

NRC Region III

February 21, 2001

# Kewaunee Nuclear Power Plant Steam Generator Replacement

# NMC Commitment to SGR

by Mark Reddemann

# Introductory Remarks

## Presentation Agenda

NMC Commitment to SGR	Mark Reddemann, Site VP
Plant Ownership of SGR	Kyle Hoops, Plant Manager
Project Overview	Jeff Jensen, Project Manager
SG Design Change	George Bieberbach, SG Design
RSG Safety Analysis	John Holly, Engineering
RSG Supply and Safe End Weld	Guy Holmes, Fabrication
RSG Installation	Kim Hull, Installation Manager
RP and OSG Disposal	Brad Gauger, Radiation Protection
Quality Assurance	Brian Koehler, QA Manager
Closing Remarks	Mark Reddemann, Site VP
Questions and Discussion	

# Plant Ownership of SGR

by Kyle Hoops

# Integration of Plant and SGR

- Key Lesson Learned
- Success Built on Uniform Site Purpose

# Integration of Plant and SGR

- SGR Team Reports to Plant Manager
- Integrated SGR Outage Schedule
- Dedicated KNPP Shift Manager to SGR Planning
- Integrated KNPP and Bechtel Processes

# SGR Project Overview

by Jeff Jensen



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# SGRP Team Leaders

## KNPP

Project Management

Contract Management

Safety Analysis

OSG Disposal

Radiation Protection

Design Change Process

Quality Programs

## Industry SGR Experts

RSG Design

RSG Fabrication

RSG Installation

Quality Programs

Welding Oversight

Licensing



# SGR Project Work Breakdown

Westinghouse

RSG Design, Licensing & Safety  
Analysis

Ansaldo

RSG Fabrication

Bechtel

RSG Installation

Duratek

OSG Disposal

KNPP

Project Management  
Design Change Process  
Non-LOCA Analysis  
Contract Mgmt  
Radiation Protection  
Licensing  
QA & QC  
Resolution of Non-Conformances

# SGR Project Goals

- Maximize Personnel Safety
- First Time Quality
- Minimize Radiation Exposure
- Minimize SGR Outage Duration

# SGR Project Strategy

- Use Industry Lessons Learned
- Ensure KNPP Retains Knowledge of SGRP

# SGR Project Readiness

- Readiness is the assurance that the strategy can be followed to achieve SGRP goals & objectives
  - Team Development
  - Employ Industry Expertise
  - Independent Assessment
  - Site Access Plan

# AFW Pump Lessons Learned

## Suction Strainer Non-Conformance

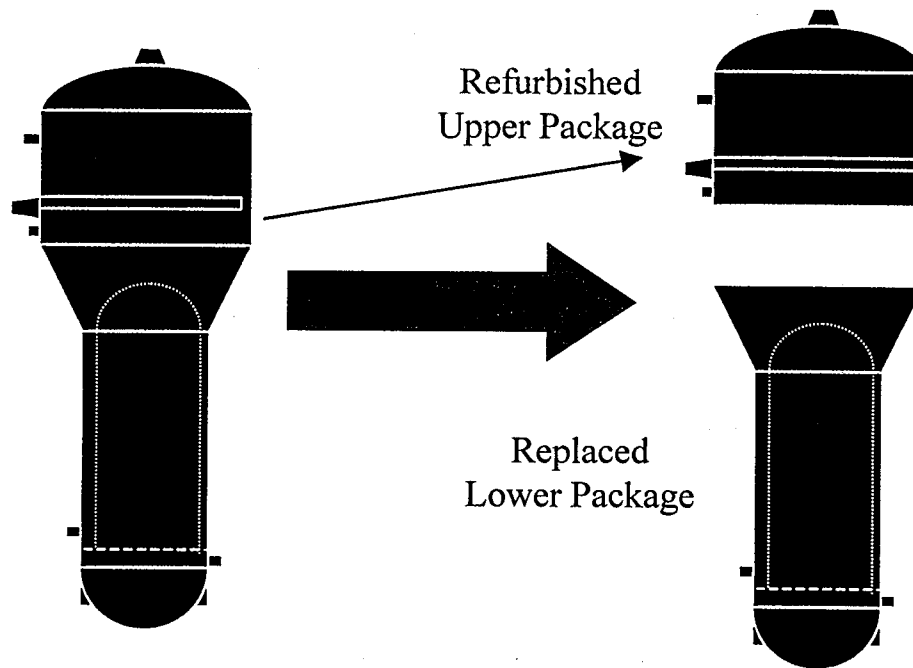
- Configuration Control
- Receipt Inspection
- Questioning Attitude



# Replacement SG Design Change

by George Bieberbach

# Replacement Steam Generator Design Change Summary



**Original SG  
Model 51**

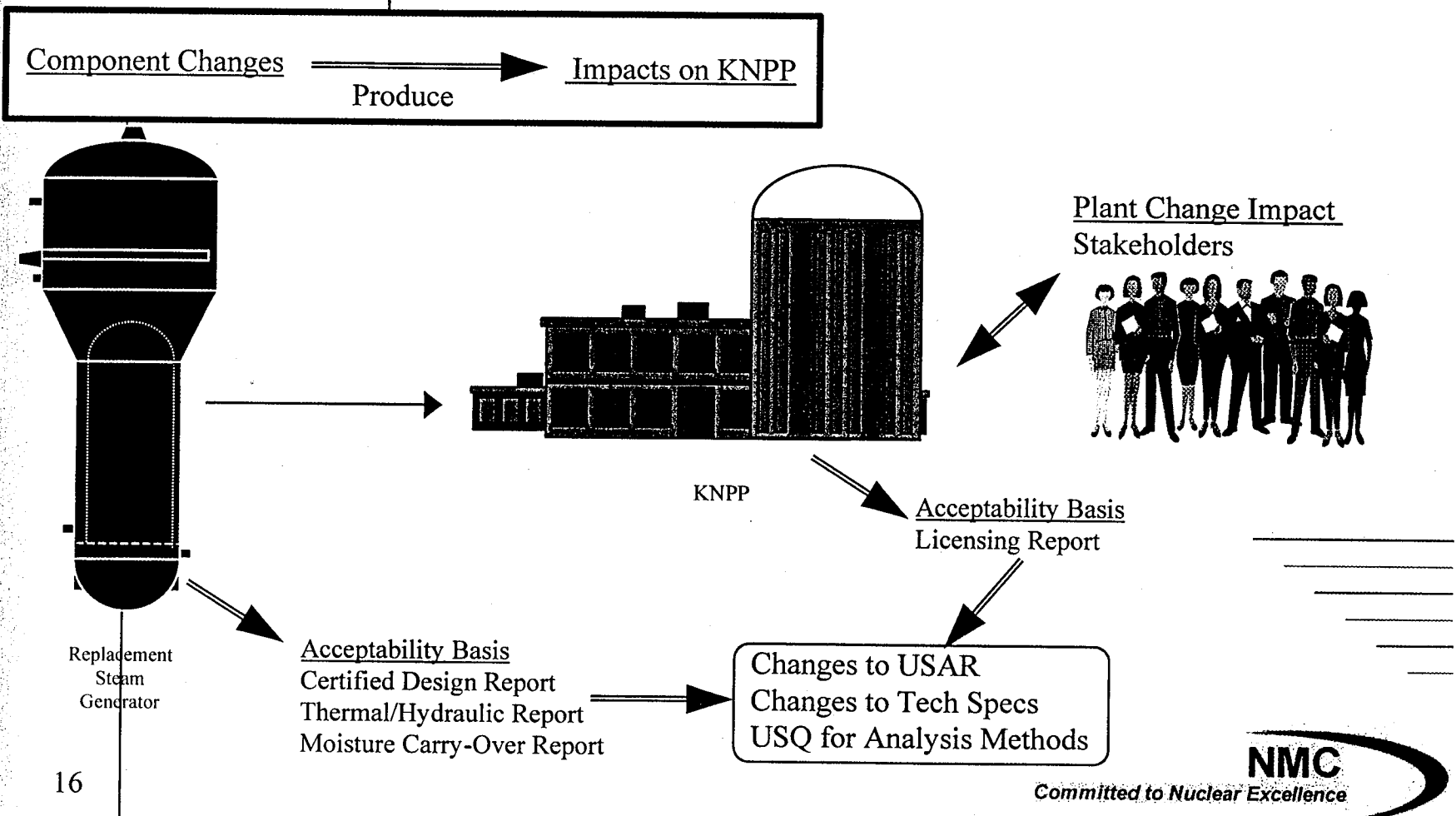
**Replacement SG  
Model 54F**

## Key Improvements

Steam Flow Limiter  
Separator Mods  
Feedwater Ring

Alloy 690 Tubes  
Stainless Support Plates  
Hydraulic Tube Expansion  
3 Sets of U-bend Supports

# Replacement Steam Generator Design Change Overview





# Replacement Steam Generator Design Key Changes/Resulting Plant Impacts

## Plant Operation Impacts are Minimal

### Change

Primary Loop Flow Rate Increase (+6%)

Primary Volume/Mass Change(+3%)

Secondary Volume/Mass Change (-2%)

Circulation Ratio(2.71 to 4.28)

Constant Water Level Program

### Impact

None, remains below MDF

} Only minor changes  
during load changes

Minor simplification

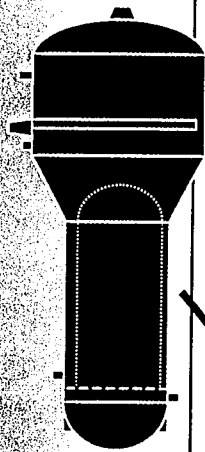
These changes have been fully evaluated and all results are within acceptance criteria

# 10CFR 50.59

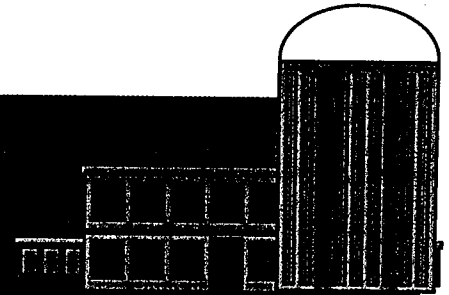
10 Safety Evaluations were Completed for Mod 1  
to Assure Sufficient Evaluation Detail

-Overall

- Materials
- Design Feature
- Thermal Hydraulic
- Component/Structural
- Analysis Methods
- Non LOCA
- LOCA
- Radiological
- Systems/Components



# NRC Submittals



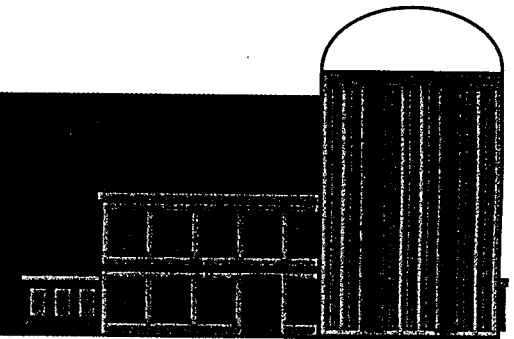
## ■ Tech Spec Changes

- TS 3.1.d.2 - RCS Min Flow Rate → Returned to Zero Plugging Value
  - TS 3.10.m - Primary to Secondary Leak Rate → Reduced from 500gpd to 150gpd
  - TS 5.1 - Site → Previous Owner, deleted
  - Steam Generator Tube Repair
  - Support Plate and Tubesheet Crevice Plugging Criteria
  - Voltage Based TSP Repair Criteria
- Eliminated, not applicable to RSG Design

## ■ USQ

- RETRAN3D
- GOTHIC

# RSG Design Change



## Summary/Conclusions

- ◆ In terms of plant operations, there are only minor impacts
- ◆ All changes and their impact on the plant have been reviewed and assessed
- ◆ Mod 1 was divided into 10 Safety Evaluations to assure thoroughness and completeness.
- ◆ There are only a few required Tech Spec changes caused by the RSG

# RSG Safety Analysis

by John Holly

# Analysis Scope

- Design Basis Accidents, NSSS
- Split between Westinghouse and KNPP
- KNPP Scope
  - USAR Chapter 14 Non-LOCA Accidents
  - MSLB Accident inside and outside containment
  - LTOP Analysis

# Analysis Scope

- Westinghouse Scope
  - USAR Chapter 14 LOCA
    - ✦ Large Break LOCA
    - ✦ Small Break LOCA
    - ✦ LOCA containment response
    - ✦ LOCA hydraulic forces
  - NSSS components/systems/controls
  - RCS Loop piping & support systems
  - Radiological
  - RSG Component T/H and Structural

# Analysis Methods

- Consistent Methods for Analyses
- Upgrade to Methodology
  - RETRAN 3D and GOTHIC
- KNPP Experts Used
  - Ensured accurate analysis inputs
  - Reviewed results/licensing report



# Unchanged Analysis Inputs

- Reactor Core Physics Parameters
- Reactor Power Level
- Reactor Temperature
- Fuel Design
- Engineered Safeguards Systems
- Plant Setpoints

# Changed Analysis Inputs

- RSG Component Design and Performance
- NSSS Thermal Hydraulics
  - ✦ e.g., RCS flow, 10% SGTP
- SG Programmed Level vs. Power
  - Constant at 44%
- SG Outlet Nozzle Flow Restrictor

# Summary and Conclusions

- SGR Change was Analyzed
  - Design Basis Accidents/Transients and NSSS
  - All Acceptance Criteria are Satisfied
  - Verified plant operation within design and licensing basis
- KNPP is Positioned for the Future
- Plant Change was Minimized

# Replacement SG Supply

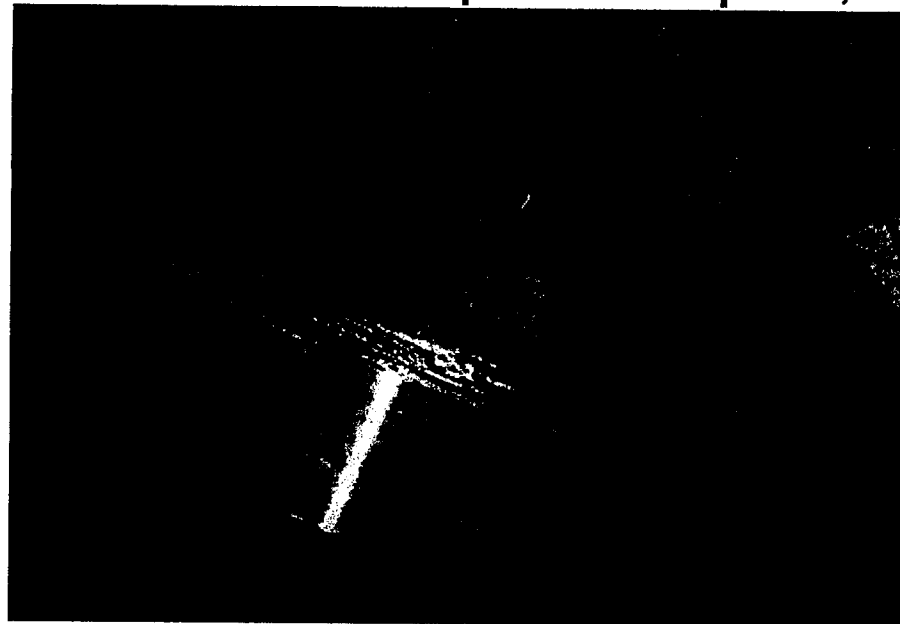
by Guy Holmes

# RSG Manufacturing / Design Scope Split

- Westinghouse- Design and Engineering - Model 54F
- Ansaldo - Manufacturing and Procurement
- KNPP - Configuration Control, Surveillance of Manufacturing

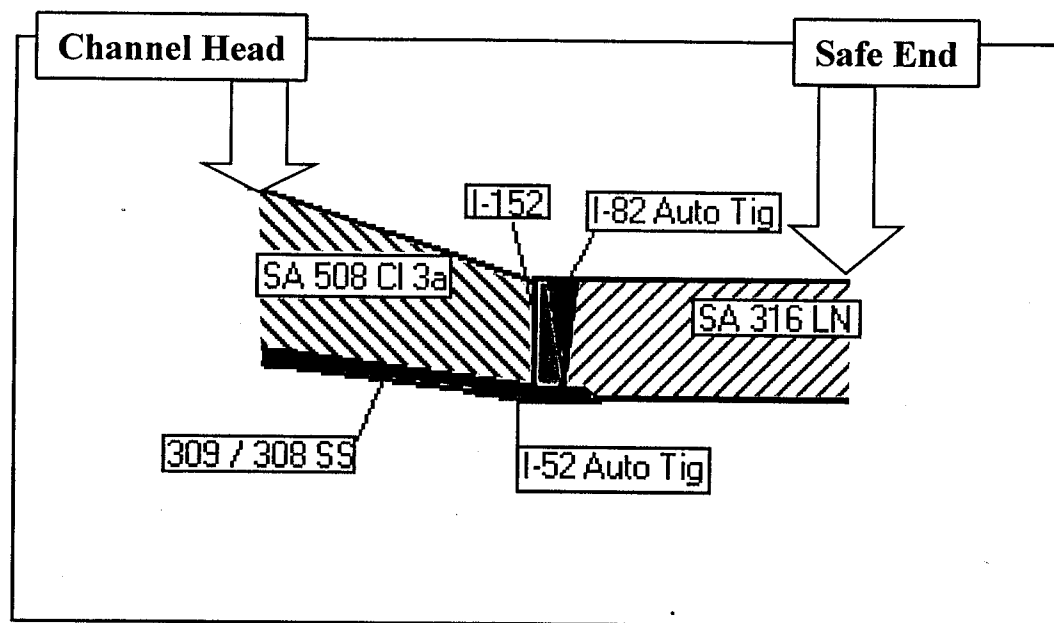
# RSG Safe End Welds

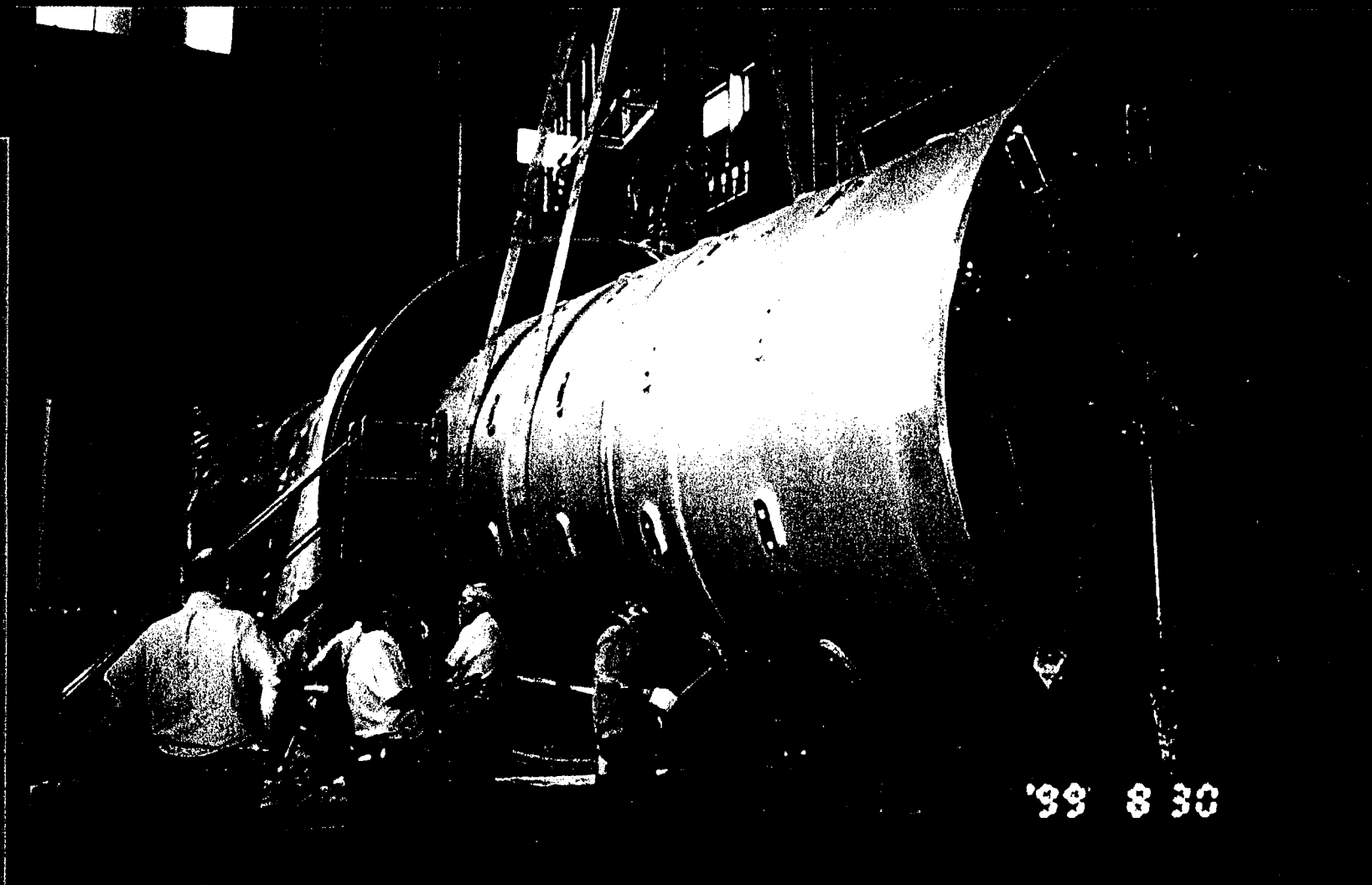
- Welds on RSG
  - Passed ASME III RT
  - One Weld required repair, ASME XI UT



# RSG Safe End Weld Resolution

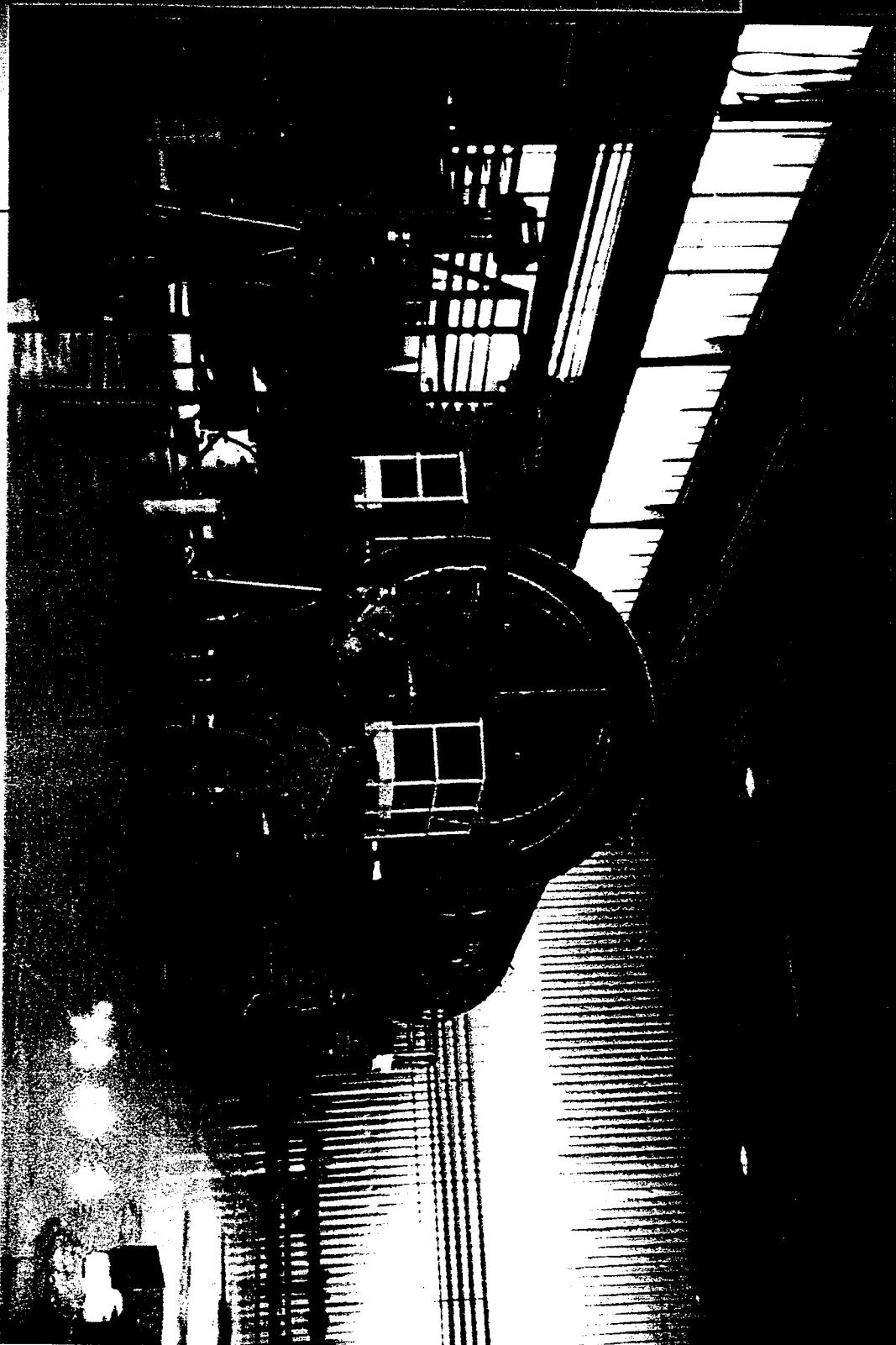
- Weld will be performed on site by PCI





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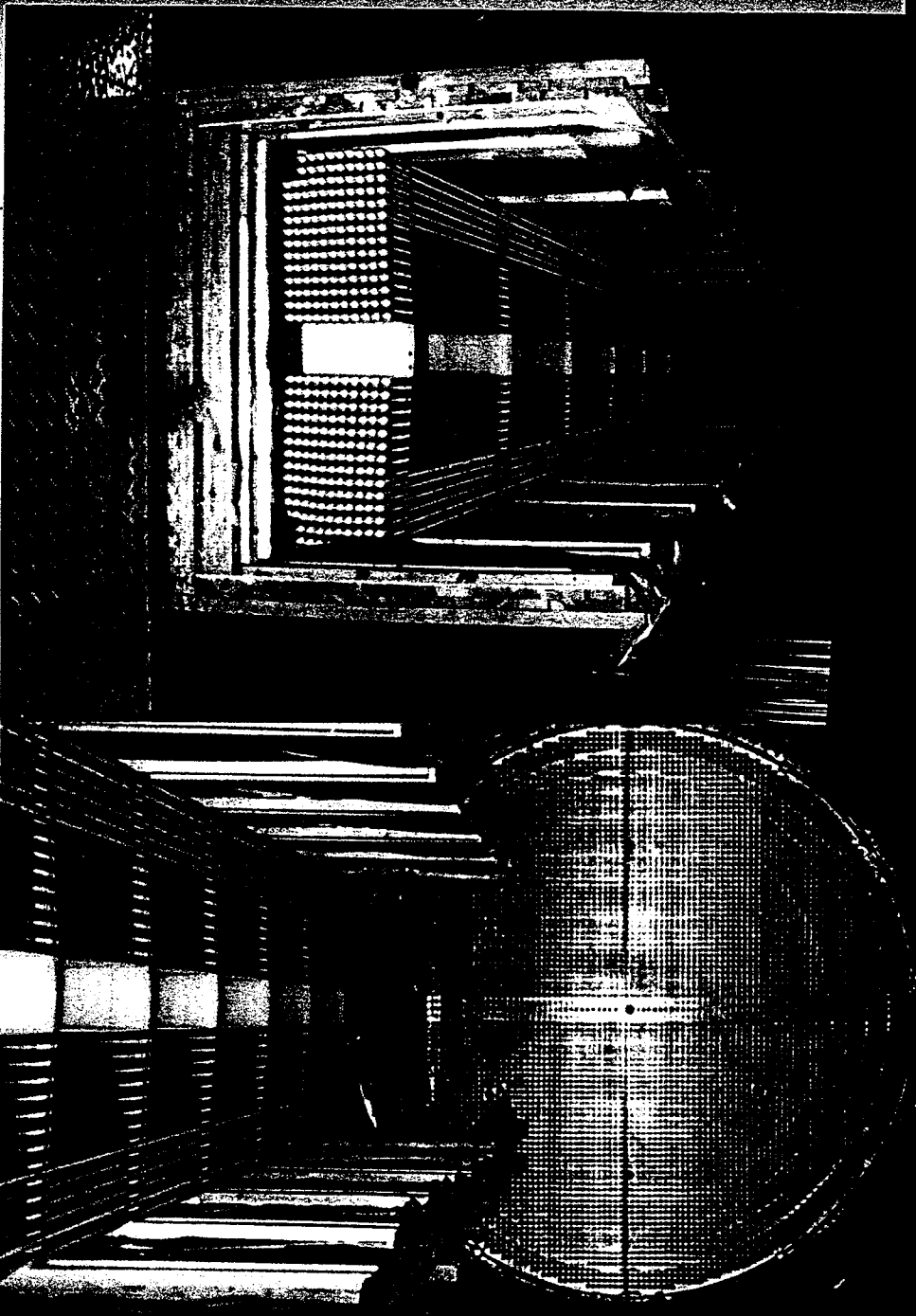
## Tube Support Plate Insertion

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**NMIC**

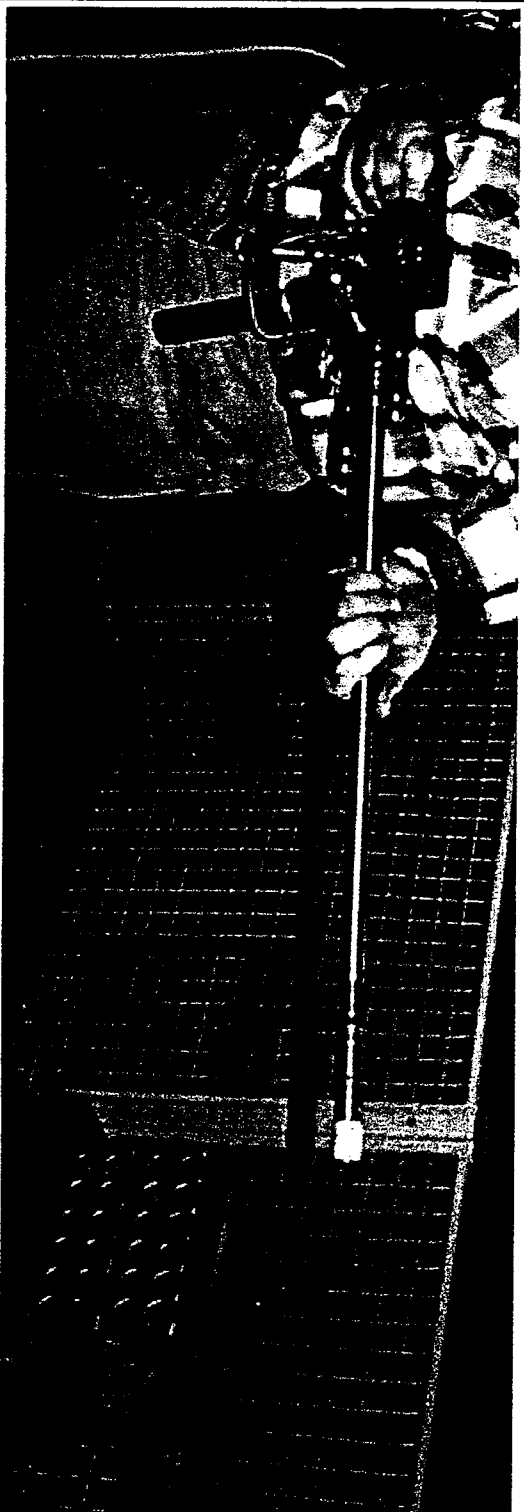
RSG Tubing

Tube Insertion





**Tack Expander**



**Hydraulic Expander**

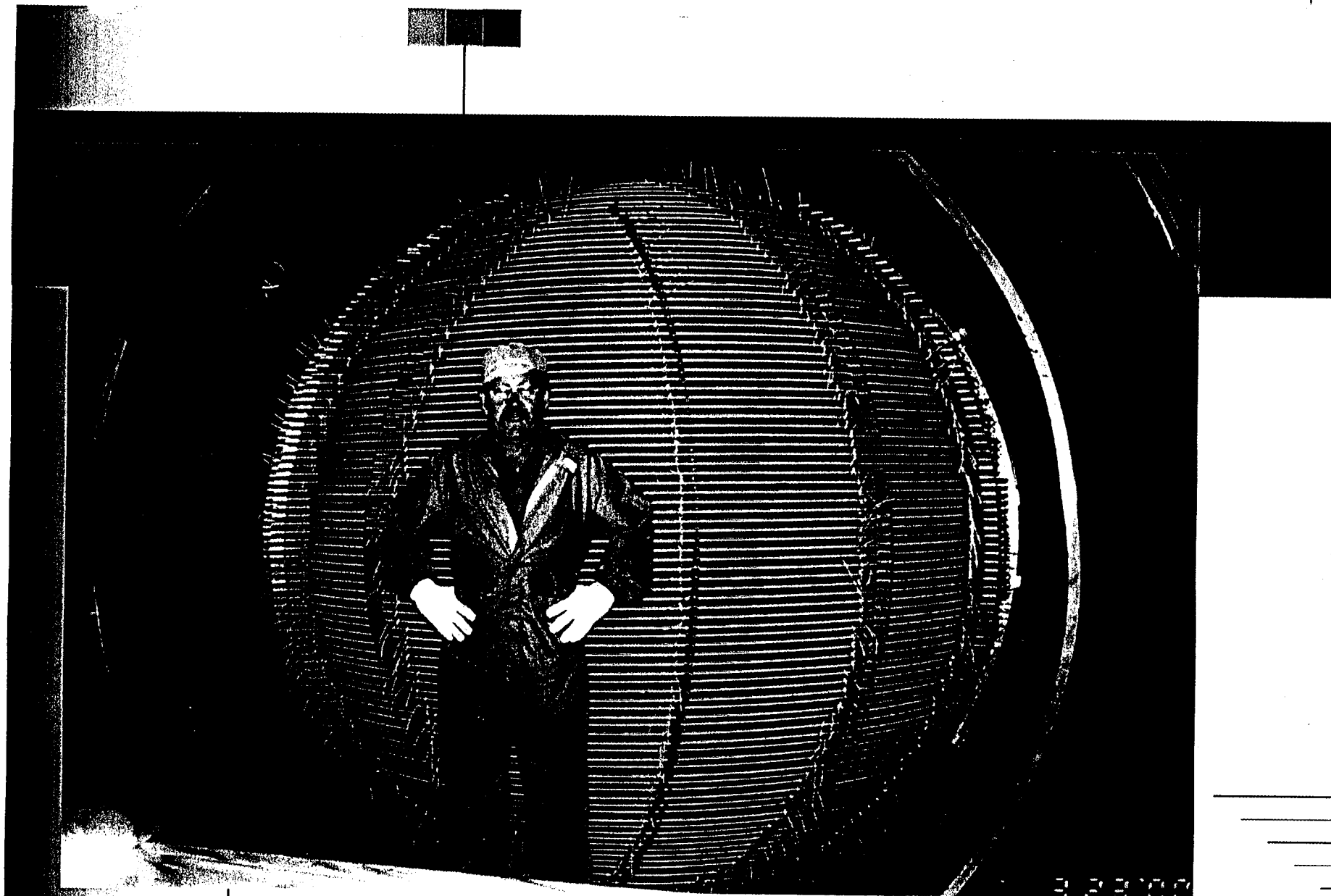


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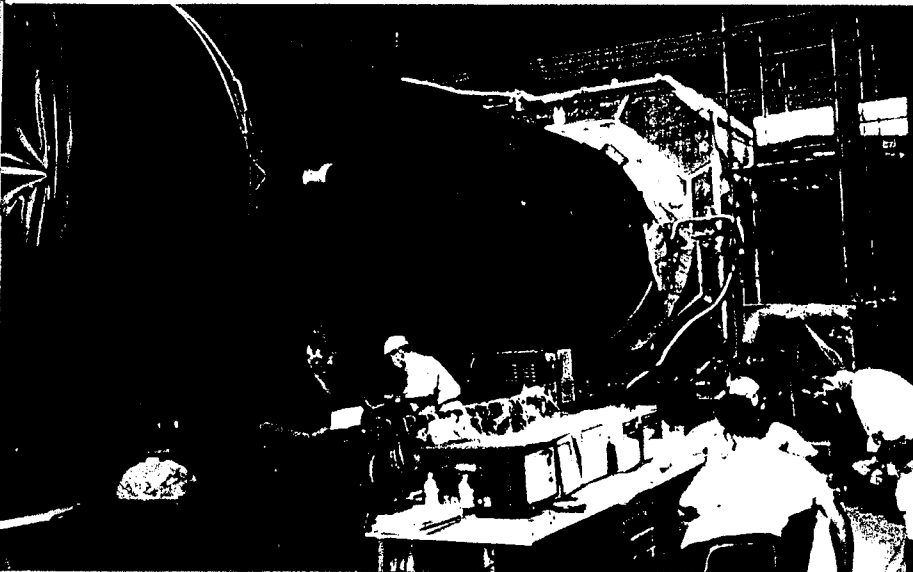
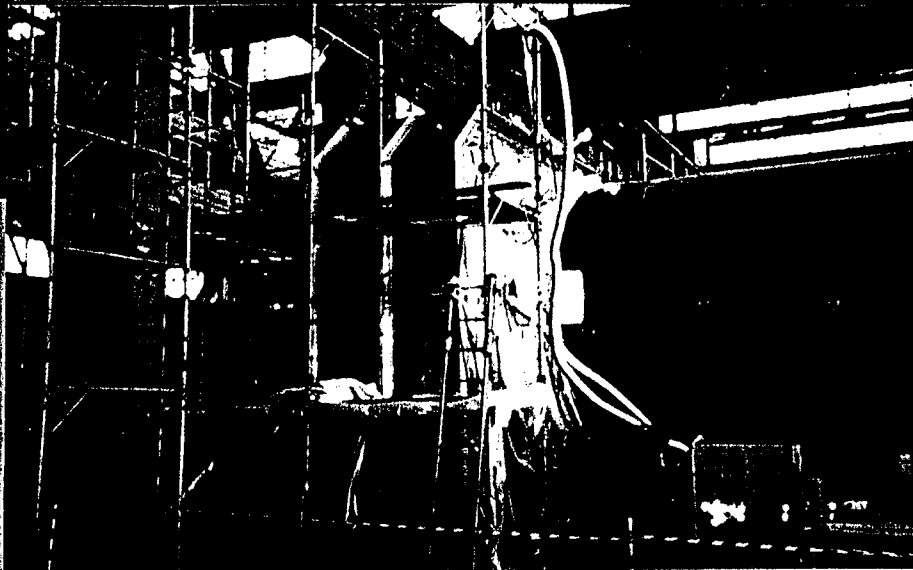
**Tube End Welds**

**Tube End Welding**

**NMC**  
*Committed to Nuclear Excellence*



AVBs Installed. End Caps ready to Weld to Retaining Rings.



Channel Head to

Tube Sheet Weld

Post Weld Heat Treatment



## Unloading From Ship in Port of Kewaunee

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**NMCC**



# RSG Installation

by Kim Hull



# Outside Railway System - 1971



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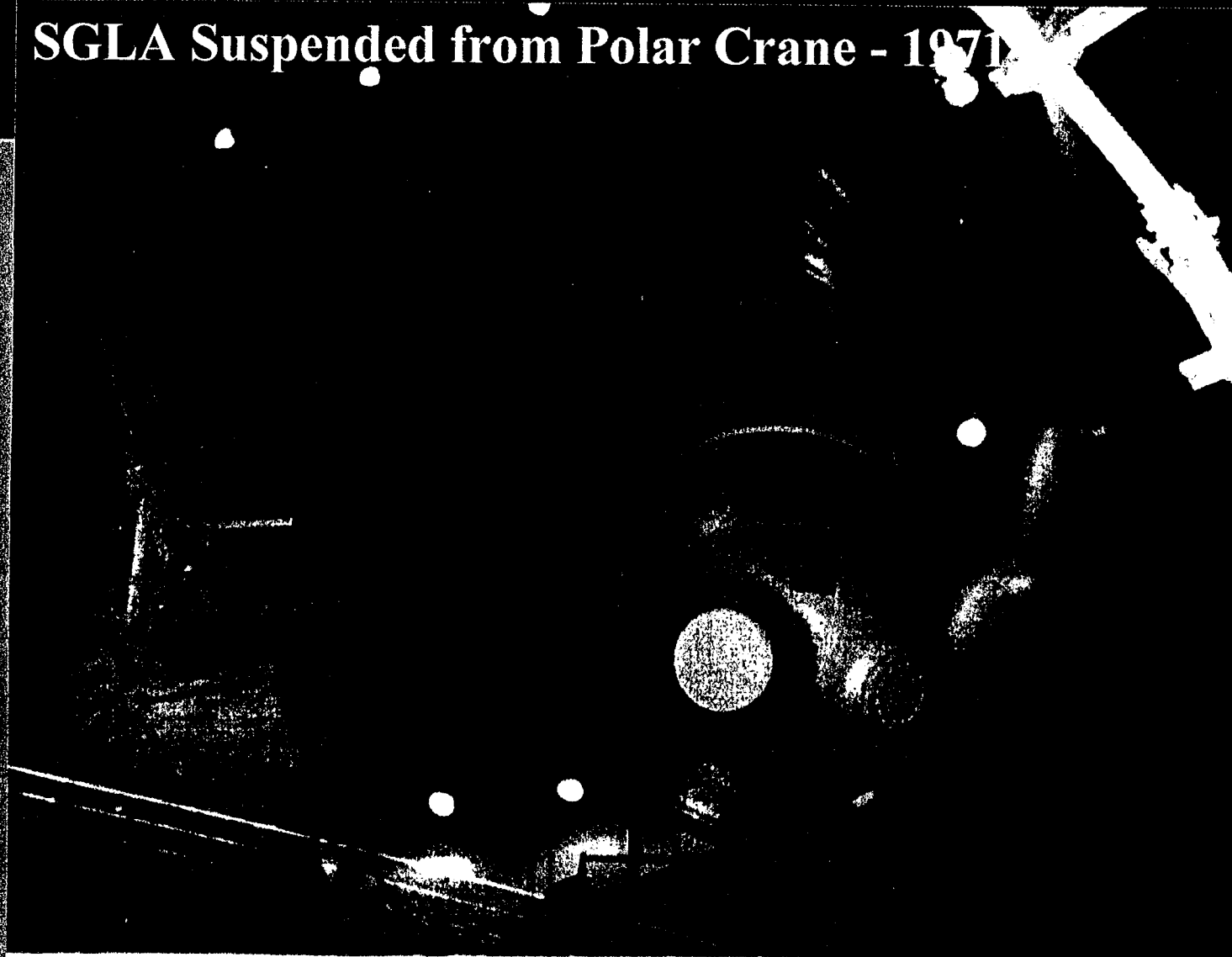
Committed to Nuclear Excellence

**NIMC**

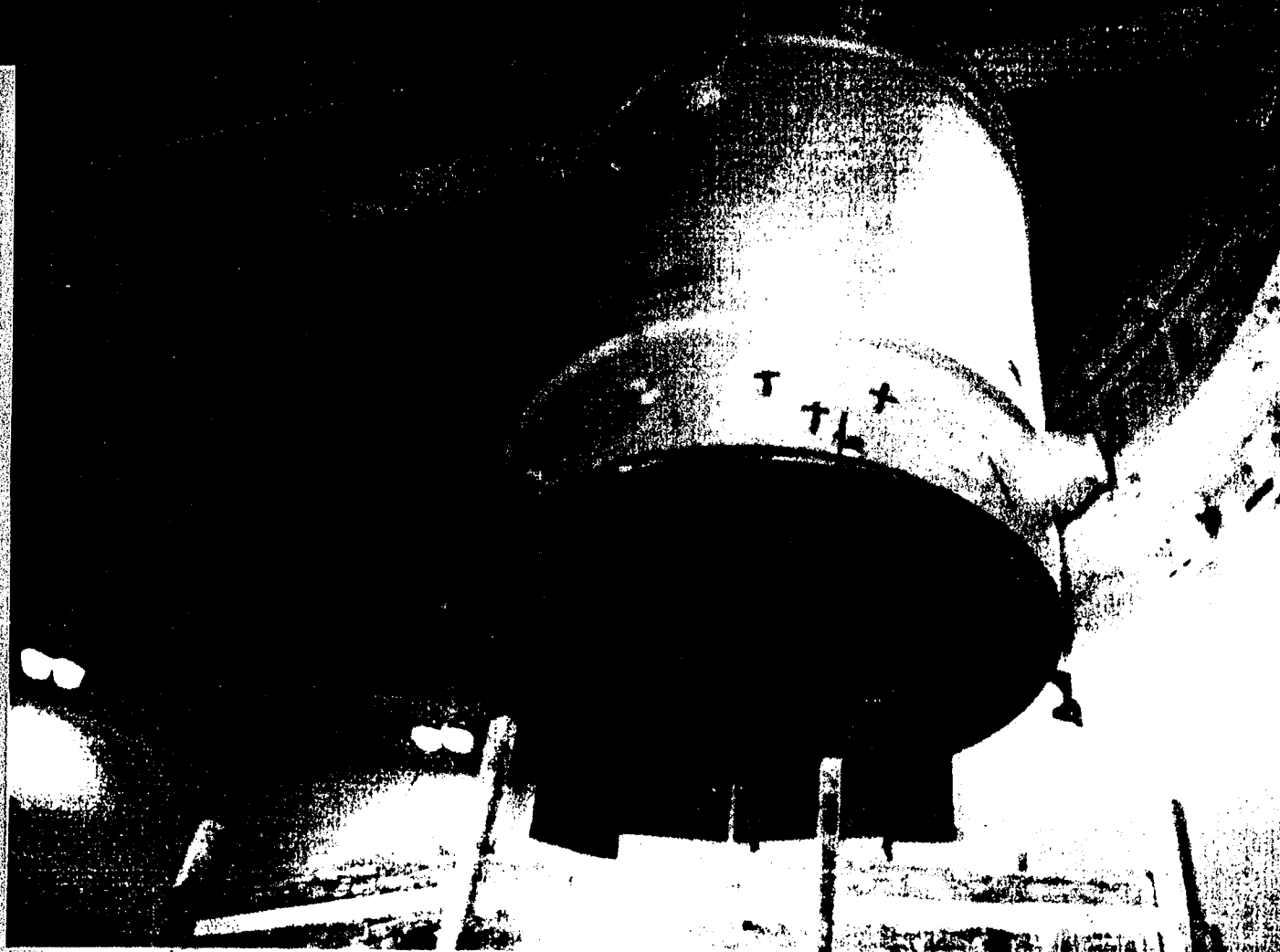
# Advanced Equipment Hatch - 1971



## SGLA Suspended from Polar Crane - 1971



## Steam Dome Suspended from Polar Crane - 1971



# SGR Welding

- Welding in RSGs
  - Lessons Learned
  - Welder training & certification
  - Weld material and process control
- KNPP Control of Welding
  - Ownership
  - Review
  - Oversight

# Installation Conclusions

## ■ Summary

- Replacement Similar to Original
- Rigorous Control of Welding



# Radiation Protection

by Brad Gauger

# Radiation Protection Process Control

- KNPP Control of Radiation Protection
  - Expanded Organization under KNPP
  - Rad Pro Plan & Interface Plan
  - Using KNPP Procedures
  - Detailed ALARA Plans for critical work



# New Facilities Planned

- Augmented Access Control Facility
  - CAF (containment access facility)
- New Decontamination Facility

# ALARA - Plan Early

- Approximately 57,000 lbs of Lead Shielding
- Closed Circuit TV
- Pipe End Decon and Shielding
- SG Secondary Water Level
- RP Training with Mockups

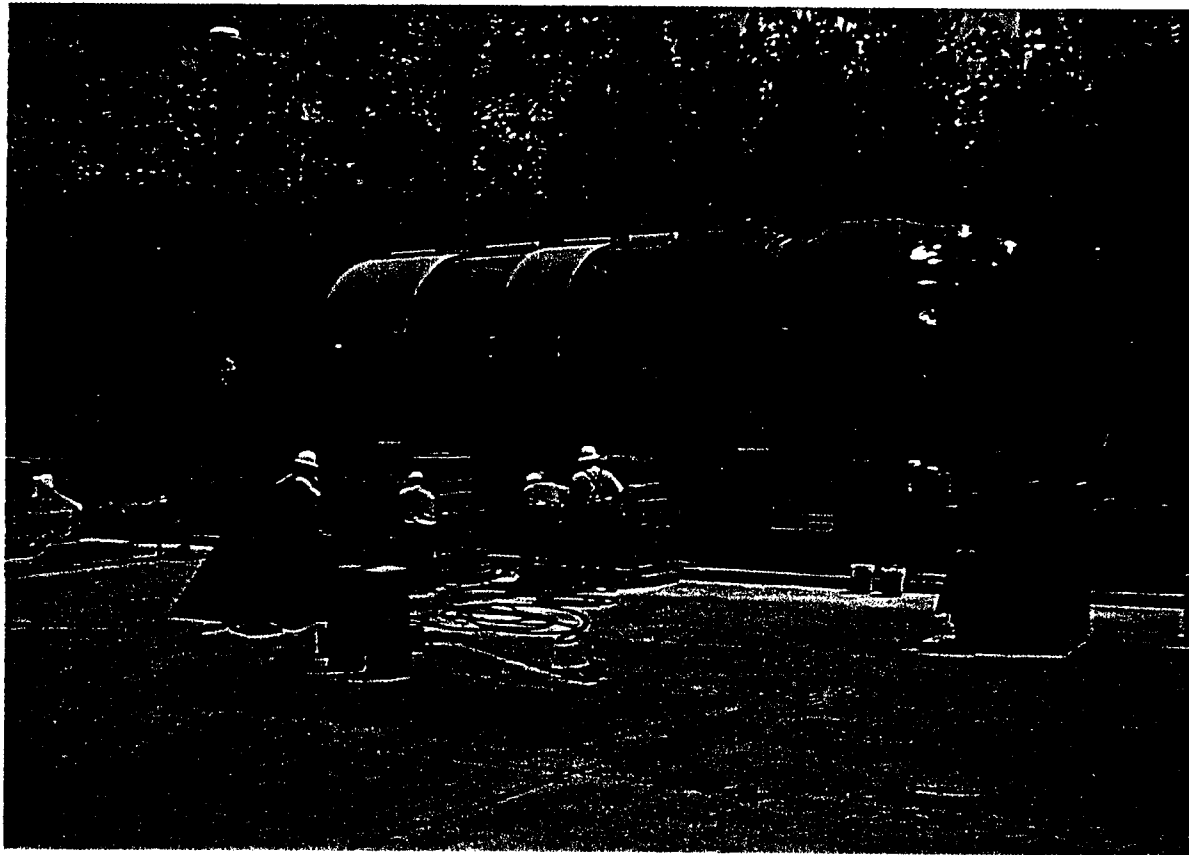
# Significant RP Challenges

- Radiography
- RCS Pipe Cut and Decon
- Moving Original Steam Generators
- Increase in Personnel - Doubling of Site Staff

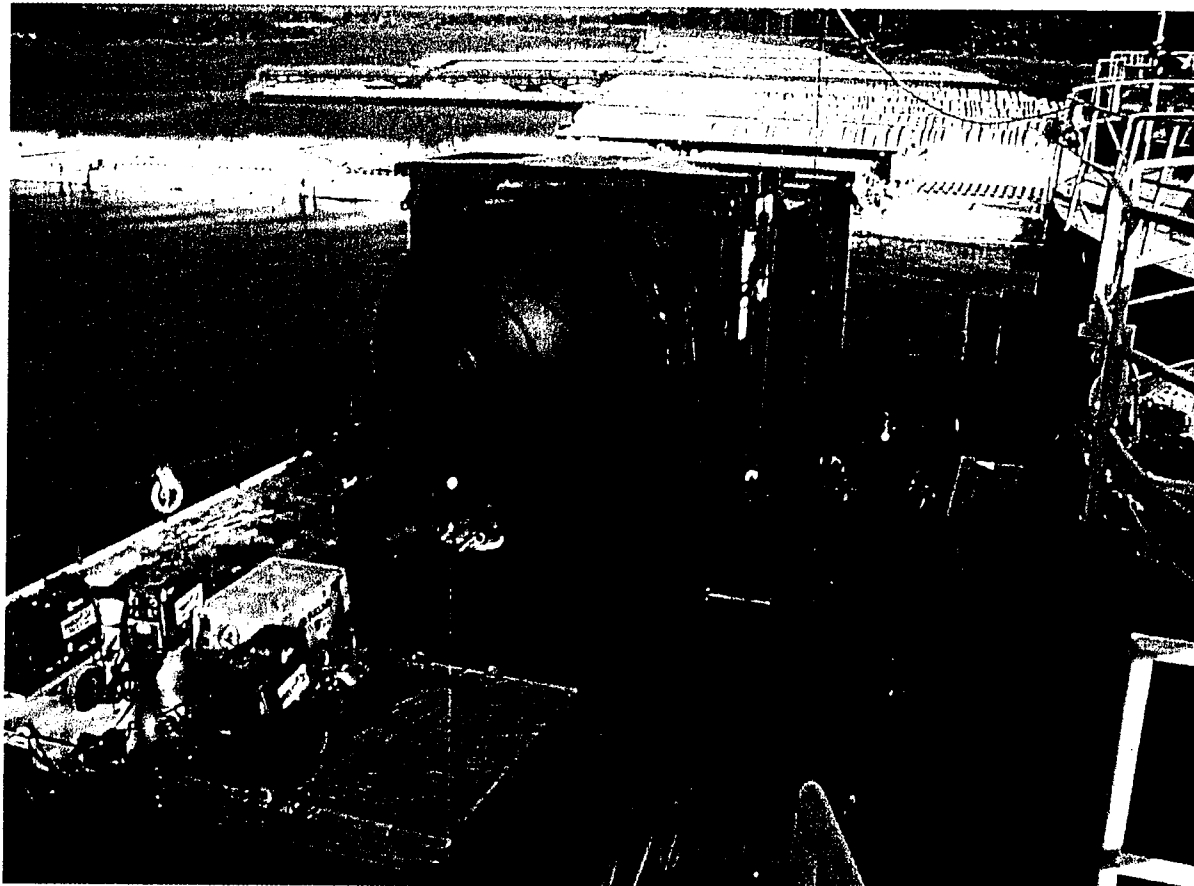
# Original Steam Generator (OSG) Disposal

- Duratek
  - Performs work under contract
- Move OSGs
  - KNPP to Port by Transporter
  - Kewaunee to Memphis by Barge
  - Port to Duratek by Transporter

# DC Cook To Barnwell, SC



# Maine Yankee to Duratek in Memphis, TN



# Original Steam Generator (OSG) Disposal (cont.)

- KNPP Similar to Maine Yankee
  - NRC Generic Letter 96-07
  - 49 CFR 173.403 Exemption
    - ✦ surface contamination demonstration
  - 49 CFR 173.427(b)(1) Exemption
    - ✦ packaging requirements

# Original Steam Generator (OSG) Disposal (cont.)

- Duratek will:
  - Decontaminate
    - ✦ SIVAblast Grit
  - Divide OSG into Sections
  - Metal Melt
    - ✦ Shielding Blocks
  - Free Release of Clean Metal





# Quality Assurance

by Brian Koehler

# General

- Quality Oversight
  - Early in project
  - Dedicated QA staff
- Specific QA Plan for SGRP

# Westinghouse Design & Licensing

- Vendor Evaluation
- Audits & Surveillances
  - Pensacola - RSG Design
  - Monroeville - Licensing and Safety Analysis
  - Waltz Mills - Steam Dome Design
- Technical Specialists Used

# Ansaldo - Fabrication in Milan

- Vendor Selection
- Supplier Qualification - 1996
  - Joint Utility Audit (APS and BG&E)
- Re-Evaluation Audit - 1999
  - APS lead
- Fabrication at Ansaldo
  - Including major sub-suppliers

# Bechtel - Frederick, MD

- Supplier Audit Evaluation (initial)
- NUPIC Audit - 1999
  - KNPP Lead on Joint Utility Effort
- Surveillances
  - Bechtel and Sub-suppliers
    - ✦ Westinghouse, Colonial Machine

# KNPP Site

- Internal Audit of SGRP
- Document Control Audit
- ECT Surveillance
- Safe-End Surveillance at PCI
- Readiness Review (Planned)
- SGRP Surveillances (on-going)

# Closing Remarks

by Mark Reddemann

- NMC Committed to SGRP
- Operating Plant Integrated with SGR
- SGR Project Focused on Excellence
- Questions and Discussion