Sequoyah Nuclear Plant

Plant Performance

TVA/NRC Meeting

Region II, Atlanta Ga.

May 7, 2001

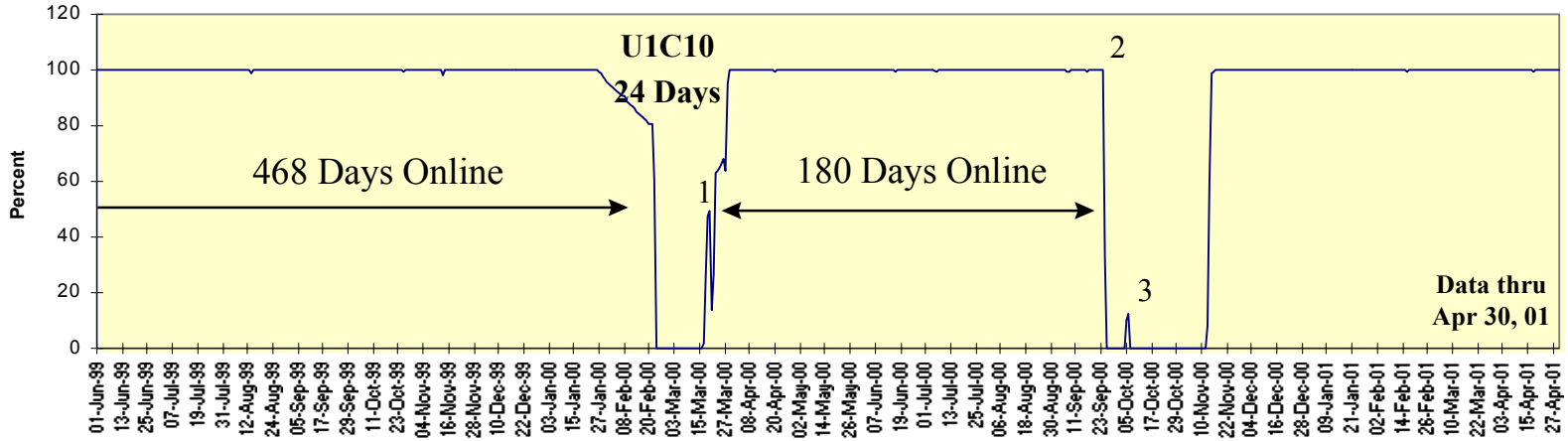
Agenda

• Introduction	R. T. Purcell
• Plant Performance	D. L. Koehl
• Site Focus Areas	M. J. Lorek
• Performance Indicators	P. Salas
• Plant Refueling Outages	N. A. Welch
• Long-Term Projects	J. Valente
• Conclusion	R. T. Purcell

Introduction

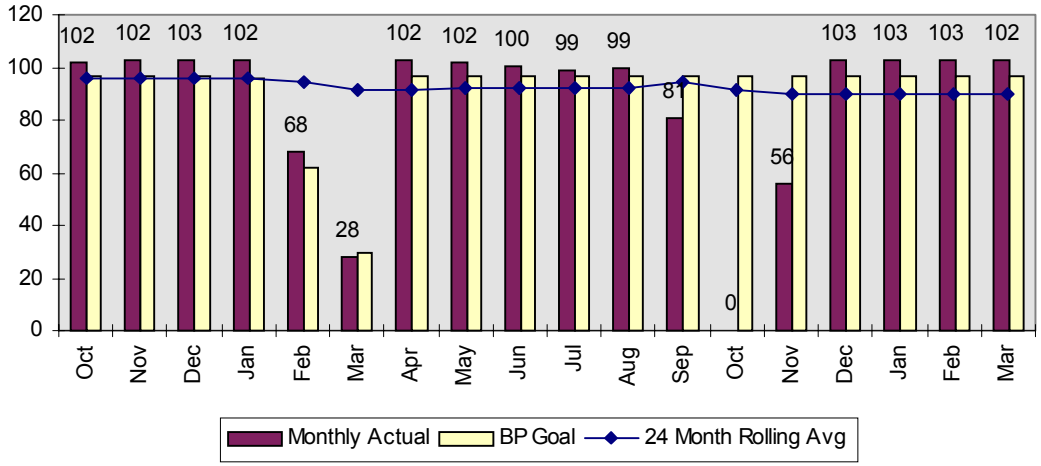
Plant Performance Unit 1

Daily Rx Power Level Averages



1. 3/21/00 - 0440, Loss of Excitation Field on Main Generator.
2. 9/25/00 - 1033, Reactor Tripped Due to MFP Oil Pump Failure.
3. 10/6/00 - 0659, Unit 1 Removed From Service Due to Vibration on RCP #4.

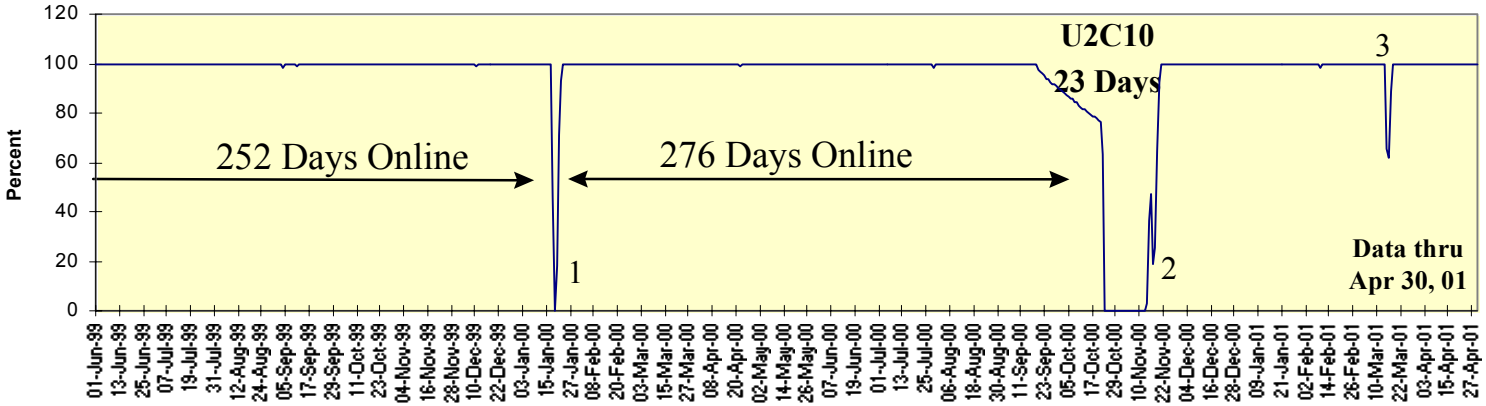
Net Capacity Factor (Maximum Dependable Capacity)



Koehl

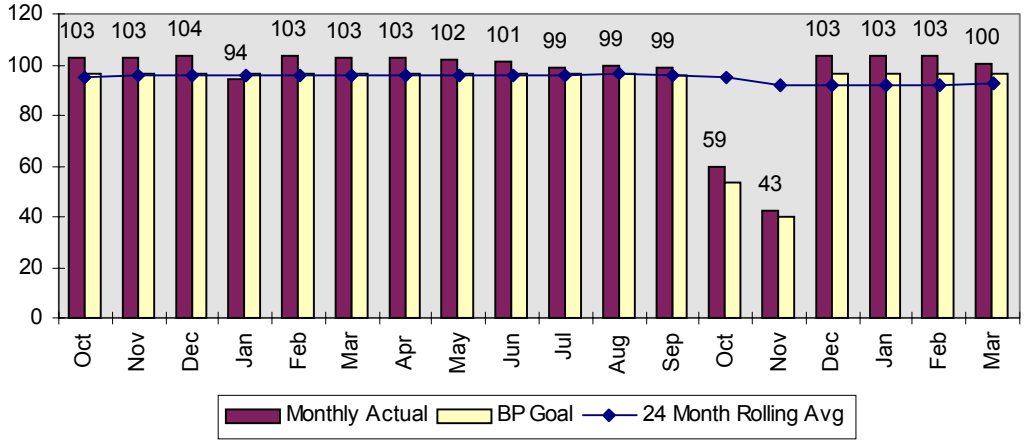
Plant Performance Unit 2

Daily Rx Power Level Averages



1. 1/18/2000 - 1051 - Unit Trip as a Result of Loss of 2-IV Vital Inverter.
2. 11/17/2000 - 0842 - Unplanned Automatic Scram From 50% Power due to Main Transformer Bushing Failure
3. 03/15/2001 - 0441 - Planned Power Reduction to 55% Power for Removal & Repair of Both MFPs

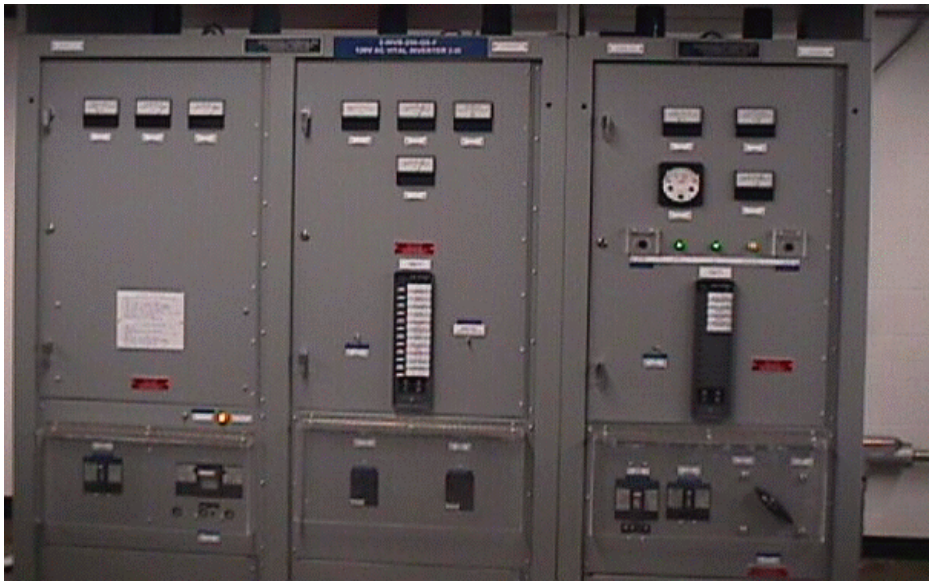
Net Capacity Factor (Maximum Dependable Capacity)



Koehl

Plant Performance

- Three Vital Inverter Challenges to the Units Since 1998
- Comprehensive Corrective Actions - Complete Inverter Replacement
  - First Inverter (Unit 2) placed in service in January 2000
  - Remaining three Unit 2 Inverters replaced during the U2C10 RFO
  - The four Unit 1 Inverters to be placed in service during U1C11 RFO
  - Four of the Original Inverters (one per channel) will remain as spares for either unit



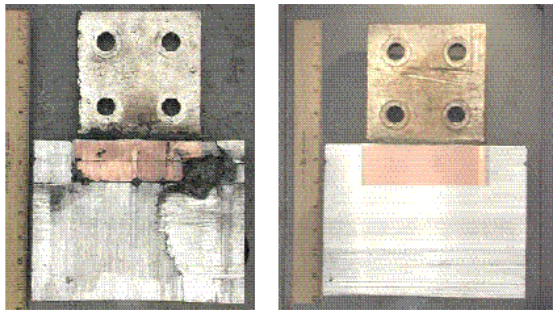
Newly Installed Inverters

Plant Performance

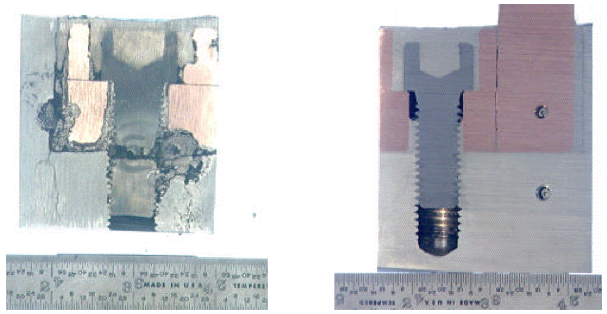
- 11/17/00 - Unit 2 Unplanned Automatic Scram from 50% Power - Main Transformer Bushing Failure
  - Bushing was cleaned and the solder on the top of the bushing was resurfaced following an over-heat condition
  - Copper/Aluminum composite bushings that experience an over-heat condition will not be reused

Failed Porcelain

Evidence of Over Heating

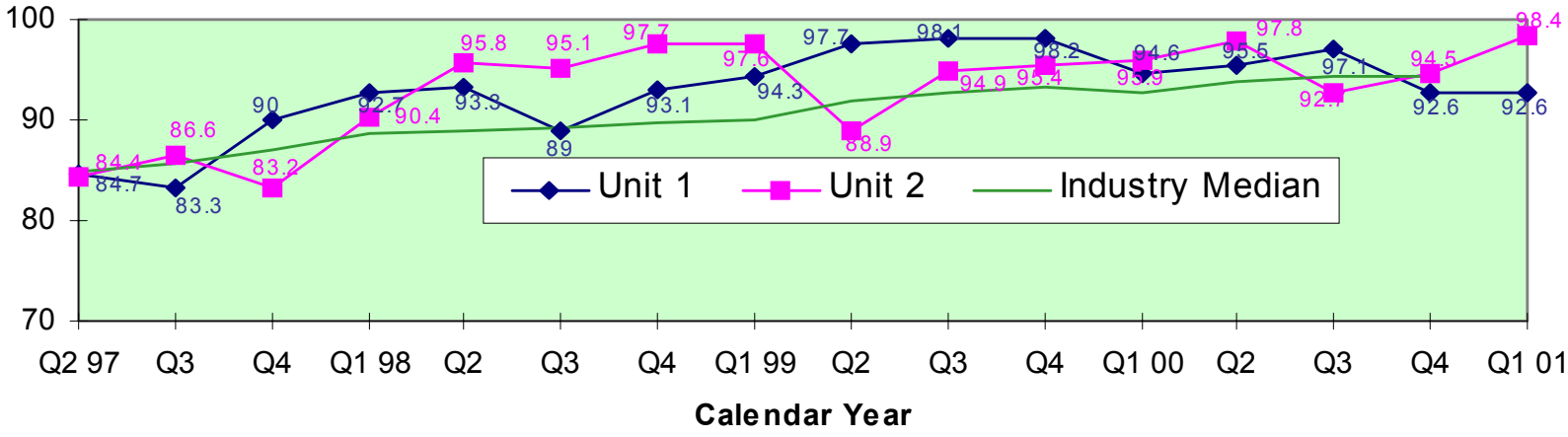


Cross sections of failed (left) and undamaged bushing components (right)



Plant Performance

INPO Performance Index



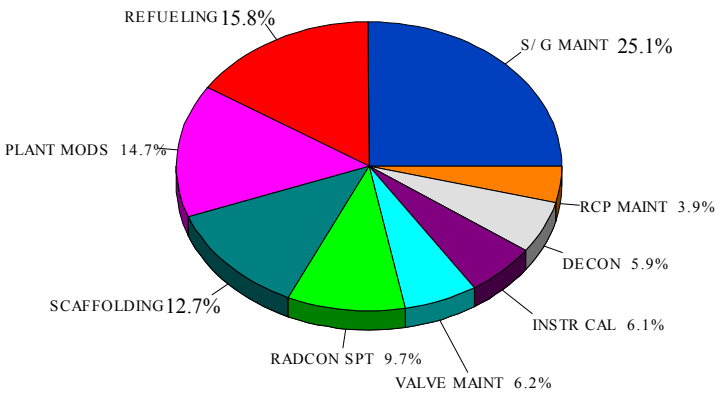
Performance Indicator	Unit 1 Actual Value	Unit 1 Weight	Unit 1 % Max	Unit 1 Product	Unit 2 Actual Value	Unit 2 Weight	Unit 2 % Max	Unit 2 Product
Unit Capability Factor (1)	89.08	16	98.2%	15.7	94.19	16	100%	16.0
Unplanned Capability Loss Factor (1)	7.34	12	51%	6.1	0.66	12	96%	11.5
Unplanned Automatic Scrams (1)	0.89	8	100%	8.0	0.84	8	100%	8.0
High Pressure Injection (1)	0.00	10	100%	10.0	0.00	10	100%	10.0
Auxiliary Feedwater (1)	0.00	10	100%	10.0	0.01	10	100%	10.0
Emergency AC System Availability (1)	0.01	10	97%	9.7	0.01	10	97%	9.7
Fuel Reliability (3)	0.00	8	100%	8.0	0.00	8	100%	8.0
Chemistry Index (2)	1.01	7	100%	7.0	1.08	7	100%	7.0
Collective Radiation Exposure (1)	117.62	8	94%	7.5	79.99	8	100%	8.0
Industrial Safety Accident Rate (2)	0.12	5	100%	5.0	0.12	5	100%	5.0
INPO Performance Index - April 2001				92.6				99.1

(1) Based on 24 Month Average
(2) Based on 12 Month Average
(3) Based on 3 Month Average

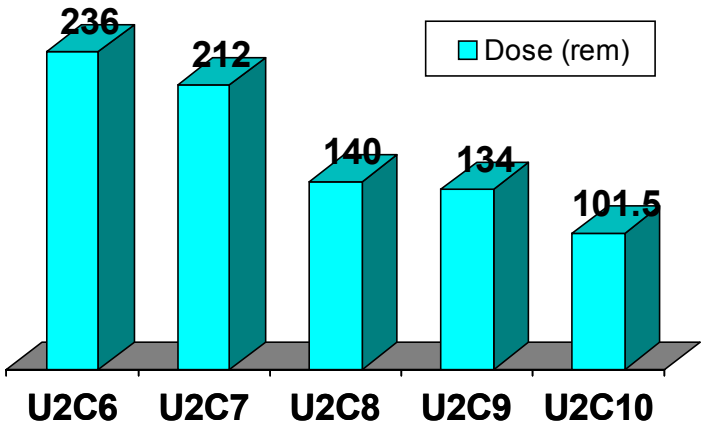
Koehl

Plant Performance

- U2C10 Dose Reduction Initiatives (32% Dose Reduction From Previous Best)
  - Formal integration of all scaffolding into the the outage schedule
  - New steam generator nozzle dams
  - Effective shutdown chemistry plan
  - New manway stud cleaning method
  - Hydrazine addition to RHR System
  - Maximized letdown after crud burst
- U1C11 Dose Reduction Initiative
  - Benchmarking ice condenser plant dose performance



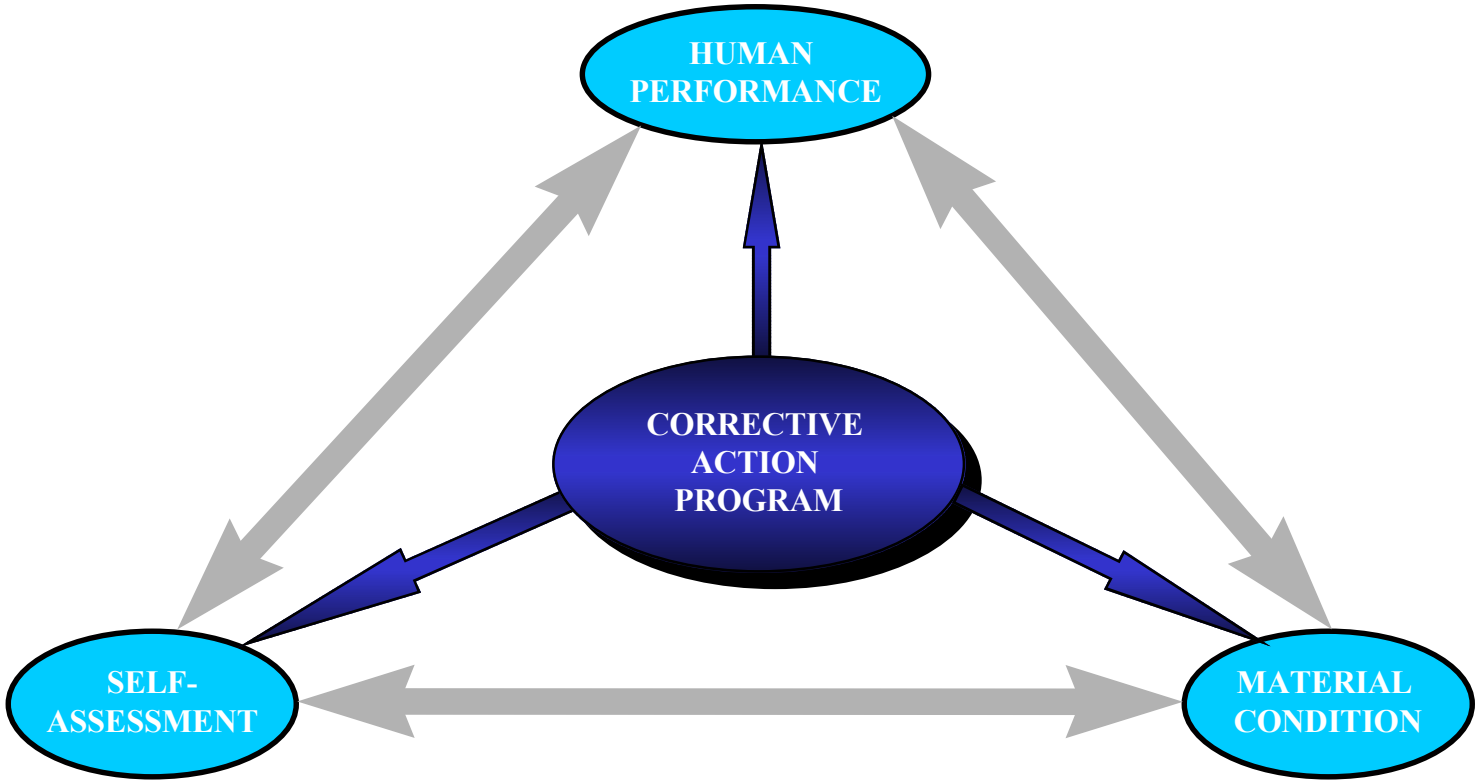
SQN U2C10 Dose



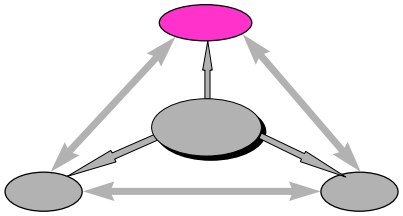
SQN U2 Outage Exposure History

Site Focus Areas

- Management Focus Areas

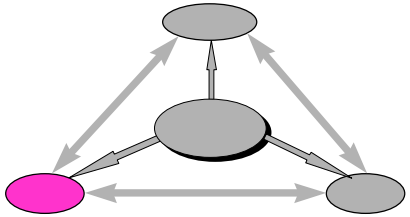


Site Focus Areas



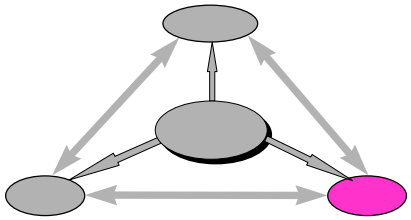
- Human Performance
  - Established a Human Performance Steering Committee chaired by the Assistant Plant Manager
  - INPO Based Human Performance Fundamentals (Error Reduction) Training
    - ✔ Training complete for subcommittee members, instructors, and CRC members
    - ✔ Training in progress for steering committee members
    - ✔ Training to be provided to site personnel by department managers (estimated to complete by end of July)
  - Improving prejob brief effectiveness
    - ✔ Standardize and simplify prejob brief checklist
    - ✔ Develop prejob brief training video
  - Subcommittee members conducting benchmarking of industry top performers in human performance
  - Conduct observation and coaching training for supervisors and managers

Site Focus Areas



- Self-Assessment/Corrective Action
  - Self-assessment program improvements
    - ✔ Use of industry peers
    - ✔ Benchmark to help achieve “industry best” performance in all areas
    - ✔ Provide periodic employee feedback on site-assessment results
  - Self-assessment of the self-assessment and corrective action programs scheduled for mid-summer with INPO participation
  - Cause analysis
    - ✔ Apparent cause training
    - ✔ Root cause training
    - ✔ Equipment root cause training
    - ✔ Use root cause experts and root cause grading checklists to ensure quality
  - Trending
    - ✔ Identification of low level precursors
    - ✔ Standardization within TVAN

Site Focus Areas

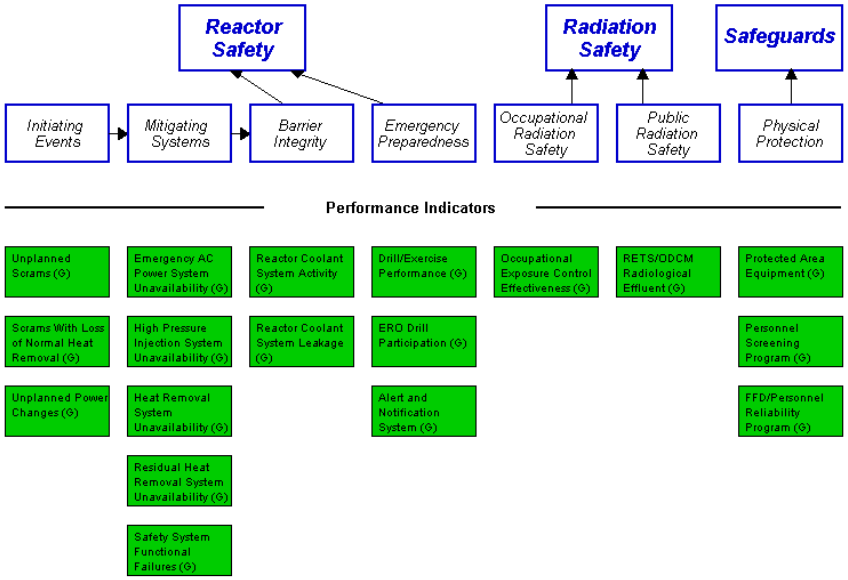


- Material Condition
  - Reliability improvement
    - ✔ AFW pump replacement
    - ✔ CCP rotating element replacement
  - Scram/power change reduction
    - ✔ Inverter replacement
    - ✔ Sudden pressure relay 2/3 logic
- System Health Windows
  - Identifies systems requiring highest attention
    - ✔ Chillers
  - Continues as an effective tool for resource allocation

Performance Indicators

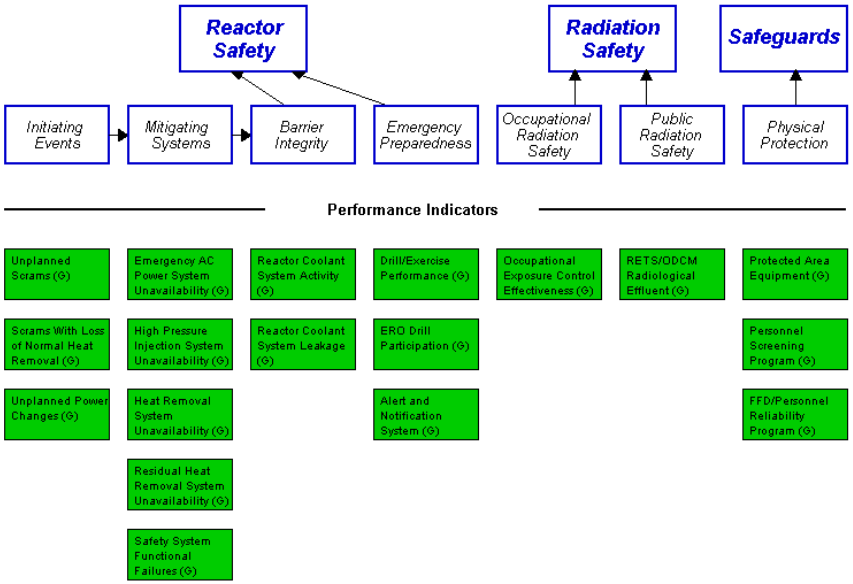
Sequoyah 1

1Q/2001 Performance Summary



Sequoyah 2

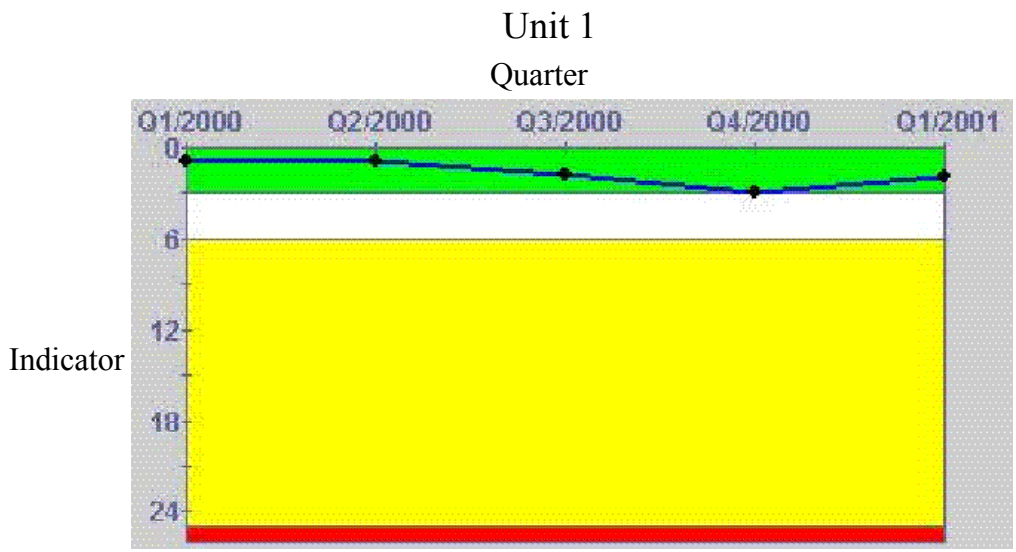
1Q/2001 Performance Summary



Salas

Performance Indicators
Initiating Events Cornerstone

- Unplanned Scrams per 7,000 Hours (4-Quarter Rolling Sum)



  - 3/21/2000 - Loss of Excitation Field on Main Generator
  - 9/25/2000 - Reactor Tripped Due to MFP Oil Pump Failure
  - 10/6/2000 - Reactor Coolant Pump Forced Outage

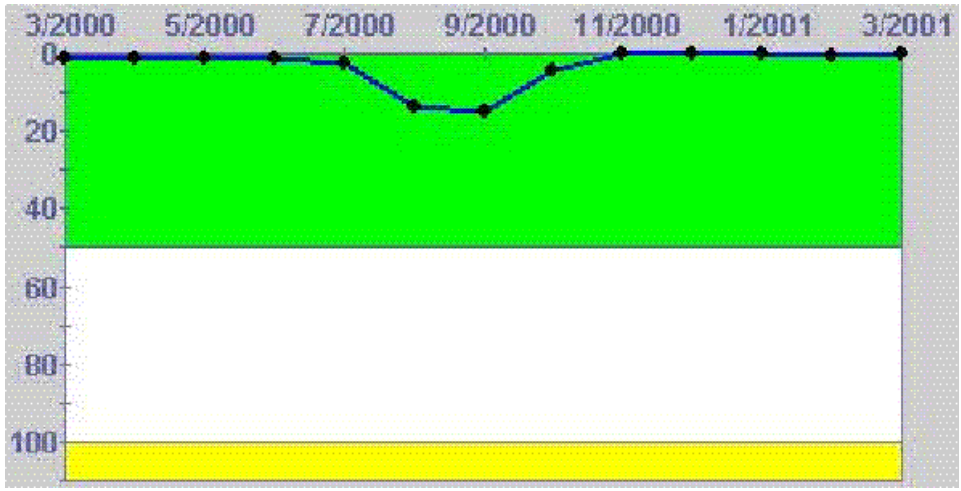
Salas

Performance Indicators
Barrier Integrity Cornerstone

- RCS Specific Activity (Monthly Maximum)
  - Increased activity due to two leaking fuel assemblies
    - ✔ Third time burned Westinghouse bundle
    - ✔ Once burned blended uranium lead test assembly

Unit 2

% Tech Spec Limit



Salas

Performance Indicators
Physical Protection Cornerstone

- Personnel Screening Program

Unit 1

Indicator

Unit 2

Indicator

Salas

Outage U2C10 Results

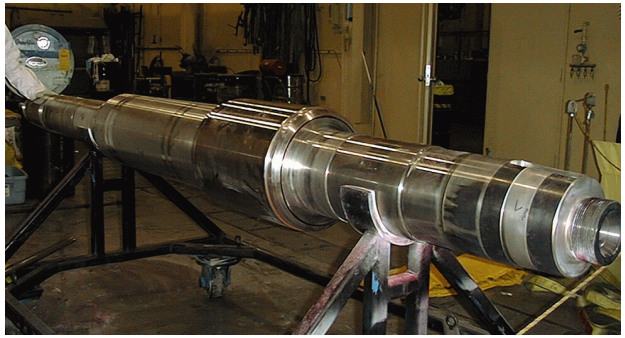
- Dual Outage Challenges
  - Conservative decision making
  - No Unit 2 work deferred
- Plant Improvements for Safety and Reliability
  - Completed 5799 scheduled activities
  - Cleared all outage-related TACFs
  - Cleared all outage-related Main Control Room deficiencies
  - Completed 185 FAC program inspections
  - Cleared all temporary leak repairs
  - Cleared 4 operator work arounds (1 Category-1, 3 Category-2)
  - Improved Reliability
    - ✔ Replaced "C" low pressure turbine rotor
    - ✔ Replaced turbine driven auxiliary feedwater pump
    - ✔ Replaced 2A centrifugal charging pump rotating element
    - ✔ Replaced seal packages on 2 reactor coolant pumps
    - ✔ Placed in service four new vital inverters
    - ✔ Inspected main feedwater pump and turbine

Units 1 Cycle 11 Refueling Outage

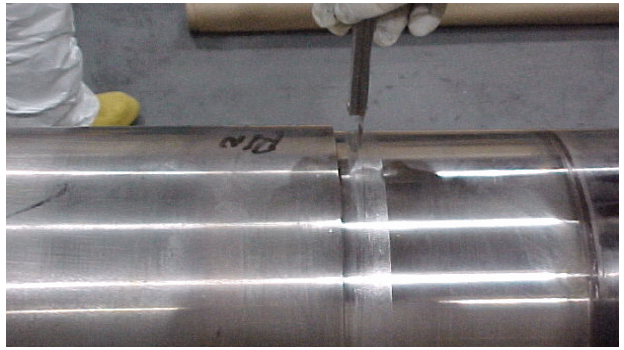
- Material Condition Improvements
  - Reliability
    - ✔ Split pin replacement
    - ✔ “B” low pressure turbine rotor replacement
    - ✔ 1B centrifugal charging pump rotating element replacement
    - ✔ Rebuild primary and BOP pumps/motors (11 total)
    - ✔ TDAFW pump replacement (U-1)
    - ✔ RCP motor and flange bolt stretch (1 motor, 2 pump flange bolt stretching activities)
    - ✔ Place in service Unit 1 vital inverters
  - Equipment performance
    - ✔ Temporary leak repairs
    - ✔ Flow-accelerated corrosion inspection/repairs
    - ✔ Steam generator work
    - ✔ Replace MTOT tube bundles
    - ✔ Refueling water storage tank outage

Unit 1 RCP Outage

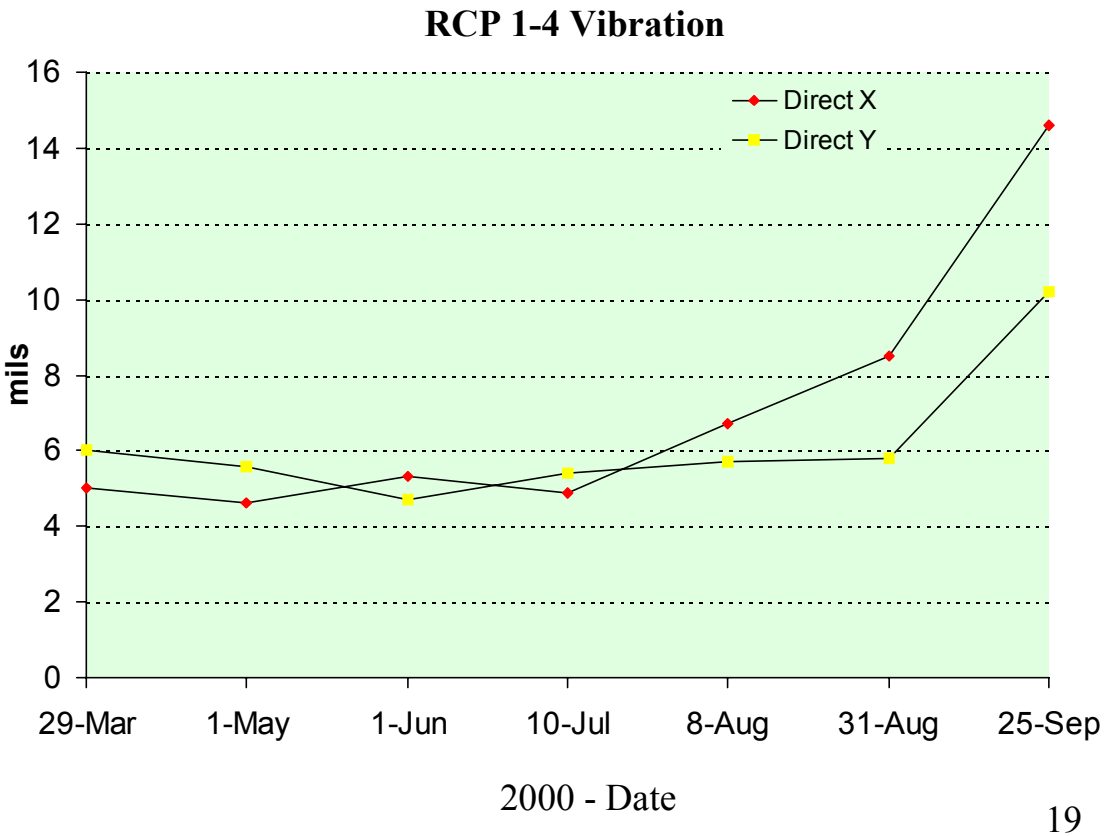
- RCP Shaft Failure
  - Failure is not brittle type failure mechanism
  - Shaft failure is progressive and detectable in pump performance - very observable condition
  - Root cause evaluation ongoing and scheduled for completion in July 2001
  - Evaluation being performed jointly by TVA and Westinghouse



Cracked RCP shaft

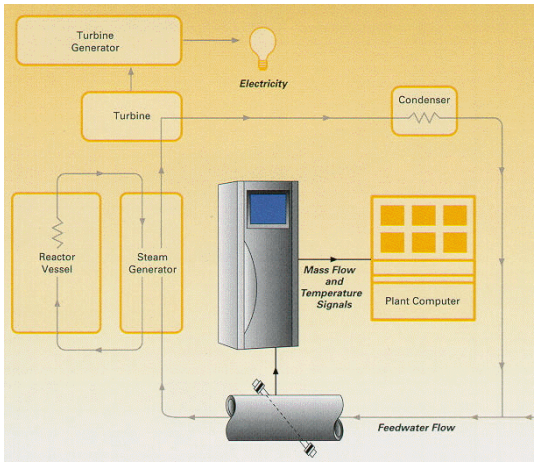


Crack Location



Long-Term Projects

- Power Up-Rate
  - Leading Edge Flow Meters
    - ✔ Same modification completed and operational at WBN
    - ✔ WBN lessons learned applied to SQN
    - ✔ Hardware (piping and electronics package) to be installed during each units Cycle 11 refueling outage
    - ✔ Technical specification change request to be submitted by Fall 2001
    - ✔ Expect up to a 15 MW electric increase per unit



  - High Pressure Turbine Rotor Uprate
    - ✔ Original equipment manufacture to provide hardware and perform installation
    - ✔ Scheduled to implement during the U1C12 and U2C13 refueling outages
    - ✔ Expect an approximate 13 MW electric increase per unit

Long-Term Projects

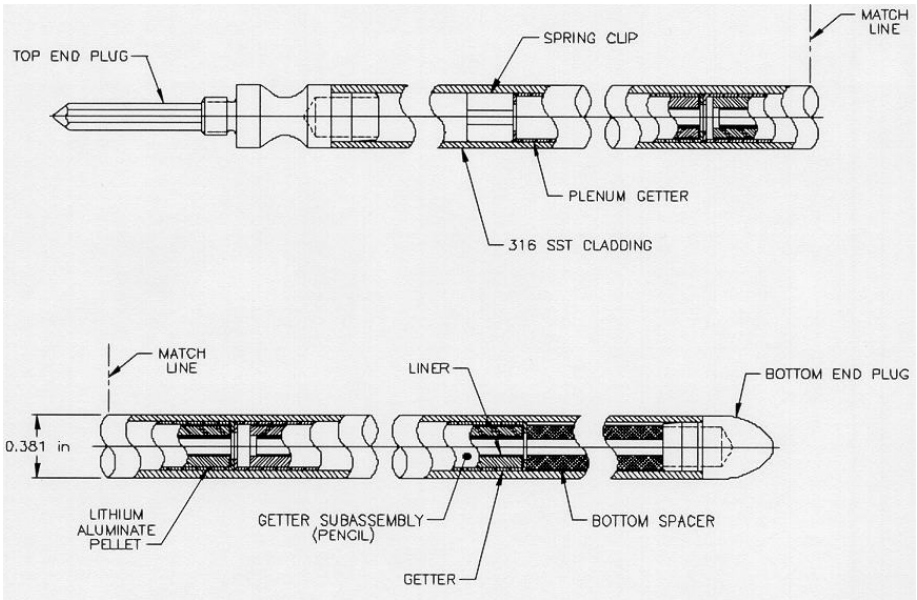
- Dry Cask Storage
  - Loss of full core reserve by Fall 2004
  - Met with NRR on August 23, 2000
  - General license facility
  - Project currently in design phase, expect to move to the construction phase in early 2002
  - On site dry cask storage facility expected operational by Spring 2004

Typical Storage Cask being up-ended

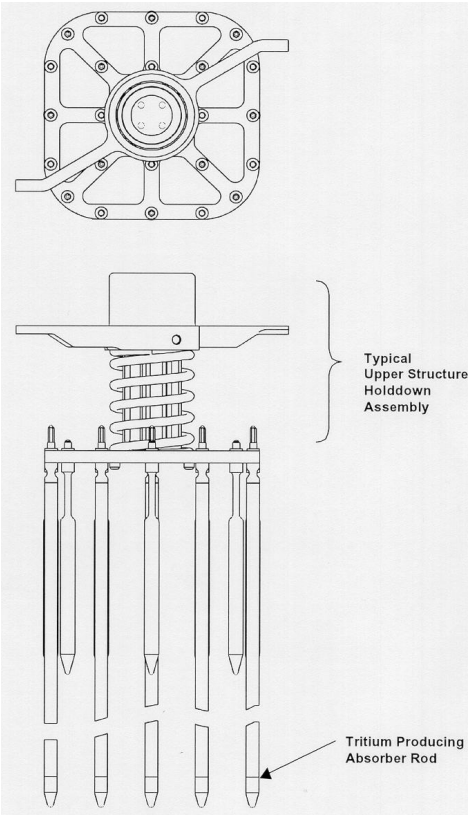
Typical Storage Cask being transported

Long-Term Projects

- Tritium
  - Preliminary data will be provided to NRR for advance review
  - Performing confirmatory checks on radiation calculations
  - Technical specification change request to follow completion of checks

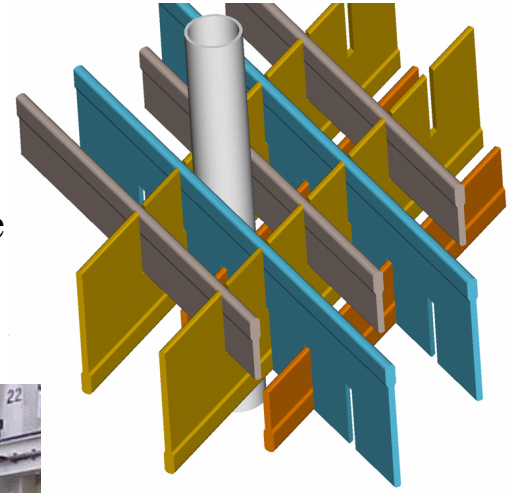


Tritium Production Bar



Long-Term Projects

- Unit 1 Steam Generator (S/G) Replacement
  - Replacement scheduled for U1C12 refueling outage (2003) under the 50.59 process
  - Fabrication in progress - delivery expected by Fall 2002
  - Replacement via Reactor Building roof
  - New S/Gs include advanced tube structure
    - ✔ Tube support structure minimizes contact length with tube
    - ✔ Smaller contact area reduced chemical deposit trap area



Advanced tube support structure

Cladding placement in the Primary Head

Lower Assembly

Conclusions