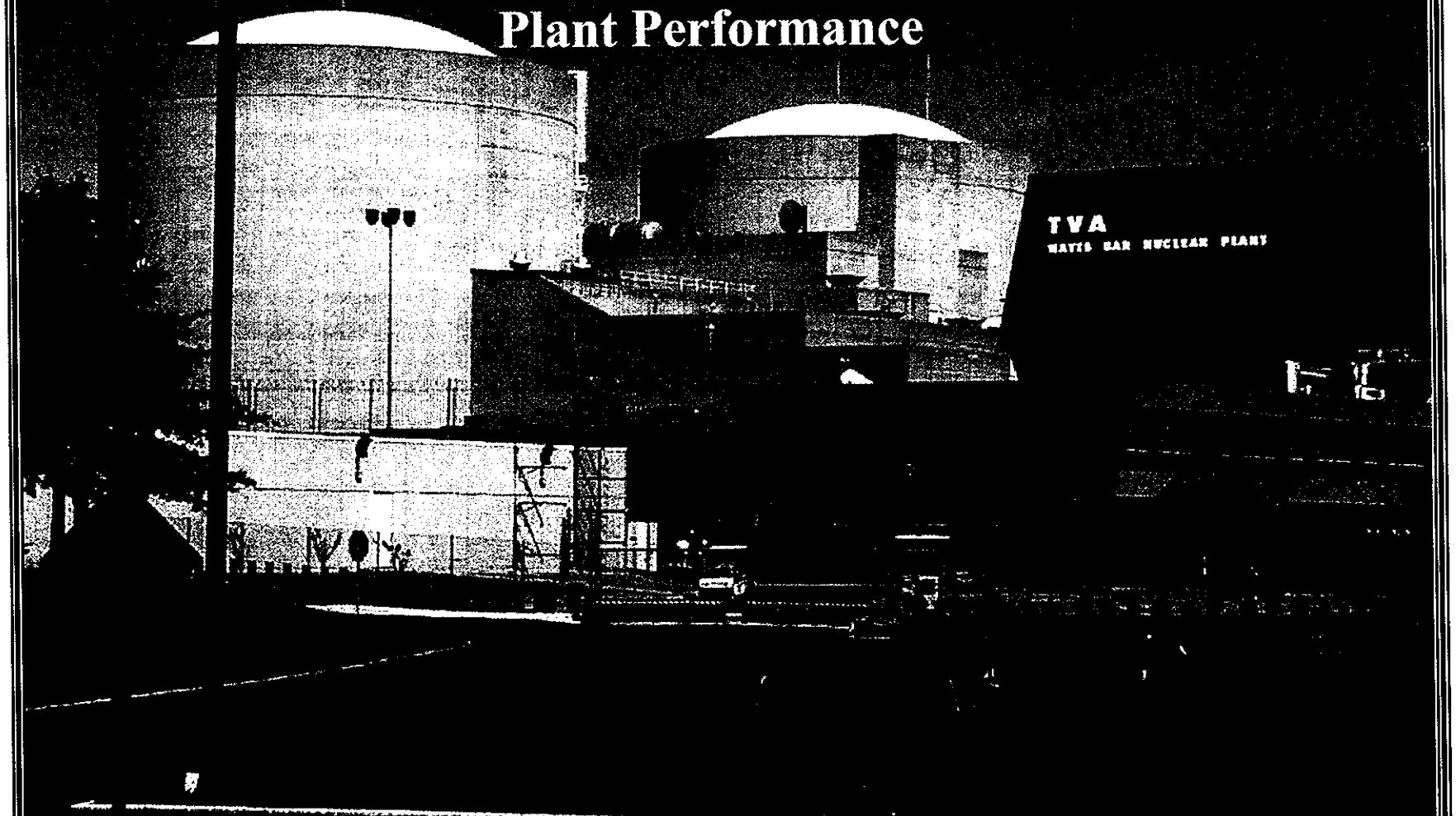
Tennessee Valley Authority
Watts Bar Nuclear Plant
Plant Performance



TVA

TVA/NRC Meeting

NRC Region II - Atlanta, Georgia

December 18, 2002

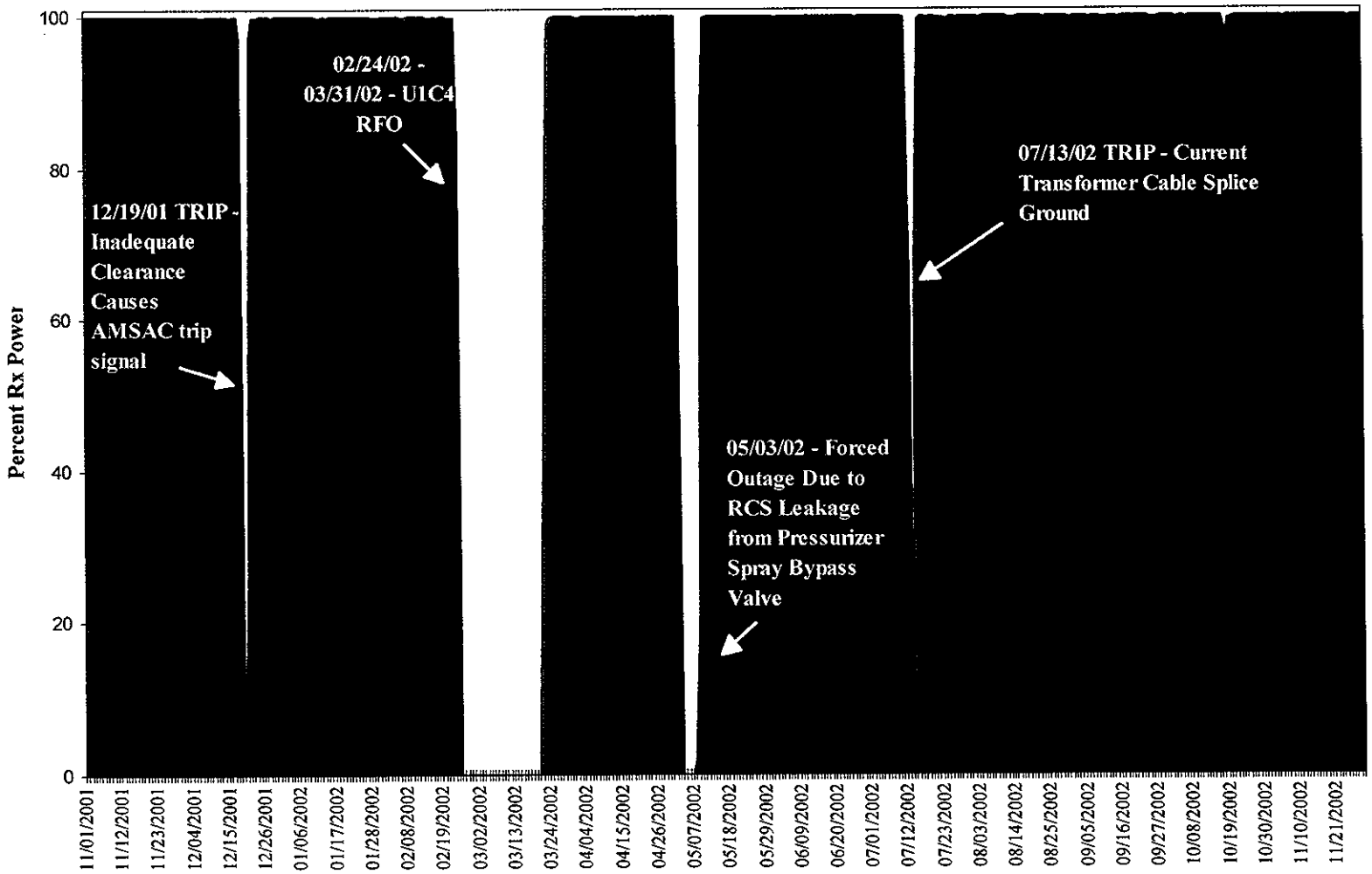
Agenda

• Introduction	Bill Lagergren
• Plant Performance	Larry Bryant
• Performance Indicators	Larry Bryant
• Occupational Radiation Safety Cornerstone	Larry Bryant
• Initiating Events Cornerstone	Tom Wallace/John Kammeyer/Jay Laughlin
• Mitigating Systems Cornerstone	John Kammeyer/Nick Welch
• Site Focus Areas	Larry Bryant
• Conclusion	Bill Lagergren

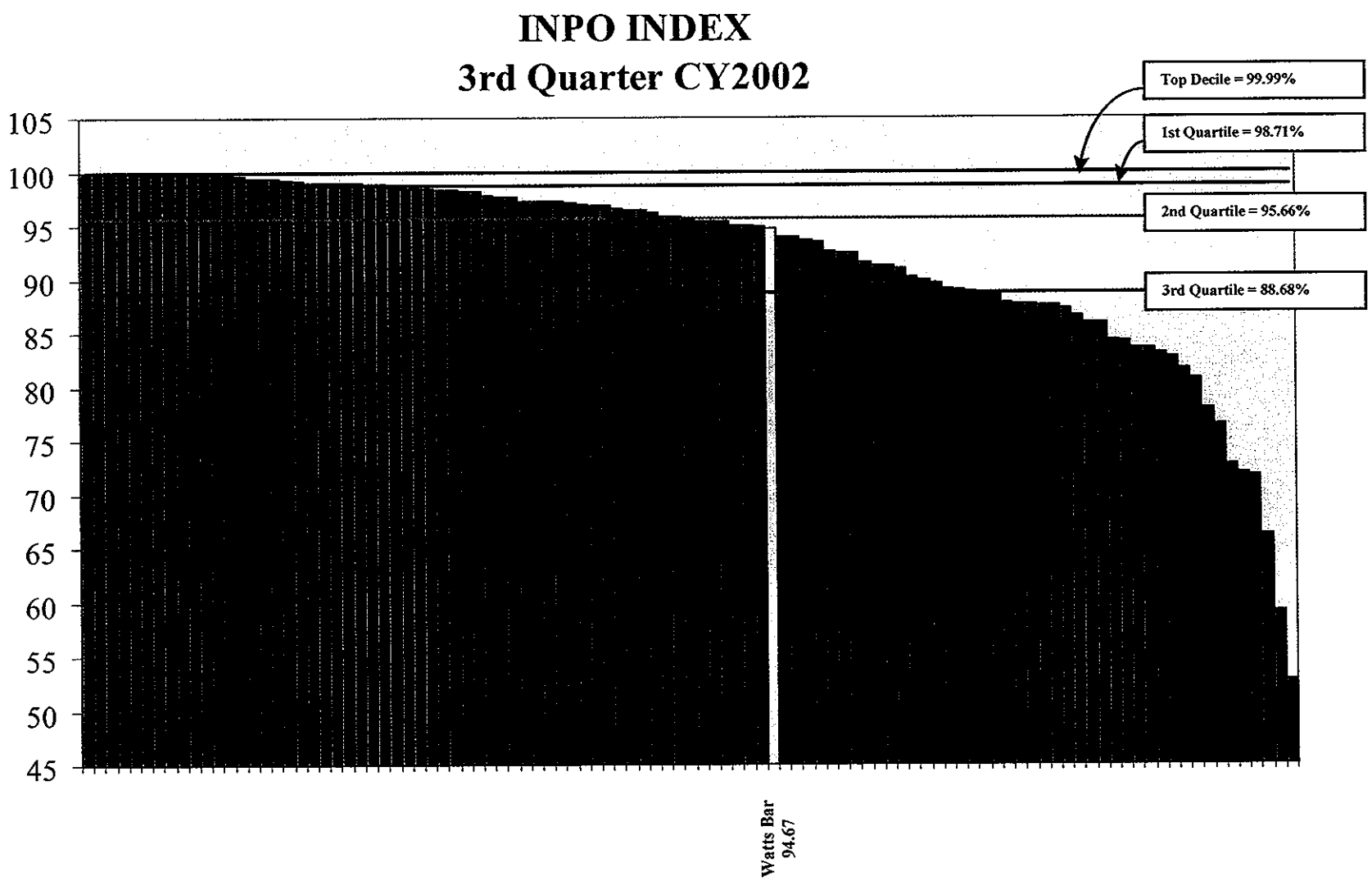
Introduction

Plant Performance

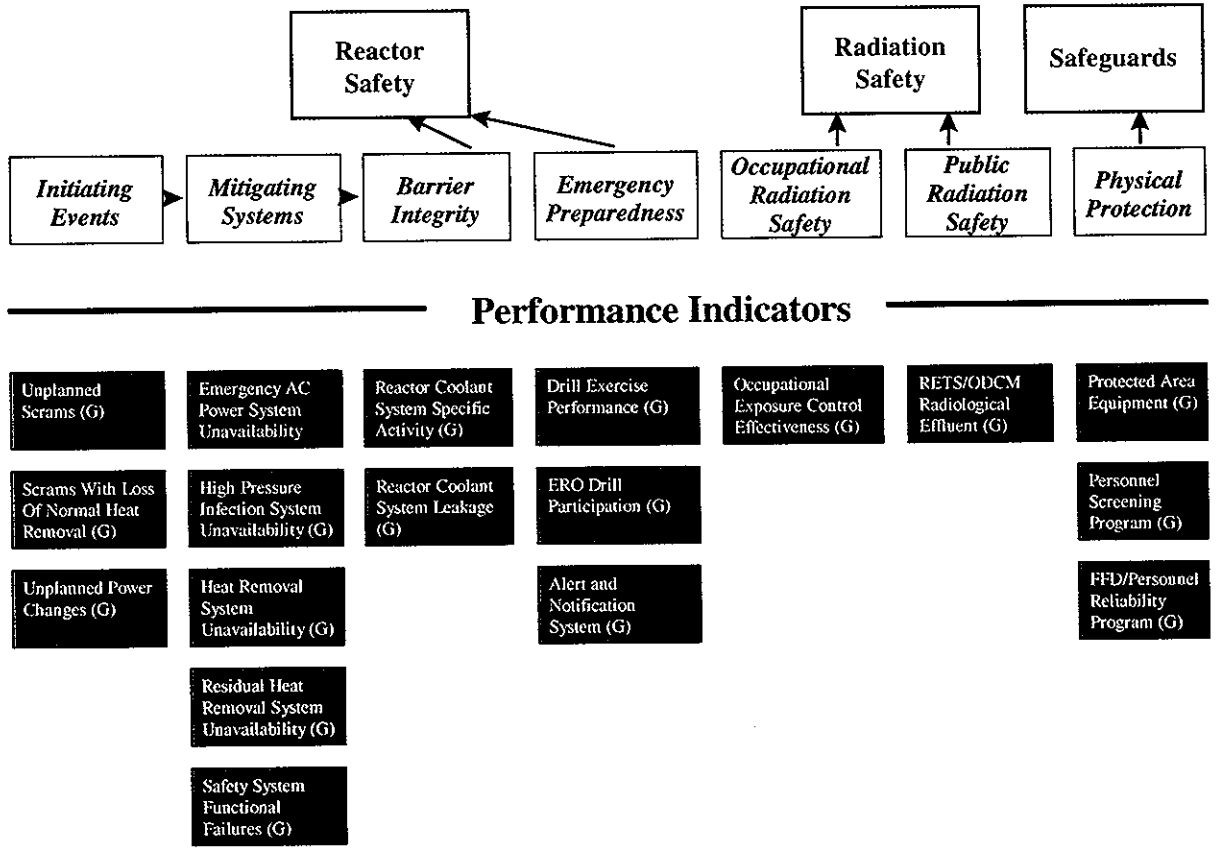
Daily Average Rx Power for November 2001 - November 2002



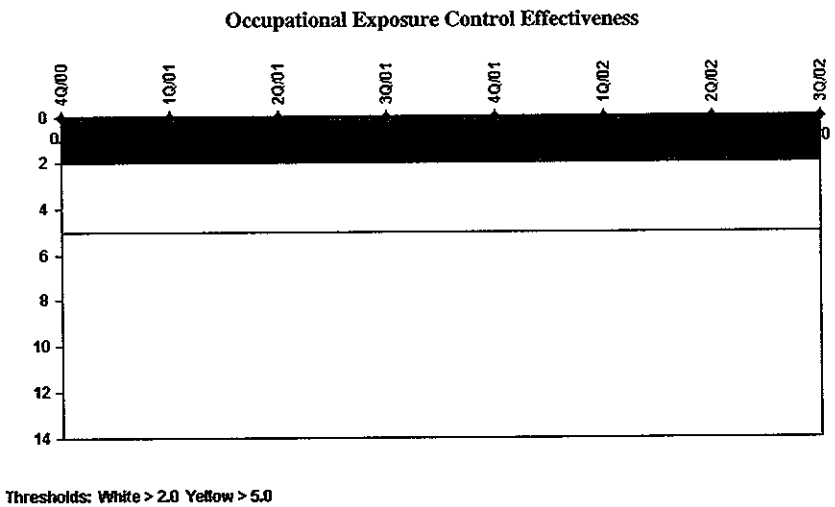
Performance Indicators

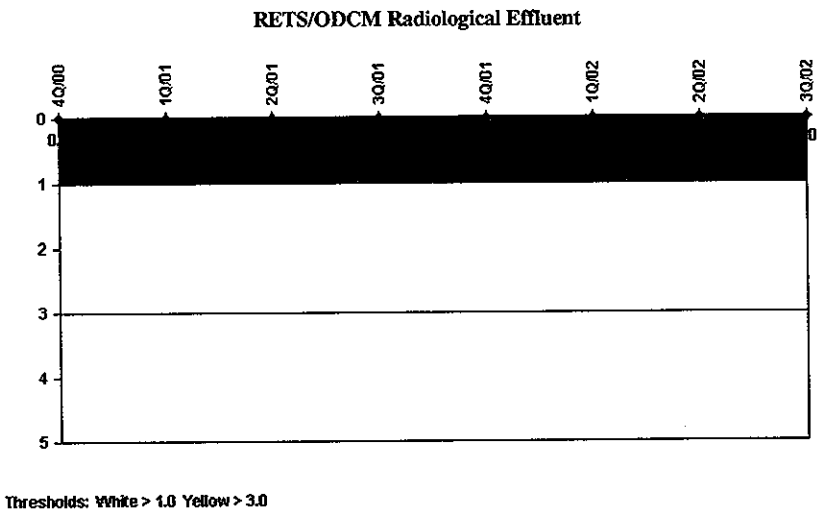


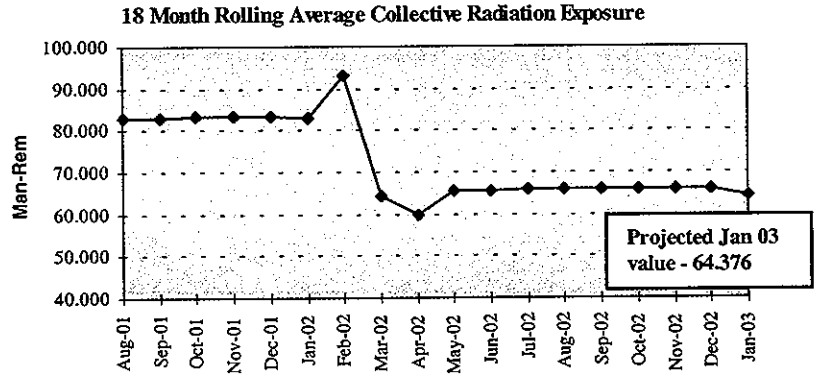
Performance Indicators



Occupational Radiation Safety Cornerstone
Dose Reduction Plan



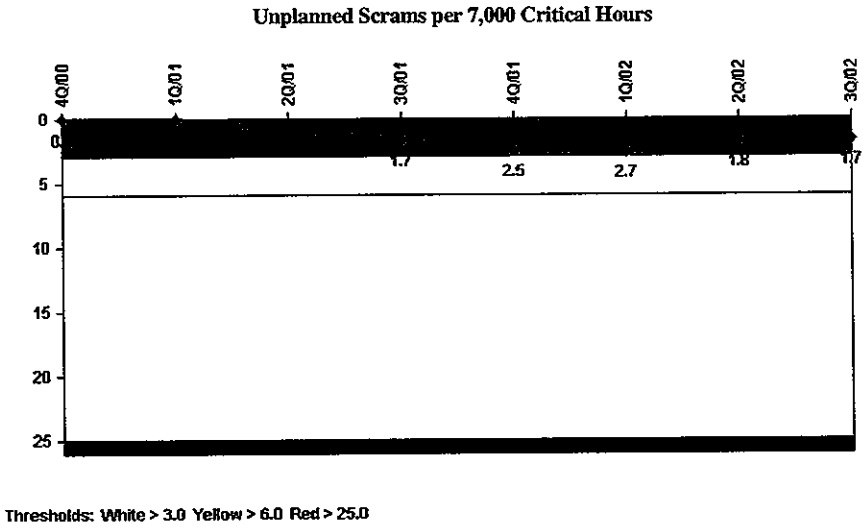




Initiating Events Cornerstone

December 19, 2001 - Reactor Trip (LER 390/2001 - 004)

- While placing hold order, an invalid AMSAC (anticipated transient without scram mitigation system actuation circuitry) signal was initiated resulting in Reactor Trip.
- Tagout was to support modification to the Turbine Driven Auxiliary Feedwater pump control instrumentation.
- Clearance activities opened breakers which supply power to instrumentation.
- The loss of power resulted in an invalid steam generator lo-lo level signal and satisfied the logic (3 out of 4 SGs less than 12% level) for the initiation of an AMSAC signal.
- Corrective actions
  - Review of open on-line clearances
  - Enhanced controls for tagging of low voltage equipment
  - Establishment of a formal process for senior management review of plant work activities for risk/trip sensitive actions.



Initiating Events Cornerstone

July 13, 2002 - Reactor Trip (LER 390/2002 - 003)

- While in Mode 1 at 100 % power, an automatic turbine/reactor trip occurred.
- Resulted from a bolted cable splice associated with a C-phase current transformer which came into contact with the current transformer junction box.
- Shorted the differential relay protection circuit to ground.
- Root cause determined to be inadequate work instructions that allow lower temperature rated tape to be used on a non-safety cable replacement and/or inadequate application of splice material.
- Corrective actions included:
  - Revision to TVA's engineering and maintenance procedures for high temperature jacketing material
  - Training for those newly revised procedures
  - Inspection and taping of similar vulnerable cable splices.

Initiating Events Cornerstone

September 27, 2002 - Loss of Offsite Power (LER 390/2002 - 005)

- Watts Bar Hydro Plant Fire's Impact on Plant
  - At 0824 EDT, while operating at 100% power, the 1A-A load stripping relay actuated.
  - At 0842 EDT, the 1B-B load stripping relay actuated.
- Previous Offsite Power Configuration
  - Regulated power provided from 161kV feed from the Watts Bar Hydro Switchyard.
  - Switching and relaying for switch yard controls were located in the Hydro Station.
  - System load limitation of 32,033 MW and a minimum voltage of 153kV (11kV maximum voltage drop)

Initiating Events Cornerstone

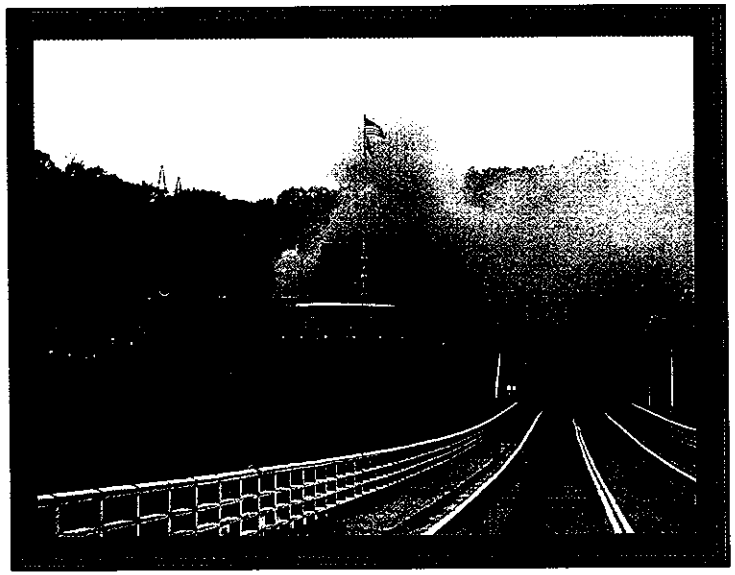
September 27, 2002 - Loss of Offsite Power (LER 390/2002 - 005)

- Fire at Hydro Plant

  - Most probable cause is a ground resulting from long term fretting of the insulation against a metal grating located in a vertical cable shaft.

  - The insulation on the cable was flammable and conducted the fire to the relay room and other areas in the Hydro Station.

  - The fire in the relay room resulted in spurious actuations eventually resulting in loss of offsite power to the Watts Bar Station shutdown busses.



Initiating Events Cornerstone

September 27, 2002 - Loss of Offsite Power (LER 390/2002 - 005)

- Plant Response
  - At 0852 EDT, Watts Bar Nuclear Plant declared a notification of unusual event (NOUE) due to the loss of both offsite 161kV preferred power sources.
  - The Technical Support Center and the Operational Support Center were activated and fully operational at 0926 EDT. The plant remained at 100% power all four emergency diesel generators operating.
  - Completed an analysis to qualify the system to a maximum loading of 25,000 MW. The two independent regulated offsite power sources were restored on September 28, 2002, at 0125 and 0300.
  - The NOUE was terminated at 0308 on September 28, 2002.

Initiating Events Cornerstone

September 27, 2002 - Loss of Offsite Power (LER 390/2002 - 005)

- 10 CFR 50.54(x) call
  - Dispatched WBN Fire brigade to assist in Hydro Fire fighting - best method to restore preferred power to plant
  - Onsite Fire Brigade staffing less than Fire Protection Report for longer than allowance of two hours - License Condition
- Impact on Diesel Generator Program
  - Rescheduled Diesel Generator maintenance overhauls until offsite power configuration is restored to pre-fire configuration.

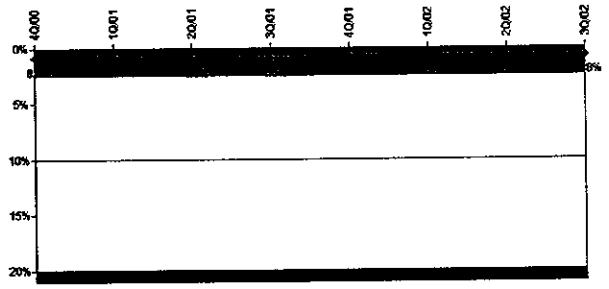
Initiating Events Cornerstone

September 27, 2002 - Loss of Offsite Power (LER 390/2002 - 005)

- Current Offsite Power Configuration
  - Transfer Trip/Fast Transfer capability installed for the Rockwood and Sequoyah feeds. It will require entry into a 72 hour LCO.
  - System load limitations are 32,531MW. (Summer Peak is historically <30,000MW.)
  - Operating guides are in place to ensure communications with the Control Room for any impacts to the offsite power.

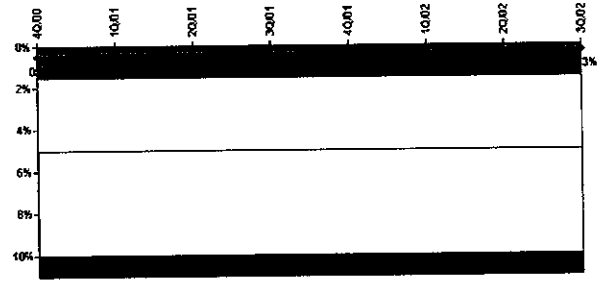
Mitigating Systems Cornerstone

Safety System Unavailability (SSU) - Emergency AC Power System



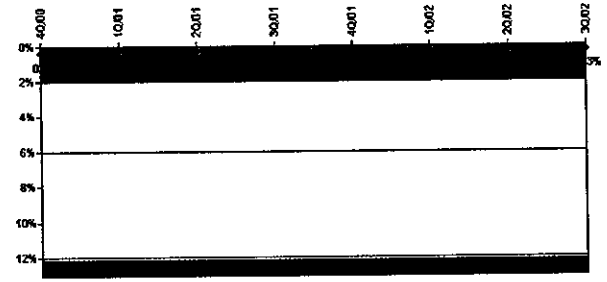
Thresholds: White > 2.5% Yellow > 10.0% Red > 20.0%

Safety System Unavailability (SSU) - High Pressure Injection System



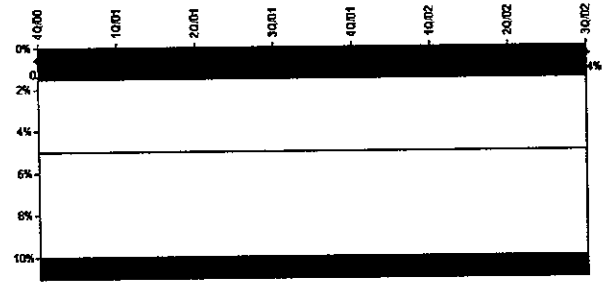
Thresholds: White > 1.5% Yellow > 5.0% Red > 10.0%

Safety System Unavailability (SSU) - Heat Removal System



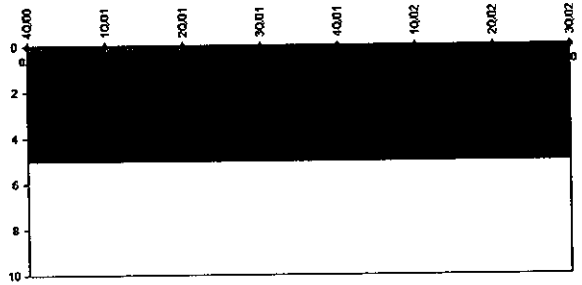
Thresholds: White > 2.8% Yellow > 6.0% Red > 12.0%

Safety System Unavailability (SSU) - Residual Heat Removal



Thresholds: White > 1.5% Yellow > 5.0% Red > 10.0%

Safety System Functional Failures (SSFF)



Thresholds: White > 5.0

Mitigating System/Barrier Integrity

NRC Bulletin 2001-01 - Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles

- Resulted From Circumferential Cracking of Reactor Vessel Head Nozzle at Oconee
- WBN Susceptibility Ranking Greater Than 30 EFPY From Oconee Unit 3 Category
- Vessel Head Penetration Nozzles Under Insulation Were Not Inspected During Cycle 4 Outage Due to:
  - Low Susceptibility Ranking,
  - Low Operating Temperatures, and
  - Low EFPY of Operation

Mitigating System/Barrier Integrity

NRC Bulletin 2001-01 - Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles

- Cycle 4 Visual Inspection Included:
  - CRDM Eyebolts on CRDM Seismic Support Platform
  - Reactor Vessel Head Flange Insulation Before Removed
  - Reactor Vessel Head Flange Surface After Insulation Removed
  - Bolted Connections on Flange Area
  - Lower Canopy Seal Welds - 100%
  - Instrument Ports (Conoseals) - 100%

- No Signs of Boric Acid Crystals, Active Leaks or Corrosion From Cycle 4 Inspections

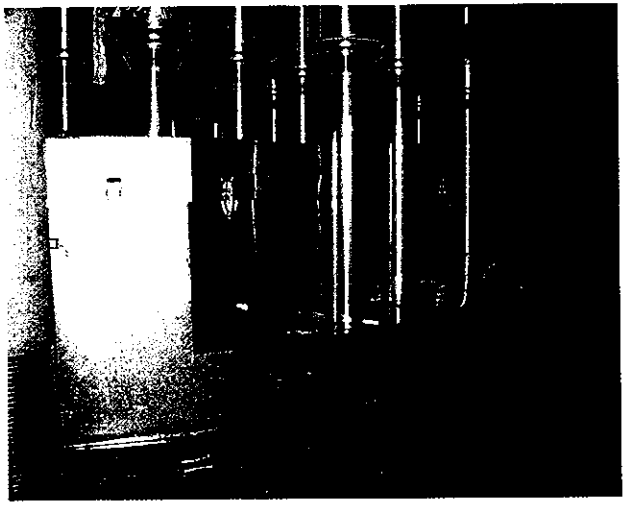
- Commitment to Perform a Remote Visual Inspection of Reactor Vessel Head during Cycle 5 Outage

Mitigating System/Barrier Integrity

NRC Bulletin 2002-01 - Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity Resulted From Reactor Vessel Head Degradation From Nozzle Leak at Davis Besse

15 Day Response

- One Previous Canopy Seal Leak Resulted in Insulation Around Head Penetration Being Removed for Inspection
- Two Other Canopy Seal Pinhole Leaks Cleaned/ Repaired
- No Leaks Since March 1999
- Committed to Perform Remote Under Insulation Inspection of Vessel Head During Cycle 5 Outage
- Committed to Revise Program to Include Limited Head Surface Examinations Each Outage and
- Committed to Revise ISI Program to Include 100% Head Surface Examinations Each 10-Year Inspection



REACTOR HEAD
WATTS BAR UNIT 2

Mitigating System/Barrier Integrity

NRC Bulletin 2002-01 - Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity Resulted From Reactor Vessel Head Degradation From Nozzle Leak at Davis Besse

60 Day Response

- Evaluated Boric Acid Corrosion Program Per GL 88-05
- Response Included Materials Reliability Project (MRP) Alloy 600 Issue Task Group Criteria Discussion
- Procedures, Inspections, and Corrective Actions in Place to Provide Assurance of Compliance With Regulatory Requirements
- Committed to Perform Self Assessment of Boric Acid Program by Fall 2003 to Identify Enhancements
- Committed to Revise Procedure to Evaluate If Accumulated Boric Acid Is Not Removed From Component Surfaces Susceptible to Corrosion

RAI Response (60 days, due 1/24/03)

- Provide Technical Basis for Inspection Program for Alloy 600 and Alloy 82/182
- Describe Boric Acid Control Program
- Provide Basis for Concluding Program Complies with Tech Specs, 10CFR50.55a, ASME Code

Mitigating Systems Cornerstone
Refueling Outage - Cycle 5 Preview

- Major Work Scope
  - Low Pressure Turbine 'B' Inspection
  - HP Turbine Gland Seal Repair
  - Main Feedpump Turbine 'A' Inspection
  - Replace Bushing on CSST 'D'
  - A RHR Pump Seal Replacement
  - 1A Charging Pump Seal Replacement
  - RCP 1 and 4 Seal Replacement
  - RCP 2 Motor Swap
  - SG ECT/Sludge Lance/Tube Plugging
    - Contingency Steam Generator Sleeving
  - AFW Terry Turbine 6 Year Rebuild
  - Pressurizer ISI and Reactor Head Inspection
  - 1B 6.9 Shutdown Board Outage
  - Ice Condenser Weighing and Servicing
  - Equipment Upgrades to Support Tritium Production

Mitigating Systems Cornerstone
Refueling Outage - Cycle 5 Preview

- Plant Safety Improvements
  - Main Steam Isolation Valve maintenance and modification upgrades
  - Replace obsolete Foxboro 0 - 5 V module for control rod drive speed and direction loop in auto mode.
  - Replace piping due to flow accelerated corrosion evaluations
  - Install taps for differential pressure measurement on Component Cooling heat exchangers A & C
  - RCS elbow tap flow measurement (eliminate RCS flow calorimetric).
  - Add flush connections on ERCW supply piping to the 1A-A and 1B-B Containment Spray heat exchangers.
  - Vital Inverter modification to connect U1 and U2 boards
  - Upgrade Loose Parts Monitoring
  - Replace analog Rod Position Indicator system
  - Install Main Feedwater corrosion monitor
  - Replace the DC Reliance motor on the Limitorque operator for AFW Trip & Throttle Valve with a Peerless motor.
  - Replace Ronan annunciator system computers and software
  - Upgrade Auxiliary Building Crane

Site Focus Areas
Intolerance for Equipment Deficiencies

Critical Success Factor: Improve power reliability to meet customer requirements
WBN Strategic Objective: Eliminate unplanned scrams and unplanned power changes

Equipment Problem Tolerance Index

Operational Challenges	
1. Operator Workarounds (Priority 1)	0.05
2. Operator Workarounds (Priority 2)	0.05
3. CR Panel Deficiencies (non-outage)	0.05
4. Unplanned Lit Annunciators	0.05
5. AUO Round Deficiencies - avg. age	0.05
6. Plant Appearance Indicator (EIP - Housekeeping grade sheet)	0.05
7 Fire Protection Impairments (non-outage)	0.05
Maintenance Backlog / Production	
1. CM Backlog (non-outage)	0.05
2. CM Average Age (non-outage)	0.05
3. Total WO Backlog	0.10
4. Maintenance Production Unit Rates	0.05
5. Deferred PM Activities	0.05
6. PdM Components in Alert Range (non-outage)	0.05
7. Planning Timeliness	0.05
Engineering & Support	
1. Average Age Of Significant Eqpt. PERs	0.05
2. Chronic Red and Yellow Systems	0.05
3. 91-18 Average Age (non-outage)	0.05
4. TACF Average Age (non-outage)	0.05
5. Open DCN Average Age	0.05
Overall Index	1.00

IMPROVEMENT ACTION PLAN

1. Survey TVAN culture tolerance to equipment deficiencies.

2. Generate an action plan to implement ER cultural improvements.

3. Address inadequate questioning of equipment condition, insufficient analysis and troubleshooting of equipment problems.

4. Confirm maintenance troubleshooting WOs have adequate control to effectively address equipment problems.

5. Address exceeding PM grace period.

6. Review recommendations from WBN offsite, develop implementation schedule and roll out to all WBN employees.

DEFINITION:
Equipment problem tolerance index as defined by the above operational challenges, maintenance backlogs, engineering and support backlogs.

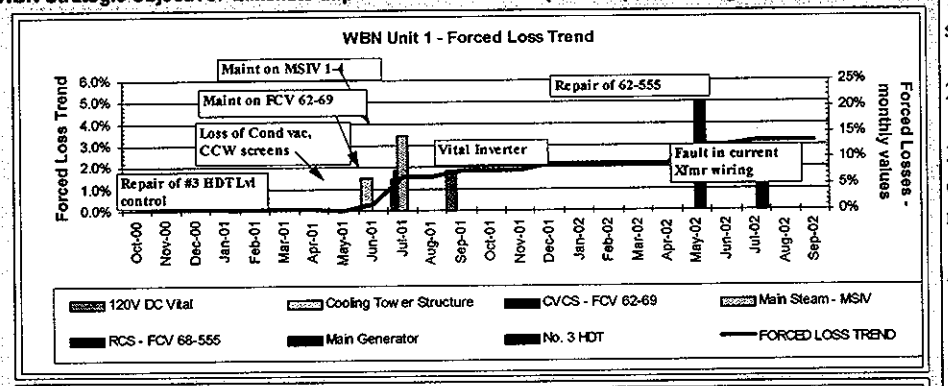
Sponsor: J. C. Kammeyer
Contact: D. F. Helms

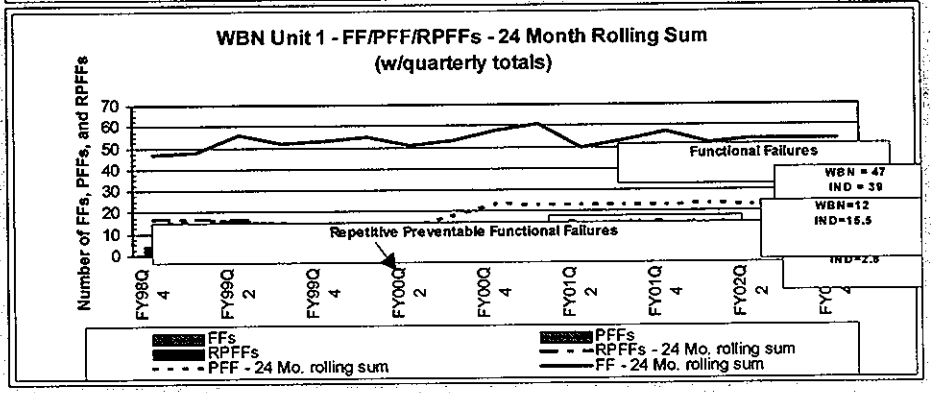
Site Focus Areas
Intolerance for Equipment Deficiencies

	Indicator / Measure	Station Performance	Goal (maximum value)	Cut-off for minimum value	Index points	Station Value
	Operational Challenges					
1	Priority One - Operator Work Arounds (non-outage)	0	Zero	> 2 (BFN, SQN) 1 (WBN)	0.05	0.05
2	Priority Two - Operator Work Arounds (non-outage)	3 total 2 > 1 cycle old	Zero	> 9 (BFN,SQN) 5 (WBN)	0.05	0.02
3	CR Panel Deficiencies (non-outage)- total and age	4 total 2 > 4 weeks old 1 > 12 weeks old	one / unit with none > 4 weeks old	> 12 (BFN. SQN) 7 (WBN) or one > 12 weeks old	0.05	0.00
4	Unplanned Lit Annunciatrs (non outage) - total and age	0	one / unit with none > 2 weeks old	> 12 (BFN. SQN) 7 (WBN) or one > 12 weeks old	0.05	0.05
5	AUO Rounds Deficiencies - average age	4.3 months average age 1 > 12 months old 8 > 6 months old	Average age < 6 weeks with none > 6 months old.	Average age > 5 months or one > 12 months old.	0.05	0.00
6	Operator Housekeeping and Materiel Condition Observation Results (EP form 19)	Observations 2 Unaccepta	> 20 observations / month with < 10 % obs unacceptable	< 12 observations / month or > 25% obs unacceptable	0.05	0.05
7	Fire Protection Impairments that require a fire watch (non-outage)	0 Requiring Comp Measures 0 > 6 months old	None requiring comp measures	> 2 requiring comp measures or one > 6 months old	0.05	0.00
	Maintenance Backlog and Production					
8	Corrective Maintenance Backlog (non-outage) AP 928 benchmark data after Dec 2002	5	Below the station goal	> 25% above the station goal and trending up	0.05	0.05
9	Corrective Maintenance Average Age (non-outage) AP 928 benchmark data after Dec 2002	8.2	Average age less than 3 months	Average greater less than 6 months	0.05	0
10	Total Work Order Backlog (non-outage, non DCN, plant process equipment) AP 928 benchmark data after Dec 2002	487	Below the station goal	> 25% above the station goal and trending up	0.10	0.0
11	Maintenance Production Unit Ratio	2.39	> 3 jobs / week / craftsman	< 2 jobs / week / craftsman	0.05	0.0
12	Deferred Preventative Maintenance Activities	8/247=3.2	<2% deferred/month	>10% deferred/month	0.05	0.0
13	Predictive Maintenance - components in Alert Range non outage	12.2	Average age < 6 months	Average age > 12 months	0.05	0
14	Planning Timeliness (non-outage, non DCN, plant process equipment)	57	average time to plan package from WO initiation < 35 days	average time to plan package from WO initiation > 49 days	0.05	0.0
	Engineering and Support					
15	Average age of Significant Equipment PERs (A&B level Equipment PER's)	1	None > 18 months	three > 18 months old	0.05	0.03
16	Long-standing red and yellow system health windows	2	None > 2 quarters old	three > 2 quarters old	0.05	0.07
17	91-18 issues average age (non outage)	9	Average age < 1 month with none greater than 6 months	Average age > 3 month or any greater than 6 months	0.05	0
18	Temporary Alterations of Configuration average age (TACF's) - (non outage)	1	Average age < 1 month with none greater than 6 months	Average age > 3 month or any greater than 6 months	0.05	0.05
19	Average age of DCNs (non-outage DCNs which are assigned a number)	11	average age less than 12 months	Average age greater than one refueling cycle	0.05	0.05
20						
21	Overall Tolerance Index	N/A	N/A	N/A	1.0	0.56

Site Focus Areas
Excellence in Equipment Reliability

Critical Success Factor: Improve power reliability to meet customer requirements
WBN Strategic Objective: Eliminate unplanned scrams and unplanned power changes





DEFINITION:

Forced generating capability losses due to equipment performance aggregated by system and month; and trended over a rolling 18-month interval.

Maintenance rule functional and preventable functional failures aggregated by quarter

Sponsor: J. C. Kammeyer
Contact: D. F. Helms

IMPROVEMENT ACTION PLAN

1. Eliminate scrams and runbacks resulting from single point failures

2. Complete parameter monitoring on 35 systems.

3. Participate in NEI ER benchmarking project to determine and adopt the industry's best equipment reliability programs and practices.

4. Develop integrated master PM schedule

5. Benchmark TVAN's equipment reliability practices to AP-913 to Identify and Close Gaps.

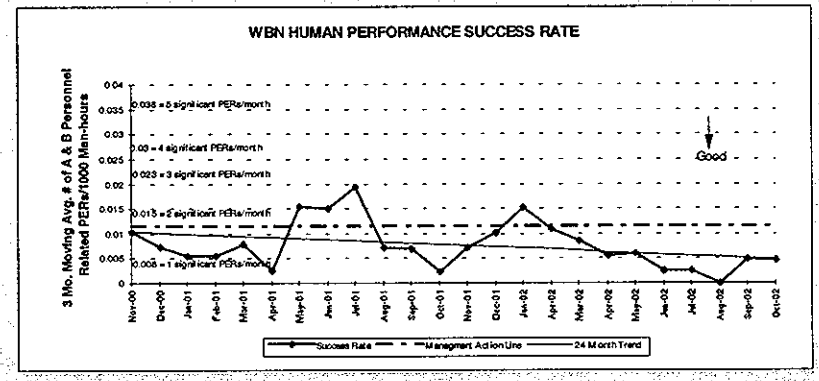
6. Resolve Equipment Performance and Material Condition.
   a. Chiller Reliability long range plan.
   b. Safety review and configuration control of Temporary Alterations under WO's.

7. Perform a detailed review of equipment issues over the last 2 years to evaluate missed opportunities and common causes.

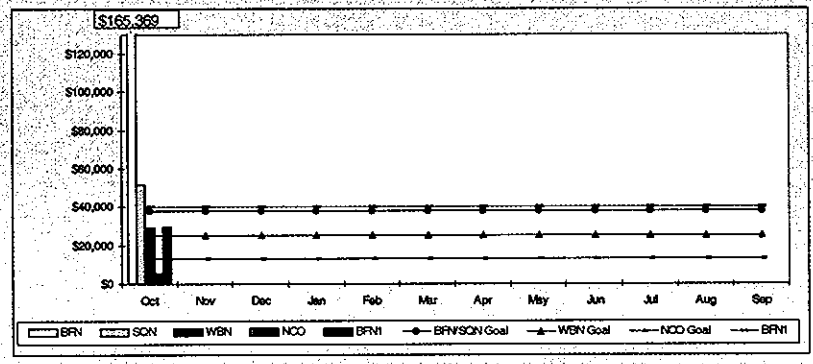
Larry Bryant

Site Focus Areas
Excellence in Human Performance

Critical Success Factor: Manage the environmental and safety impacts TVA's operations have on employees and the region
WBN Strategic Objective: Establish and reinforce performance standards



Cost of Human Error



DEFINITION:
The Human Performance Success Rate is the measure of significant events caused by personnel performance. The Cost Of Human Error is an estimated cost of human performance PERs derived from a standard

Sponsor: D. A. Kulisek
Contact: P. P. Salkeld

IMPROVEMENT ACTION PLAN

1. Implement an enhanced observation training program for supervisors that includes work preparation observation techniques

2. Continue to implement site-wide human performance improvement focus areas – This quarter is Industrial Safety

3. Prevention of non-consequential status control errors by enhancing Clearance writers knowledge -- Step 3 Electrical Training

4. Develop and implement an Engineering prejob briefing form based on INPO good practice

5. Enhanced OE training sessions emphasizing identification of error types and human error drivers

6. Quarterly site-wide all-hands meetings

7. Address rollout of the INPO Human Performance Model - with emphasis on use during work preparation and PER analysis and corrective action development.

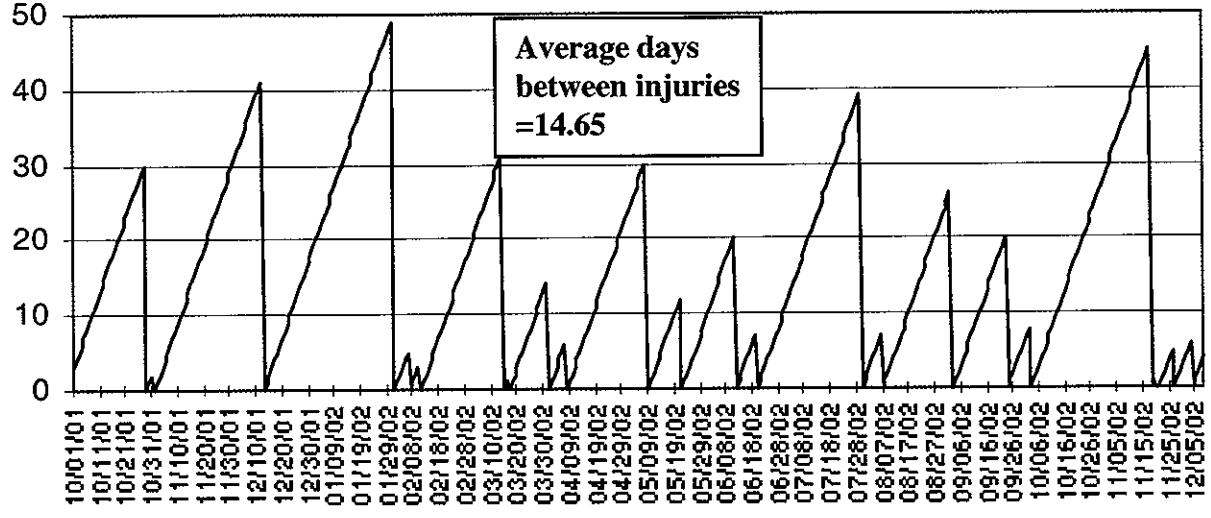
8. Periodic integrated assessment and site review of Key Focus Areas (SPP-1.6) identified actions

9. Initiative for improving human performance are continuing through the H.P. steering committee and H.P. subcommittee

Larry Bryant

Site Focus Areas
Industrial Safety

Days Since Last Personnel Injury (Including First Aids)



Recordables - Accident Free Trees

Conclusion