UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

March 12, 2007

James J. Sheppard, President and
Chief Executive Officer
STP Nuclear Operating Company
P.O. Box 289
Wadsworth, TX 77483

SUBJECT: SUMMARY OF MEETING WITH STP NUCLEAR OPERATING COMPANY REGARDING SOUTH TEXAS PROJECT ELECTRIC GENERATING STATION EQUIPMENT RELIABILITY

Dear Mr. Sheppard:

This refers to the meeting conducted at Arlington, Texas, on March 6, 2007, between the NRC and your staff. The participants discussed equipment reliability issues at the South Texas Project Electric Generating Station.

The attendance list is enclosed with this summary (Enclosure 1). A copy of the STP Nuclear Operating Company presentation slides is also enclosed (Enclosure 2).

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this matter, we will be pleased to discuss them with you.

Sincerely,

Claude E. Johnson, Chief
Project Branch A
Division of Reactor Projects

Dockets: 50-498
50-499
Licenses: NPF-76
NPF-80

Enclosures:
1. Attendance List
2. STP Nuclear Operating
   Company Presentation Slides

cc w/enclosures:
E. D. Halpin
Site Vice President
STP Nuclear Operating Company
P.O. Box 289
Wadsworth, TX 77483

Ken Coates
Plant General Manager
STP Nuclear Operating Company
P.O. Box 289
Wadsworth, TX 77483

S. M. Head, Manager, Licensing
STP Nuclear Operating Company
P.O. Box 289, Mail Code: N5014
Wadsworth, TX 77483

C. T. Bowman
General Manager, Oversight
STP Nuclear Operating Company
P.O. Box 289
Wadsworth, TX 77483

Marilyn Kistler
Sr. Staff Specialist, Licensing
STP Nuclear Operating Company
P.O. Box 289, Mail Code 5014
Wadsworth, TX 77483

C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

J. J. Nesrsta/R. K. Temple/
E. Alercon/Kevin Pollo
City Public Service Board
P.O. Box 1771
San Antonio, TX 78296

Jon C. Wood
Cox Smith Matthews
112 E. Pecan, Suite 1800
San Antonio, TX 78205

A. H. Gutterman, Esq.
Morgan, Lewis & Bockius
1111 Pennsylvania Avenue NW
Washington, DC 20004

Institute of Nuclear Power Operations (INPO)
Records Center
700 Galleria Parkway SE, Suite 100
Atlanta, GA 30339

Director, Division of Compliance & Inspection
Bureau of Radiation Control
Texas Department of State Health Services
1100 West 49th Street
Austin, TX 78756

Brian Almon
Public Utility Commission
William B. Travis Building
P.O. Box 13326
1701 North Congress Avenue
Austin, TX 78701-3326

Environmental and Natural
Resources Policy Director
P.O. Box 12428
Austin, TX 78711-3189

Judge, Matagorda County
Matagorda County Courthouse
1700 Seventh Street
Bay City, TX 77414

Terry Parks, Chief Inspector
Texas Department of Licensing
and Regulation
Boiler Program
P.O. Box 12157
Austin, TX 78711

Susan M. Jablonski
Office of Permitting, Remediation and Registration
Texas Commission on Environmental Quality
MC-122, P.O. Box 13087
Austin, TX 78711-3087

Ted Enos
4200 South Hulen
Suite 422
Fort Worth, TX 76109

Steve Winn/Christine Jacobs/
Eddy Daniels/Marty Ryan
NRC Energy, Inc.
211 Carnegie Center
Princeton, NJ 08540

**ENCLOSURE 1**

# ATTENDANCE LIST

ENCLOSURE 1

**MEETING ATTENDANCE**

**SOUTH TEXAS PROJECT NUCLEAR OPERATING COMPANY MEETING WITH THE NRC**

**MARCH 6, 2007**

| NAME | POSITION | ORGANIZATION |
|---|---|---|
| John Mateychick | Sr Reactor Inspector | EB2 |
| V. TAYLOR | RI—STP | DRP A |
| George Replogle | Sr. Reactor Inspector | EB1 |
| Claude E. Johnson | BRANCH CHIEF | DRP A |
| DWIGHT CHAMBERLAIN | DIRECTOR | DRS |
| Art Howell | Director, DRP | DRP |
| Bruce Mallett | Region IV, VAC | RA |
| Ed Halpin | Site Vice President, STP | STP |
| Dave Rencurrel | VP, Engineering & Strategic Projects | STP |
| Tim Powell | Site Engineering Manager | STP |
| Harry Murray | Maintenance Manager | STP |
| Jay Phelps | Ops. Division Manager | STP |
| Scott Head | Manager, Licensing | STP |
| Jim Morris | Licensing Engineer | STP |
| Clyde M. Canady | Dir., Nuclear & Coal Gen, Austin | Austin Energy |
| Shiattin Makor | Reactor Inspector | NRC (EB1) |
| Tom Farnholtz | SR Project Engineer | DRP A |
| Jim Von Suskil | Owners Representative | Austin Energy |
| John Dixon | SR Resident Inspector | NRC (via phone) |
| Cathy Gann | Manager, Public Affairs | STP (via phone) |
| | | |
| | | |
| | | |
| | | |
| | | |

Electronic distribution by RIV:
Regional Administrator **(BSM1)**
DRP Director **(ATH)**
DRS Director **(DDC)**
DRS Deputy Director **(RJC1)**
Senior Resident Inspector **(JLD5)**
Branch Chief, DRP/A **(CEJ1)**
Senior Project Engineer, DRP/A **(TRF)**
Team Leader, DRP/TSS **(FLB2)**
RITS Coordinator **(MSH3)**

SUNSI Review Completed: _____ ADAMS: ☑ Yes ☐ No Initials: _____
☑ Publicly Available ☐ Non-Publicly Available ☐ Sensitive ☑ Non-Sensitive

R:_REACTORS_STP\2007\ST3-6-07MS-DRP.wpd

| RIV:C:DRP/A | | | | |
|---|---|---|---|---|
| CEJohnson;df | | | | |
| | | | | |
| 3/12/07 | | | | |

OFFICIAL RECORD COPY T=Telephone E=E-mail F=Fax

**ENCLOSURE 2**

# STP NUCLEAR OPERATING COMPANY

# PRESENTATION SLIDES

ENCLOSURE 2

# South Texas Project
# Equipment Reliability
# &
# Maintenance Work Practices

NRC Region IV Briefing

March 6, 2007

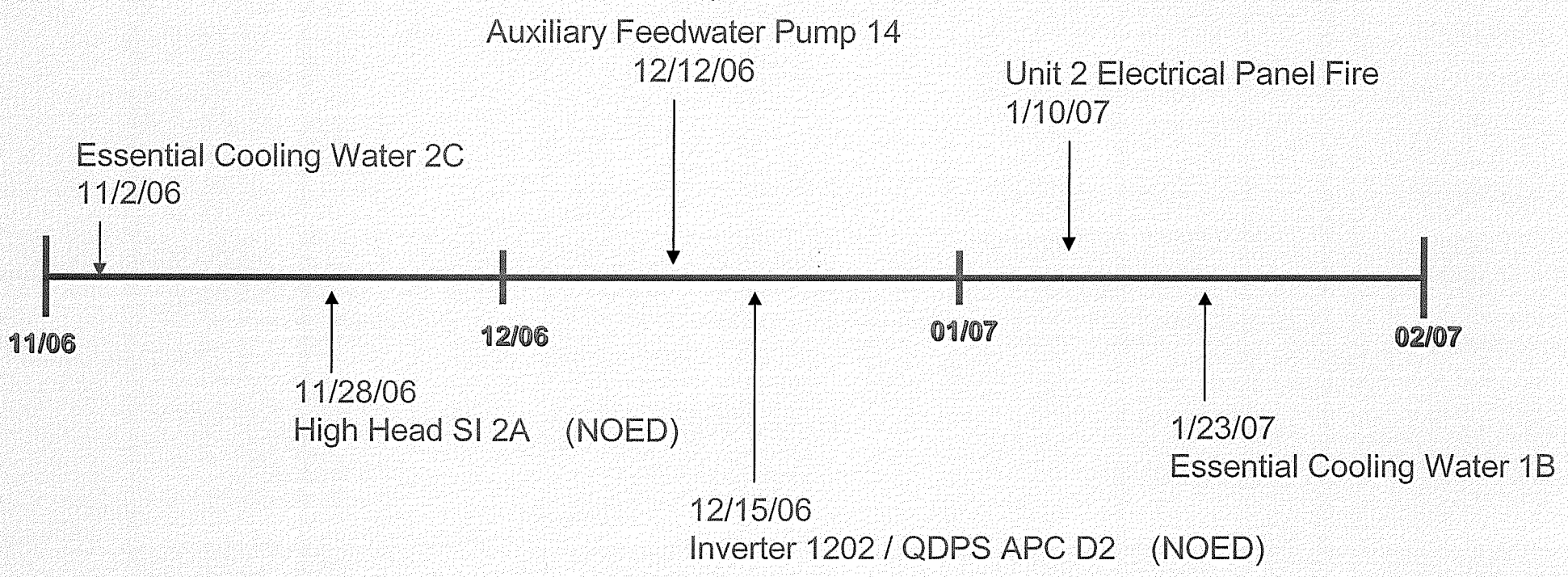
# STP Participants

- Ed Halpin, Site Vice President
- Dave Rencurrel, Vice President, Engineering and Strategic Projects
- Tim Powell, Site Engineering Manager
- Harry Murray, Manager Maintenance
- Jay Phelps, Operations Division Manager
- Scott Head, Manager Licensing
- Jim Morris, Licensing Engineer

# Desired Outcomes

- By the end of this presentation we will have an understanding of:
  - The recent Equipment Reliability and Work Practice challenges so that the context of the events are understood
  - The Common Causes of the recent events so that the strategy and corrective actions to address the adverse trend is recognized
  - The Equipment Reliability and Human Performance Goals and Indicators to better understand overall station performance

# Timeline of STP Equipment Reliability Challenges



# Equipment Reliability

## Current Challenges

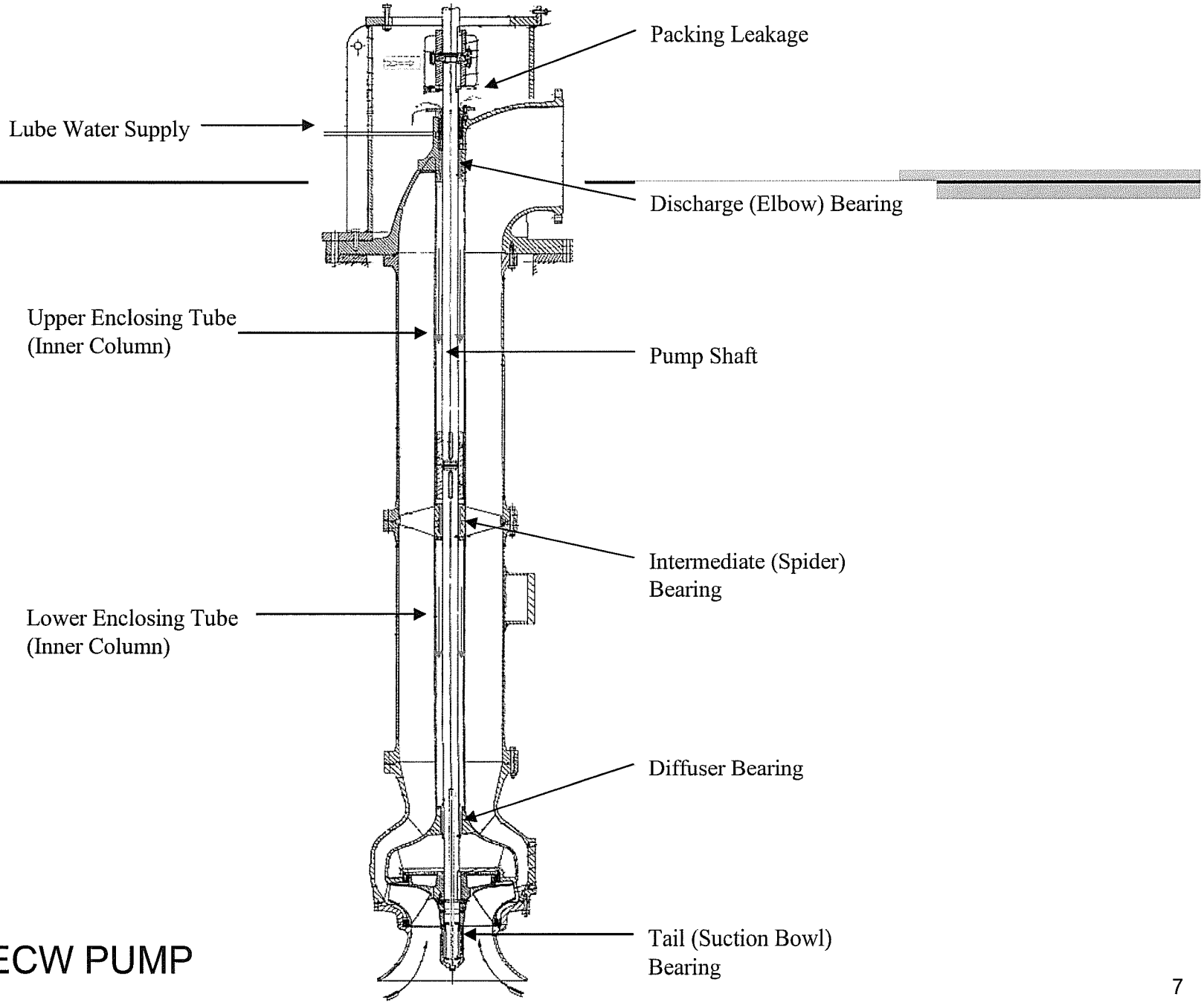
# Equipment Reliability Challenges

Essential Cooling Water (ECW) Pumps

11/2/06 and 1/23/07

# Equipment Reliability Challenges ECW – Event Description

- **Event Description**
- 11/2/06 - ECW Pump 2C exhibits abnormal lube water flow fluctuations. Troubleshooting determines the pump is hard to turn resulting in pump disassembly.
  - Martensitic 440B sleeve material is not compatible with ECW water
  - Design of lube water flow system for ECW does not meet current reliability expectations
- 1/23/07 - ECW Pump 1B – During a scheduled pump overhaul damage to the intermediate bearing sleeve and the diffuser bearing sleeve & bearing are identified.
  - Scheduled Maintenance based on Lube Water Flow Trends
  - Martensitic 440B sleeve material corrosion worse than expected




# TYPICAL ECW PUMP

# Equipment Reliability Challenges
## Essential Cooling Water – Corrective Actions

- Perform pump overhauls and replace all sleeves with Nitronic 50 sleeves. Pump overhaul schedule changed from one pump per year to two pumps per year.
- Install design change to provide lube water flow prior to start of pump.
  - Utilize abandoned sodium hypochlorite injection system to provide potable water into each pump bay.
  - Product lubricated design under evaluation.

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# Equipment Reliability Challenges

High Head Safety Injection Pump 2A

11/28/06

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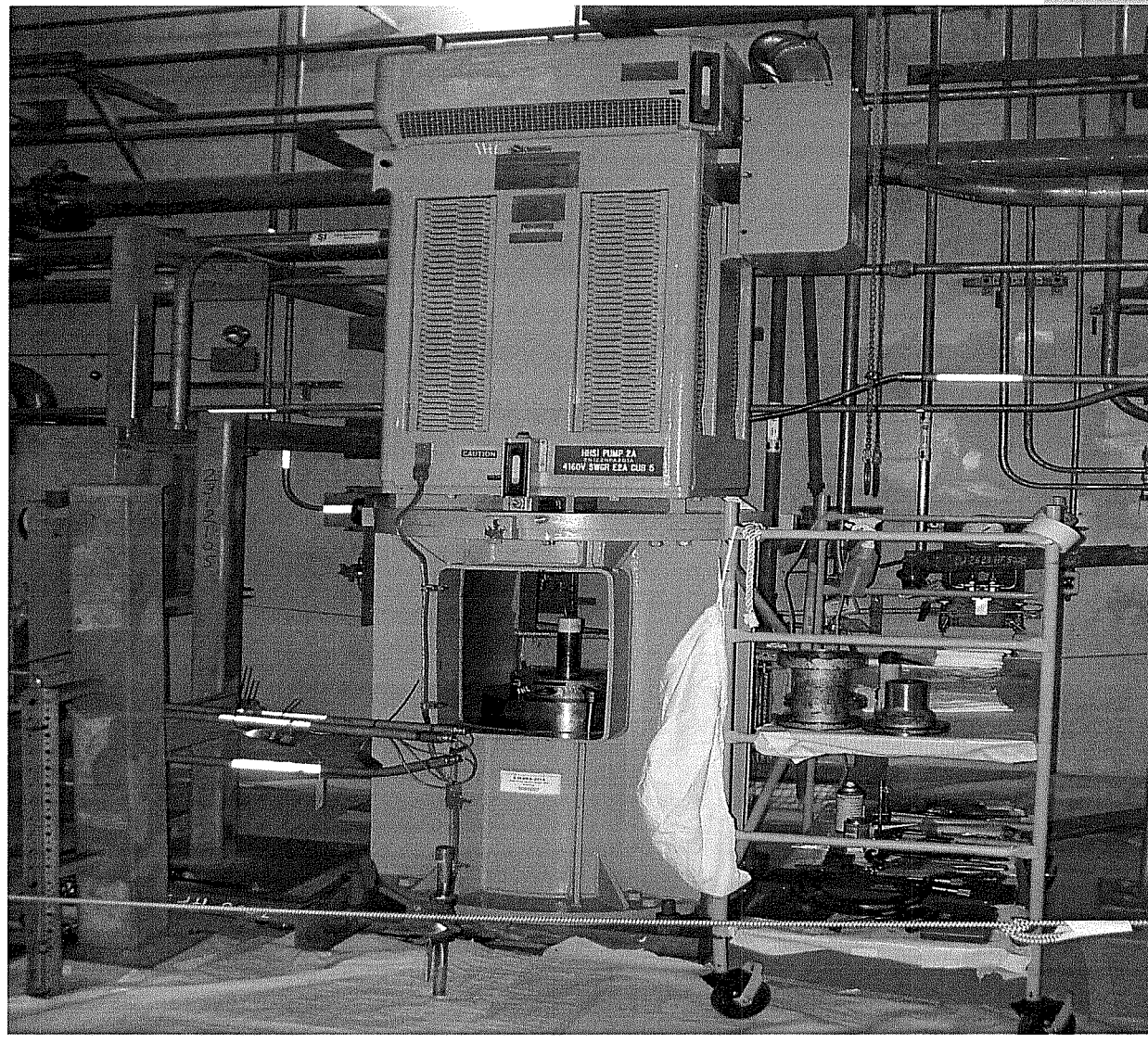
# Equipment Reliability Challenges
## High Head Safety Injection (HHSI) 2A



# Equipment Reliability Challenges
## HHSI 2A – Event Description

- Insufficient clearance to remove the coupling spacer
  - Tight Stack-up Tolerances
- Pump half coupling was bonded to the shaft due to oxidation.
  - Coupling in place since initial startup
- Proceeded in the face of uncertainty
- Use of hydraulic force to remove the coupling half exacerbated the problem.

# Equipment Reliability Challenges HHSI 2A - Causes

- Knowledge, Skills, and Abilities Not Applied During Task Performance.

- Individual Supervisory Practices Allowed Undesirable Behaviors.

# Equipment Reliability Challenges
## HHSI 2A – Corrective Actions

- Deactivated certifications, remediated, and recertified the craftsmen who were involved.
- Implement Constructive Discipline.
- Develop performance improvement plan for the supervisor.
- Retrain Mechanical Maintenance Personnel on the Conduct of Maintenance and HU Tool expectations.
  - 30 Minute Rule
- Conduct focused shop discussions with Maintenance Department Personnel on the Lessons Learned from this event.
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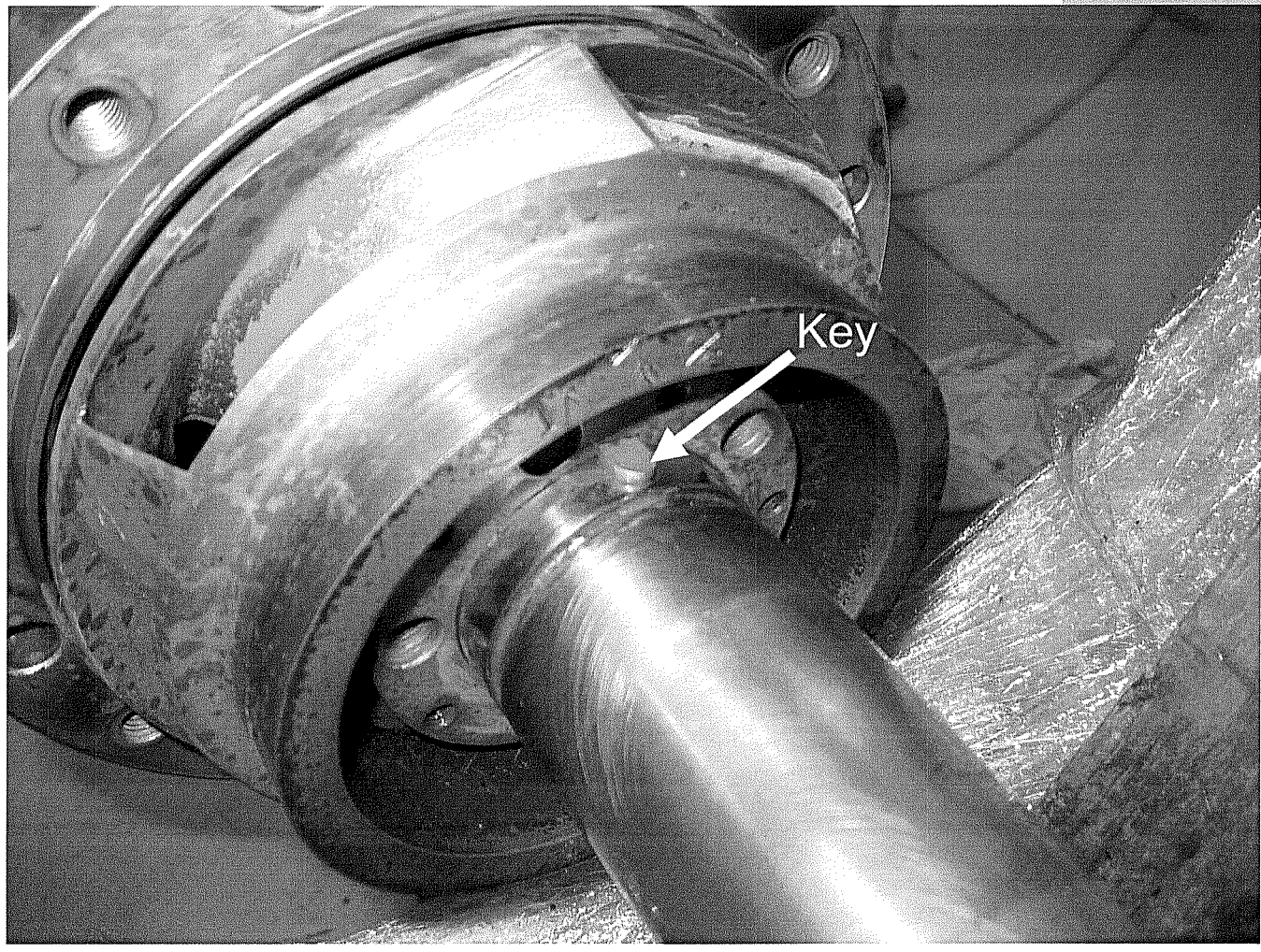
# Equipment Reliability Challenges
## HHSI Pump 2A – Pre-existing Condition




2nd Stage Impeller

# Equipment Reliability Challenges
## HHSI Pump 2A – Pre-existing Condition

- AREVA, Flowserve (Pacific Pump - OEM) and Independent Engineering analysis (Exponent Failure Analysis Associates) agree that the downward motion of the impeller would have reduced pump efficiency but not to a measurable extent
- All inservice tests have been satisfactory and within specification for pump performance
- Evidence indicates that the condition has existed since plant startup or shortly thereafter
- AREVA is currently rebuilding the rotating pump assembly
- Evaluating the appropriate schedule for subsequent HHSI pump rotating assembly change-out

# Equipment Reliability Challenges

Auxiliary Feedwater Pump 14

12/12/06

ENCLOSURE 2

# South Texas Project
# Equipment Reliability
# &
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NRC Region IV Briefing

March 6, 2007

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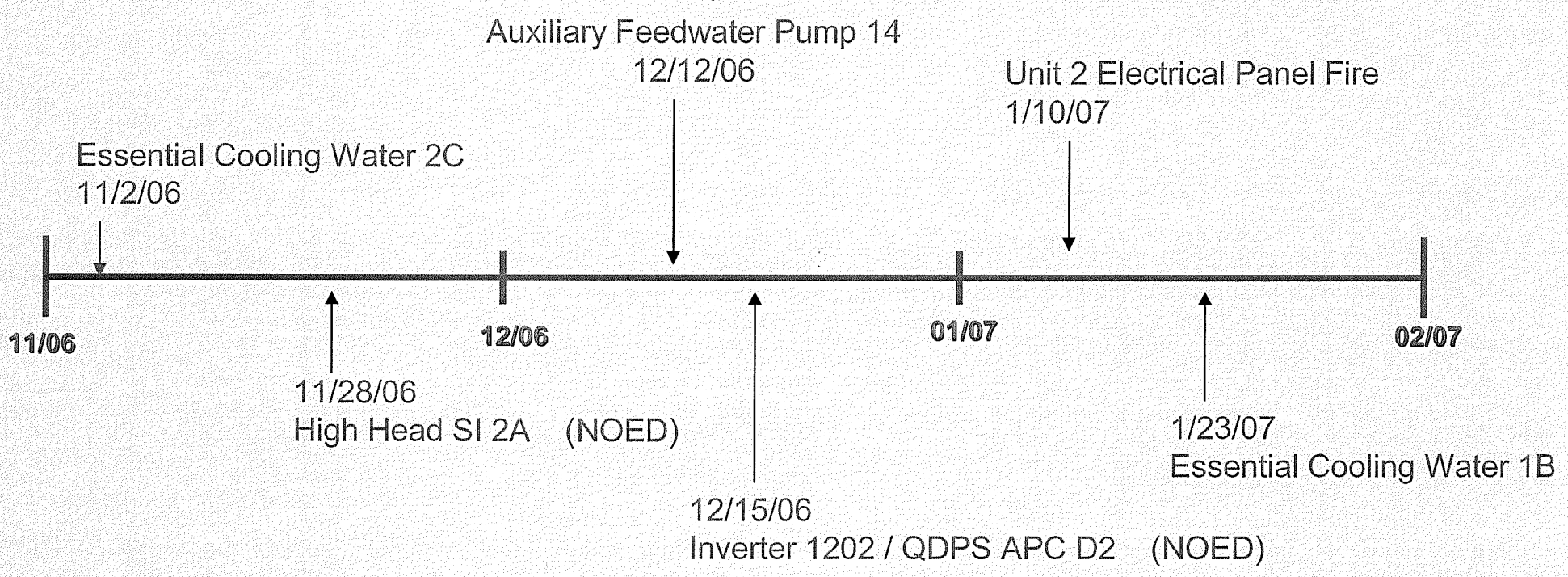

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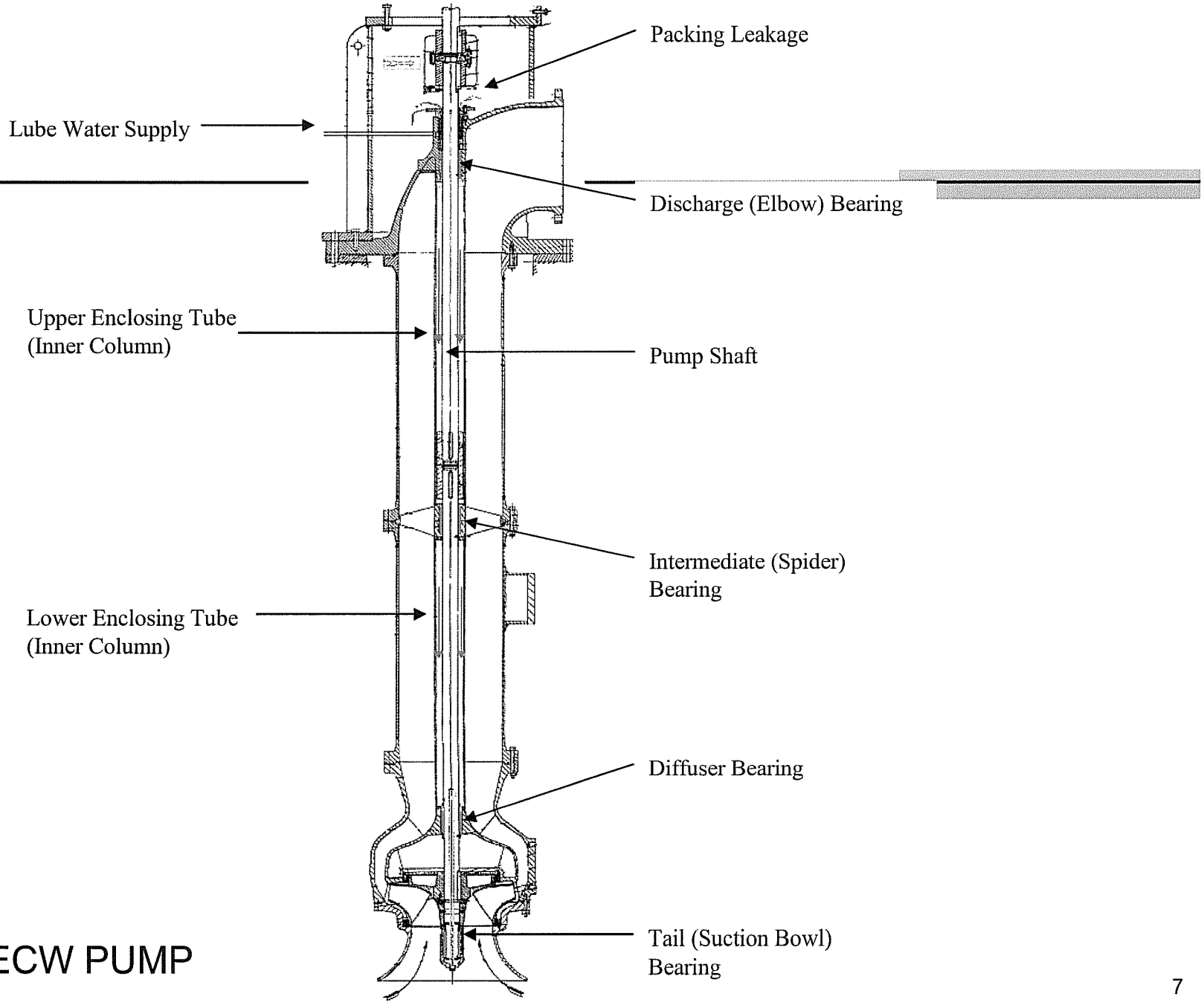


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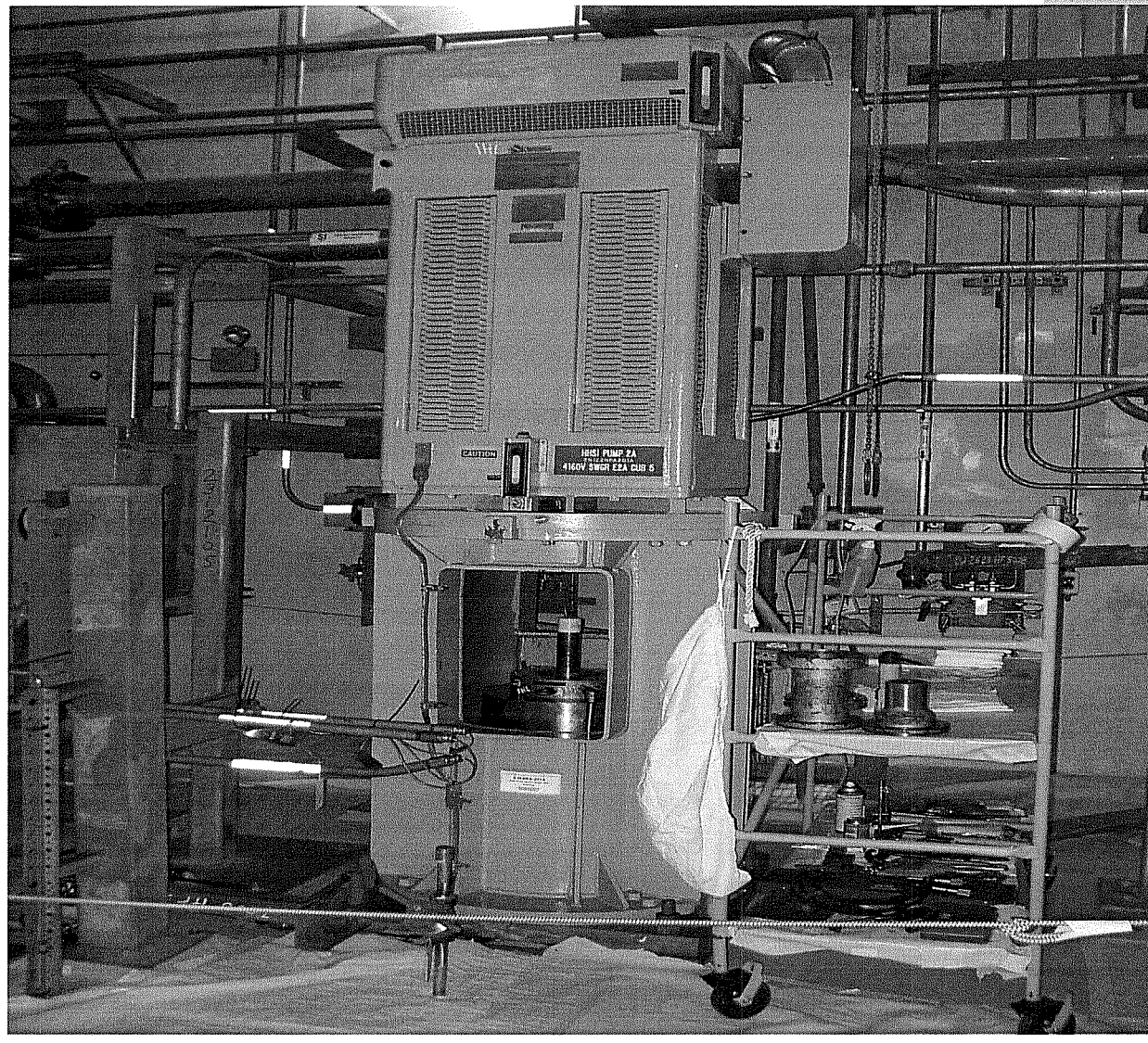

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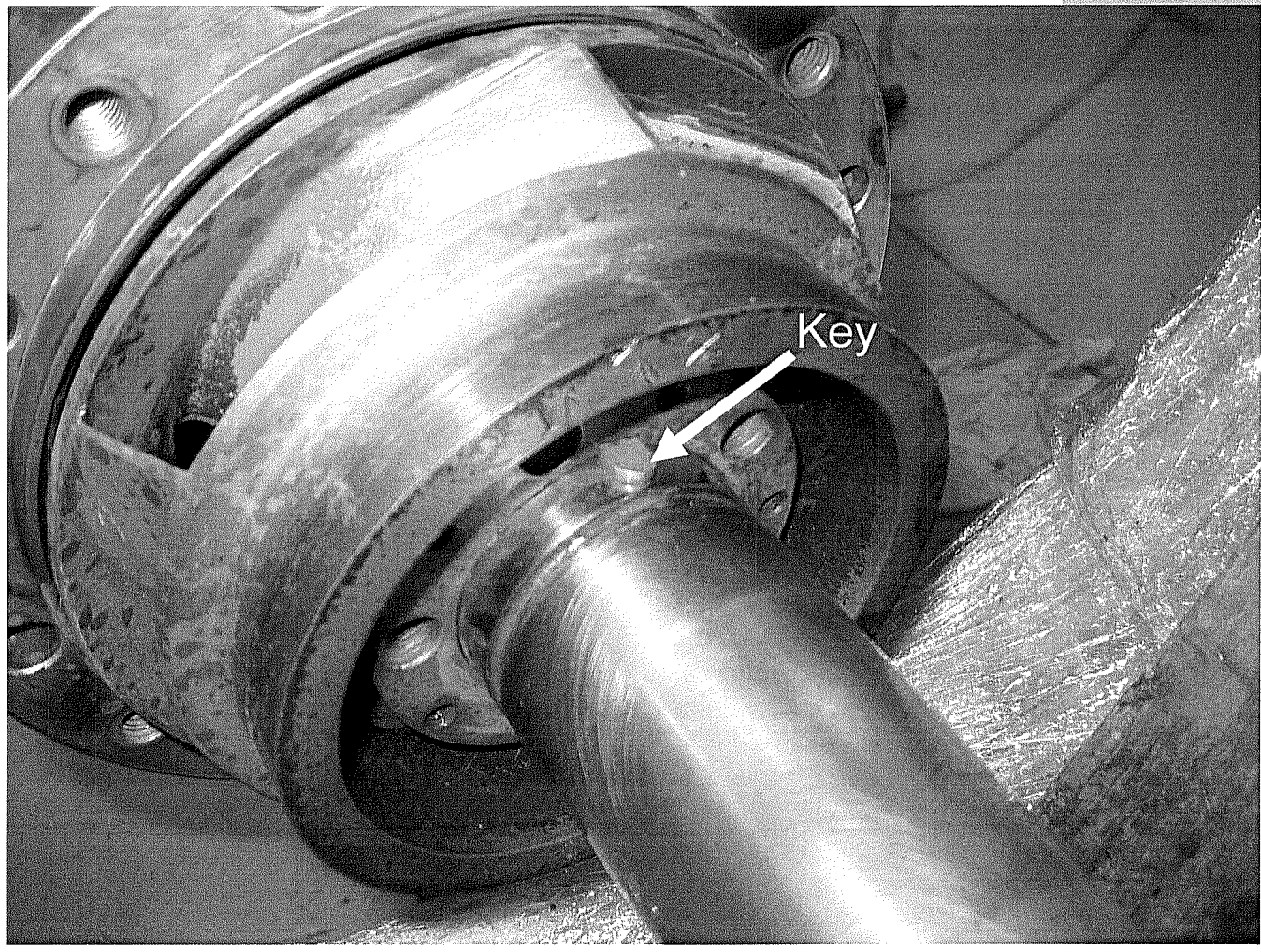


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# Equipment Reliability Challenges

Auxiliary Feedwater Pump 14

12/12/06

# Equipment Reliability Challenges
## Auxiliary Feedwater Pump 14

- 12/12/06 – Auxiliary Feedwater Pump 14 failed to start during a surveillance test.

**Cause**

- Less than adequate level of detail in the associated work instructions, resulting in the improper adjustment of the trip latch linkage and the required impact space.

# Equipment Reliability Challenges
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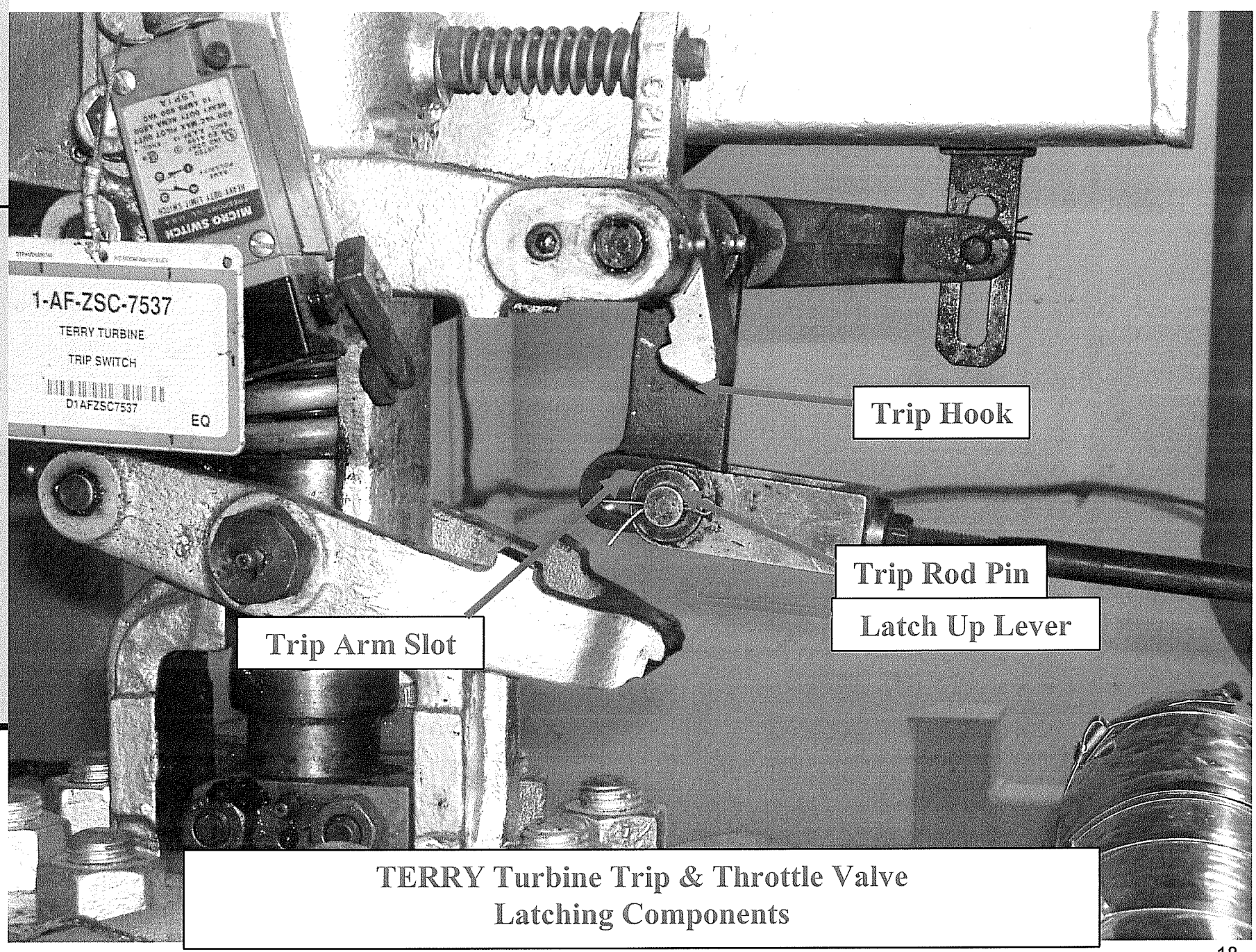
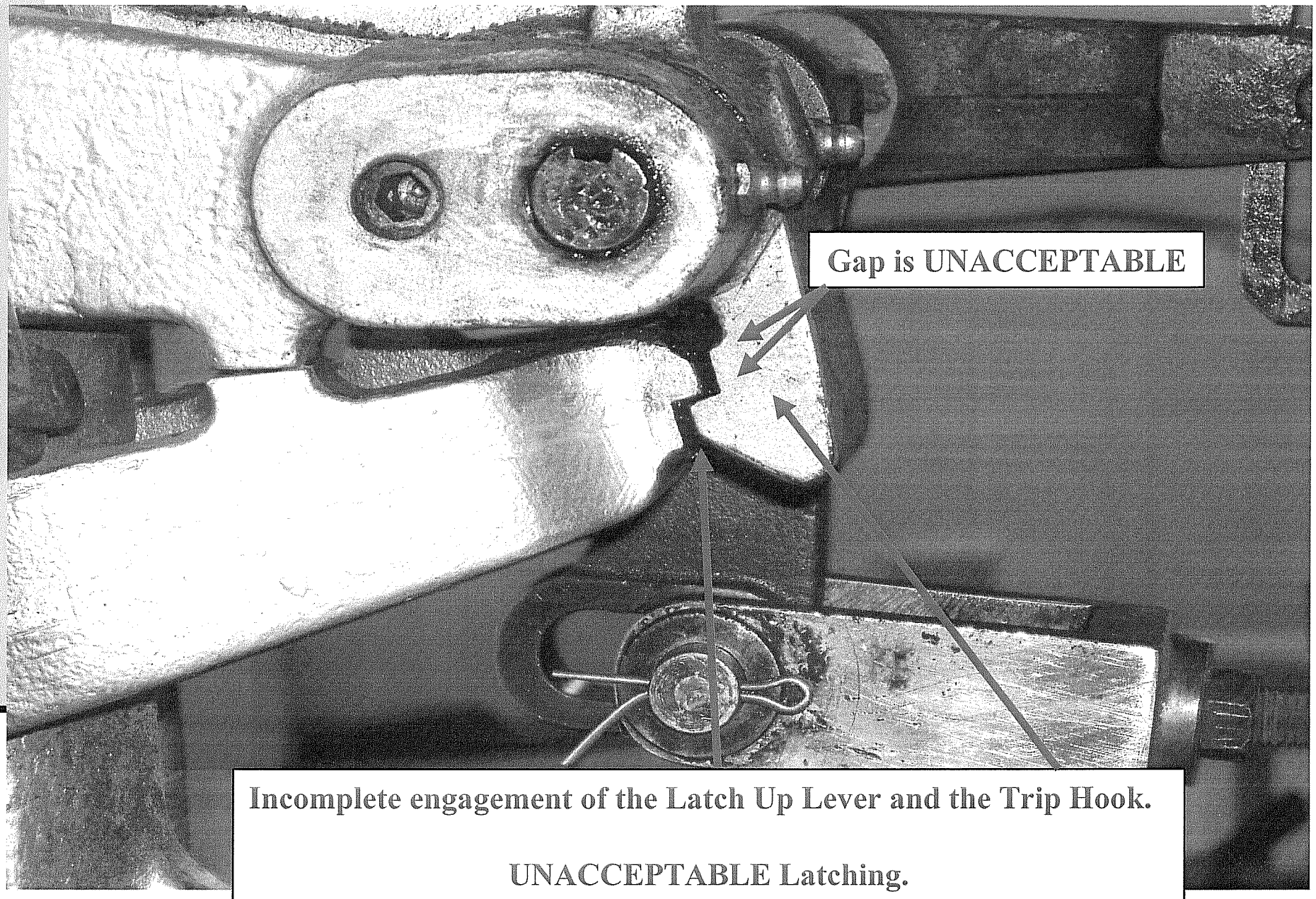
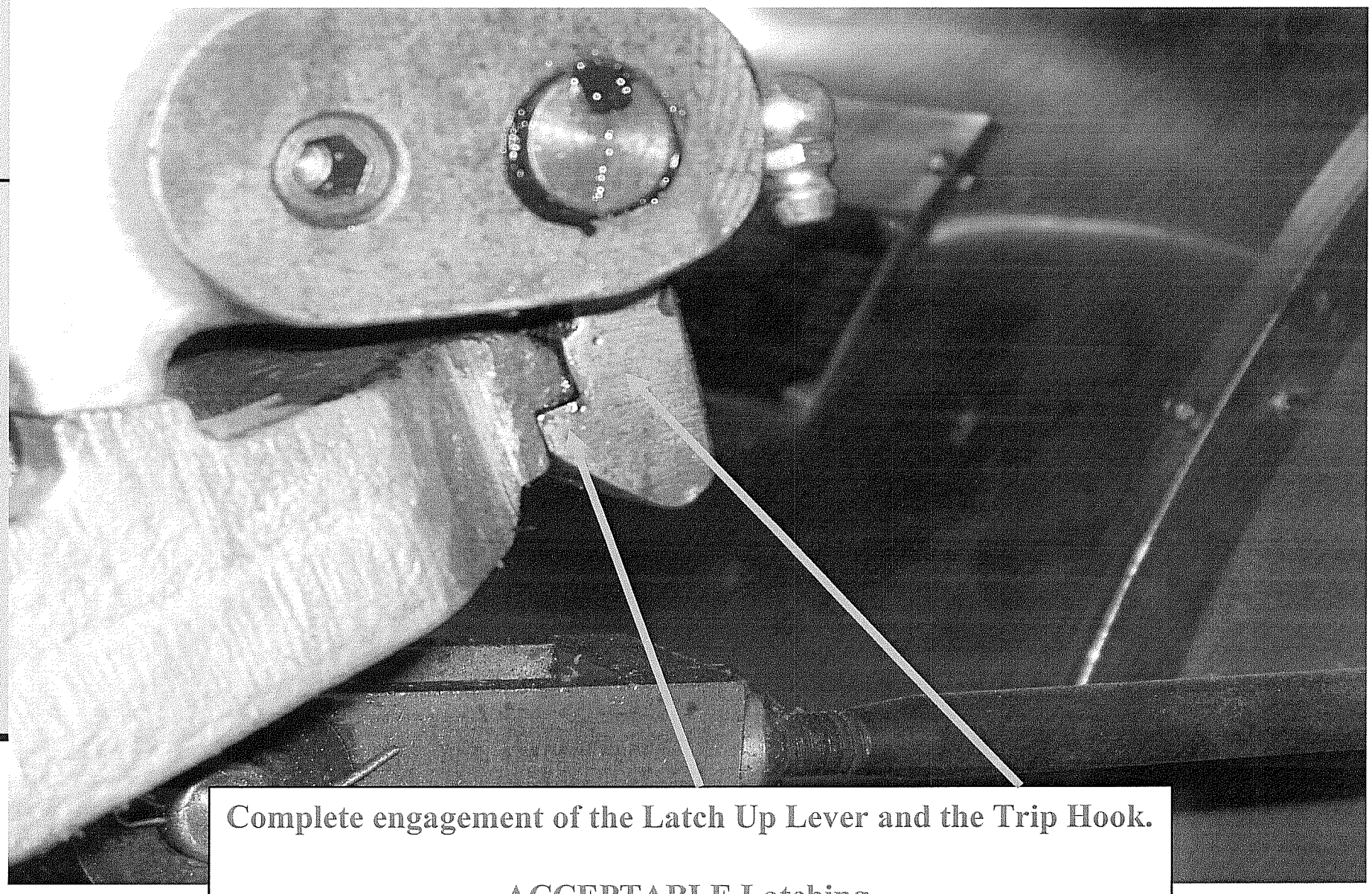



**TERRY Turbine Trip & Throttle Valve**
**Latching Components**




Incomplete engagement of the Latch Up Lever and the Trip Hook.

UNACCEPTABLE Latching.



Complete engagement of the Latch Up Lever and the Trip Hook.

ACCEPTABLE Latching.

# Equipment Reliability Challenges
## AFW Pump 14 – Compensatory Actions

- Weekly engineering walkdowns of both Terry Turbines
- Revised Operation Guidance and Operator Aid
- Performed additional testing of the Unit-1 Terry Turbine – ensured reproducible of latch-hook operation/engagement

# Equipment Reliability Challenges
## AFW Pump 14 – Corrective Actions

- Revise procedure to apply enhanced level of detail/guidance to correctly set/adjust the latch-up lever & trip hook.
- Revise the training/certification for the Terry Turbine overspeed trip device to include how to correctly set the impact space setting.
- Prior to 2RE12, use the Trip & Throttle (T&T) Valve Linkage mockup to train our certified mechanics on correctly setting the impact space setting.
- Utilize a vendor in 2RE12 to provide oversight on correctly setting the impact space and latch gap settings.

# Equipment Reliability Challenges
## AFW – Follow-up Actions

- Common Cause Analysis of all "latching related" conditions from 1994 to the present was performed
  - 19 condition reports were reviewed
  - Only 2 of the conditions would have been considered as equipment failures
- Common Causes Identified
  - Inadequate Maintenance Instructions
  - The design of the trip arm slot dimensions is unforgiving and leaves no margin for variabilities in performance

# Equipment Reliability Challenges
## AFW Common Cause– Corrective Actions

- Review vendor documents for the MOV-0514 T&T Valve and EPRI document TR-1007461 for important notes, precautions, and information that should be incorporated into STP's maintenance instructions. Incorporate applicable material into the appropriate maintenance instruction or procedure.
- Evaluate the trip arm slot design on the MOV-0514 T&T Valve slip link lever in both units. Develop a design change to add margin to latch hook engagement set up. Confirmation will be obtained from the T&T Valve vendor to ensure that the design change will not cause unintended consequences.

# Equipment Reliability Challenges

Inverter 1202/QDPS APC D2

12/15/06

# Equipment Reliability Challenges
## Inverter 1202/QDPS

- 12/15/06 – power was lost to several loads fed from DP 1202 in Unit 1. A visual inspection of Inverter 1202 confirmed that a capacitor in bank C805 had failed. Similar to an event that occurred on 12/26/05.
- Loads lost:
  - Isolation Relay Cabinet ZLP688
  - Steam Generator 1D Power Operated Relief Valve (PORV) servo amplifier
  - QDPS APC D1
  - QDPS APC D2
  - Nuclear Instrument System control and instrument power to panel

# Equipment Reliability Challenges
## Inverter 1202/QDPS

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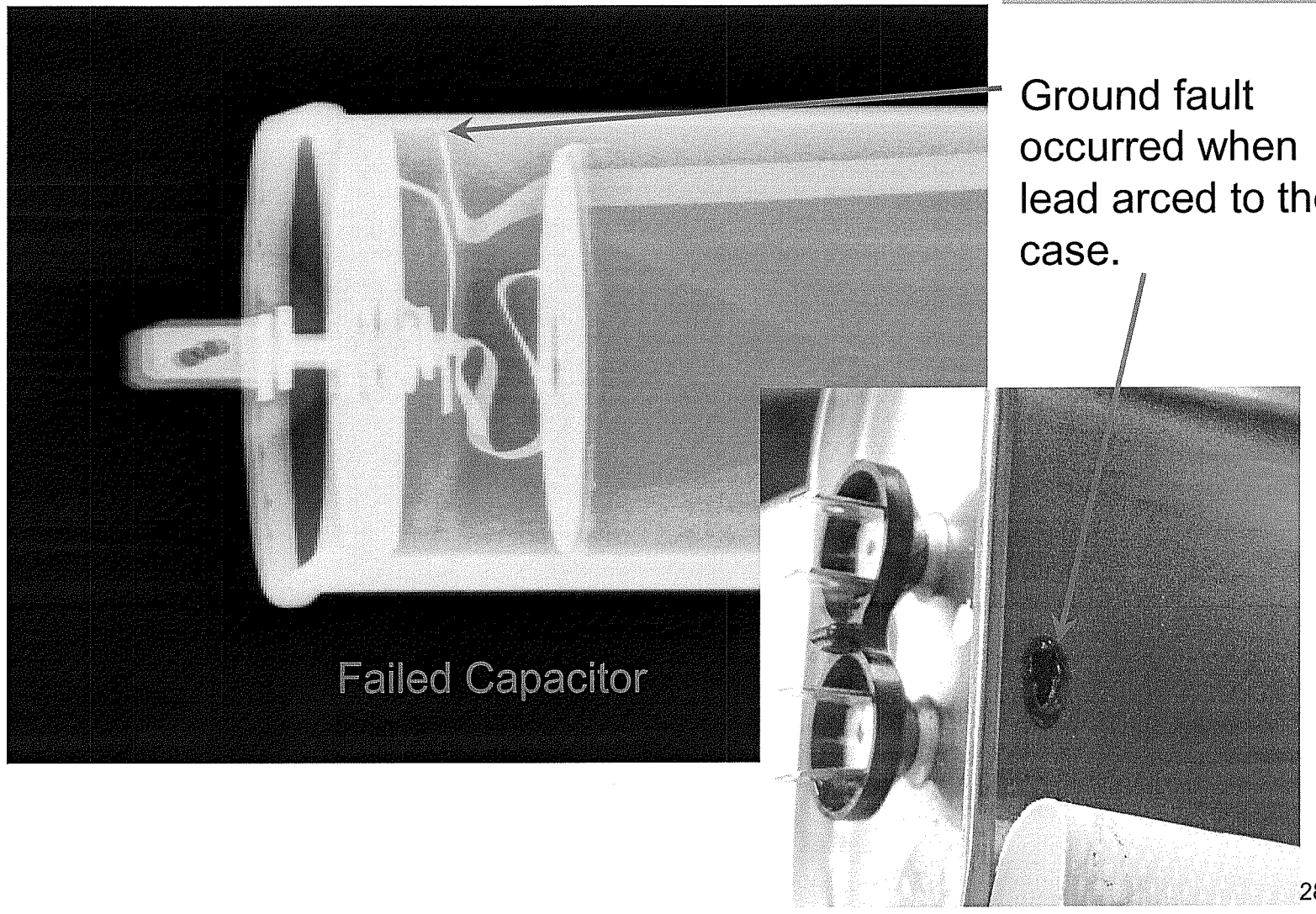

# Equipment Reliability Challenges
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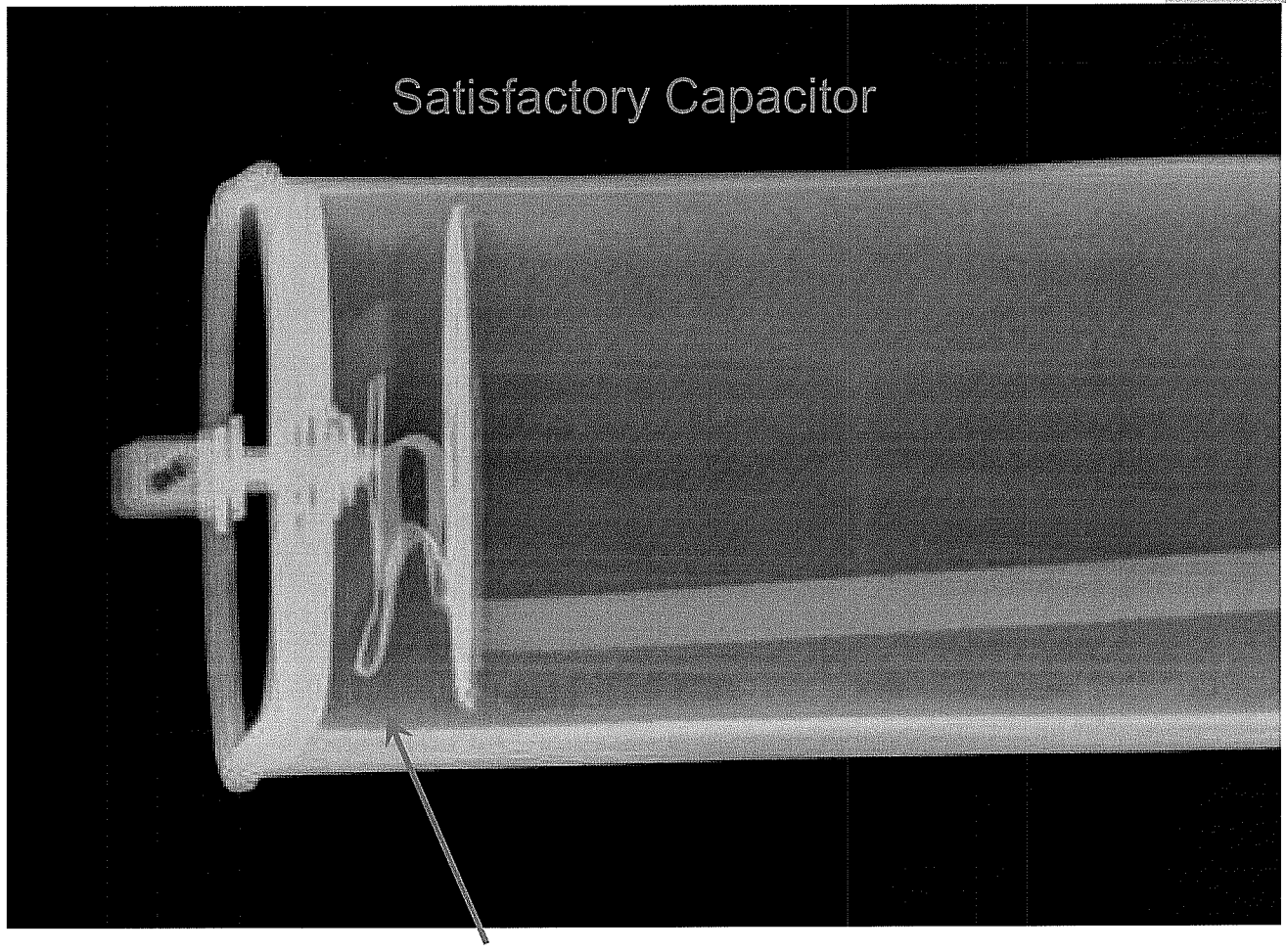



X-ray confirming satisfactory clearance between lead and case.

# Equipment Reliability Challenges
## Inverter 1202/QDPS – Corrective Actions

- Performed x-ray inspection on all new capacitors placed in inverter 1202
- Developed a plan of action for capacitors previously replaced in other Unit 1 inverters
- We will replace all capacitors in Unit 2 inverters during the 2006/7 spring outage
- Evaluating/developing a scheme for protecting the downstream loads
- Require x-ray inspection of all capacitors prior to release for installation in the plant

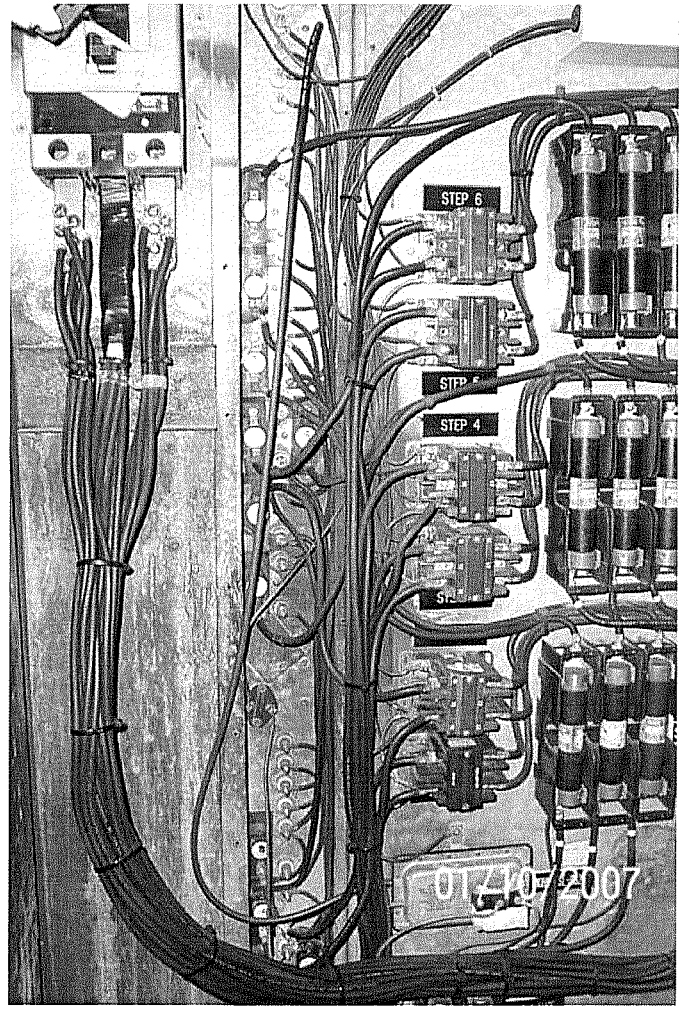
# Equipment Reliability Challenges

Unit 2 Electrical Panel Fire

1/10/07

# Equipment Reliability Challenges
## Electrical Panel Fire

# Equipment Reliability Challenges
## Electrical Panel Fire




**Properly Trained Cables**

# Equipment Reliability Challenges
## Fire – Common Cause

- A review of the fires that have been reported at STP for the previous 5 years was performed and compared to industry data recorded by NEIL.
  - Data from 26 nuclear power plants was recorded by NEIL
  - Industry Average - 2.6 fires/year
  - STP Average – 2.8 fires/year
- Fires were analyzed for common cause

# Equipment Reliability Challenges
## Fire – Common Causes

- Less than adequate work area preparation – 2 fires
- Design Change removed significant load from ERFDADS inverters – did not recognize that reducing load caused an increase in heat generated by the inverter transformer – 2 fires
- Preventative maintenance program for non-risk significant electrical panels did not include thermography.

# Equipment Reliability Challenges
## Fire – Corrective Actions

- Lessons Learned training session with all parties associated with hot work at STP. Information will be included in the on-going training program for fire watch personnel.
- Lessons Learned training session with all personnel who review design parameters and prepare Design Change Packages. This training will be added to on-going training program for engineers.
- Revise or establish Preventative Maintenance activities for non-risk significant electrical panels based on fire risk.

# Equipment Reliability & Maintenance Work Practices

## Common Causes

# Equipment Reliability Common Cause Analysis

- Vendor recommendations and latent vendor errors are impacting equipment reliability.
- Operating Experience has not always been effectively used to drive equipment reliability improvement.
- Preventive/Predictive Maintenance strategies are not in all cases improving equipment reliability.
- Work planning process does not consistently identify activities that could challenge Limiting Conditions for Operation.

# Equipment Reliability
## Common Cause Analysis - Actions

- Develop a proactive vendor management program that includes an intrusive review of vendor recommendations (trust but verify).
- Ensure in-house events are being properly flagged for operating experience and ensure that the review of industry operating experience is being properly documented in the corrective action program.
- Select specific systems/components for failure modes and analysis study. Compare results of the studies to current preventive maintenance activities.
- Develop a process to consider the "worst case scenarios" in scheduling our work activities to minimize challenges to LCO allowed outage times.

# Maintenance Work Practices
## Common Cause

**Common Cause**:

- Less than adequate use of Human Performance Tools associated with:
  - Worker Risk Recognition
  - Procedure Use and Adherence
- Less than adequate written work instructions and work processes.

# Maintenance Work Practices
## Corrective Actions

**Written Instructions / Work Processes**

- Upgrade the level of detail in our Maintenance Procedures and create new procedures.
- Improve the process for Engineering review of work packages.
- Develop a Risk Strategy that specifies when a written Plan of Action, Readiness Review, and In-Depth OE Review would be required.
- Use of Dynamic Learning Activities to demonstrate knowledge, importance, and proper application of Human Performance Tools.

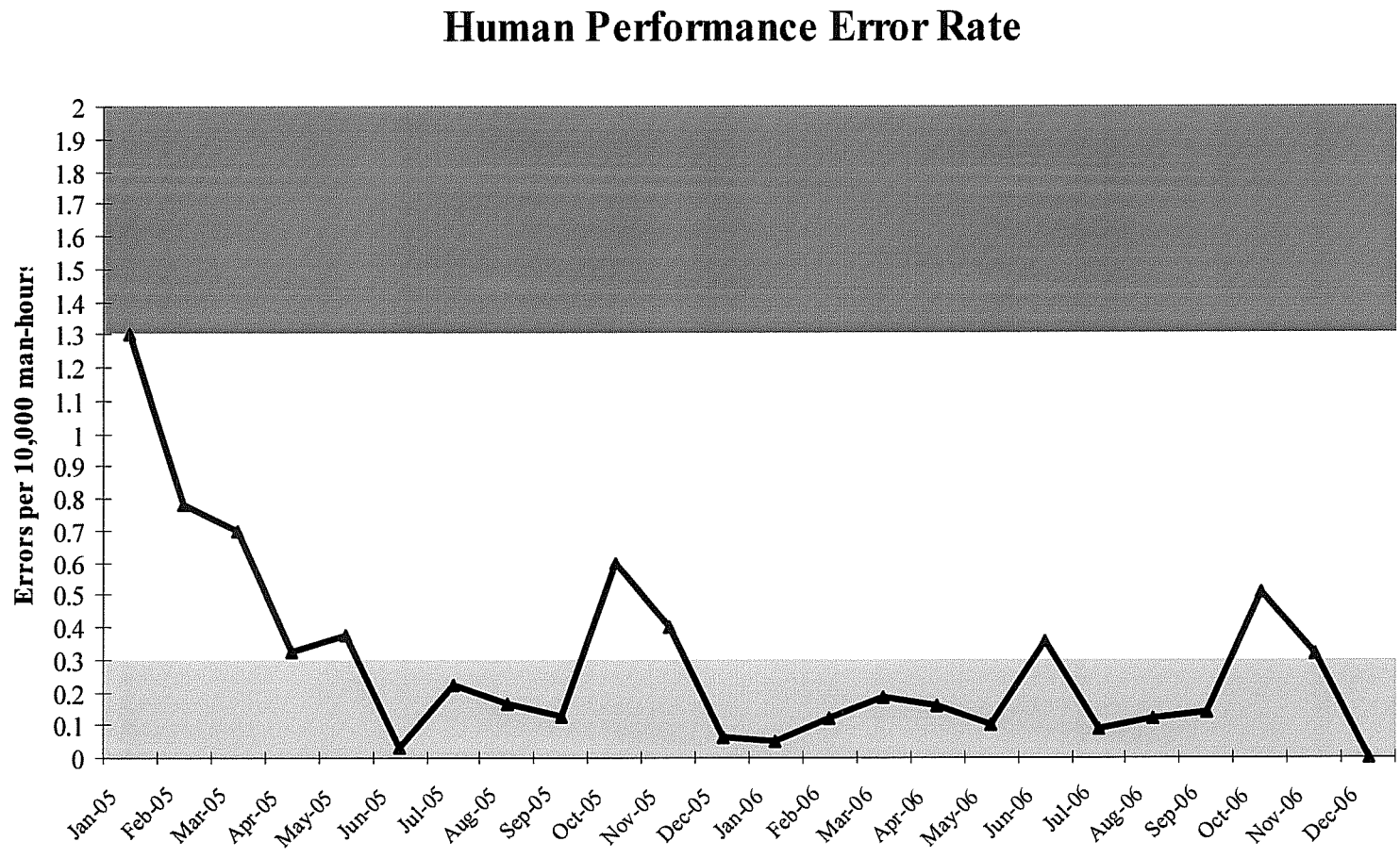
# Common Cause Analysis

- We Own It!
- This team has worked hard to identify the Common Causes.
- Our Strategies and Corrective Actions have the right balance between improving our processes and striving for performance excellence.
- Used Industry Experts for an independent review.
  - Exponent Failure Analysis Associates
  - Performance Improvement International

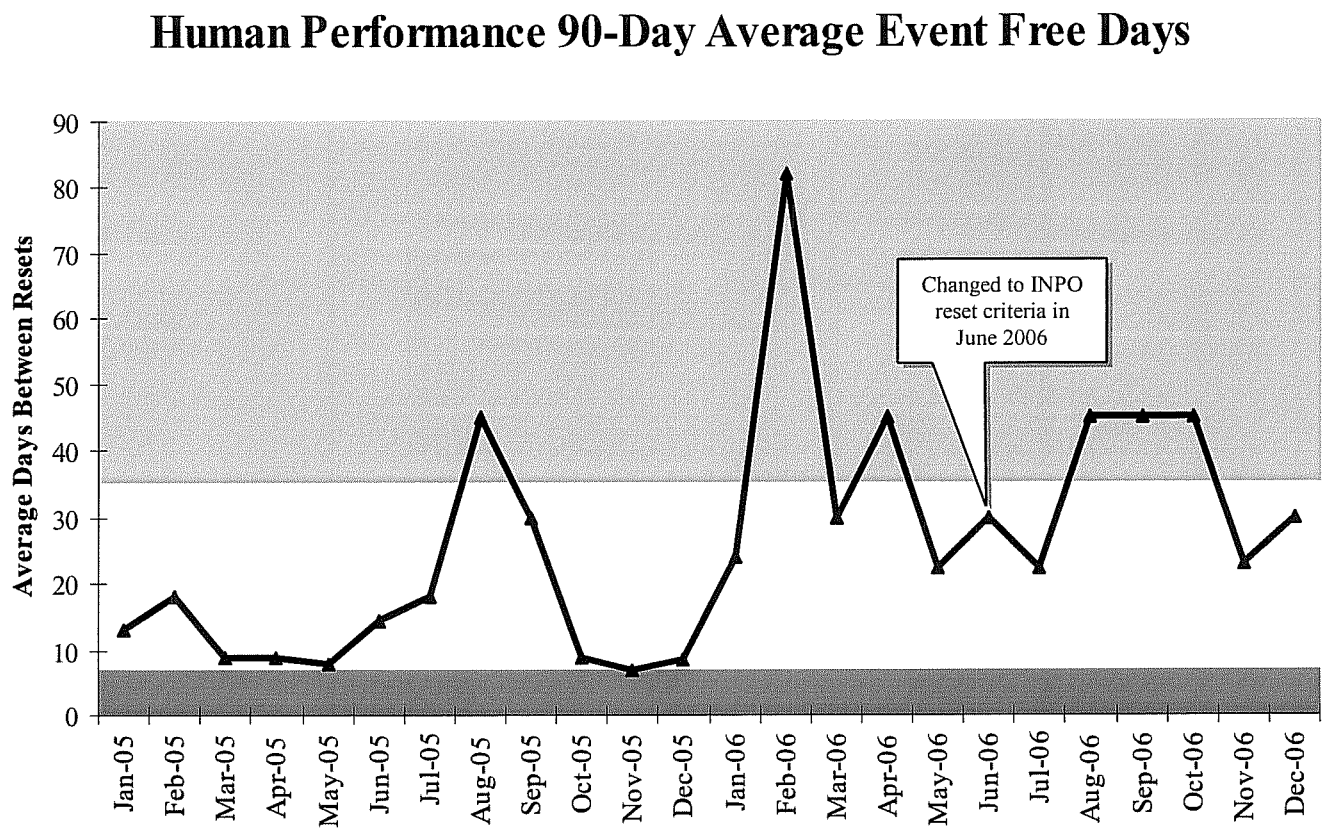
# Equipment Reliability & Human Performance

## Performance Indicators

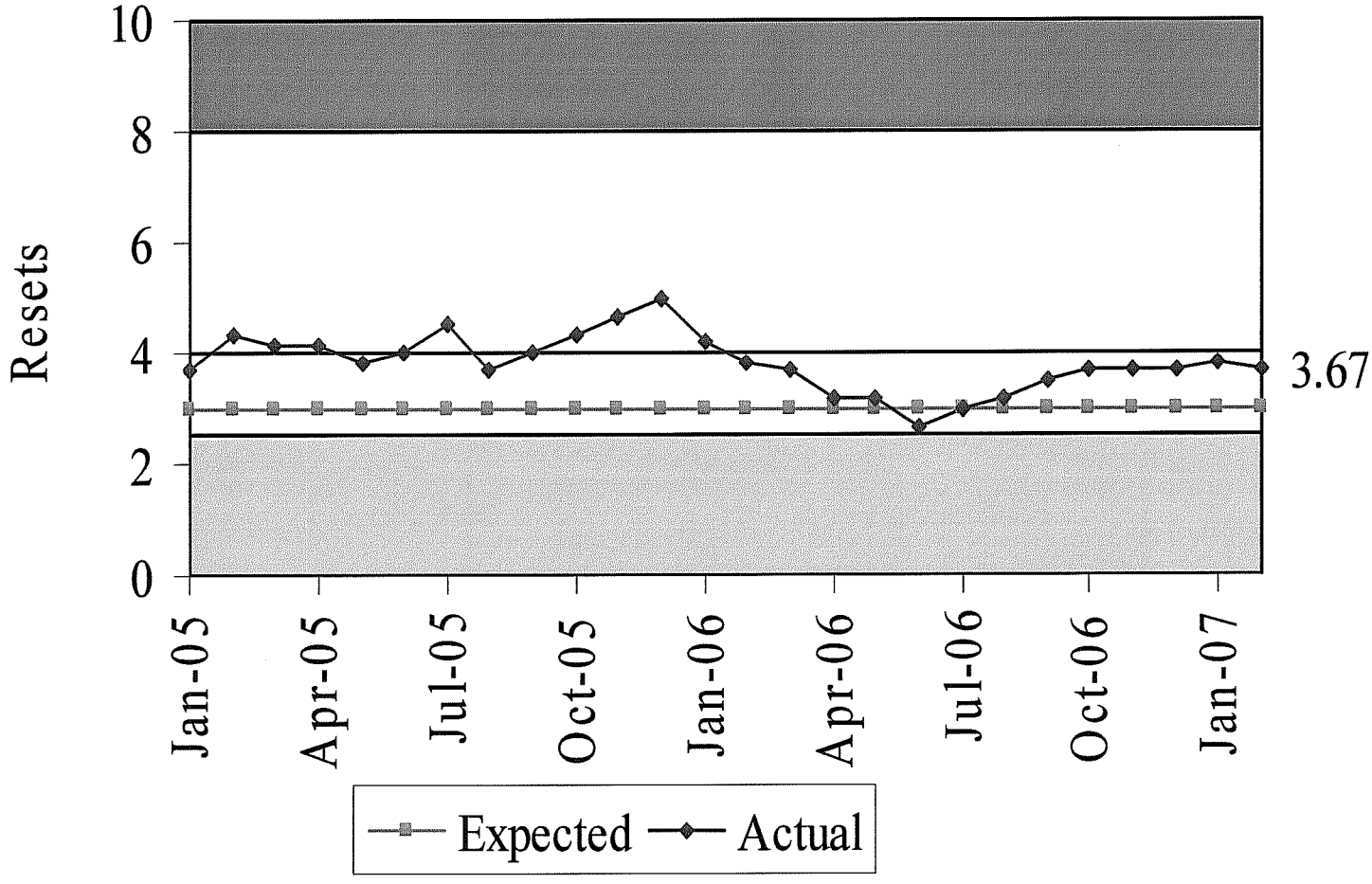
# Human Performance Error Rate 2005-2006



# Human Performance Event Free Days 2005-2006

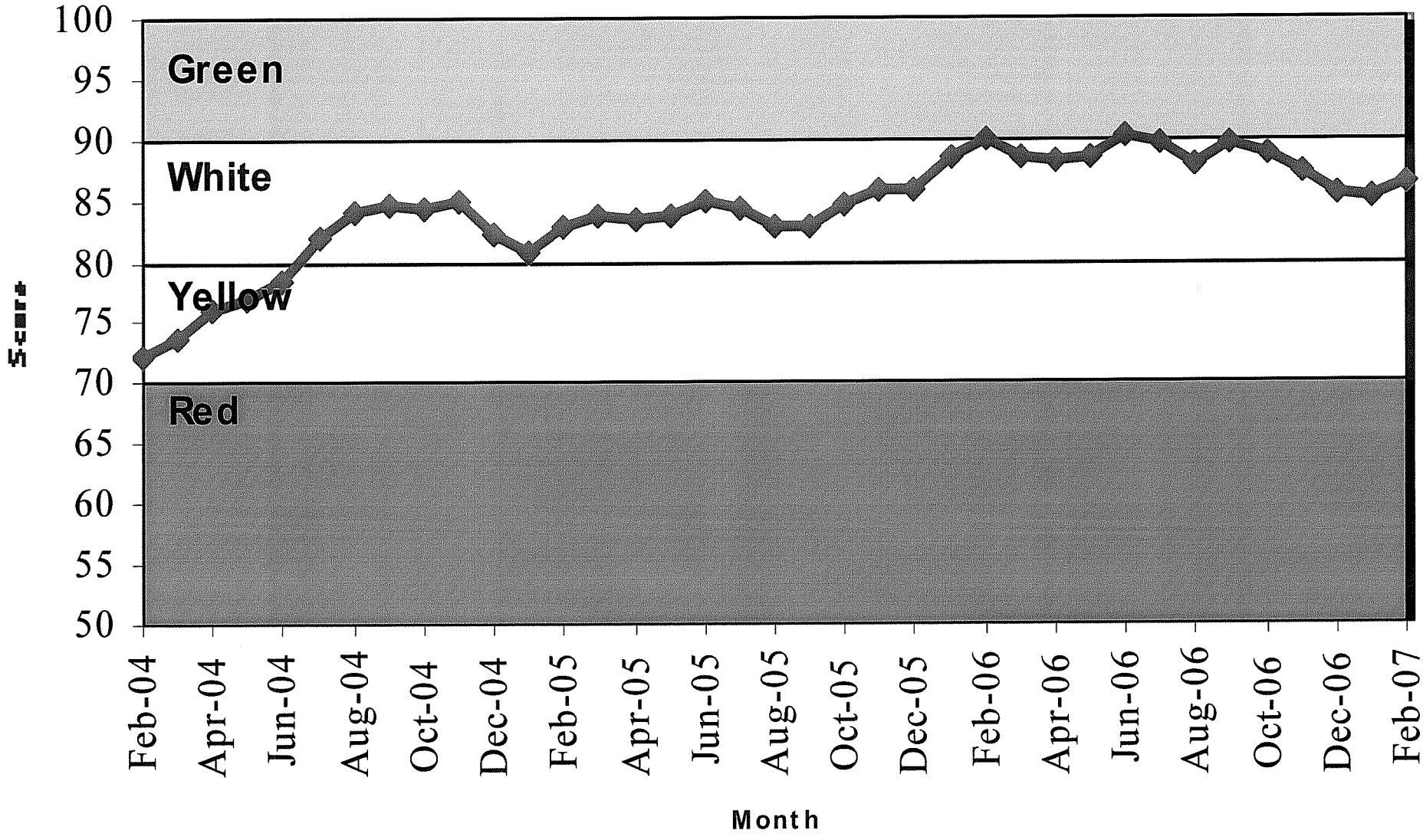


# EQUIPMENT RELIABILITY CLOCK RESETS



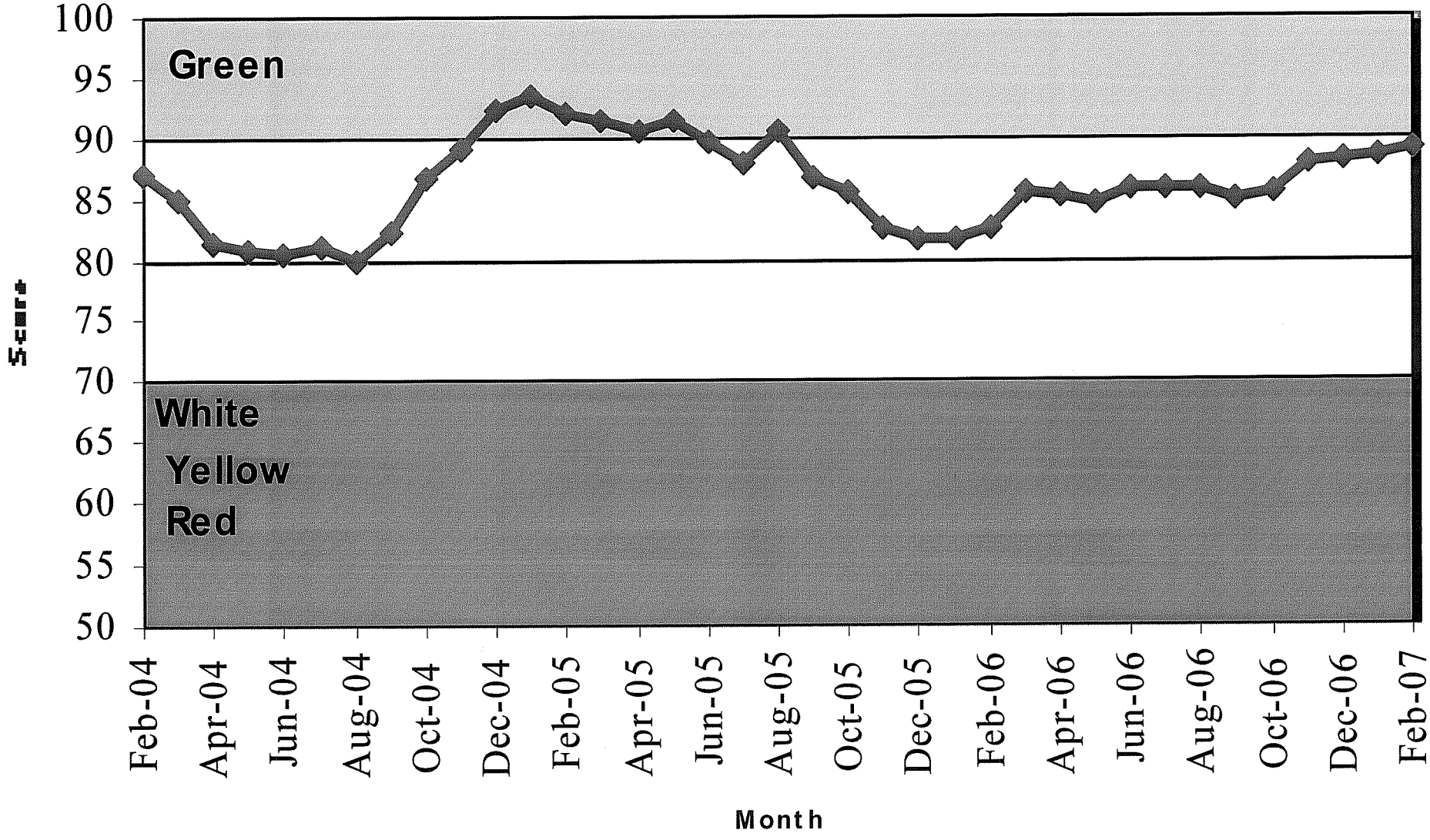
# Unit 1 Plant Reliability Index

## Six Month Rolling Average



# Unit 2 Plant Reliability Index

## Six Month Rolling Average



# Summary & Conclusions

- **These events do not meet our expectations and high standards for equipment reliability and human performance**
  - These events have stressed the station and all key stakeholders involved
  - We are disappointed they occurred
- **Several of these events are a combination of human performance, design configuration decisions made years ago, and vendor quality issues**
  - Material choices, design selections, poor vendor quality
  - Regardless, our team owns these issues
- **Important to note that we have worked hard on improving our processes so that overall performance has improved**
  - Our indicators in Equipment Reliability and Human Performance trends show overall improvement
- **As plants age, equipment issues occur. Therefore…**
  - We have aggressively worked on proactive measures to prevent and manage such issues
  - Life-cycle management Investment of > Half Billion $ in each Unit to improve reliability
  - Implementation of Risk Informed Technical Specifications to better manage issues as they occur & eliminate need for requesting enforcement discretion
- **The STP team is NOT satisfied with our recent performance and we are committed to achieving excellence in all aspects of our business**
  - A commitment to the NRC, the public, and to ourselves
  - A desire to be excellent and a recognition that we are not

# Equipment Reliability & Maintenance Work Practices

## Questions