



Asset Management, Decision Making and Counter/Condition Based Maintenance at PSE&G

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Today's Agenda

- Electric T&D Utility Industry Overview
- PI Enterprise Infrastructure
- Counter/Condition Based Maintenance (CBM)
- Why do we need CBM
- Benefits of PI-based CBM
- The Future



T&D Utility Business Drivers

Workforce Going Gray

Implication: Higher expectations knowledge-based intelligent tools in PI

Compliance Enforcement

Implication: PI to provide the secured data and architecture

- Green Initiatives and Social Programs
 - Distributed resource activity (DSM, DG, PV, PHEV, appliance automation, etc.), reinforce deployment of AMI, even BPL
 - Millions of tags

Implication: PI to manage smart grids and standards (IEC Standards, i.e. CIM) for interoperability. Driving AF – metadata, context, and enterprise.

- Grid Expansion
 - Renewables, WAMS, new operational scenarios, e.g. more HVDC, FACTS superconducting lines, etc.

Implication: PI with a new generation of visualization and user experience

PIT&D New Trends

Asset Management

- Equipment Health Monitoring
- Condition Based Maintenance

Smart Grid/Intelligent Grid

- Substation Automation
- Distribution Automation
- Distributed Generation
- Demand Side Management
- AMI (Advanced Metering Infrastructure)

Power System Monitoring

- Power Quality, Event and Disturbance Analysis
- SynchroPhasor for Grid Stability

Challenges/Solutions

Challenges:

- Integration of disparate systems and diverse data sources
- Unified modeling of power network and assets
- Advanced analysis
- Enhanced visualization

Solutions:

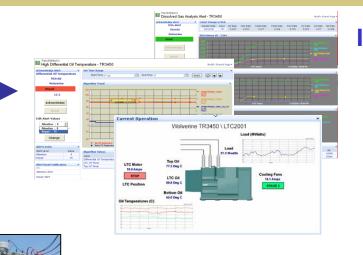
- Centralized data repository/analysis engine
- A single version of the truth
- Intelligent event-driven working by exception action
- Enabling the desktop data access throughout enterprise
- Reliability and quality through greater situational awareness

PI: An Open and Scalable Environment

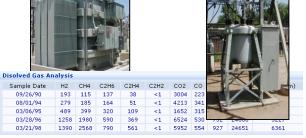


Alert Notifications
Event Triggering
Maintenance or
Work Order Generation

Real-time Rule
Assessment
(PI ACE and Analytics)



Integrated Asset
Information
KPI Dashboard
Visualization
(RtWebParts)



Asset Information
Structure
(PI Metadata and RDB)

Improve Reliability and Quality



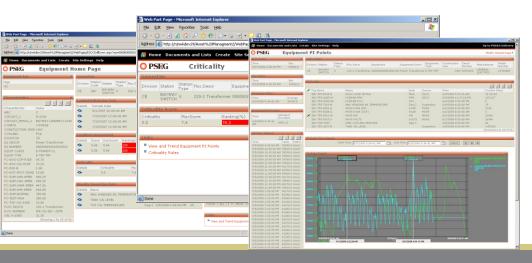
Asset Reliability (PI OLEDB and Reporting)

How we use PI? T&D Users Group Activity

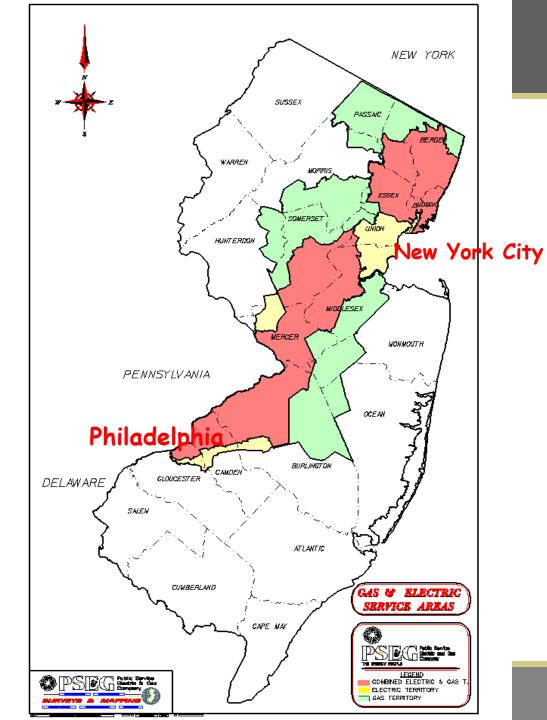
Past T&D Users Group Meeting Presentations (2002-2008)								
No.	Presentation Topic Category	Users	Partners/	Total				
			OSIsoft					
1	Business Stories (case studies, lessons learned, ROI, etc.)	15	2	17				
2	Power Grid with Power Market & Generation Management	9	0	9				
3	Condition Based Maintenance	7	2	9				
4	Control Center Operations and Visualization	7	1	8				
5	PI and Control Center Security	6	7	13				
6	Transmission Management	5	2	7				
7	Substation Automation	4	6	10				
8	System Manager & Developer Tips and Tricks	4	3	7				
9	Wide Area Measurement Systems (WAMS)	3	3	6				
10	Metering and Power Quality	3	1	4				
11	Distribution Management	2	1	3				
12	Product Focus & Demo	1	13	14				
13	Mobile Devices	1	1	2				
14	Product Roadmap and Strategy	0	4	4				











PSE&G Company Background

- One of the largest combined electric and gas companies in US
- 323 municipalities
- 70% of New Jersey's population
- 2.1 million Electric customers
- 1.6 million Gas customers
- 2,600 Square Miles
- * (between New York and Philadelphia)

What is Asset Management?

Transformers

Circuit Breakers

Managing anything of value:

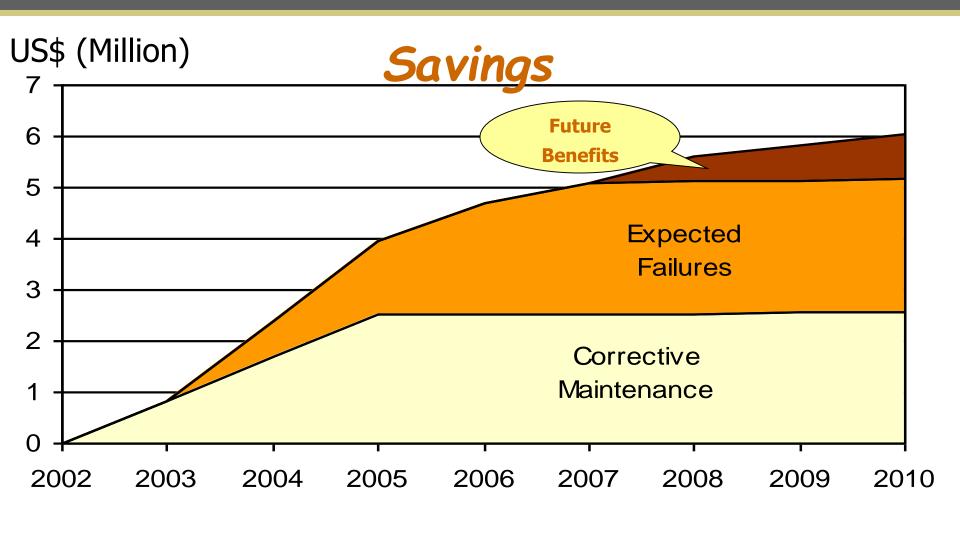
Hydraulic Pumping Plants

Protective Relays

Gas Mains

Bucket Trucks

Why Asset Management?



Years

Counter/Condition Based Maintenance

(CBM)

CBM is a *decision support system* that assists in making:

Repair

Replace

Maintain

Decisions

(Transformers, Breakers and Relays)

Counter/Condition Based Maintenance

(CBM)

It does this by correlating operational, diagnostic and work management data and turning this data into actionable information.

- > It is NOT a "crystal ball" that predicts failures
- > It does NOT put the process on "cruise control"
- > It is NOT a "budget slashing" tool

Asset Management - Inside Plant

(transformers, breaker and relays)

"What do you do when...

- You have \$1.5B of installed plant with a replacement value of \$5.4B,
- > Average age of the assets exceeds 40 years,
- All equipment is expected to be used and useful all the time, and...
- Maintenance expenditures erode earnings and capital replacement provides for no new revenue?

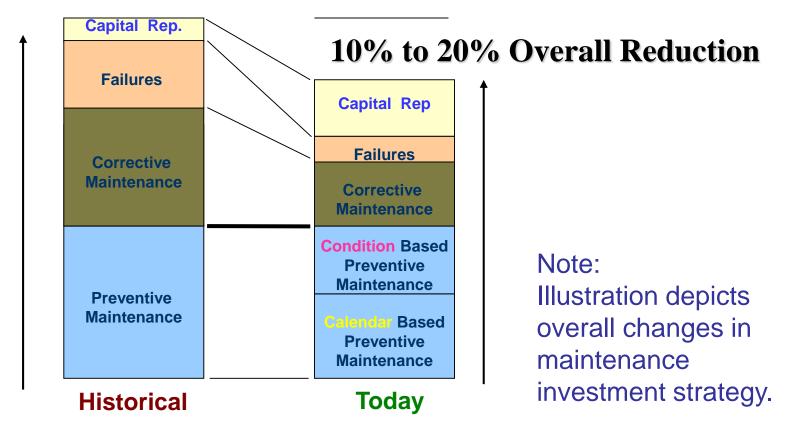
Maintenance Plan Criteria

Determine strategy for yourself on...

- > Run to failure
- > Strategic importance of asset
- > Acceptable level of reliability
- > Level of business risk
- Appropriate annualized preventive maintenance cost
- > Appropriate resource allocation for maintenance
- Appropriate replacement/re-design strategy

Benefits Breakdown

These annual expenditures protect \$1.5 B of inside plant assets and full benefits after approximately five years.

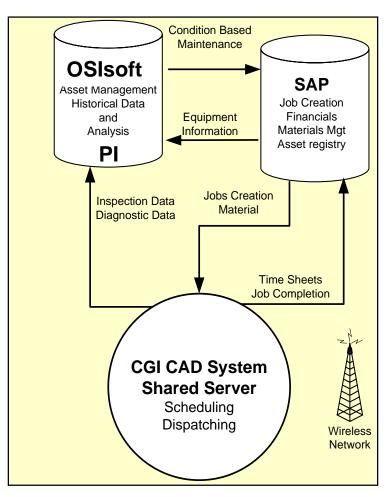


Integrated for Success





People



+ Process

System Integration

Service Assurance
Outage Management

Work Management Crew Management

Wireless Communications

Graphic Information AM/FM

Decision SupportData driven decisions

+ System

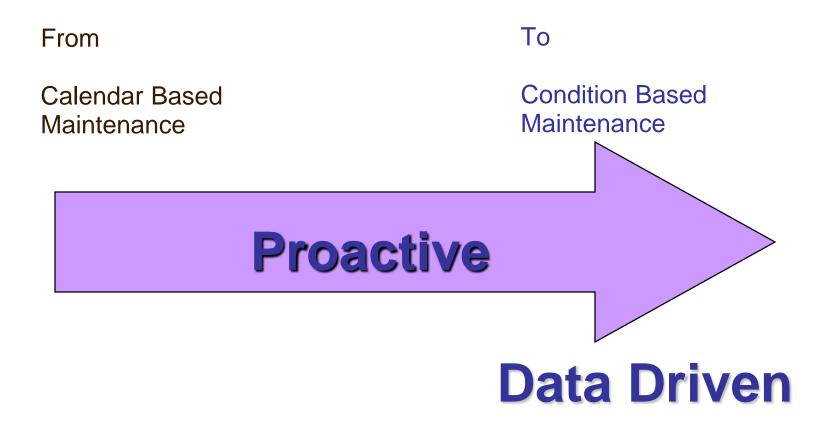
The Mission

To optimize the investment in assets while *improving* the overall system reliability of Electric Delivery

The Vision

To perform the *right* maintenance at the *right* time, based on the *consistent* analysis of data to ensure a *safe*, *reliable*, *and cost effective* approach

Maintenance Philosophy



System Strategy

- Integrate systems and deploy technology
- Provide a consistent and repeatable data collection process to insure data integrity
- Analyze all data relevant to an individual asset in a regularly scheduled and consistent manner
- Maintain asset information in one accessible database
- Automate the data collection process

Expectations

- Visibility to all key inside plant assets
- Consolidated asset inspection, test and maintenance data
- Consistent information base for comparative analysis
- Condition and performance algorithms to assist in decision making process

Condition Assessment Benefits

Identify deteriorated equipment (Automatically)

- > Pattern recognition
 - >Trending
 - > Predictive
 - > Peer group variants

Proactive

Work prioritization (Do the right thing first)

- > Drive corrective action (maintenance)
 - > Drive replacement plans

Counter/Condition Based Maintenance

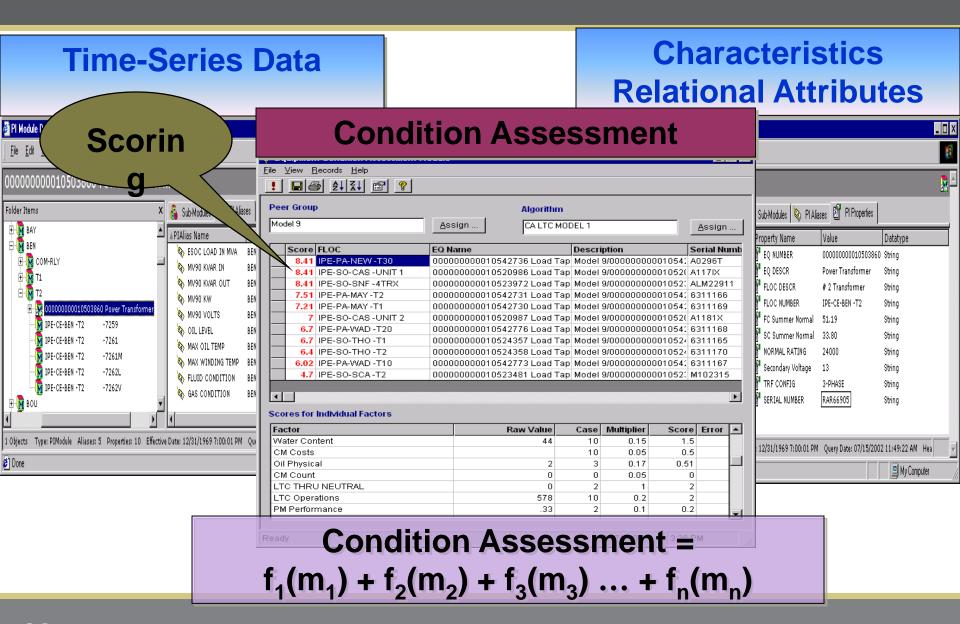
Includes the following functions-

- SAP PM Module for Asset Registry
- Integrated Work Management System & Wireless Mobile Dispatch
- The PI System for
 - Centralized Data Repository for Multiple Data Sources
 - Analysis and Notification Engine
 - Reporting

Key CBM Actions in Pl

- ➤ Collect data
- Correlate & Centralize data
- ➤ Analyze data
- Create Information
- > Drive Actionable Results

Data Collection and Correlation



Current State

Where are we?

Counter Based Maintenance based on movement for mechanical devices

- Condition based Maintenance
- Auto notification process based on data analysis
- Auto work alerts creating E-mail to Maintenance
- Auto create work in SAP PM

Future State

Where are we going?

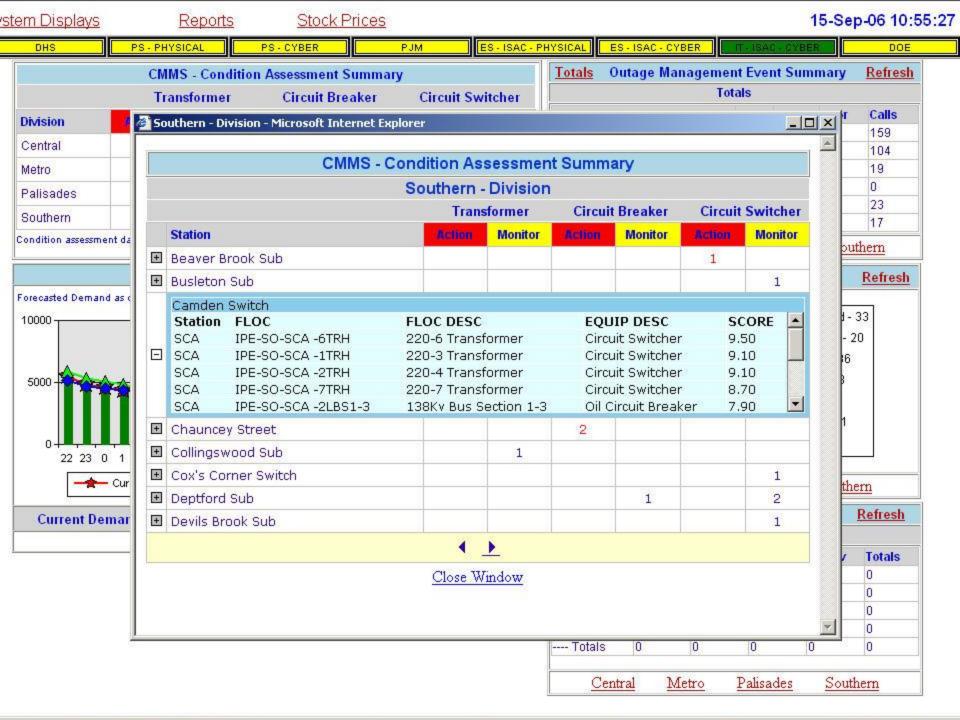
- ➤ Monitoring Points
 - > BreaketiRresauce imponitoringe to do
 - > Temperature monitoring wing:

 - Pump motor counter monitoring
 LTC counter readings monitoring
 - > Transformer Nitrogen Pressure monitoring
 - > Hydran Gatesvof renaitogieg
- > Increase collection rates for data
- > Increase points measured

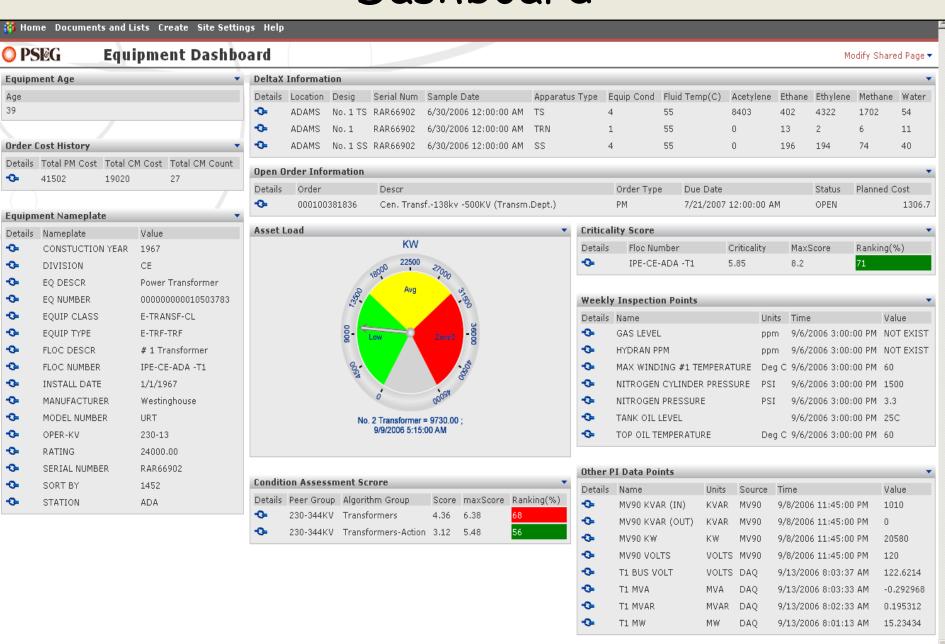
Executive Summary (dashboard)

CMMS - Condition Assessment Summary									
Ŋ	Transformer		Circuit Breaker		Circuit Switcher				
Division	Action	Monitor	Action	Monitor	Action	Monitor			
Central		18	10	51	6	31			
Metro		17	15	61		7			
Palisades		9	7	45	11	26			
Southern		10	12	38	10	38			

Condition assessment data updated on the first week of every month.



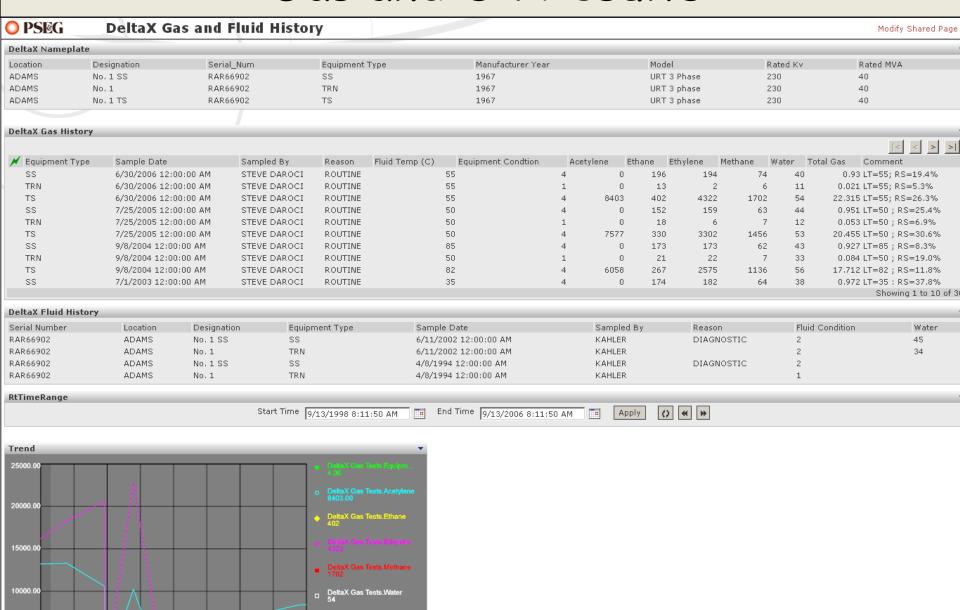
Dashboard



Trusted sites

A Done

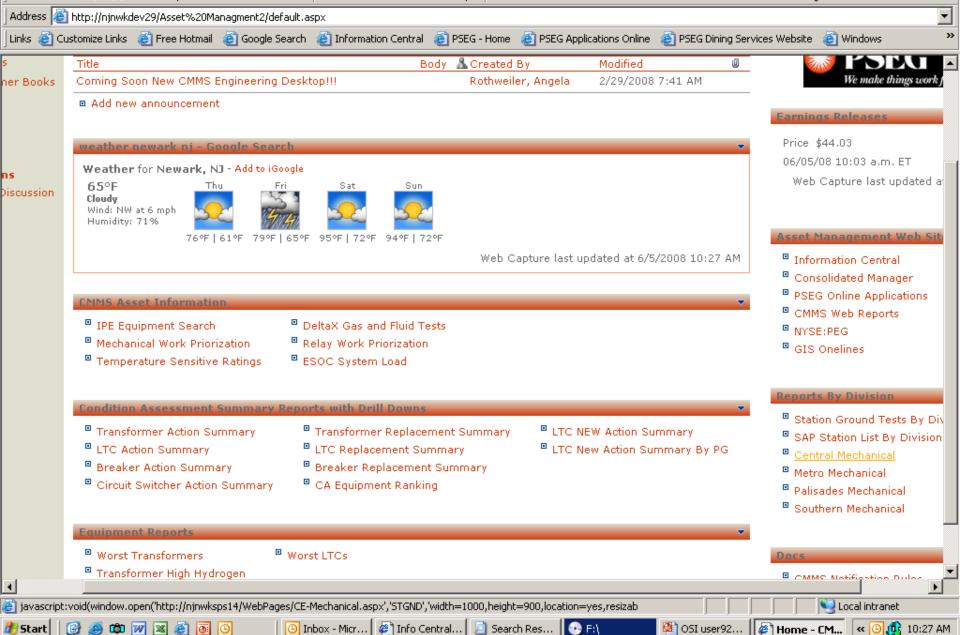
Gas and Oil Results

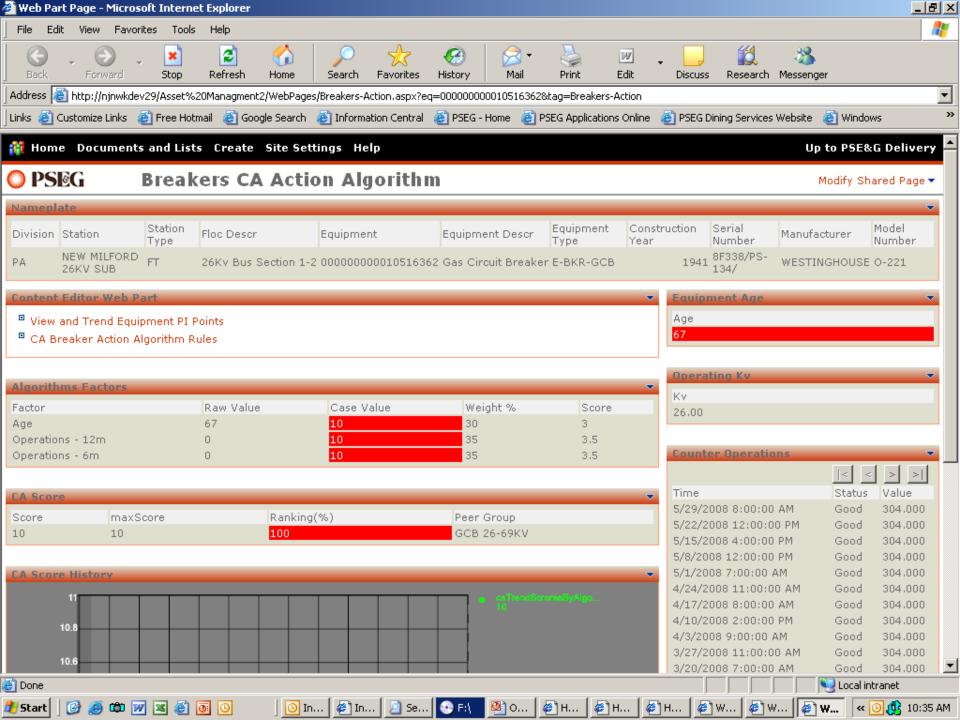


Done

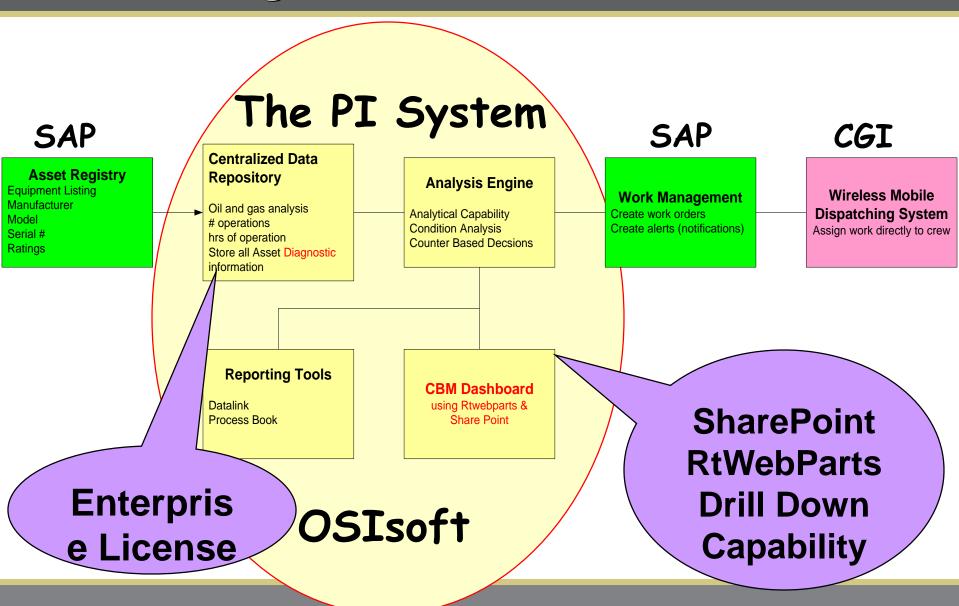
Trusted sites

CMMS Engineering Desktop





Final Configuration

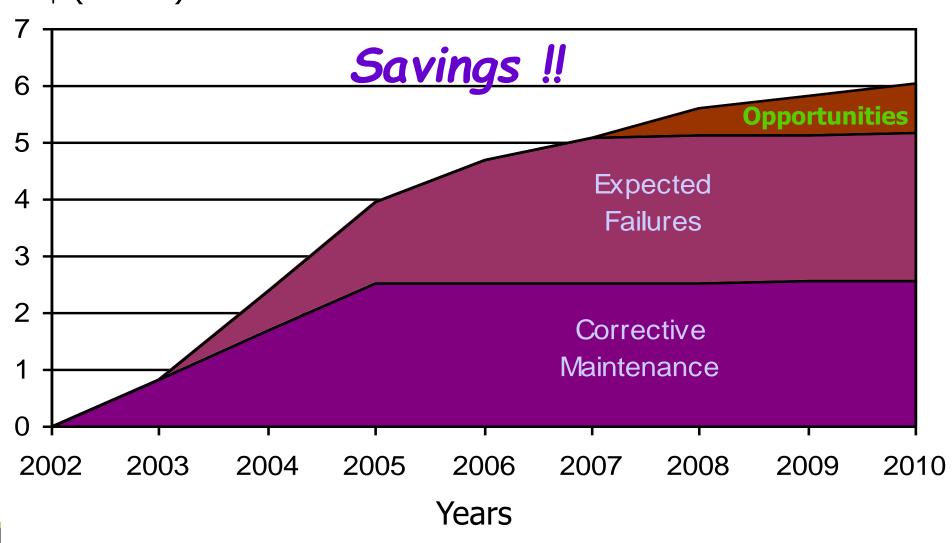


Conclusions Proactive Asset Management Enables

- Visibility to all key inside plant assets
- Consolidated asset inspection, test and maintenance data
- Consistent information base for comparative analysis
- Condition and performance algorithms to assist in decision making process
- Condition based maintenance work notifications
- Baseline record for future investments

Conclusions Proactive Asset Management Enables:





Conclusions Proactive Asset Management Enables

Drive Actionable Results!

Savings are derived from:

Maintenance Plan Extensions 36%

Condition Assessment Algorithms 26 %

Counter Based Notifications 39%

