

# OSISOFT ASIA TECHNOLOGY CONFERENCE 2007



Universal Platform, Infinite Possibilities

## Fleet Optimization

### How Enterprise Infrastructure Enables Utilities

By Mark Brown, Power Business Development Executive

# Brief Agenda

- Overview of OSIsoft in Power Generation
- Overview of Iberdrola's Fossil and Wind Centralized Performance Centers
- Overview of DTE Enterprise Infrastructure initiative
- Overview of other OSIsoft Utility customer business value examples
- Questions

# The PI System

- Real-time infrastructure platform
- Industry standard enterprise historian
- Safeguard company data
- Delivers enterprise-wide visibility into operational health to
  - Manage assets
  - Mitigate risks
  - Identify new market opportunities.
- Provides
  - Powerful data management
  - Decision support capabilities
  - Enables continuous improvement

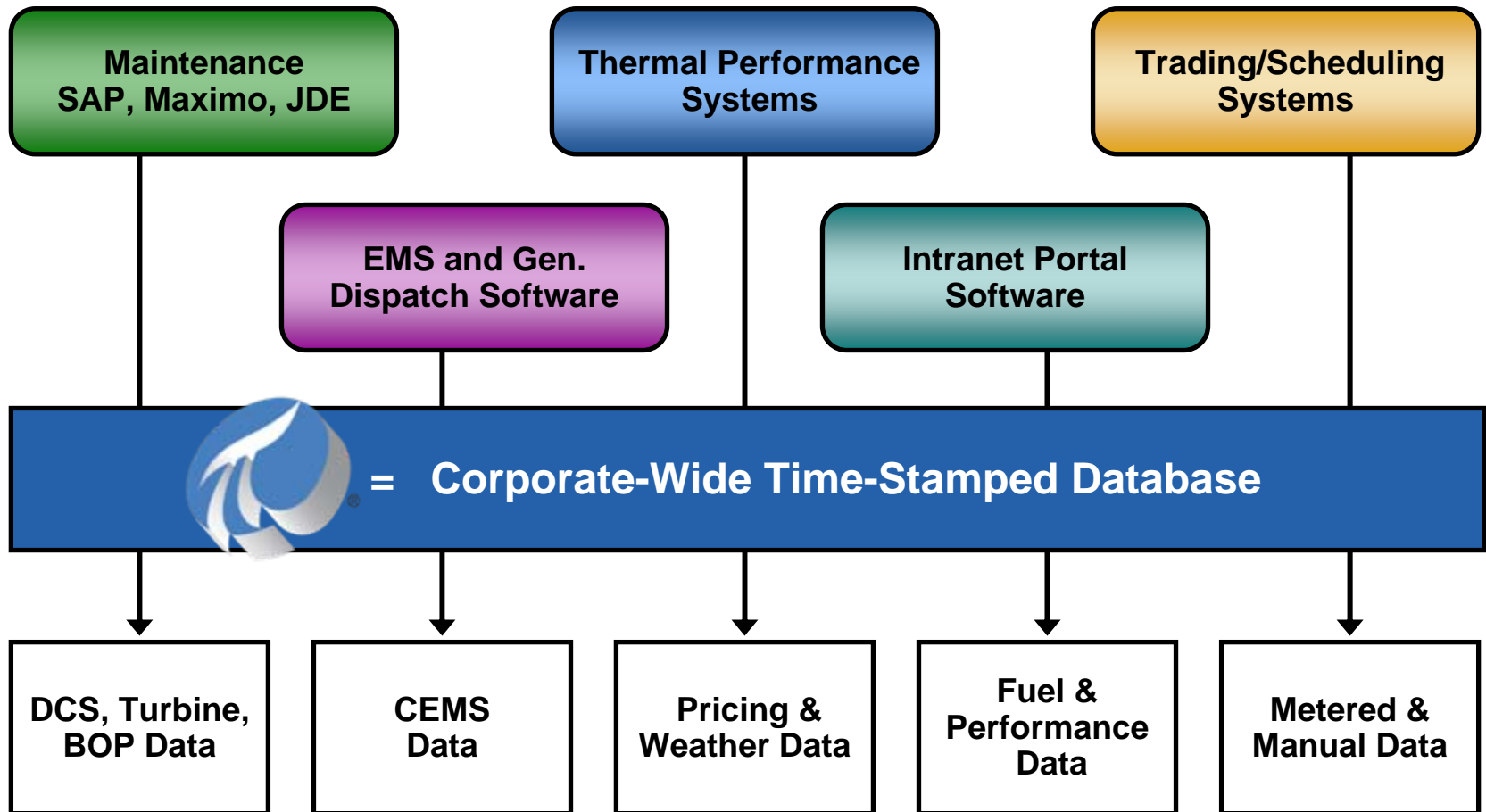
# Power Industry Profile

- OSIssoft is the world leader in Power
  - Power Generation
  - Transmission & Distribution
  - Power Trading & Marketing
- Over 3000 installations worldwide
  - Over 57% of power generated & transmitted in US daily is monitored by the PI System
  - 63% of US nuclear units are monitored by the PI System today
  - 75% of US ISOs, 50% of the mid and large sized power producers, over 50% of ITOs use the PI System today
  - 17 of the top 20 owner/operators of wind use the PI System
- Representing the largest systems in the world

# How Can I Use PI?

- Monitor assets
  - prime movers, BOP, substation equipment, IT infrastructure, etc. – implement industry best practices
- Collect, store, publish, display, and integrate PI data with other data sources
  - leverage existing systems
- Replay events and perform ad-hoc analysis
  - correlate Events/Conditions
- Event notification
  - alarming (including pre-alarm conditions)
- Monitor grid stability
  - enhance emergency response, contingency analysis, state estimation

# Where Does the PI System Fit ?



# Industry Trends

- Centralized Monitoring/Diagnostic/Performance Centers
  - Leverage dwindling SMEs
  - Virtually consolidate remote assets
- Environmental Stewardship
  - Optimize assets/fuels
  - Cap and Trade programs
- Proactive Asset Management
  - CBM/RCM
- End to End Enterprise Optimization
  - Integration of systems supporting complete operational business

# Centralized Monitoring, Diagnostic, and Performance Centers

Iberdrola Centralizes  
Optimization of Wind and  
Fossil Assets



# Iberdrola's WindCORE – Toledo, Spain



**Real-time  
Action**

**Frontline  
Operators**

**2<sup>nd</sup> Line  
Engineers**

# Iberdrola's WindCORE Project Benefits



- 1% estimated increase in Operation and Maintenance cost reduction (availability)
- O&M resources optimization
- Trading operations optimized through very precise production forecast
- Remote assistance
- Fault/lost energy calculations for economy dispatching

# Iberdrola's WindCORE Project Benefits



Benefit Received				
MW	Capacity Factor	Availability	MWh Production	
3494	27.5%	97%	8164534.62	
3494	27.5%	98%	8248705.08	

84170.46 MWh Gain from Availability Improvement  
 \$ 80.00 Feed In Tariff USD/MWh

\$ 6,733,636.80

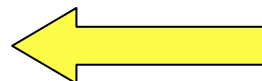
## Cost Model for WindCORE

System Cost	\$ 1,500,000.00
Variable Cost p.a.	
Labor	\$ 540,000.00
Utilities/Rent	\$ 60,000.00

	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Total Cost</b>	\$ 2,100,000	\$ 600,000	\$ 600,000	\$ 600,000	\$ 600,000
Net Present Value of Cost	\$3,638,108				
Benefit	\$ 6,733,637	\$ 6,733,636.80	\$ 6,733,636.80	\$ 6,733,636.80	\$ 6,733,636.80

Net Present Value of Benefit \$25,525,781

<b>Payout per Dollar Spent</b>	<b>\$ 7.02</b>
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• Cost Assumptions: Number of Wind Farms

# IBERDROLA Centralized Monitoring & Diagnostic Center for Fossil

La Laguna 500 MW

MW

Monterrey III

1000 MW

Altamira III y IV

1000 MW

Altamira V

1000 MW

Tamazunchale

1000 MW

Termopernambuco

500 MW

Scope

Santurce 4

400 MW

CC Riga

400 MW

Castejón 1

400 MW

Aceca 3

400 MW

Tarragona

Power

400 MW

Castellón 3

800 MW

Castellón 4

800 MW

Arcos 1 y 2

800 MW

Arcos 3

800 MW

Escombreras 6

800 MW



# Tracking Contracts with CFE

- MAINTENANCE / ENERGY CONTRACT TRACKING
  - Maintenance Contract Tracking – FS App
    - CSA between General Electric and Iberdrola
    - Bonus calculations based on FS (Factored Starts)
    - On the beginning manual calculations
    - First Option was to implement on Control Systems
    - GE proposal was 25K USD for GT
      - Iberdrola has more than 14 GE GT's so....350k USD!!!
    - We developed on ACE on 3 weeks!!!

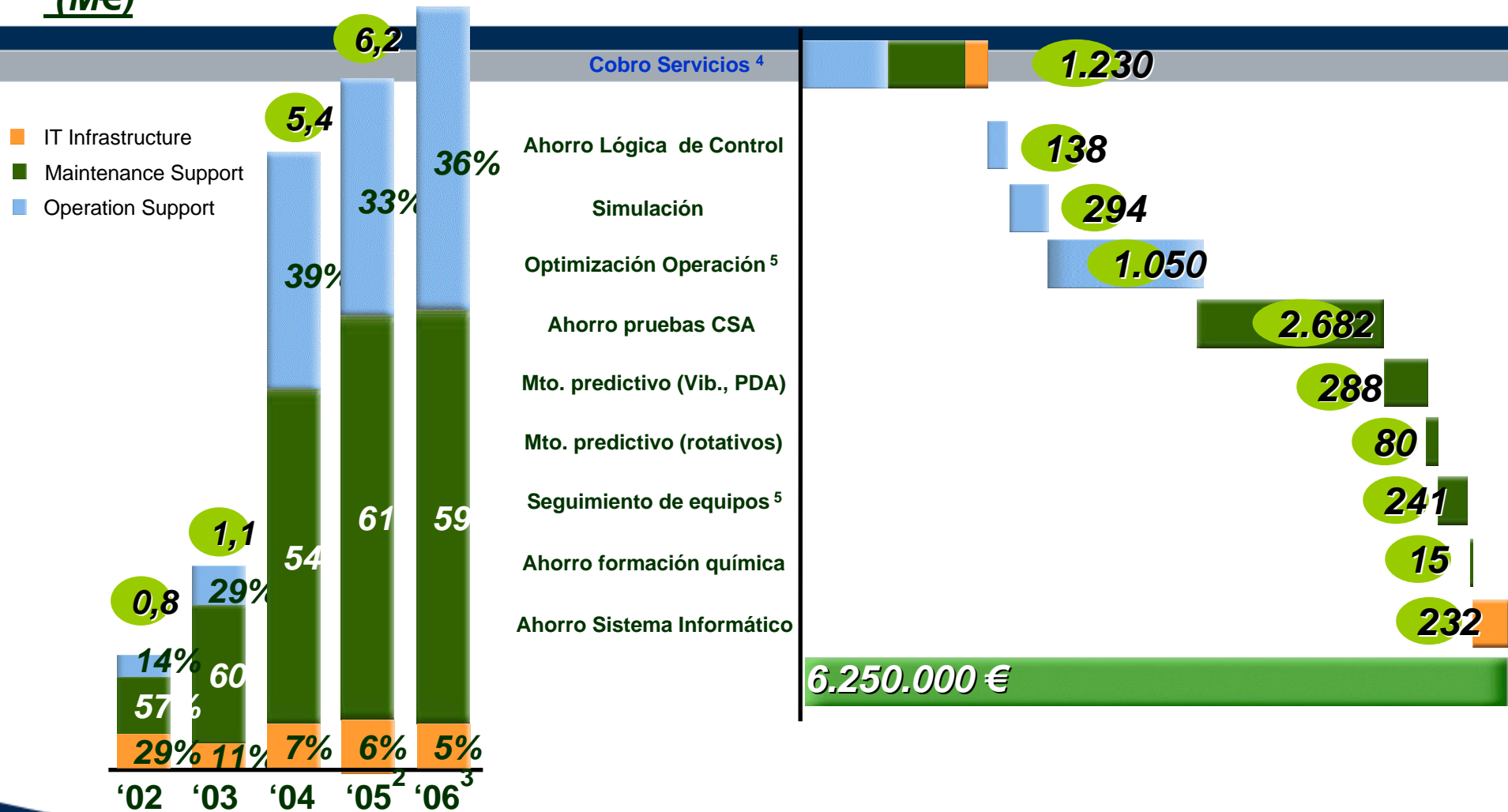
# Iberdrola Found That...

- Advanced Equipment Monitoring (AEM) concept really improves operation and maintenance of assets
- Moving to Rule Based monitoring is the key
- PI platform is a powerful tool: Robust and highly available
- Direct Cost Savings from developing on PI infrastructure > 500k USD

# IBERDROLA & CMDS Value

Incomings/Savings  
(M€)

2005 Incomings/Savings split (miles €)



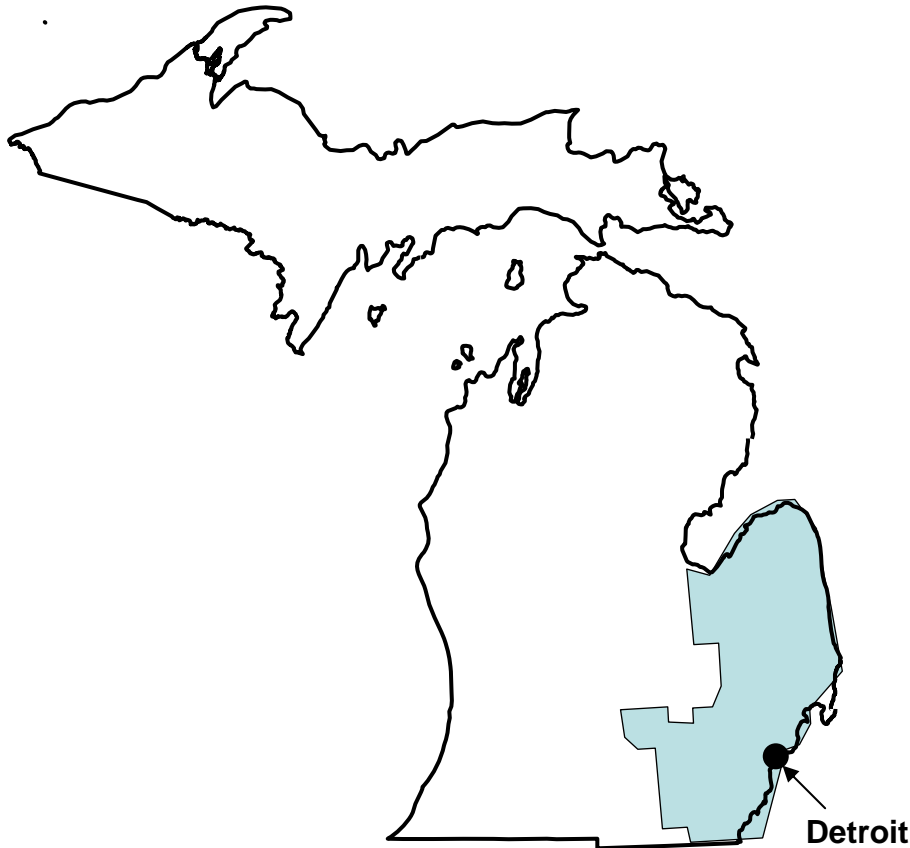
**The CMDS provides earning, savings, know-how and flexibility to IBERDROLA**

# Centralized Monitoring, Diagnostic, and Performance Centers

Detroit Edison (DTE)  
Leverages Enterprise  
Infrastructure



# DTE Summary

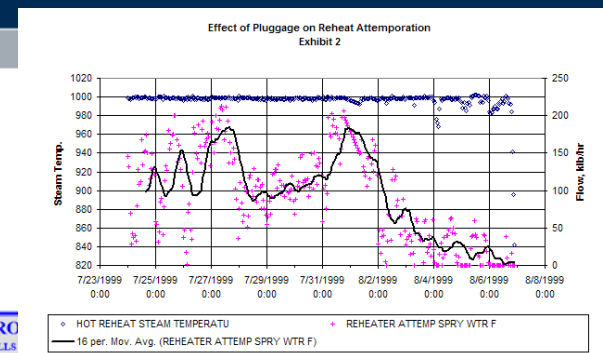
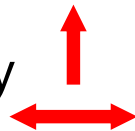


- Michigan's largest electric utility with 2.2 million customers
- Over 11,080 MW of power generation, primarily coal fired
- 54,000 GWh in electric sales
- \$4.7 billion in revenue

■ DTE Energy - Detroit Edison

# History of OSI PI in DTE Energy

- Pilot at Monroe PP in 1998
- Fossil Generation Fleet 1999
- GenOps – EMS Ranger 2001
- SOC SCADA– 2002
- Fermi Nuclear– 2003
- DTE Subsidiaries – 2007
- **Enterprise Agreement – 2007**
- Continuous PI Expansion
  - Magnitude
  - Functionality

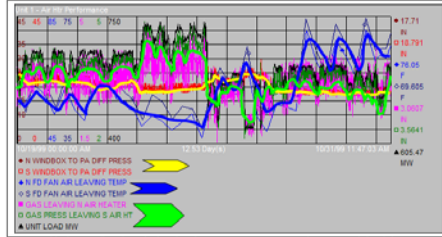


**UNIT 1 – COMBUSTION PRO**  
(L.E., AIR HEATER PERFORMANCE VS COAL MILLS)

**Exhibit 5**

Concerns have recently arisen regarding degrading performance of Unit 1's Coal Mills over this past week. I would like to take this opportunity to **throw-caution-to-the-wind** in light of two factors: 1) Lack of good air heater radial seals, and 2) rising ambient air temperatures.

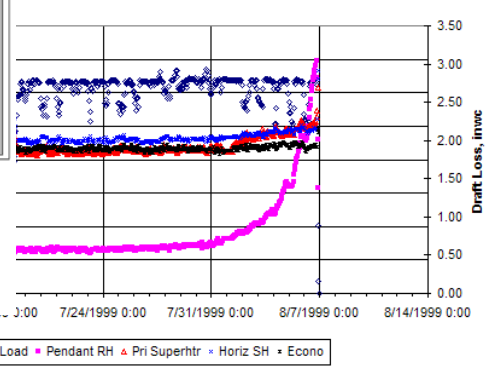
In the PI graph below of Unit 1's parameters, a review of **PA-to-Windbox** (key to Coal Mill performance) is compared simultaneously to **ambient air temperatures** (FD Fan Air Leaving) and **PA-to-Windbox delta-P**. Past operating history has defined that when the PA-to-Windbox delta-P reaches a level of **19" H<sub>2</sub>O**, that boiler combustion and coal mill performance is drastically impacted. This is the **level** at which an air heater radial seal replacement is dictated if unit load is to be maintained without restrictions.



Understanding that air density changes as temperature changes and that it has an inverse effect on fan and air heater performance (i.e., as air temp. increases, efficiency of fans/air heater decrease) we can readily see in the above graph that since October 25<sup>th</sup> the **ambient air temperature** changed drastically. This was the reported time that Unit 1 coal mill output problems began to arise. As a result, **PA-to-Windbox** was reduced and coal mills removed from service in an attempt to maintain enough Hot PA (measured as **PA-to-Windbox**) to the running mills. For a brief period, this provided a false impression that **PA-to-Windbox** pressure was not affected by rising ambient temperatures, yet when compared to unit load one can easily surmise the error of this perception. It was on Oct. 27<sup>th</sup> that the true impact on **PA-to-Windbox** pressure can be seen in the PI graph above. **Please note in the above graph that air temperature had a POSITIVE impact on PA-to-Windbox on Oct. 22<sup>nd</sup> when it cooled down.**

**Success!**

**Water, Superheater, and Economizer Draft Loss**  
Exhibit 4



# OSIsoft a Key Technology Enabler

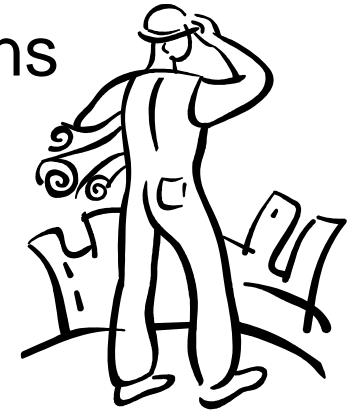
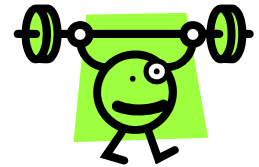
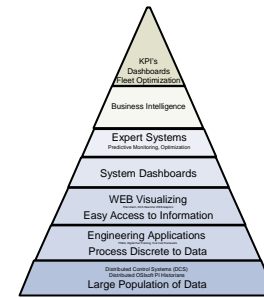
- **Information and Application Integration**
  - **Primary data source** of process data (current & historic)
  - **Integral** part of many **Applications** (process and business)
  - **Communication Conduit** (plant status, fuel cost, control, EMS)
  - **Strategic** to DTE Energy's day to day Operation
- **Performance Center – Enabling Technology**
  - Equipment Condition Monitoring – SmartSignal
  - Enables DCS Displays
  - Process & Market Analysis
- **DTE – OSIsoft Enterprise Agreement (EA)**
  - Key to the Supply Cabinet



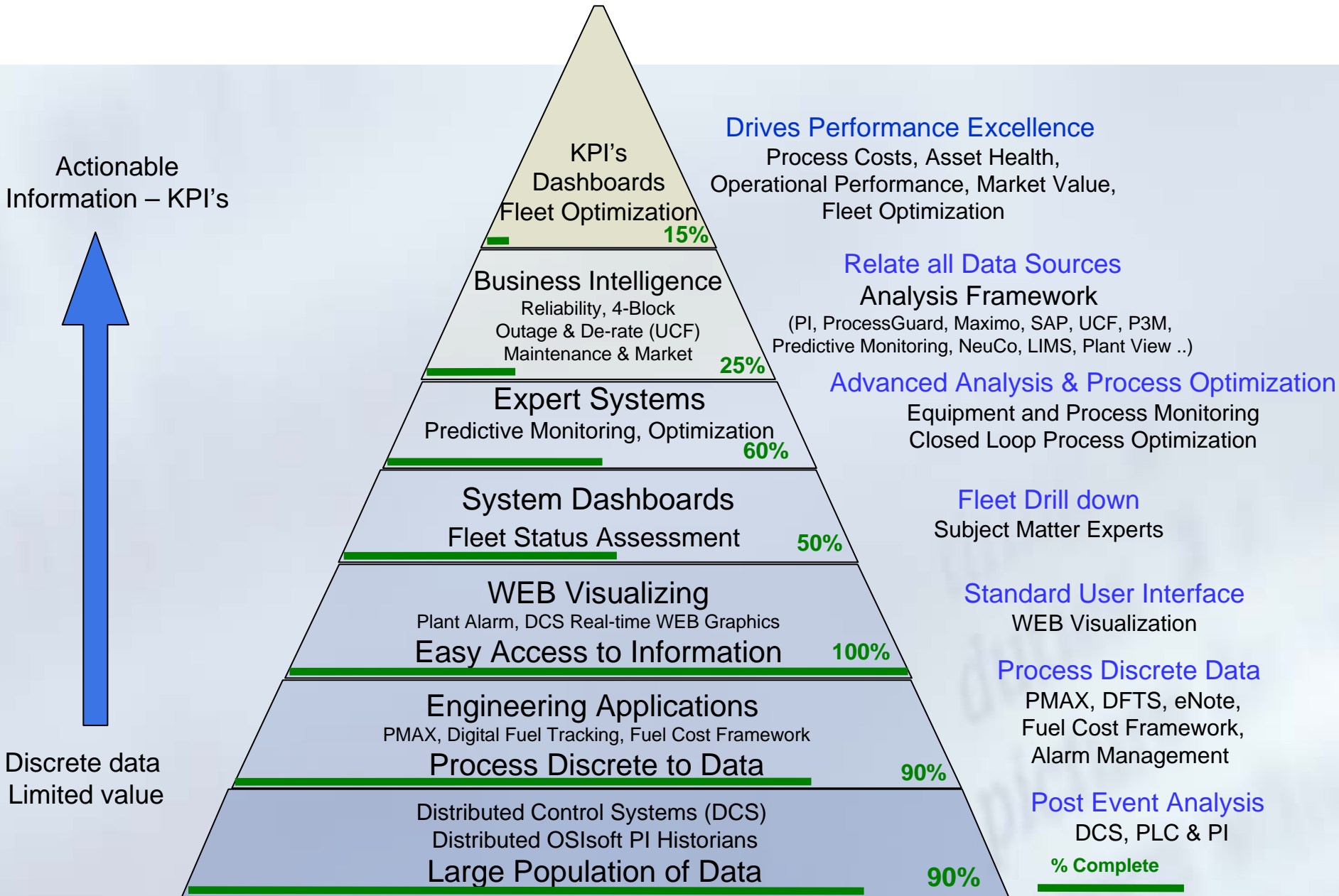
# Why – OSIsoft Enterprise Agreement?

## 5 Key Benefits

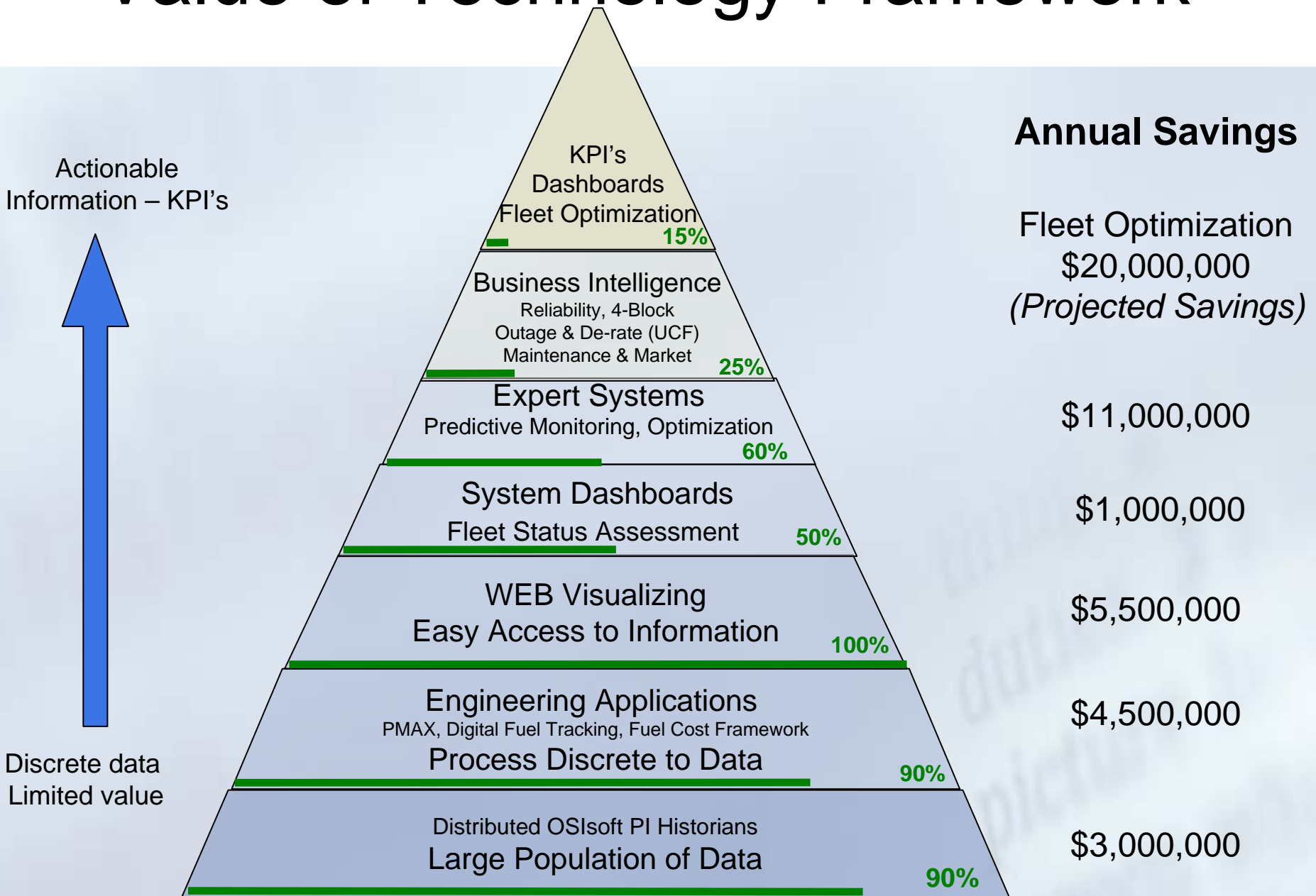
1. OSI is a DTE Core Technology
2. OSI's Strong Track Record & Future Direction
3. Expand DTE's Use of OSIsoft Applications
4. Normalize Budget Allocation
5. Premium Software Reliance Program



# Technology Framework



# Value of Technology Framework



# Fleet Performance Center

## Performance Center – Mission

Equipment Performance Optimization of the Fossil Generation Portfolio through continuous “real time and **predictive asset condition monitoring**” to maximize the asset **market value**.

## Performance Center – Vision

Fossil Generation’s Fleet-wide “**Mission Control Center**” for continuous monitoring and optimization of plant equipment performance



- Located in Ann Arbor Michigan
- 7x24 hour operation (February 2006).
- Plant interface with Merchant Operation Center.
- Oversight of Outage and de-rate coordination.



# Process Cost Drill Down

MONROE
MONROE UNIT 4
ALL PLANTS
MONROE POWER PLANT

MONROE	UNIT 4
EAf	
Year To Date	80.14
Previous Week	100.00
<b>PROD COST (Inst) \$/MWh</b>	
Current Date	21.21
Fuel Cost	18.16
Emission Cost	3.05
Previous Week	22.22
Fuel Cost	18.92
Emission Cost	3.30
<b>PROD COST \$/MWh</b>	
Year To Date	19.85
Fuel Cost	17.73
Operation Cost	1.45
Maintenance Cost	0.66
Previous Week	19.83
Fuel Cost	18.92
Operation Cost	0.91
Maintenance Cost	0.00
<b>MLLING COST \$/TON</b>	
Year To Date	4.87
Power Cons Cost	0.11
Operation Cost	3.28
Maintenance Cost	1.48
Previous Week	2.20
Power Cons Cost	0.11
Operation Cost	2.09
Maintenance Cost	0.00
<b>HEAT RATE BTU/100KWh</b>	
Current Date	10732
Previous Week	10732

Coal Mill	MILL 1	MILL 2	MILL 3	MILL 4	MILL 5	MILL 6	MILL 7
Status	●	●	●	●	●	●	●
EAf							
Year To Date	100.00	100.00	99.93	99.79	100.00	100.00	100.00
Previous Week	100.00	100.00	100.00	100.00			
<b>Milling Cost \$/TON</b>							
Year To Date	1.87	1.82	1.75	13.43			
Power Cons Cost	0.21	0.22	0.22	0.20			
Operation Cost	0.10	0.12	0.13	0.14			
Maintenance Cost	1.55	1.48	1.40	13.09			
Previous Week	0.28	0.30	0.29	0.26			
Power Cons Cost	0.21	0.22	0.22	0.20			
Operation Cost	0.07	0.07	0.07	0.07			
Maintenance Cost	0.00	0.00	0.00	0.00			
<b>SS Count</b>							
Year To Date	0	3	0	0			
Previous Week	0	0	0	0			
<b>PG Count</b>							
Year To Date	6	2	0	6			
Previous Week	0	0	0	0			

MONROE	UNIT 4	UNIT 1	UNIT 2	UNIT 3	UNIT 4
EAf					
Year To Date	96.57	76.76	0.00	80.14	
Previous Week	98.96	40.46	0.00	100.00	
<b>PROD COST (Inst) \$/MWh</b>					
Year To Date					
Previous Week					
<b>HEAT RATE BTU/100KWh</b>					
Current Date	10687	10614	10669	10732	
Previous Week	10687	10614	10669	10732	

Unit Summary

NetQuery - ProcessGuard MONPP4 - Last 10 Alarms

ProcessGuard Alarms (Last 10)

vt_start	vt_end	plant	unit	signams	description	groupid	prioritydisplay
1/29/2007 10:38:01 A.M.	Open	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR FRONT BEARING TEMP	14	AMISCTL
1/29/2007 10:37:58 A.M.	01/29/2007 10:38:01	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR FRONT BEARING TEMP	14	AMISCTL
1/29/2007 10:37:53 A.M.	01/29/2007 10:37:58	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR FRONT BEARING TEMP	14	AMISCTL
1/29/2007 10:37:46 A.M.	01/29/2007 10:37:58	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR FRONT BEARING TEMP	14	AMISCTL
1/29/2007 10:37:46 A.M.	01/29/2007 10:37:46	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR FRONT BEARING TEMP	14	AMISCTL
1/29/2007 10:37:34 A.M.	01/29/2007 10:37:46	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR FRONT BEARING TEMP	14	AMISCTL
1/29/2007 10:37:19 A.M.	01/29/2007 10:37:34	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR FRONT BEARING TEMP	14	AMISCTL
1/29/2007 10:37:17 A.M.	01/29/2007 10:37:34	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR FRONT BEARING TEMP	14	AMISCTL
1/29/2007 10:29:41 A.M.	Open	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR REAR BEARING TEMP	14	AMISCTL
1/29/2007 10:29:36 A.M.	01/29/2007 10:29:41	MONPP	U4_DCS	CMS-MTRFBPG-TC	CMS MOTOR REAR BEARING TEMP	14	AMISCTL

NetQuery - SmartSignal MONPP4 - Last 10 Items

SmartSignal Watch Items (Last 10)

Group	Asset	Rule	Total	Prst	Last
MILL2 - MOTOR, EFG TEMPS & CURRENT	MONPP4 PULVERIZERS	U4C-MTRFBPG-TC, CM2 MOTOR REAR BEARING TLOW	1757	3/23/2007 7:12:31 P.M.	4/5/2007 12:31:16 P.M.
MILL1 - MOTOR, EFG TEMPS & CURRENT	MONPP4 PULVERIZERS	U4C-MTRFBPG-TC, CM1 PULV MOTOR RAMP HIGH	6	4/5/2007 9:53:17 A.M.	4/5/2007 11:03:16 A.M.
MILL1 - MOTOR, EFG TEMPS & CURRENT	MONPP4 PULVERIZERS	U4C-MTRFBPG-TC, CM1 GEN BOX THRUST EFG TLOW	16	4/5/2007 10:31:16 A.M.	4/5/2007 4:53:14 A.M.
MILL2 - MOTOR, EFG TEMPS & CURRENT	MONPP4 PULVERIZERS	U4C-MTRFBPG-TC, CM2 MOTOR WINDING TEMP HIGH	4	4/3/2007 11:53:38 P.M.	4/4/2007 12:43:37 A.M.
MILL2 - MOTOR, EFG TEMPS & CURRENT	MONPP4 PULVERIZERS	U4C-MTRFBPG-TC, CM2 MOTOR WINDING TEMP HZ HIGH	4	4/3/2007 11:53:38 P.M.	4/4/2007 12:43:37 A.M.

● = RUNNING      ● = NOT RUNNING      ● = NOT INSTRUMENTED



# Additional Value Realized by Enterprise Infrastructure

- Entergy - \$8 for every \$1 spent on Centralized M&D Performance Center
- Calpine - \$9 Million USD saved in 8 months by optimizing fuel
- RWE nPower – Reduced cold starts from 16 hrs to 8 hrs, reducing costs by 33%
- Reliant – Saved \$2.26 Million USD by reducing forced outages
- Reliant – Converted FO to PO saving \$1.6 Million USD
- PSE&G – Saved \$300,000 in maintenance cost in 1 year via CBM

# Summary Benefits of Enterprise Infrastructure

- Provides a layer of normalization for varying types of assets
- Reduces total cost of ownership
- Improves standards
- Provides a platform for value added systems and applications
- Facilitates greater systems integration and knowledge transfer

# Questions

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**Thank You**