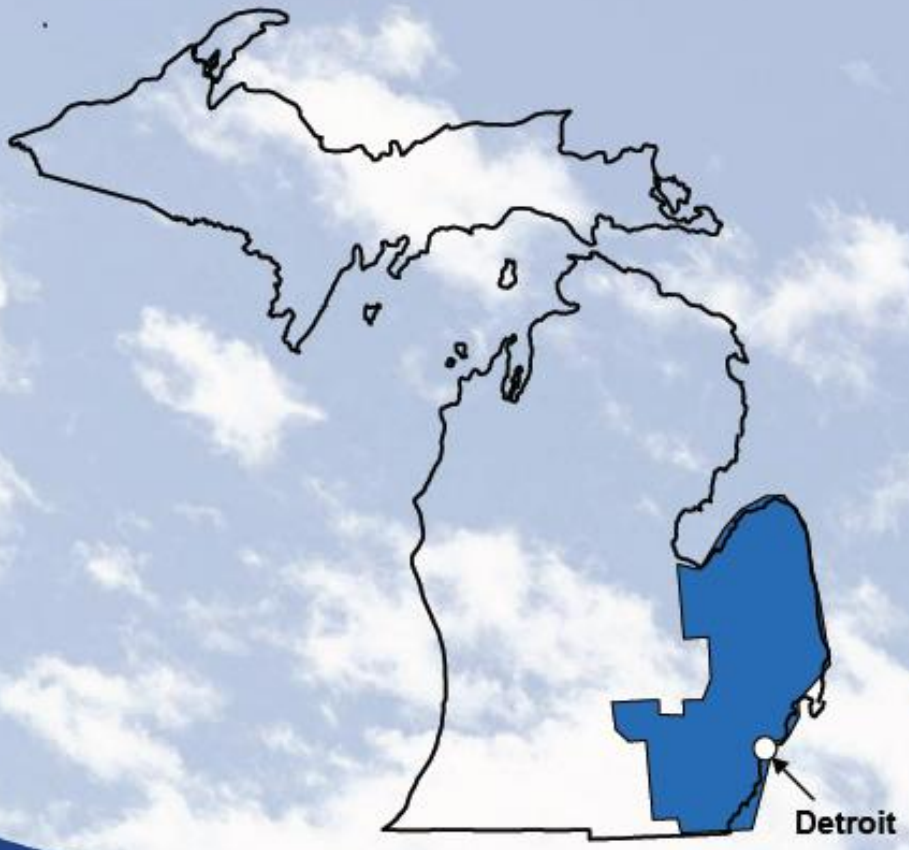
OSIsoft® VALUE NOW, VALUE OVER TIME

PI as an Infrastructure:

Energy Management

Dave Roberts
OSIsoft

DTE Energy - Detroit Edison



Detroit Edison

- 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

OSIsoft.

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

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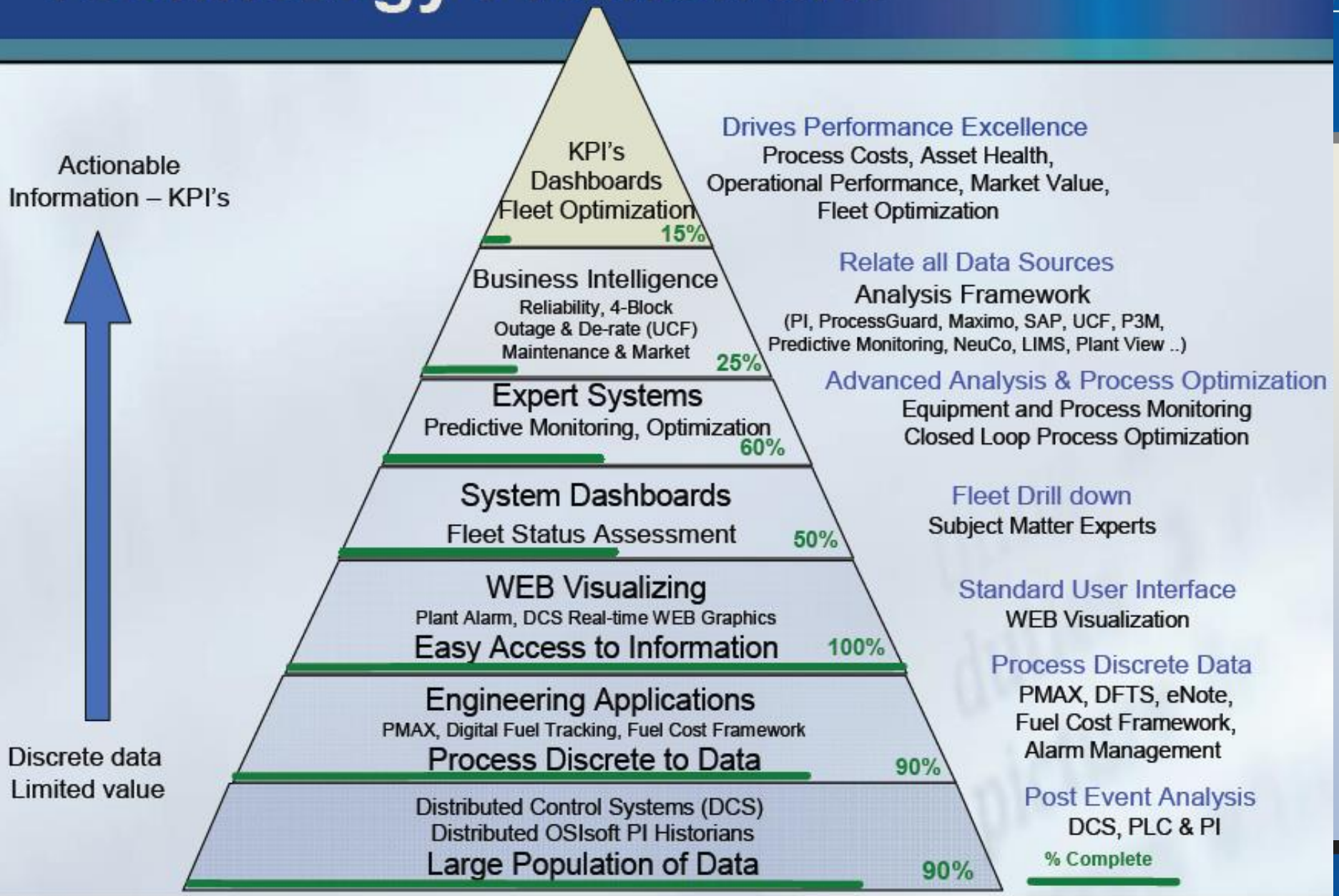
Technology Framework

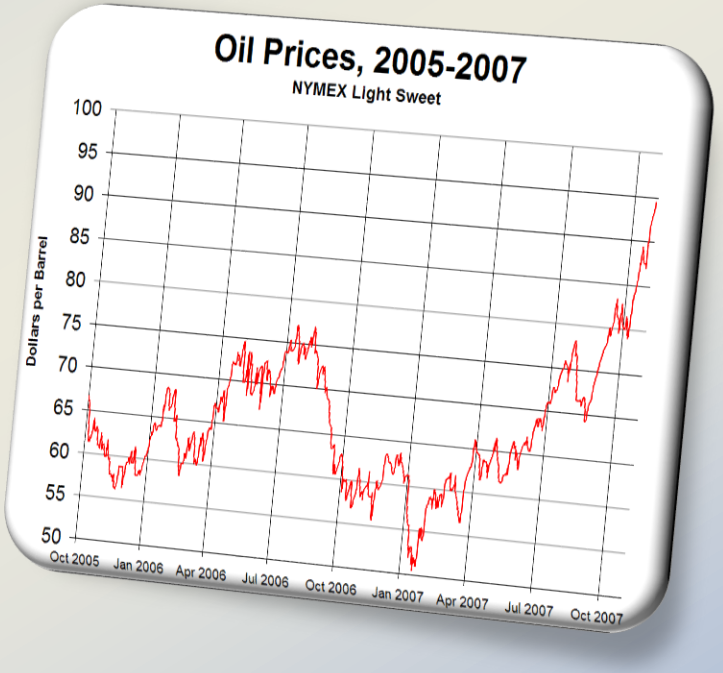


Perfect Plant – A Definition

- Three Flows (Energy, Mass, Info)
  - Emmanuel Savas (1965)
    "Computer Control of Industrial Processes"
  - Maintained, Monitored, Actionable
  - Self Healing
- Future Proofed Plant
- Minimized Footprint
  - Financial, Environmental,
- Profitable & Sustainable

Today's Energy context

- Significant increase in energy prices in the recent years
  - Petroleum[1], 30 to 40% in 3 years
  - Natural gas[1], 20 to 30% in 5 years
  - Coal[1], 5 to 10% in 2 years
  - Electricity, 3 to 10% per year
- Direct effect on production costs
  - Heating/Cooling operations
  - Steam production
  - Operation of heavy equipment and motors
  - Material movements
- Cannot overcome "laws of thermodynamics



[1] Source - USA Energy Information Administration http://www.eia.doe.gov/

Energy as a « Raw Material »

- Aluminum production[1]
  - Electricity - 20% to 40% of production cost
- Water network management[2]
  - Electricity - of 30% of the costs of water distribution & processing
- Pulp and paper
  - Steam is a significant energy source to produce paper. Between 13,000 and 17,000 pounds of steam are required for each ton of paper produced
- Data Center
  - Energy is # 1 operating cost is energy
  - 1.9% of electricity produced in US

[1] Aluminum Association Inc – http://www.aluminum.org

[2] Water Industry News – http://waterindustry.org/

Energy & Environment

- More energy = more emissions
- Outside US
  - World (Kyoto): 6% reduction of the greenhouse gases between 2008 and 2012
  - Based on 1990 levels
- Carbon Credits
  - Relate - Business – Energy – Environment

“Industrial greening” is not business as usual

Significant Unprecedented Global

Business Opportunity to “Perfect Plants”

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Energy Management In the perfect Plant

Kodak Case Study

Kodak Park

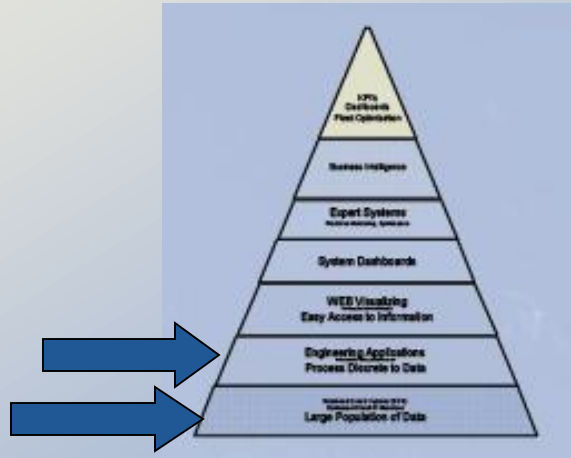
- **Largest Manufacturing Sites**
  - **Located in Rochester, New York**
  - **Referred to as a "City Within a City"**
  - **1300 Acres (5,200,000 sq m)**
  - **150 Buildings**
  - **Nearly 30 Miles of Roads**
  - **11,000 Employees**
  - **Operates Its Own Fire Department, Railroad & Water and Waste Water Treatment Plants**
  - **Operates Two Power Plants**

Utilities consumption

- 125 MW ELECTRICAL DEMAND
- 35,000 SCFM COMPRESSED AIR LOAD
- 80,000 TONS REFRIGERATION CAPACITY
- 2,000,000 LB/H STEAM LOAD
- 30,000,000 G/DAY PROCESS WATER

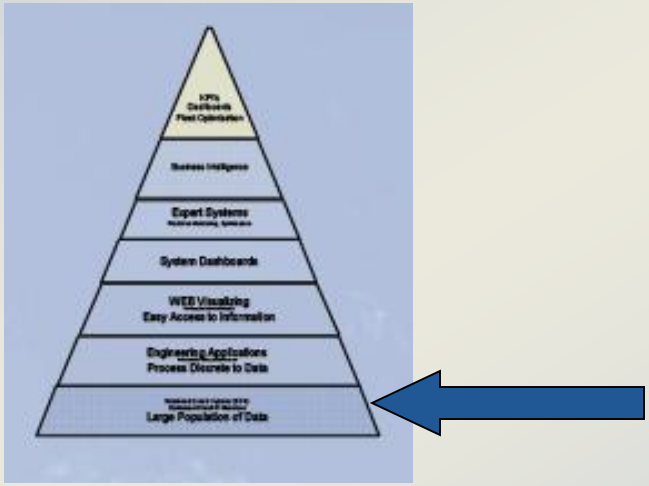
Keeping Track of consumption/utilization

- 600 Electric Distribution Meters
- 600 Additional Distribution Meters for:
  - Steam, Chilled Water, Brine, Compressed Air, Process Water, Nitrogen, Natural Gas, etc.
- Significant Metering Used within the Power Houses to Manage the Generation Side
- 100 000 Measurement points
- 125 concurrent users
- 180 + views
- 27 Systems interfaced



Kodak Park – Data Sources

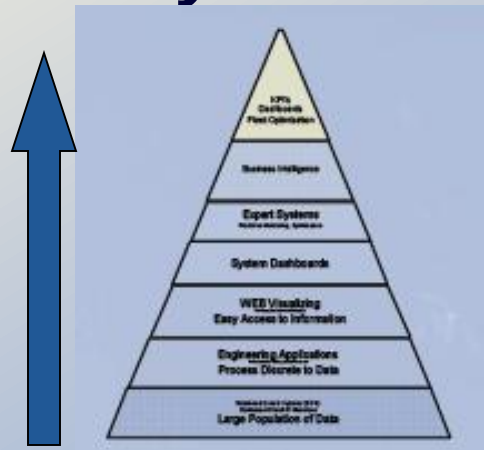
- BAS (Building Automation System)
  - Rosemount - Fix 32
  - Siemens - Apogee
  - Emerson - Delta V
  - SQL Based Historians



- DCS (Distributed Control Systems)
  - Fisher Provox
  - Westinghouse WDPF
  - Westinghouse Ovation
  - Taylor Mod 300
  - Emerson DeltaV

Kodak's Goals

- Reduce utility costs
  - improved demand side management
- Consolidation of the utilities data
- Create Awareness via the SAP portal
- Grow a Culture of Energy Efficiency



Steam Scorecard

Electric Scorecard

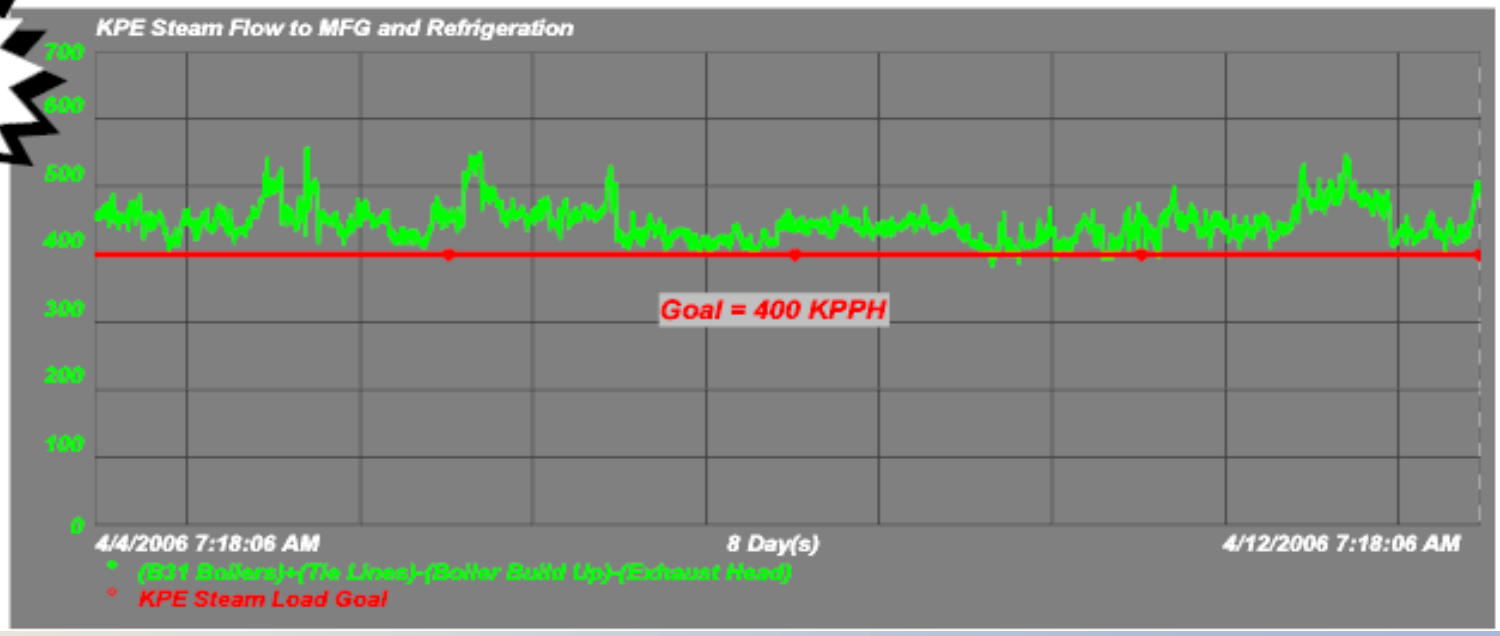
Chilled Water Scorecard

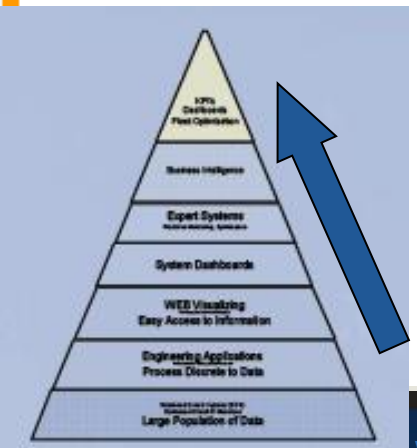
Kodak Water Scorecard

Compressed Air Scorecard

Total KP Plant Steam Flow	1426 KPPH (Goal < 1350)
KPE Steam Flow to MFG & Refrigeration	497 KPPH (Goal < 400)
KPW,X&M Steam Flow to MFG & Refrigeration	377 KPPH
KPS Steam Flow	79 KPPH
Exhaust Steam to Atmosphere	127 KPPH
Total Boiler Build-Up	353 KPPH
260# Steam - Tie Line Flow from B-321 to B-31	57 KPPH
Total Megawatts	98 Megawatts (Goal < 95)
Purchased Power	14.0 MWATTS

Link to "The Energy Times"

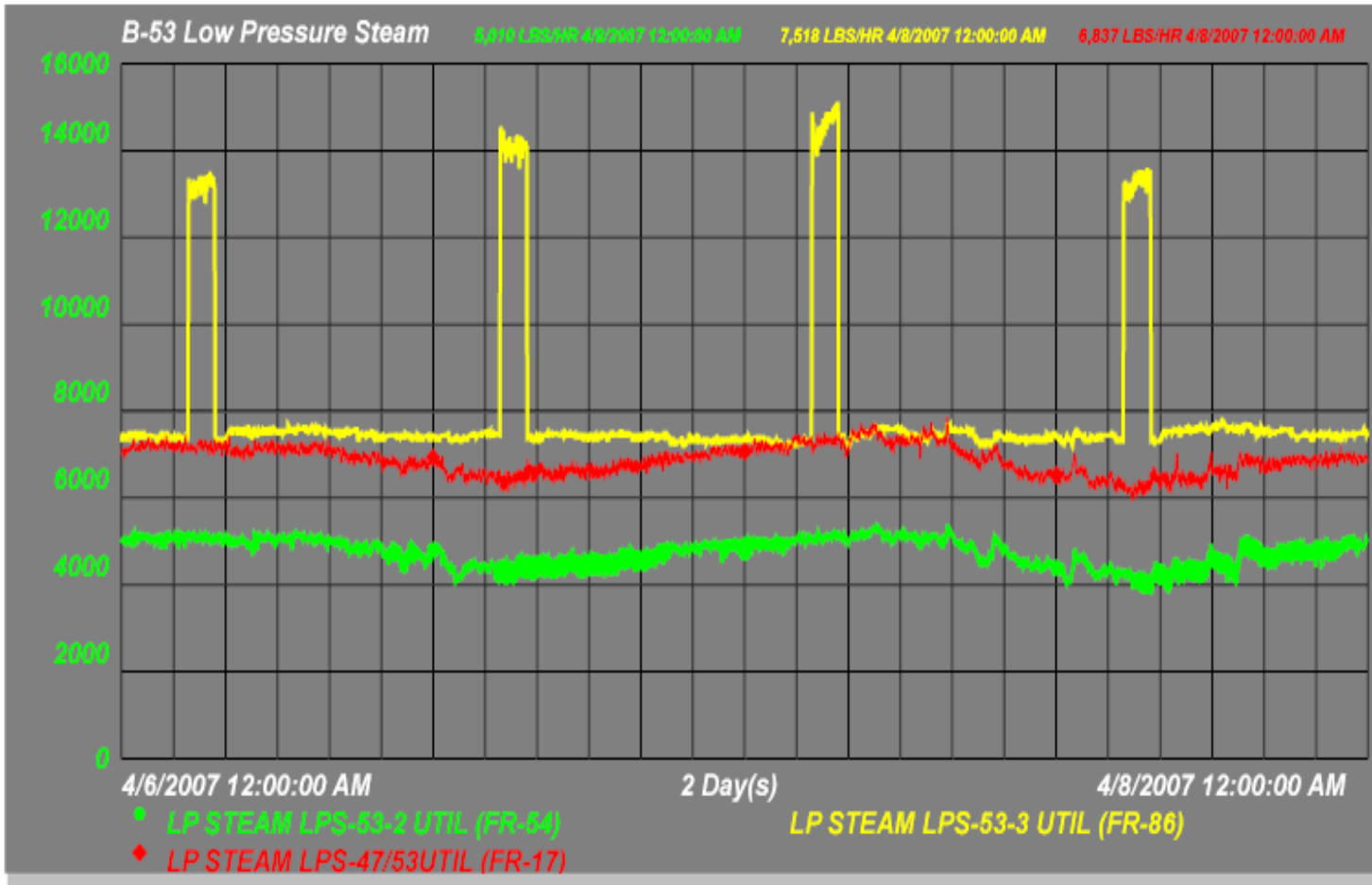




Detailed Navigation

- KPE
  - B6
  - B12
  - B28
  - B29
  - B30
  - B38
  - B42
  - B52
  - B53
    - B53 Electric
    - **B53 LP Steam**
    - B53 135# Steam
    - B53 Chilled Water
    - B53 Brine
    - B53 Compressed Air
  - B54
  - B59
  - B65
  - B69
  - B81
  - B81S
  - B82
  - B83
  - RL
- KPWX

Start Time: 04/06/2007
End Time: 04/08/2007
Apply



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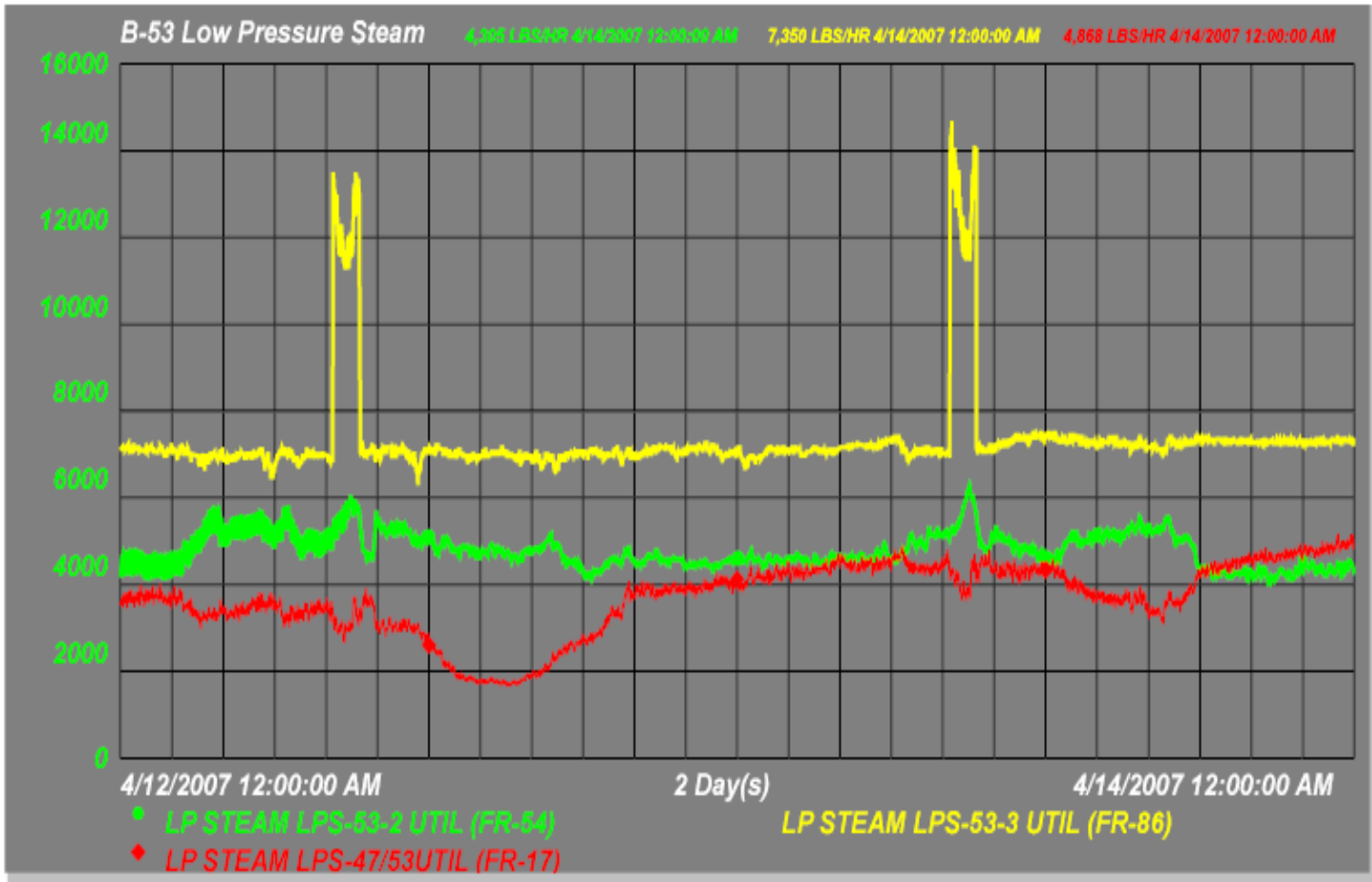
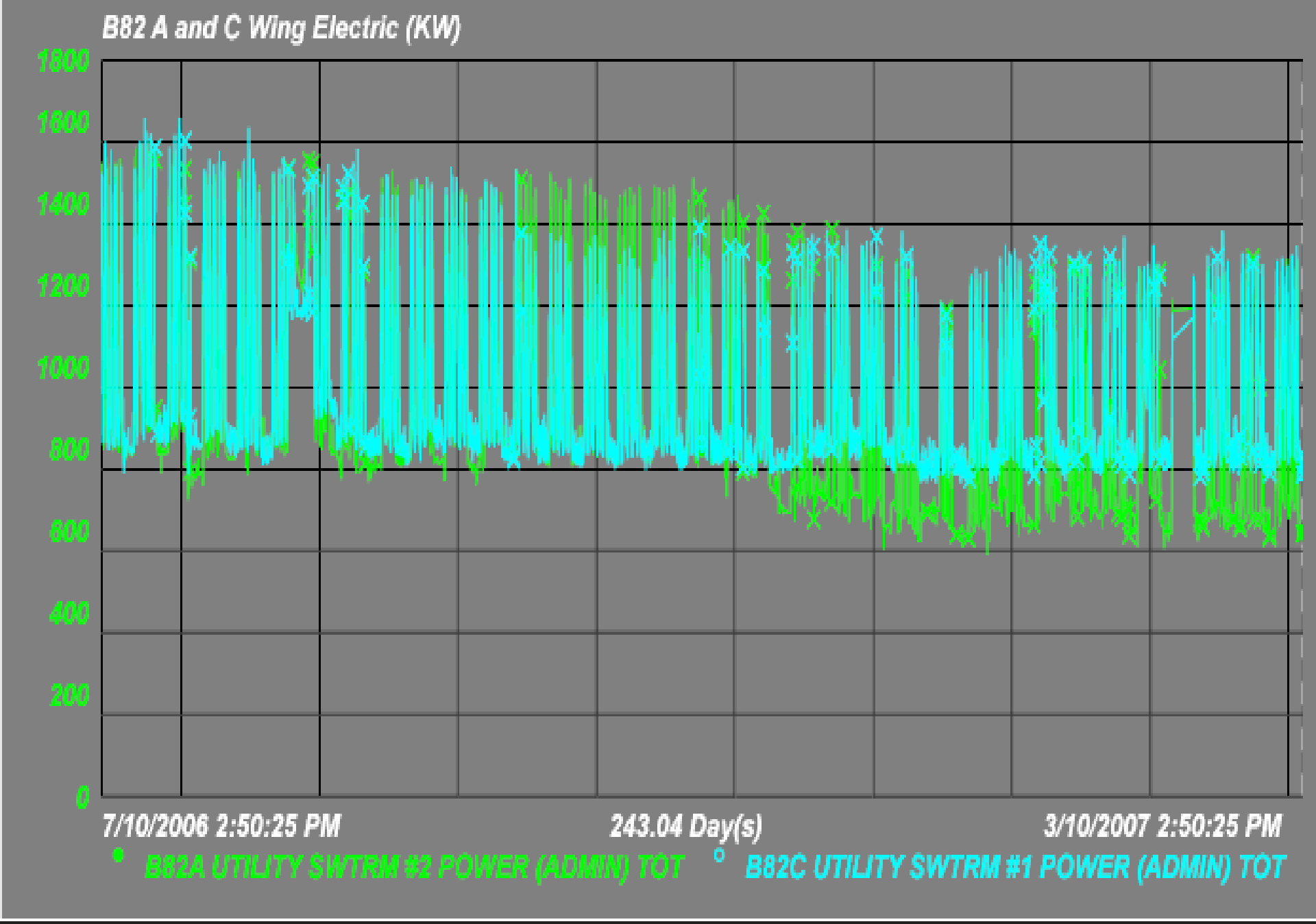
Start Time: 4/12/2007 12:00:00 AM
End Time: 4/14/2007 12:00:00 AM
Apply





Harvest Time

- The Energy Information System (EIS) has been an essential tool to help us reach our goal of "One Powerhouse for Kodak Park"
- Collectively these efforts have yielded savings into the millions of dollars

« We are identifying savings opportunities on a regular basis. OSIsoft products have exceeded our expectations. They are viewed as critical tools to help us assess and meet our very aggressive site energy reduction goals that amount to several million dollars annually »

James Breeze, Engineer and project leader, Eastman Kodak

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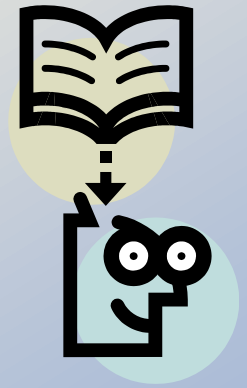
Energy Management
In the perfect Plant

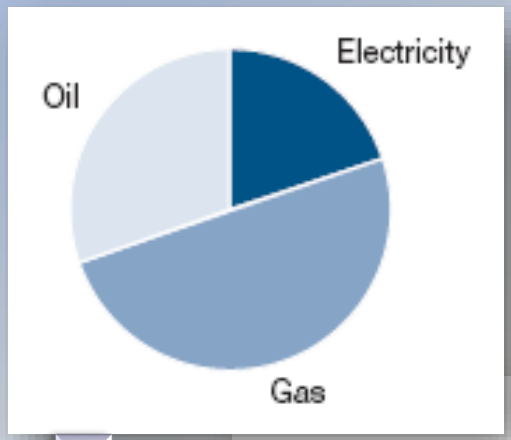
How to pursue the “Perfect Plant”

Lessons Learned at Kokak

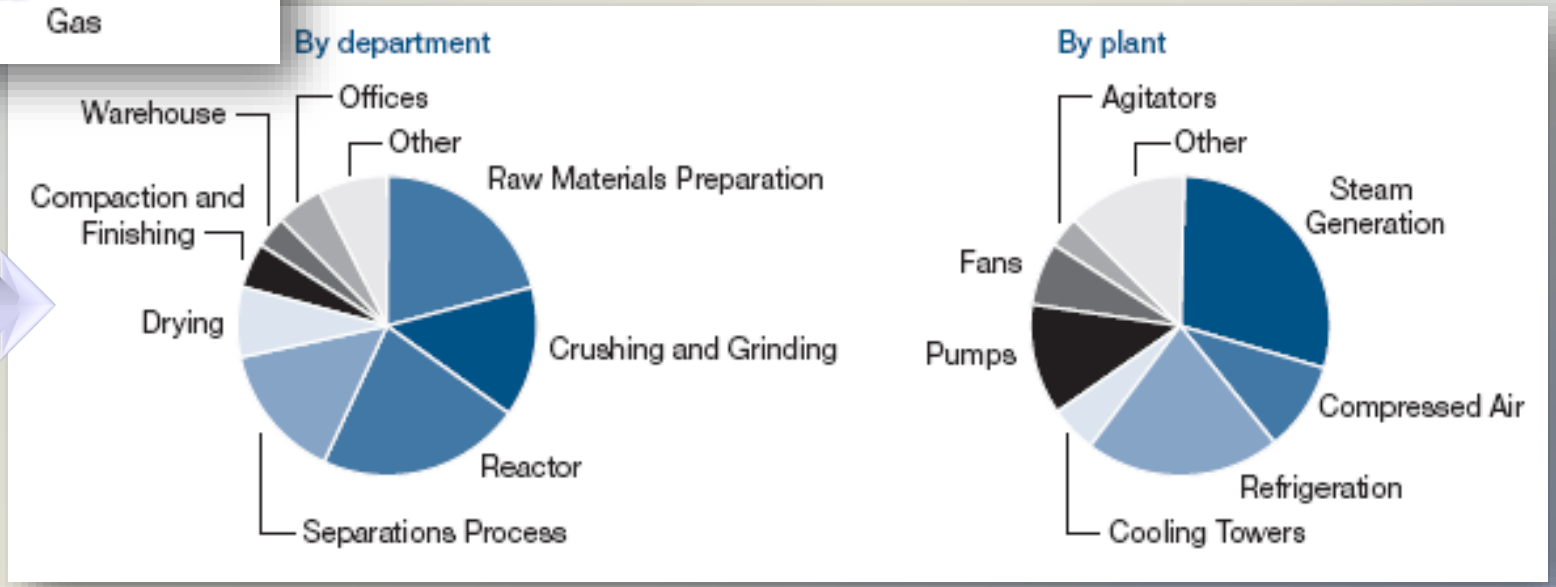
- No BIG BANG – 1000 little bangs
- Continuous Improvement Process
- Combined Capital and Intelligence Operation
- Infrastructure Approach
  - Remove Infrastructure from Projects
  - Lower entry
- Lowers the Cost of Curiosity
- Culture Change
  - Facilitated by IT



Awareness



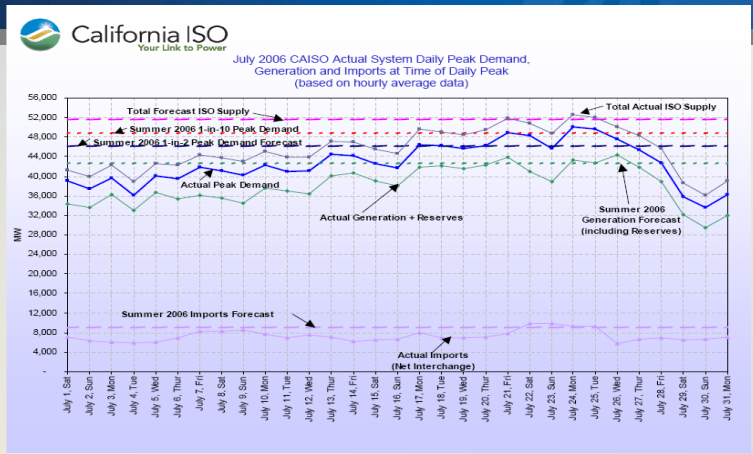
Follow the energy, Follow the money



Decoupling of BTU's and $'s

- Changes due to energy price
  - Supply team
  - Change operational configuration
- Changes due to throughput
  - Energy function
  - Optimization of process
- Changes due to efficiency improvement
  - Real long term winner
- Changes due to reduction of waste
  - Low hanging fruits

Perfect Plant in an “Imperfect” World



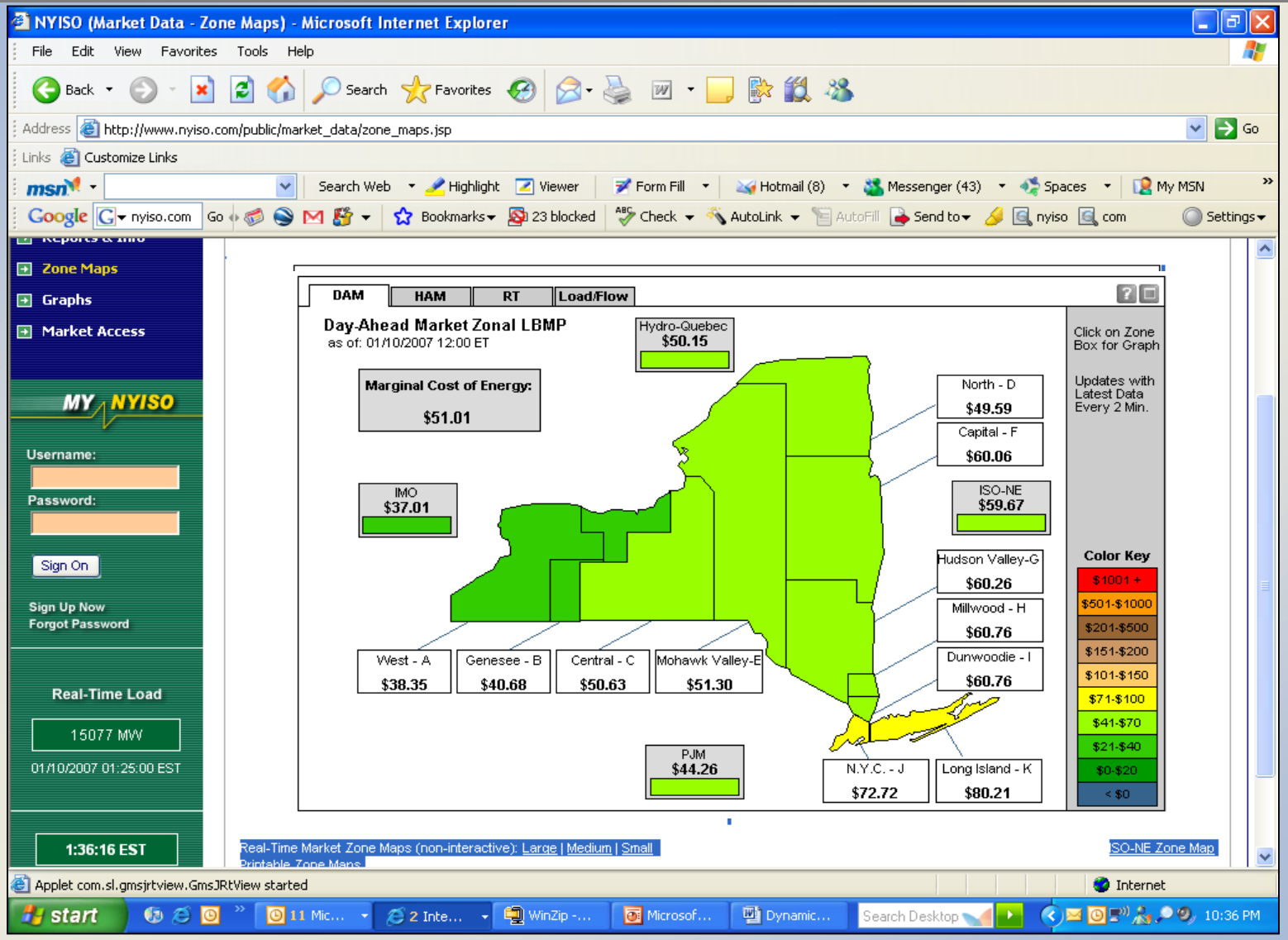
- Utility Response
  - Renewable Energy
    - Hard on the Grid
  - AB32

    “AB 32 requires the California Air Resources Board (CARB) to develop regulations and market mechanisms that will ultimately reduce California’s GHG emissions to 1990 levels by 2020 (a 25 percent decrease), and to 80 percent below 1990 levels by 2050. Mandatory caps will begin in 2012 for certain significant emission sources and will continue to ratchet down to meet the 2020 goals.
  - Once Through Water
- Grid designed for centralized distribution
- Little or difficult collaboration between Energy generators/distributors and consumers

Responses on the Horizon…

- Dynamic changes occurring in the market
  - Deregulation
  - Market Based Pricing
- Demand Response
- TOU Pricing
- LMP (Locational Marginal Price)

Nodal Power Markets



Conclusion

- The pursuit of the “Perfect Plant” is **a Process, a Journey**
- **“People”** are the main actors in a “Perfect Plant”
- “Perfect Plant” is socially & environmentally **“Responsible Business Entity”**
- “Perfect Plant” is a “**Learning plant”**
  - Can take the measure of its performance in real time
  - Sustain improvement & innovation

Without the data provided by OSIsoft’s PI Infrastructure, Kodak’s achievement would not have been possible

Thank you!

"The Perfect Plant is one that knows how to achieve business goals with minimal resources"