



State of the Art Submetering

**ENERGY STAR Monthly Partner
Web Conference**

August 16, 2006

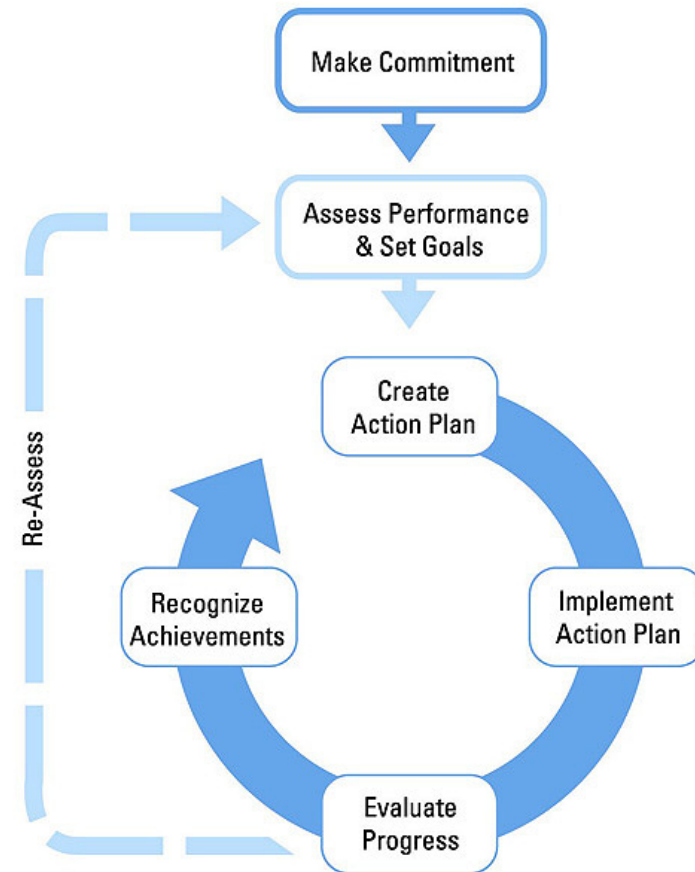
Call-in Number: 1-866-299-3188

Conference Code: 202 343 9965

About The Web Conferences



- **Monthly**
- **Topics are structured on a strategic approach to energy management**
- **Opportunity to share ideas with others**
- **Slides are a starting point for discussion**
- **Open & Interactive**
- **Supports the **ENERGY STAR Challenge** to build a better world, 10% at time**



Web Conference Tips



- Mute phone when listening! Improves sound quality for everyone.
Use * 6 – to mute and # 6 to un-mute
- Hold & Music – If your phone system has music-on-hold, please don't put the web conference on hold!
- Presentation slides will be sent by email to all participants following the web conference.

Today's Web Conference



Submetering

- **Accurate information is the foundation of effective management.**
- **Proper metering practices provide good information.**

Today's web conference will examine best practices in using submeters to inform energy management.

Today's Web Conference



Presenters:

- Joe Almaguer, Global Energy Efficiency Leader, Dow Chemical Co.
- George Denise, General Manager, Cushman & Wakefield



Sub-metering - An Energy Efficiency Program Key Element

The Dow Chemical Co.

Joe Almaguer

16 Aug., 2006

Sub-metering Presentation:



- About Dow
- Dow's Key Energy Efficiency Program Elements
- Energy Metering /Sub-Metering – Key Element
- Sub-Metering Strategies
- Data Reporting System
- Energy Efficiency / Energy Intensity Improvement Results

About Dow



A 108 year old company committed to Sustainable Development

- **Leader in Chemicals, Plastics and Ag Products**

Top Industries for Dow Products

- Automotive & Transportation
- Building Maintenance & Construction
- Electronics & Entertainment
- Food & Food Packaging
- Furniture & Furnishings
- Health & Medicine
- Home Care and Improvement
- Paper & Publishing
- Personal & Household Care
- Water Purification



- **Annual sales of \$46 billion**
- **Serve customers in 175 countries**
- **43,000 employees**

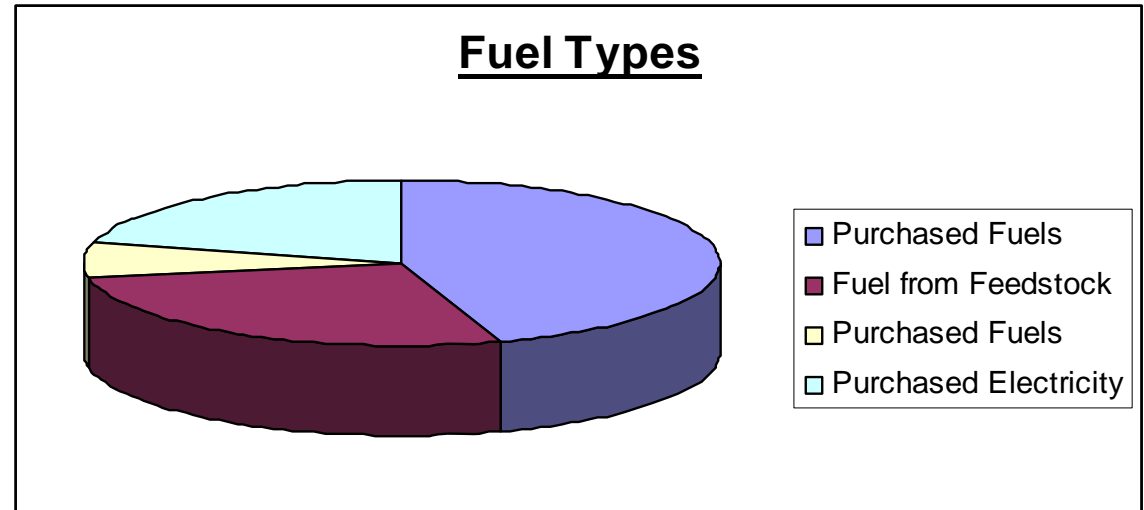
About Dow



Annual Energy Consumption Globally \approx 600 Million MMBtu's

Energy forms Include:

- Fuels: Gas, Coal, Fuel Oils
- Feedstock Fuels
- Electricity
- Steams
- Compressed Air/N₂
- Waters





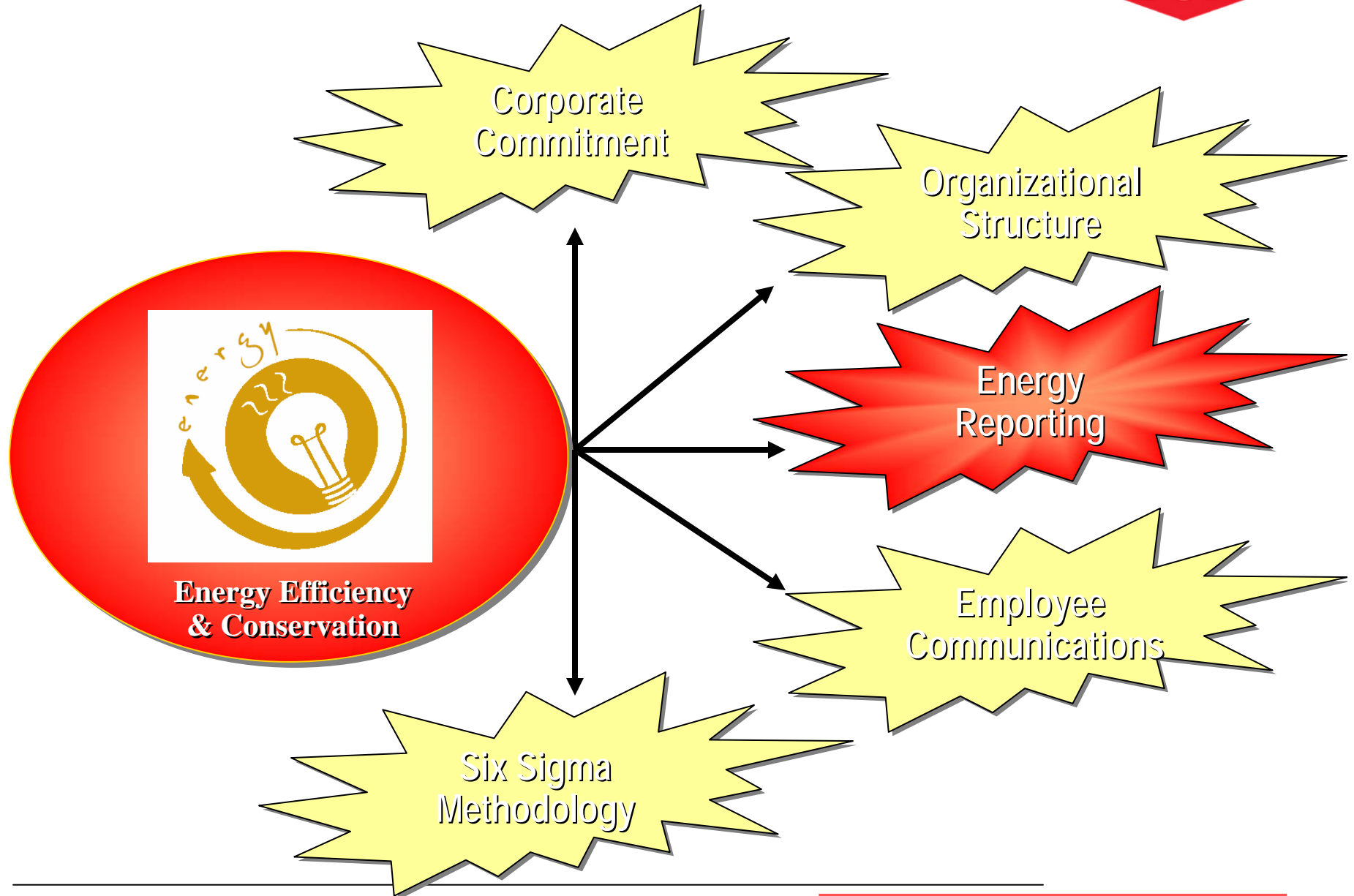
Energy Efficiency & Conservation Program at Dow

- Long History of EE&C
- Solid Leadership Commitment to Sustainability
- Mature Energy Management Program

Recent Achievements:

- In 2005 Surpassed our 10 yr Energy Intensity Reduction Goal - 22%
- Achieved Cumulative Energy Savings = Approx 900 Trillion Btu's
- Cost Savings (avoided fuel) = Over \$ 4 Billion
- American Chemistry Council - Exceptional Merit Award for EE&C
- IETC – National Leadership in Energy Conservation and Environmental Stewardship Award
- Alliance To Save Energy's - 2006 Galaxy Star of Energy Efficiency Award

Key Elements – EE&C Management Program



Key Element – EE&C Management Program



- A robust energy accounting system
- Drill down capabilities
- Converts data to information
- Available to all employees
- Basis for monitoring and reporting Energy Efficiency Improvement progress

Energy Measurement/Reporting System



- First step in improving energy efficiency is understanding where, how, and how much energy is used.
- In Dow, it is important to understand how much energy is consumed:
 - At a Global Level
 - At Each Site (group of plants)
 - At Each Plant
 - At Each Facility or Major System
 - By Business – Technology
- Energy Goals are established on a BTU/lb of product basis

Energy Measurement System



but.....the level of sub-metering provided is a business decision driven by:

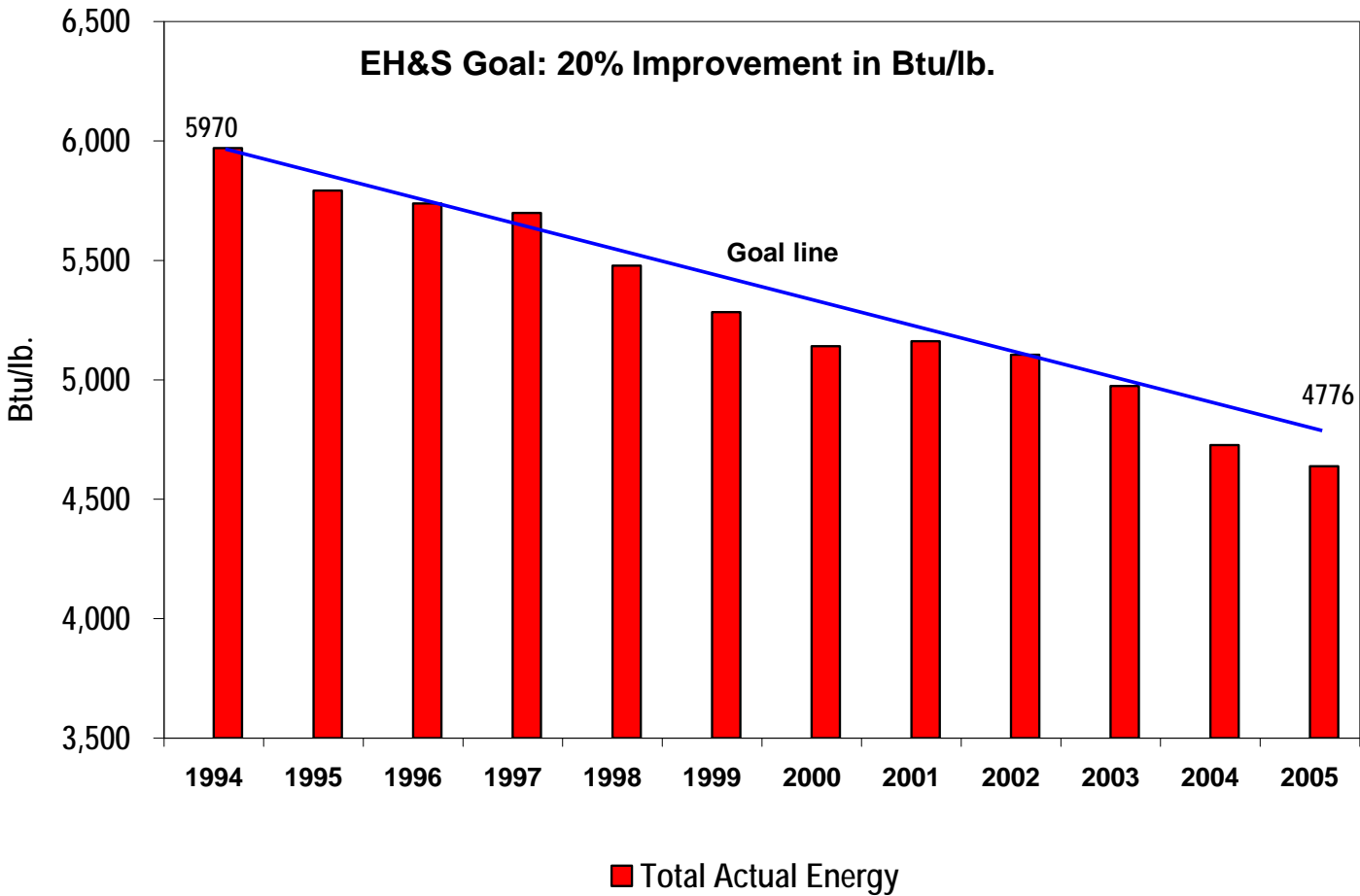
- Commercial / Contractual Obligations
- Accurate Product Costing
- Technology Validation / Optimization
- Equipment Efficiency Monitoring
- Process Control
- EE&C Improvement Goals

result.....Dow's systems make extensive use of sum-meters

Energy Measurement System



A Global Level - Corporate Energy Intensity Goals / Targets / Performance:
Energy Intensity Performance

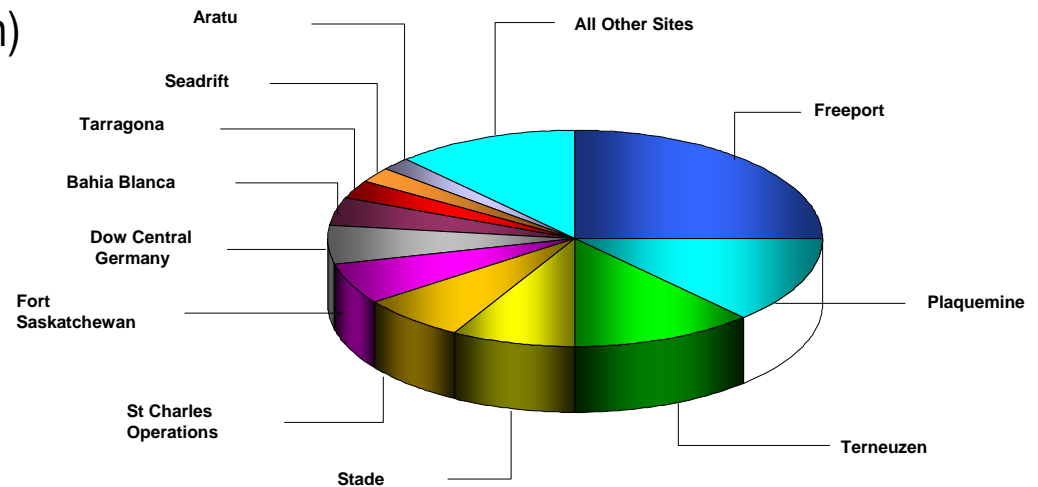


Dow's Energy Use By Site



By Site – Bill Payment; site competitiveness, cost by geography, energy balance

- Typical Metering - Custody Transfer Grade Meters
- Fuel Gas – Contractual Accuracy
 - Ultrasonic – press/temp compensated
 - Turbine meters - press/temp compensated
 - BTU analyzers (Chromatograph)
 - Flow Computers – Total BTU's
- Steam – Contractual Accuracy
 - Flow with T/P Compensation
 - Venturi, Ultrasonic
- Electricity – Utility Grade Accuracy
 - microprocessor based meters



Dow's Energy Use – Plant Level



By Plant – Product Cost, Plant Performance, Improvement Goals

- Typical Metering – Internal Customer Metering - Accounting:
 - Fuel Gas – expect 1 to 2% accuracy
 - Vortex – press/temp compensated
 - Coriolis – mass meters
 - DCS calculation, perhaps with a BTU correction from site number
 - Steam – expect approx 2% Accuracy
 - Flow with Temp / Pressure Compensation
 - Vortex Meters, Ultrasonic, Venturi
 - Electricity – Utility Grade or Relay Accuracy
 - Micro Processor Based

Dow's Energy Use – Facility / Equipment Level



By Facility - Process – Product Cost, Op Performance, Efficiency Improvement, Cost KPI's

- Typical Metering – Process Control / Operating Metering:
 - Fuel Gas – accuracy is on case by case basis
 - Vortex – press/temp compensated
 - Coriolis – mass meters
 - Steam – Accuracy is on case by case basis
 - Flow with Temp / Pressure Compensation
 - Vortex Meters, Ultrasonic, Venturi
 - Electricity – KWH meter or Derived from PT/CT/PF

Meter Maintenance / Calibration



Meter installation is only beginning, must have:

- ✓ Accurate measurement element factors and calculations
- ✓ Management of Change Process
- ✓ Active meter maintenance program
 - ✓ Objective: Verify equipment condition and calibration
 - ✓ Frequency:
 - ✓ Custody metering determined by Utility agreement or contract, and Fuel gas supplier practices.
 - ✓ On site metering determined by system balance.
 - ✓ Maintenance/Frequency: Condition based monitoring.

Energy Reporting System



Metering data must be usable and useful and therefore reporting system should provide:

- ✓ Accurate/reliable measurement of energy consumption
- ✓ Timely reporting / monitoring
- ✓ Easy / automatic data entry/input
- ✓ Allow for data analysis and breakdown
- ✓ Provide graphics / tables
- ✓ Data available to all users & management

Enhanced Public Reporting



The Dow Global Public Report 2003



Sustainability

Public Commitment:

- In 1995 Dow Committed:
 - To Reduce Energy Intensity
 - By 20% by the year 2005
 - From Base Year 1994

The Dow Public Report

www.dowpublicreport.com

Enhanced Public Reporting - Results

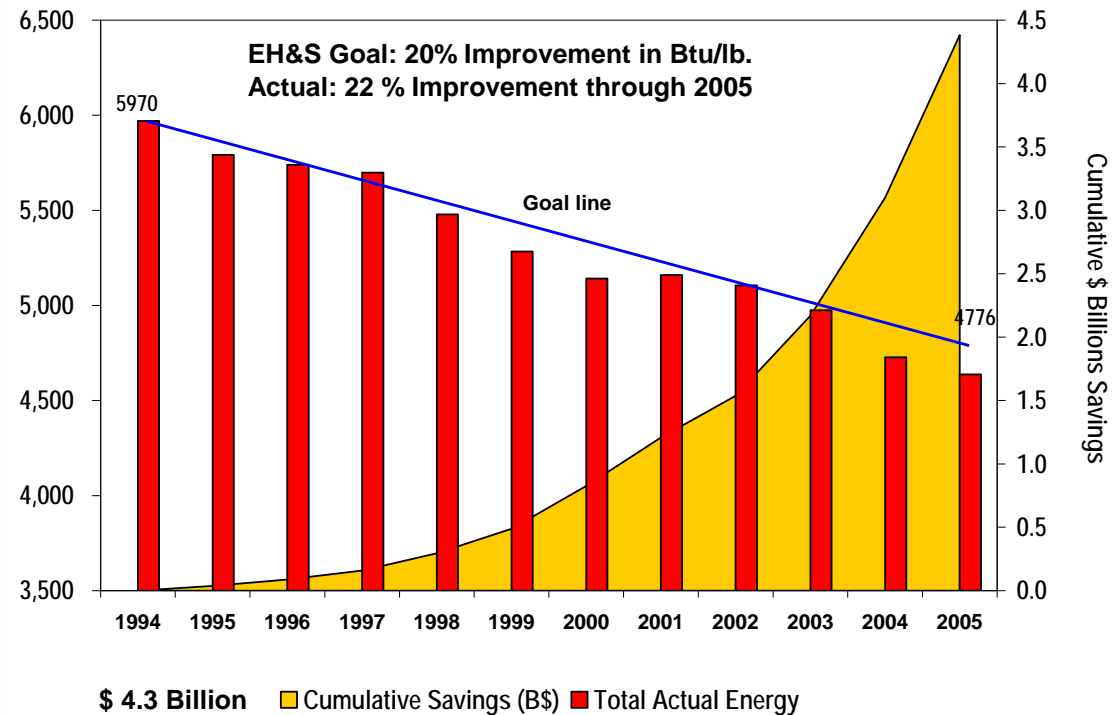


Energy Intensity Performance

The Dow Global Public Report 2003



Sustainability



The Dow Public Report

www.dowpublicreport.com

Summary



Summary:

- ✓ Metering & Sub-metering is a key element of an overall EE&C Program
- ✓ Level of sub-metering and type is business driven
- ✓ A meter maintenance program is essential
- ✓ Data collection/reporting/analysis/monitoring system is needed to create value
- ✓ Dow makes extensive use of its metering/sub-metering system, as a key element of the overall program to drive EE&C
- ✓ Dow has achieved significant benefit from aggressively pursuing EE&C



Thank You

**Please turn off your lights
and monitor when you leave.**

Adobe Systems Incorporated



The background of the slide is a photograph of the Earth as seen from space. The planet's curved horizon is visible on the left side, showing a mix of green landmasses and blue oceans. The rest of the background is a dark, starry space.

Adobe Systems Incorporated

The Value of Sub-Metering, and the Return On Investment

Prepared by Cushman & Wakefield

George Denise, CFM, CPM, FMA, RPA

General Manager

Adobe Systems Incorporated

PRESENCE

Adobe helped launch the desktop publishing revolution in 1982.

Adobe expanded into desktop software applications with Adobe Illustrator and Adobe Photoshop software.

Adobe released Adobe Acrobat software and Adobe Portable Document Format (PDF).

With the acquisition of Macromedia in 2005 – developer of the Flash technology and a pioneer in multimedia and web development – Adobe expanded its technology foundation and portfolio of customer solutions.

Cushman and Wakefield

■ WHO WE ARE

- Preeminent, full-service global real estate services provider
 - Founded in New York in 1917
 - Privately held firm - strong financials
 - 165 offices, 50 countries, 6 continents
 - Pure service organization; no real estate ownership conflicts

■ EXPERIENCE

- More than 4,586 properties under management worldwide
- Major clients include Citigroup, eBay, Fireman's Fund Insurance Company, Novell, Nokia, and Symantec and Adobe Systems Incorporated.
- One of the largest third-party managers of real estate in the world
- C&W has more Energy Star rated properties than any other third-party manager
- C&W has more properties in the process of being certified as LEED Green Buildings than any other third-party manager

Adobe Towers

- Adobe Towers are Adobe's headquarters buildings in San Jose, California.
- Adobe Towers consist of three high-rise office buildings totaling just under 1 million square feet.
- West Tower is 18 stories and was completed in 1996.
- East Tower is 16 stories and was completed in 1998.
- Almaden Tower is 17 stories and was completed in 2003.
- The facilities include a cafeteria, fitness center, and 30,000 square feet of data center.
- The facilities management was outsourced to Cushman & Wakefield in 1999.

The background of the slide is a photograph of Earth as seen from space. The planet's curved horizon is visible on the left side, showing green landmasses and blue oceans. The rest of the background is a dark, starry space.

Summary of Adobe's Experience

Over the past five years, Adobe has spent \$1.1 million on energy and energy-related projects, has received \$350,000 in rebates for these projects, and is saving \$1,000,000 per year in reduced costs.

This is a 122% return on investment, with a 10 month average payback!

Real-time Electric Sub-meters



In June 2004, we installed real time main electric meters (revenue graded and ethernet ready) in order to better monitor in real time, electricity use and changes in use.

The meters were purchased used and cost \$19,969 installed.



Digital Water Meters for Cooling Towers

In April 2005, we installed real-time digital water meters (pulse meters) on our cooling towers to record water loss through evaporation in order to reduce our sewage treatment bill.

Cost was \$43,000; savings through reduced sewer treatment charges, \$12,000 per year.



Chilled Water Pump Issue

In July 2005, through the graphic display of our electricity use, we were able to locate and correct a chilled water pump programming issue that had existed since the building was built in 1996.

Cost to correct was \$1,200; savings in electricity, \$43,000 per year.



Web-based Lighting Controls

We have just completed installing web-based central controls and monitoring for lighting throughout the three towers, enabling us to turn off corridor lighting and perimeter office overhead lighting to allow us to participate in PG&E's Demand Response Program. Requirement is a 10% reduction on demand.

Cost was \$78,000; savings in electricity,
\$28,000 per year.

Water Meter Monitoring

We have recently installed real-time meters for our irrigation system with tie-in to our web-based central monitoring system.

Cost was \$65,000; we have already discovered and repaired a leaking valve, saving \$6,000 per month in water and sewer treatment charges.

Data Center Monitoring



We have just completed installing data center utility and environmental monitoring with web-based tie-in to the central station.

Cost was \$18,000; savings to be realized through improving reliability by being able to easily determine when loads are out of balance or approaching capacity.

Gas Meter Monitoring



We are just starting on a project to install real-time gas meters on our natural gas system and tie them in to the central station in order to monitor gas usage more carefully. .

Cost will be \$20,000; savings to be realized through more careful monitoring of use and the discovery of losses.

Summary of Adobe's Experience



Over the past five years, Adobe has:

- Effectively reduced electricity use on a per person basis by 35%,
- Effectively reduced natural gas use by 41%,
- Reduced domestic water use 22%,
- Reduced landscape irrigation water use by 76%,
- Is recycling or composting 85% of their solid waste,
- Have reduced their total pollution from all sources by 26%, and CO² emissions by 16%

Summary (continued)

From 2000 to 2004, Adobe made energy improvements that cost \$614k to implement, resulted in rebates totaling \$221k, and annual savings of 632k.

As part of our overall strategy at Adobe, we have developed an interface system which integrates temperature, data center & utility monitoring, HVAC controls, lighting controls and fountain controls into a single, web-based system that we can monitor and operate from anywhere. It cost us so far about \$163,000 to develop, we have received rebates of \$37,617, and we have already realized annual savings of \$96,000. We originally began developing it to make it easier to shed energy for PG&E's Demand Response Program, however, we just kept finding more applications.

IN SUMMARY

The job of the facilities manager is to provide a clean, safe, healthy, productive and uninterrupted work environment...

at the lowest cost possible.



Questions?



Questions & Discussion

Announcements



Change A Light Campaign Update

Wednesday, Sept. 6, 2006

3 PM Eastern

Register on energystar.webex.com training calendar

Change A Light Day – October 4, 2006

Upcoming Web Conferences



September 20 – Remote Monitoring and Control
Systems

October 19 – Energy and Climate Risk
Management

Download past web conference presentations at:
www.energystar.gov/networking

Questions or comments? Contact: tunnessen.walt@epa.gov



Thank You!