

Leveraging Energy & Environmental Costs for Higher Profitability

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Presented By:
John Hurtenbach, CHMM, CEM
BT Squared, Inc.

WORKSHOP OBJECTIVES

- The goal is to better understand the relationship between profitability and sustainability.
 - Explore energy use patterns
- Take Home Message:
 - Measure energy in order to manage

U.S. Economy Grinds to Halt as Nation Realizes Money Just a Symbolic, Mutually Shared Illusion

 the **ONION**



“Calling it ‘basically no more than five rectangular strips of paper,’ federal chairman Ben Bernanke illustrates how much “\$200” is actually worth.”

Source: © The Onion

Walmart Announces Goal to Eliminate 20 Million Metric Tons of Greenhouse Gas Emissions from Global Supply Chain

“BENTONVILLE, Ark., Feb. 25, 2010 - Walmart today announced a goal to eliminate 20 million metric tons of greenhouse gas (GHG) emissions from its global supply chain by the end of 2015. This represents one and a half times the company's estimated global carbon footprint growth over the next five years...

...Projects must reduce GHGs from a product in either the sourcing of raw materials, manufacturing, transportation, customer use, or end-of-life disposal. **Walmart must demonstrate it had direct influence on the reduction and show how that reduction would not have occurred without Walmart's participation.**”

Source: <http://walmartstores.com/FactsNews>, Feb. 25, 2010

ECO:nomics: Creating Environmental Capital

The Wall Street Journal's third annual conference on the business of the environment

- Environmental efforts need to be central to the company's operations and mission.
- Financial capital flowing to smart metering, green products, alternative energy.
- The spoils will go to those who exploit the uncertainty the best.

“... businesses can do much to improve energy efficiency and reduce carbon emissions while at the same time helping, not hurting, their bottom line financial performance.”

Source: <http://online.wsj.com> March 8, 2010

Supply & Demand

Natural capital is the stock of natural ecosystems that yields a flow of valuable ecosystem goods or services into the future.

Natural capital costs are linked to profitability.

- **Define** – Sources and cost of natural capital
- **Measure** – Natural capital intensity
- **Analyze** – Uses and high intensity tasks
- **Improve** – Select projects to reduce intensity
- **Control** – Monitor costs through dashboard

Track Energy

Amounts and costs of energy consumed

Month	Electricity			Natural Gas			Fleet				Normalize
	kWh	Peak Demand kW	Total Cost	Therms	Heating Degree Days	Total Cost	Gas gal	Total Cost	Diesel gal	Total Cost	Production Rate Units
Mar-10	900,000	2,200	\$50,000	40,000	900	\$41,200	625	\$1,100	3,300	\$526	526
Feb-10	940,448	2,057	\$45,000	47,977	1,407	\$49,416	451	\$1,164	3,492	\$447	447
Jan-10	902,011	2,000	\$47,005	43,087	1,285	\$44,380	968	\$1,419	4,258	\$437	437
Dec-09	863,856	2,141	\$48,099	39,761	1,048	\$32,165	939	\$938	2,814	\$493	493
Nov-09	905,442	2,096	\$53,880	11,889	794	\$11,736	590	\$1,464	4,391	\$544	544
Oct-09	1,008,099	2,068	\$55,274	10,277	627	\$9,217	669	\$1,706	5,118	\$461	461
Sep-09	1,051,453	2,172	\$52,514	5,008	225	\$3,991	1,112	\$1,041	3,122	\$525	525
Aug-09	1,016,885	2,229	\$69,897	3,840	0	\$3,691	355	\$1,155	3,465	\$517	517
Jul-09	839,549	2,217	\$53,849	3,049	0	\$2,826	916	\$1,299	3,896	\$382	382
Jun-09	837,600	2,179	\$61,991	4,134	0	\$3,645	1,110	\$1,207	3,621	\$375	375
May-09	890,400	2,198	\$54,287	6,113	258	\$5,077	993	\$1,425	4,275	\$463	463
Apr-09	926,400	2,237	\$51,713	8,626	416	\$8,002	544	\$1,102	3,307	\$480	480
Mar-09	832,800	2,136	\$50,285	17,548	934	\$17,214	888	\$1,276	3,828	\$426	426

Productivity

A measure of value added by a unit of capital

▪ INPUTS

- Labor Capital - \$ / hr labor
- Natural Capital - \$ / ??
 - Energy - \$ / mmBtu
 - Land - \$ / ft²
 - Material - \$ / unit
 - Water - \$ / unit

▪ OUTPUTS

- Product = Profits \$ / unit
- By-Products or Waste = Costs (Internal and External)

Supply Efficiency

Energy efficiency measured at each step:

- **Primary Energy** - Found in nature:
 - Fossil – Coal, Petroleum, Gas
 - Nuclear – Uranium
 - Renewable – Biomass, Solar, Wind

- **Secondary Energy** - Transformed into forms we use:
 - Gasoline, diesel, natural gas, graded coal
 - Electricity
 - Heat

- **Tertiary** – Consumption or end use
 - Motors
 - Lights
 - Heaters
 - Etc.

***Leverage efficiency improvements and waste reduction
before, during, and after each step***

Natural Capital Efficiency

- Water
 - Groundwater levels dropping
 - Contamination increasing
- Land
 - Greenfield to Brownfield
 - Neighbors / NIMBY
- Air
 - Industry vs. Transportation vs. Residential
 - Uncertainty will drive volatility
- Raw Materials
 - Supply
 - Demand

Efficiency vs. Conservation

- **Energy Conservation** - Behavior that results in the use of less energy
 - Change Culture
 - People are resistant to change
- **Energy Efficiency** - The use of technology that requires less energy to perform the same function
 - Increase Productivity
 - Increase Profits
 - Free up capital

Barriers to Improving Efficiency

- **Who gets the savings?**
 - Who pays for the equipment?
 - Who pays the cost of energy?

- **What are the true costs?**
 - Internal life cycle costs
 - External costs to customers

- **What are my priorities?**
 - Lack of capital
 - Lack of resources
 - Other priorities

Solutions

- Information and education
- Incentives and financing
- Standards to expedite replacement
- Third party involvement

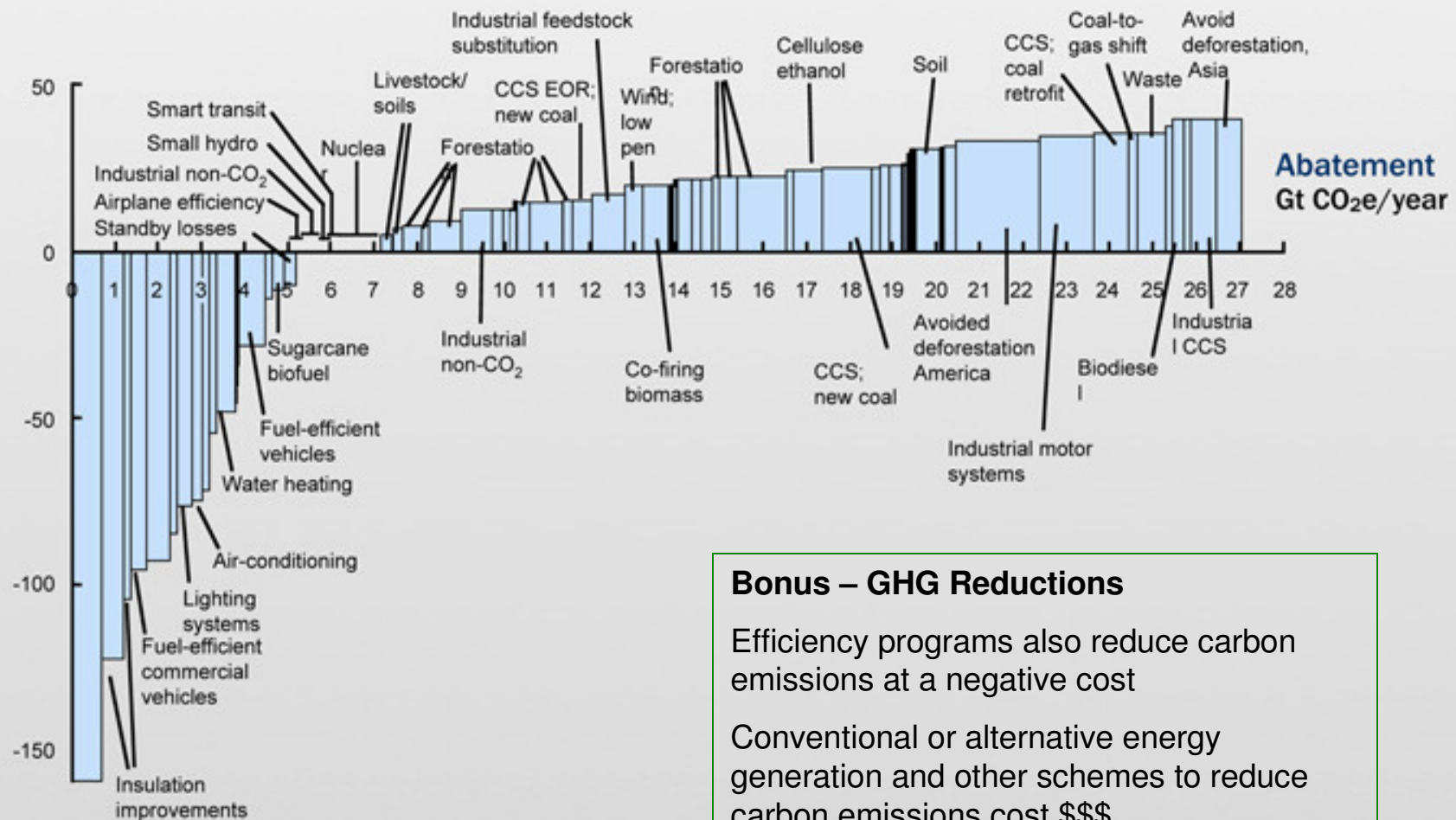


Supply vs. Demand

- Past efficiency projects mean we now need fewer generating units, transmission lines, etc.
- Efficiency measures cost less than building new energy sources.
- Supply Side – Cost to add capacity:
 - Increasing capacity costs thousands of \$ / kW
 - Efficiency programs cost hundreds of \$ / kW
- Demand Side – Your cost:
 - Electricity Cost: averages 6-7 cents per kWh
 - Energy efficiency projects: 2.5-3 cents per kWh

THE COST CURVE PROVIDES A “MAP” OF ABATEMENT OPPORTUNITIES

Cost of abatement, 2030, €/tCO₂e*



* Cubic feet of carbon equivalents.
Source: McKinsey and Vattenfall analysis

Bonus – GHG Reductions

Efficiency programs also reduce carbon emissions at a negative cost

Conventional or alternative energy generation and other schemes to reduce carbon emissions cost \$\$\$

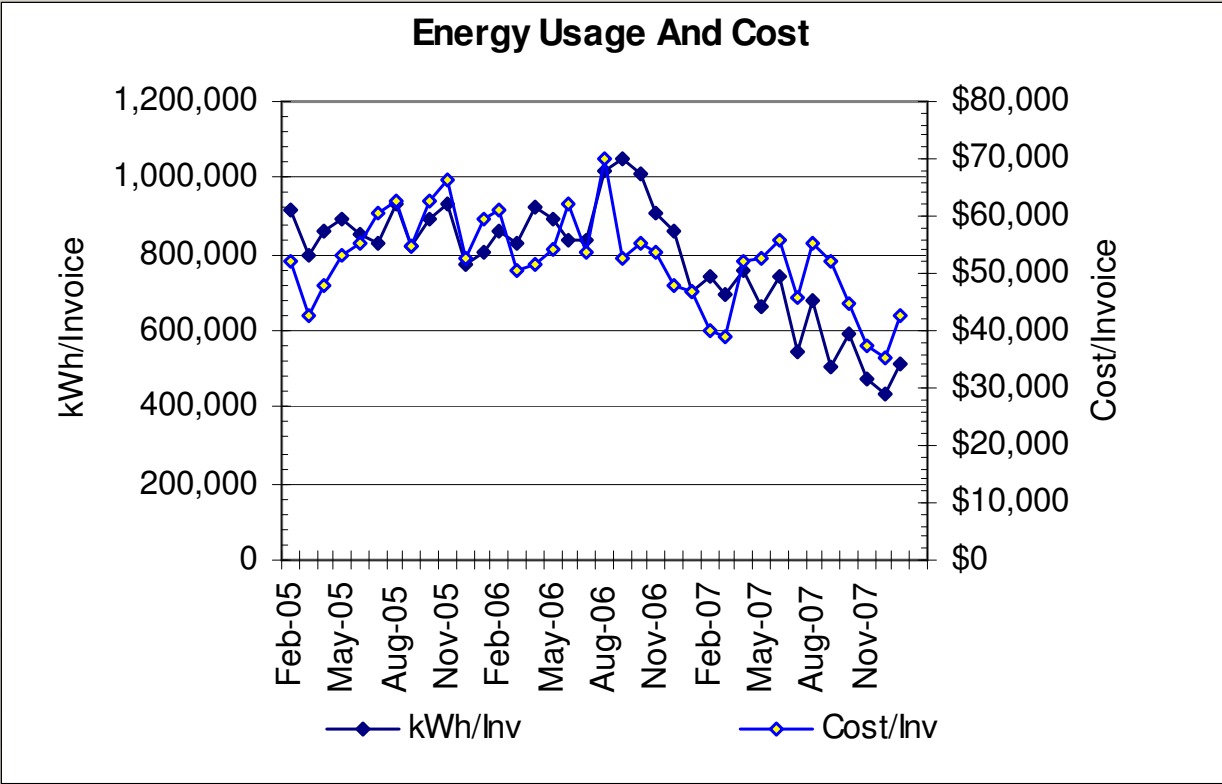
Energy Accounting

Ways to Look at Energy

- Use - Line item on annual budget
 - All costs as overhead
 - Consumption and demand
 - Know the difference, but no action

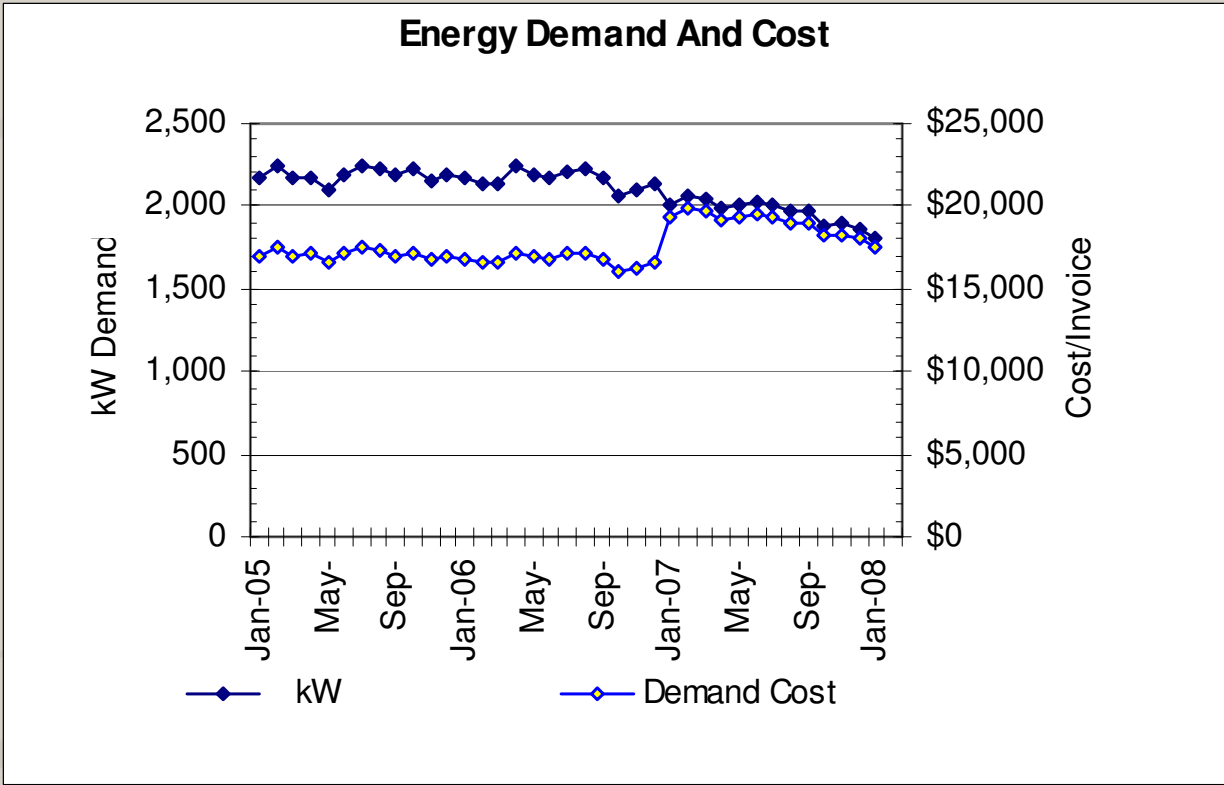
- Intensity - Productivity metric
 - Energy / Revenues
 - Energy / Production
 - Energy / Building footprint

Electricity Consumption and Cost



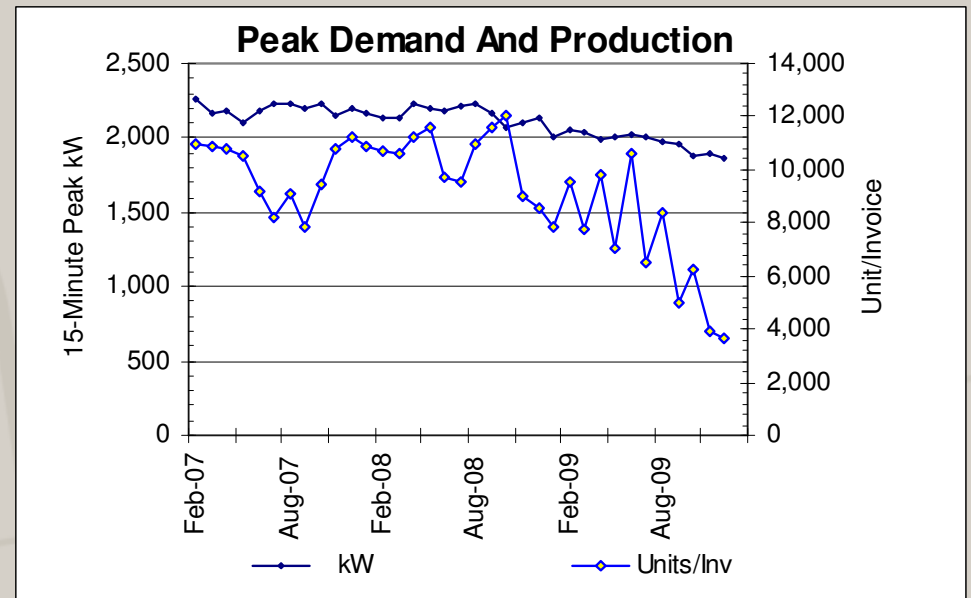
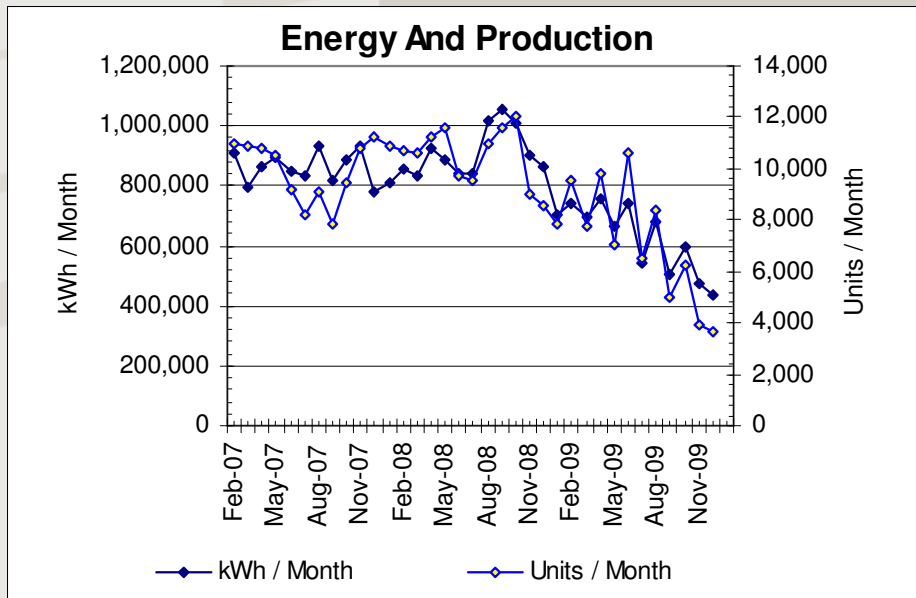
- Consumption in kiloWatt hours (kWh)
- Cost in dollars

Electricity Demand and Cost



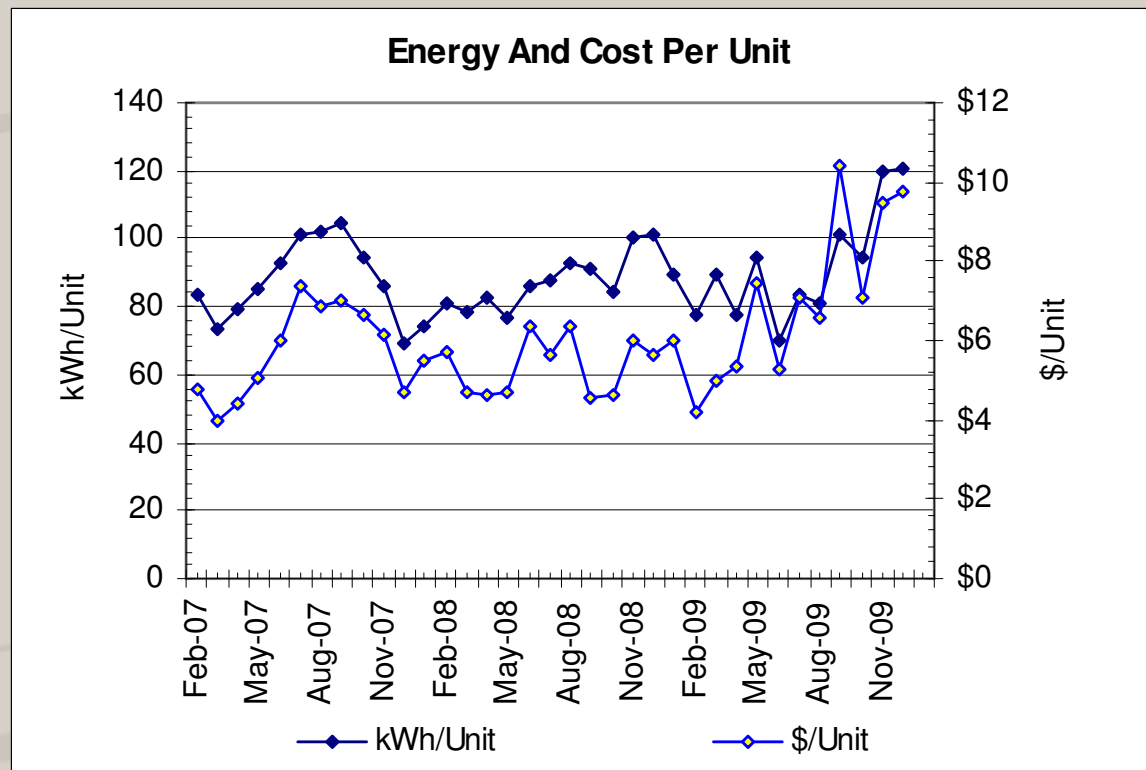
- Demand in maximum kiloWatts (kW) per 15 minutes
- Cost in dollars

Energy and Production



Energy use is decreasing, but so is production

Cost per Unity

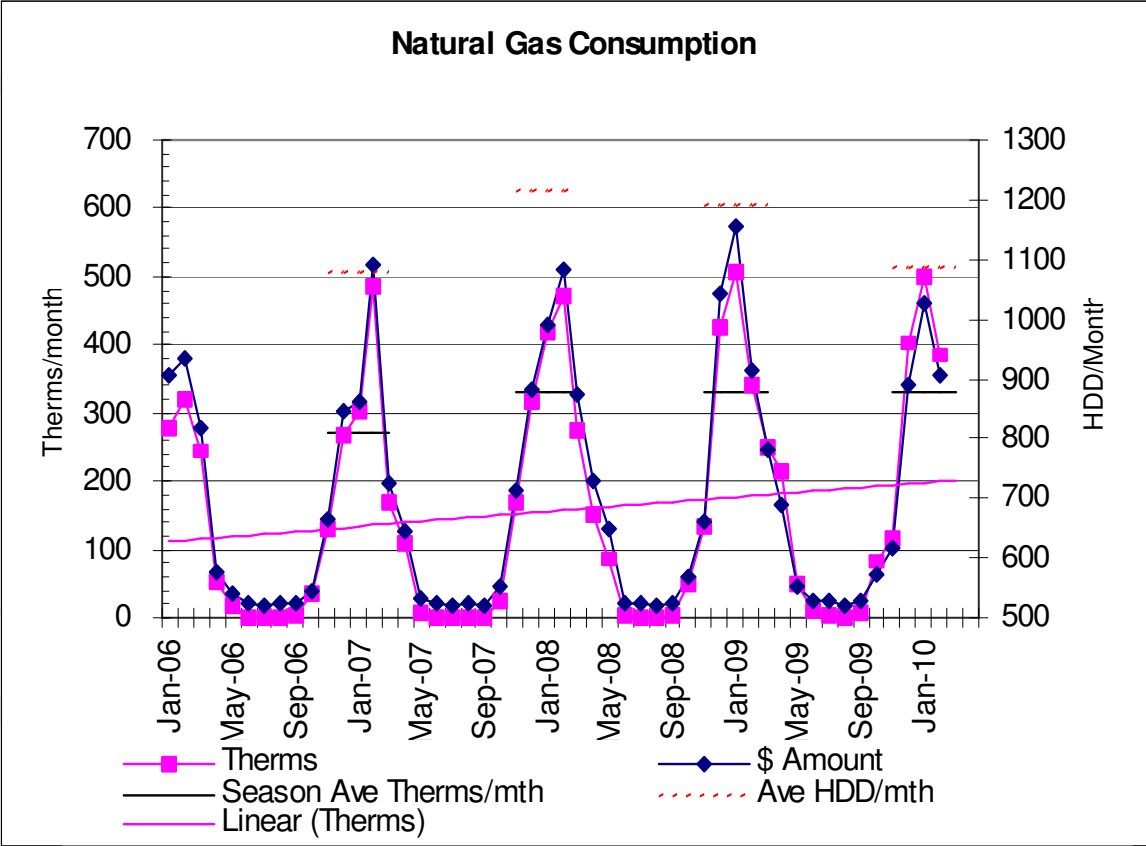


Data normalized to production – Cost per Unit

2008 \$5.30

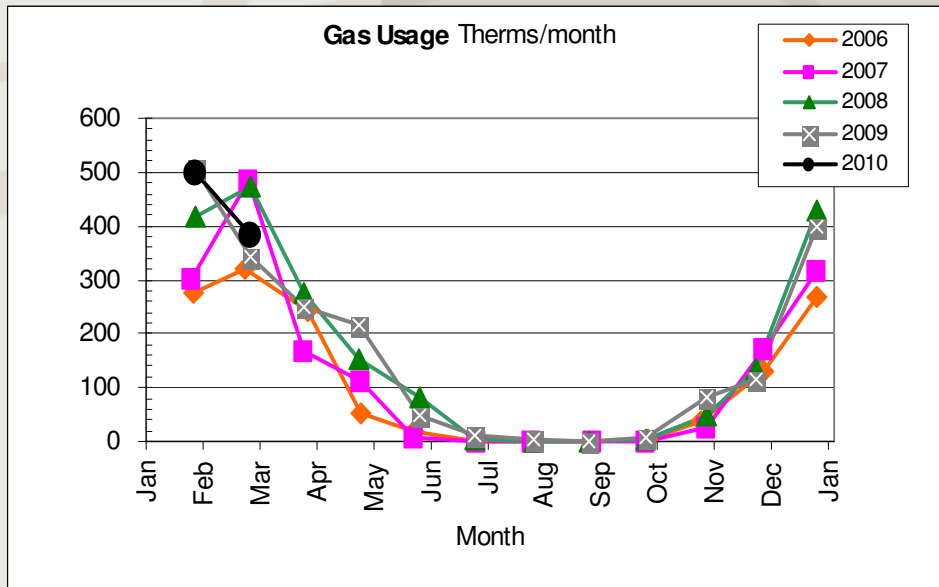
2009 \$6.45 (120%)

Process-Specific Energy Consumption

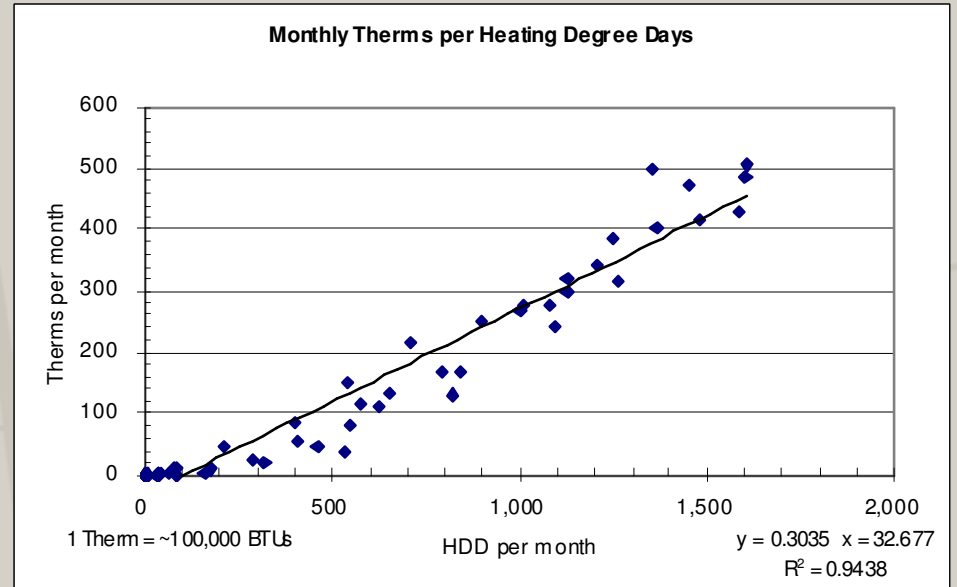


Space heating

Space Heat

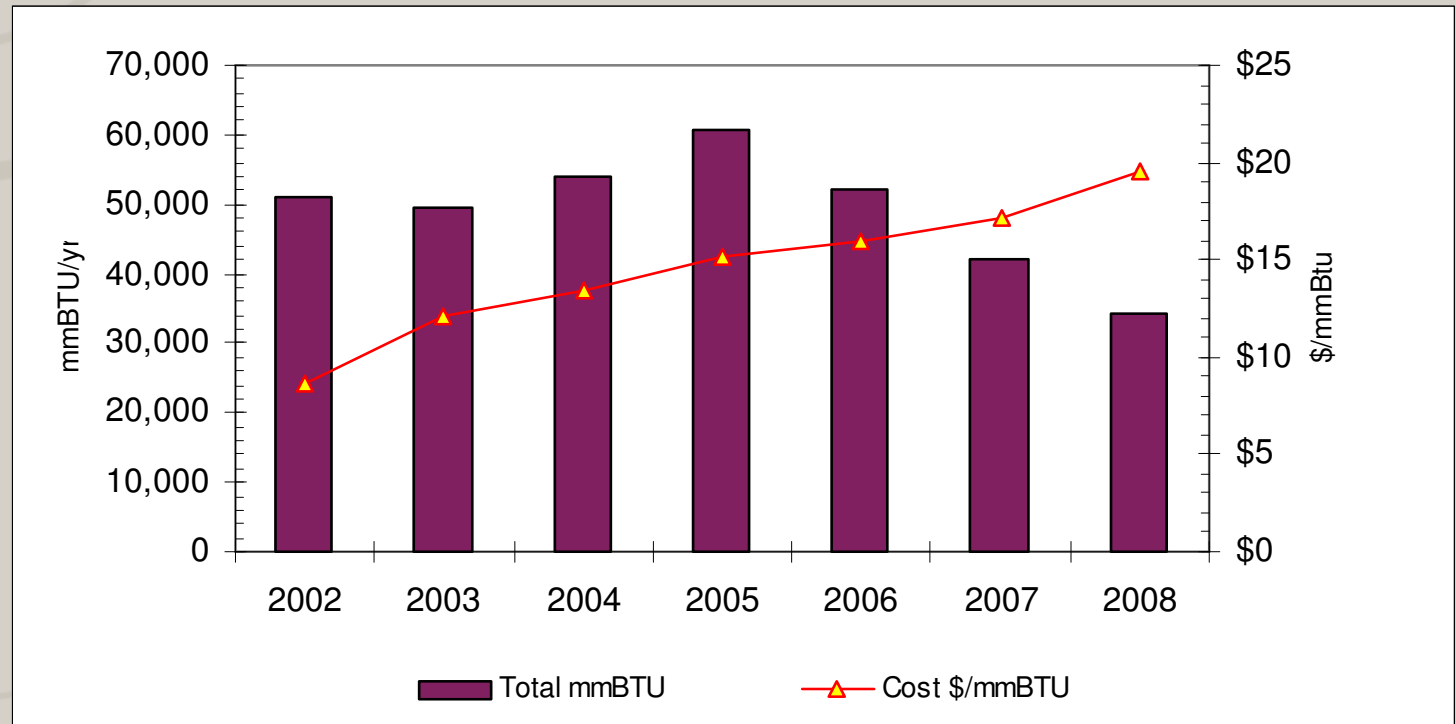


Monthly with years as series



Normalized to weather

Facility Level – All Energy



- Baseline of Total Energy
- Electricity converted from kWh to mmBtu

(1 kWh = 3412 Btu)

Benchmark to Industry

- Benchmarks normalized to compare similar facilities
- Benchmarks available for offices, schools, hotels, other similar spaces
- Not much for industry due to variability

Natural Capital - Environmental

- Land use
- Water use and discharge
- Air use and emissions
- Fuel combustion and exhaust

Baseline analysis requires a deeper look.

Environmental Accounting

The Four Levels of Environmental Costs:

1. **Conventional costs** - capital and operating costs, energy, equipment, labor, materials, etc.
2. **Potentially hidden costs** - regulatory costs, monitoring, records, testing, training, inspections, etc.
3. **Contingent liability costs** - penalties, fines, and future liabilities
4. **Image and relationship costs** - corporate image, community relations, consumer response, etc.

Source: Richard MacLean, Environmental Accounting for Competitive Advantage, 1998

Strategies

- **None** - No environmental costs, energy cost insignificant, high profits
- **Ad hoc** - As identified to solve a given problem
- **Systems based** - Commitment, internal team with external component to provide perspective, plan to fit your needs

Systems Based Assessments

- **Levels**

- Facility
- Processes
- Products

- **Areas**

- Energy: electric, fuels, transportation, fuels
- Materials: input / output ratio
 - Waste costs
 - Recycling value vs. initial cost

Low Hanging Fruit

- Different from other projects. Don't wait to implement them.
- Examples
 - Leaks – steam, compressed air, ventilation air, water, etc.
 - Maintenance – tuning burners, belts, lubrication
 - Lights

Financial Calculations

- Simple payback
- Net present value
- Internal rate of return
- Calculators

Consider costs beyond obvious savings

Identify benefits to society

Incentives – Financial Resources

- Focus On Energy
- Utilities
- State & Federal

First identify the project and determine potential savings

Examples

- Utility Bills
- Energy Use
- Energy Intensity
- Processes

Energy Management System

1. Track Energy
2. Develop a metric
3. Set goals and targets
4. Identify projects and prioritize by ROI
5. Implement projects
6. Track and control results
7. Repeat

Systemic Continuous Improvement

Thank You.

Questions?



Smart, Simple Solutions.