Assessing Energy Performance

December 18, 2002

Money Isn't All You're Saving

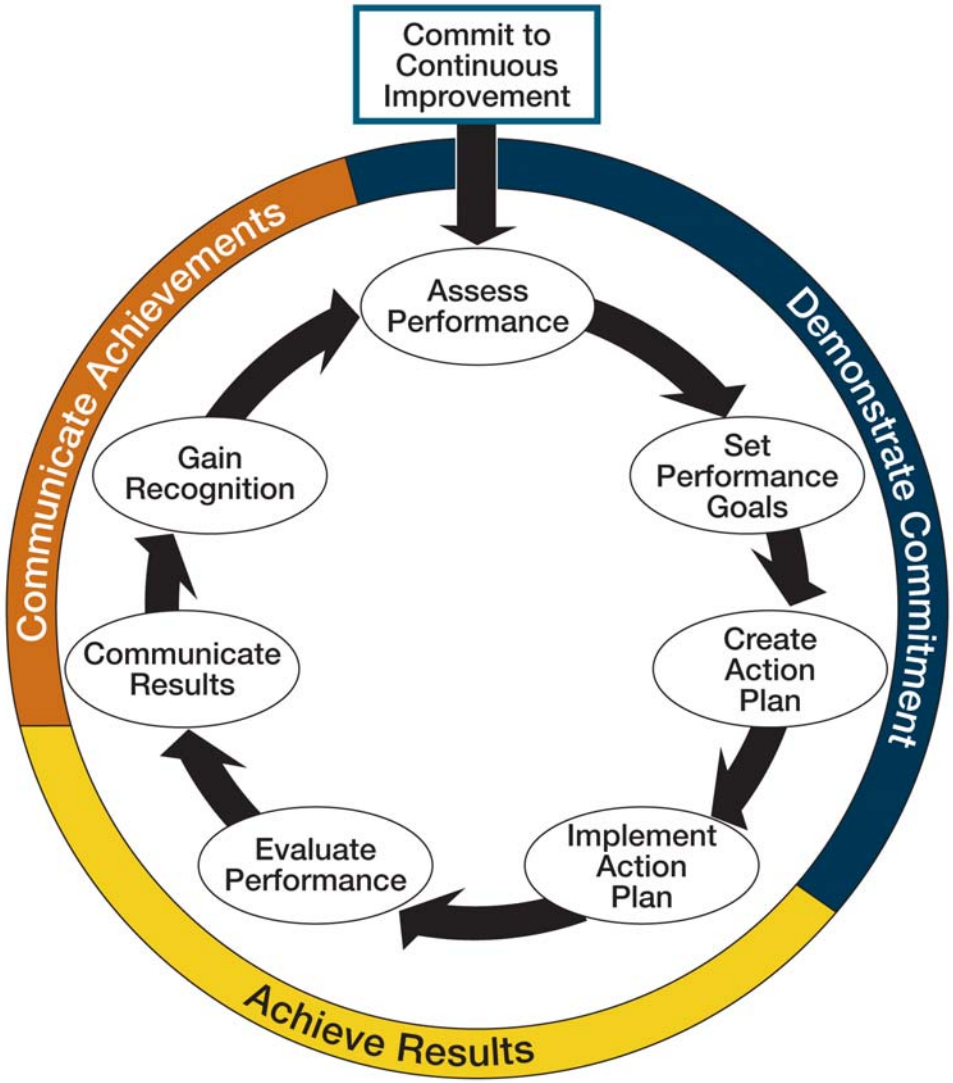
About the Web Conferences

- Monthly
- Based on strategic approach
- Continually improve energy performance
- Opportunity to share ideas
- Open & interactive

Today's Web Conference

- Introductions
- Why assess energy performance?
- Key steps
- Partner examples
- Open discussion
- Wrap-up

Strategic Approach to Energy Management



Why assess performance?

- Provide an **understanding** of usage
- Establish a **baseline**
- Identify improvement **opportunities**
- Facilitate **goals**
- Initiate the **planning** process

Steps to Performance Assessment

- Measure
- Track
- Normalize
- Analyze
- Benchmark
- Identify

MEASURE all energy use

- Electric, oil, gas, steam, coal, etc.
- Purchased or produced
- Continuous and summarized
- Peaks and valleys
- Sites, buildings, processes, equipment, etc.

TRACK by keeping records

- Historical log
- Regular input
- Spreadsheet or database
- Graphs
- Consolidate

NORMALIZE to reflect drivers

- Degree-days
- Product
- Space
- $ales

ANALYZE to determine

- Trends
- Peaks and valleys
- Relationships
- Key events
- Company strategies

BENCHMARK by comparing

- Standard – industry, building, function, etc.
- Similar company facility
- Competitor
- Best practice

IDENTIFY SWOT

- **S**trengths
- **W**eaknesses
- **O**pportunities
- **T**hreats

What comes next?

- Develop goals
- Implement plans
- Measure progress
- Etc.

Industry partner examples

- Quad/Graphics, Inc.

  Kristin Mackus, Environmental Coordinator

- ExxonMobil Corporation

  Art Tenner, System Coordinator, ExxonMobil Research & Engineering

- Pharmacia Corporation

  Henry Molise, P.E., Corporate Energy Manager, Global Engineering, Maintenance & Utilities

Quad/Graphics, Inc.

Kristin Mackus, Environmental Coordinator

Corporate Energy Policy

- Energy efficiency, employee awareness and education:
  - "Energy efficiency is accomplished through a total management system which measures and balances costs, energy reductions, pollution prevention and production demands"
- Focus: **Consumption not Cost!**
- Energy security through diverse supplies of all forms with contingency plans in place to mitigate energy supply disruptions
- Increased measurement, "To measure is to manage"
- Remain active in local, state and national policy making

Corporate Mission

- Reduction on energy consumed, relative to output, by 10 percent?
- Educate all employees on the benefits of supporting energy management
- Develop an improved network of communication between production and maintenance to focus on energy
- Develop an "Energy Report Card" to measure results

Energy Report Card

Year 2000	Pages Produced	Electrical Consumption (kWh)	Natural Gas Consumption (Therms)	Propane Consumption (Gallons)	Total MMBTU Consumed	MMBTUs/ 1000 Pages	Energy Cost	
Jan	7,820,934,016	7,053,217	335,892	19,150	59,404	0.00760	420,707	
Feb	8,240,303,972	7,154,890	286,396	17,965	54,694	0.00664	409,551	
Mar	8,746,289,104	7,336,420	288,702	18,550	55,597	0.00636	417,763	
Apr	7,571,640,412	8,369,517	221,984	27,660	53,281	0.00704	436,698	
May	7,725,245,116	6,868,573	196,888	18,126	44,781	0.00580	398,477	
Jun	7,912,530,840	8,367,980	198,164	17,950	50,010	0.00632	459,868	
Jul	9,770,167,552	8,609,262	226,178	27,907	54,541	0.00558	491,436	
Aug	9,327,244,064	8,053,117	236,000	18,475	52,767	0.00566	470,888	
Sep	9,599,966,584	10,141,429	239,019	27,930	61,056	0.00636	538,744	
Oct	10,557,401,288	8,243,962	265,362	30,470	57,446	0.00544	520,763	
Nov	7,807,521,192	8,849,021	265,803	20,826	58,657	0.00771	525,163	
Dec	8,386,939,800	7,536,116	330,133	66,106	64,750	0.00772	633,380	
	103,266,183,940	96,583,504	3,090,321	311,115	686,983	0.00652	5,723,437	

Year 2001	Pages Produced	Electrical Consumption (kWh)	Natural Gas Consumption (Therms)	Propane Consumption (Gallons)	Total MMBTU Consumed	MMBTUs/ 1000 Pages	Energy Cost	Savings (+) Cost (-)
Jan	7,880,690,288	6,848,785	318,841	28,499	57,852	0.00734	679,678	$23,567
Feb	7,868,270,288	8,187,389	305,907	18,800	60,245	0.00766	598,375	-$79,661
Mar	7,813,338,480	6,705,623	254,565	18,322	50,010	0.00640	507,693	-$3,483
Apr	6,577,562,004	6,969,412	168,646	18,705	42,353	0.00644	440,017	$40,851
May	6,552,135,944	5,994,216	138,933	18,504	36,035	0.00550	394,333	$21,286
Jun	7,379,700,480	7,976,531	172,605	9,051	45,308	0.00614	477,759	$14,068
Jul	8,908,175,328	7,918,397	184,616	18,000	47,125	0.00529	498,374	$27,536
Aug	9,430,130,008	8,295,247	207,333	26,950	51,497	0.00546	522,875	$18,796
Sep	8,258,315,788	9,827,819	184,677	36,874	55,366	0.00670	554,446	-$28,464
Oct	9,500,301,332	7,755,856	206,213	0	47,092	0.00496	489,635	$47,845
Nov	5,764,074,228	6,206,432	171,517	18,850	40,050	0.00695	427,048	$46,852
Dec	9,117,787,164	7,181,500	282,899	37,160	56,182	0.00616	520,142	$131,560
	95,050,481,332	89,867,207	2,596,752	249,715	589,116	0.00625	6,110,375	$260,750

YTD 2001 vs. YTD 2000

Production	Electrical Consumption	Natural Gas Consumption	Propane Consumption	MMBTUs Consumed	MMBTUs/ 1000 Pages	Energy Cost
-7.96%	-6.95%	-15.97%	-19.74%	-11.67%	-4.11%	0.067605935

	Electrical Cost/ MMBTU	Natural Gas Cost/ MMBTU	Propane Cost/ MMBTU	Energy Cost/ 1000 Pages
	$13.10	$7.44	$7.08	$0.06

Sound Analysis Defines Baseline

Extracted from
ExxonMobil Energy Management System

Previously Presented at
ENERGY STAR Industrial Partnership Network Meeting
June 19, 2002 – Bethesda, MD

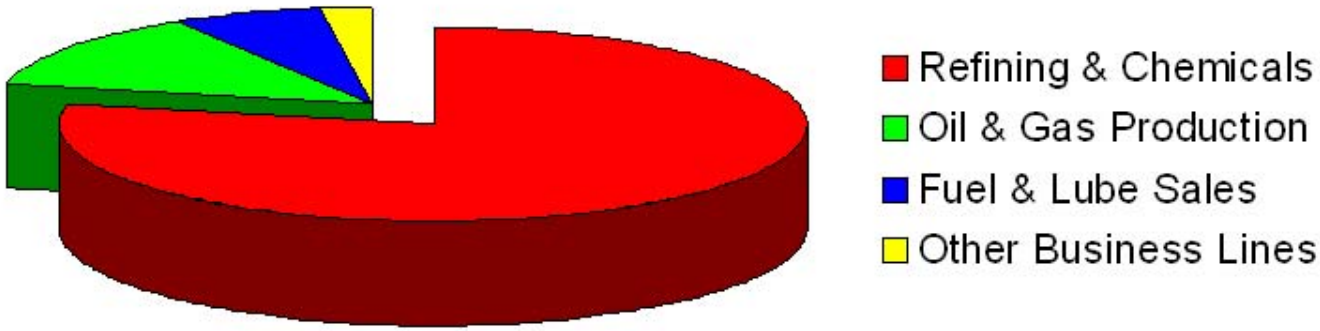
A. R. Tenner
ExxonMobil Research & Engineering Company

ExxonMobil

Sound Analysis Defines Baseline

Pareto Analysis Focus on *Vital Few*

- Petroleum Refining and Chemical Manufacturing Comprise Major Share of Corporation's Energy Costs



- Strategy
  - ✓ Target Initial Application in Major Business Lines
  - ✓ Address ***Interesting Many*** Business Lines Through Simpler, Less Intensive Approaches

Sound Analysis Defines Baseline
Normalizing Data Enables Comparisons

External Benchmarking for Refining and Chemicals

- Third-party Service Provided by Solomon Associates
- Normalizing Index Spans Array of Different Types of Processes

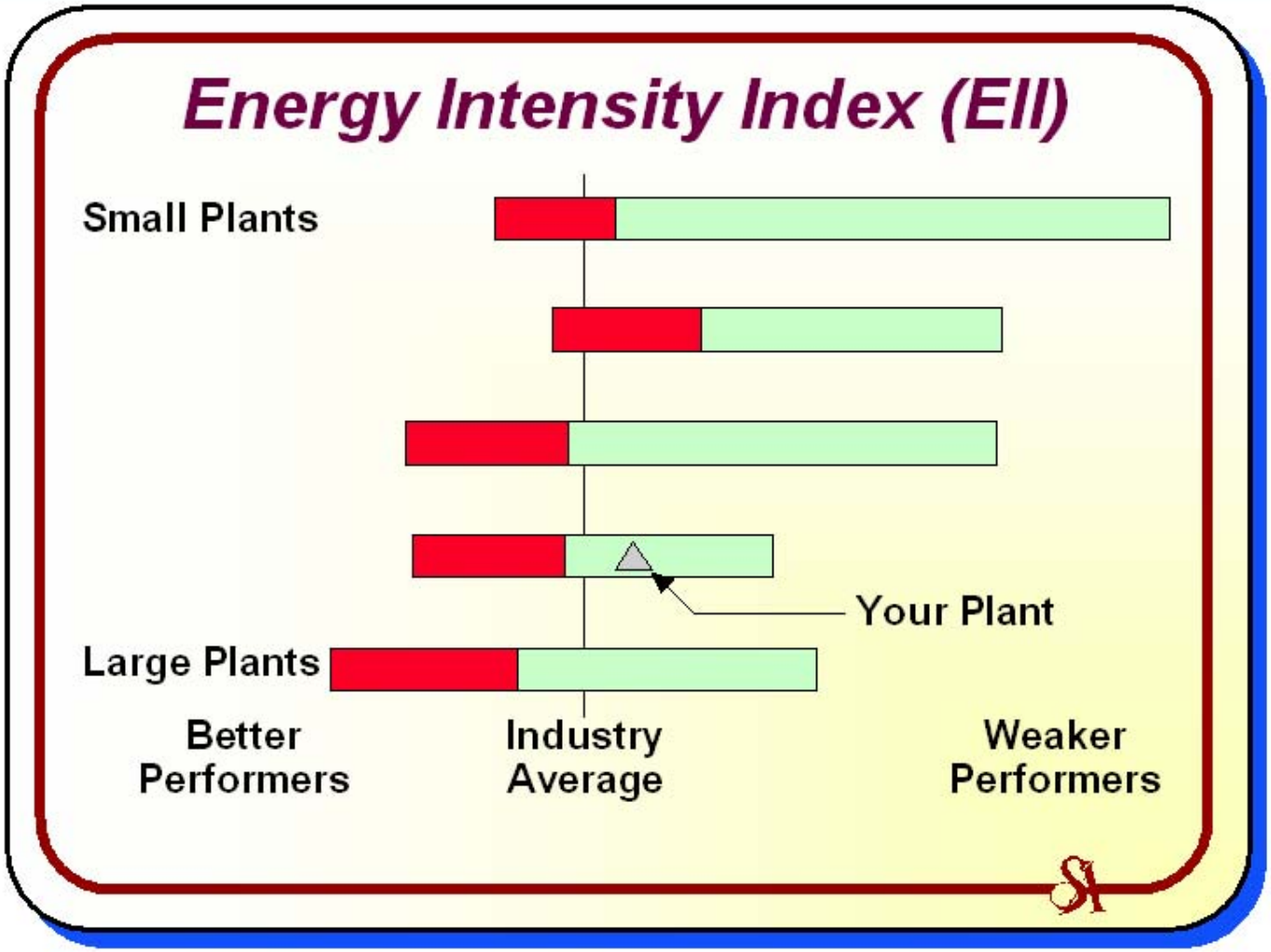
  EII = Energy Intensity Index

  = (Actual Energy) ÷ (Standard Energy)

- Enables Quantifying Opportunities
  - ✓ Company-wide for Petroleum Refining and Olefins Plants
    - ❖ Size of the Prize for Justifying Initiative
    - ❖ Setting Aggressive Yet Realistic Targets
  - ✓ Plant-by-Plant Comparisons for Implementation Strategy

Sound Analysis Defines Baseline

Industry Benchmark Reveals Opportunity

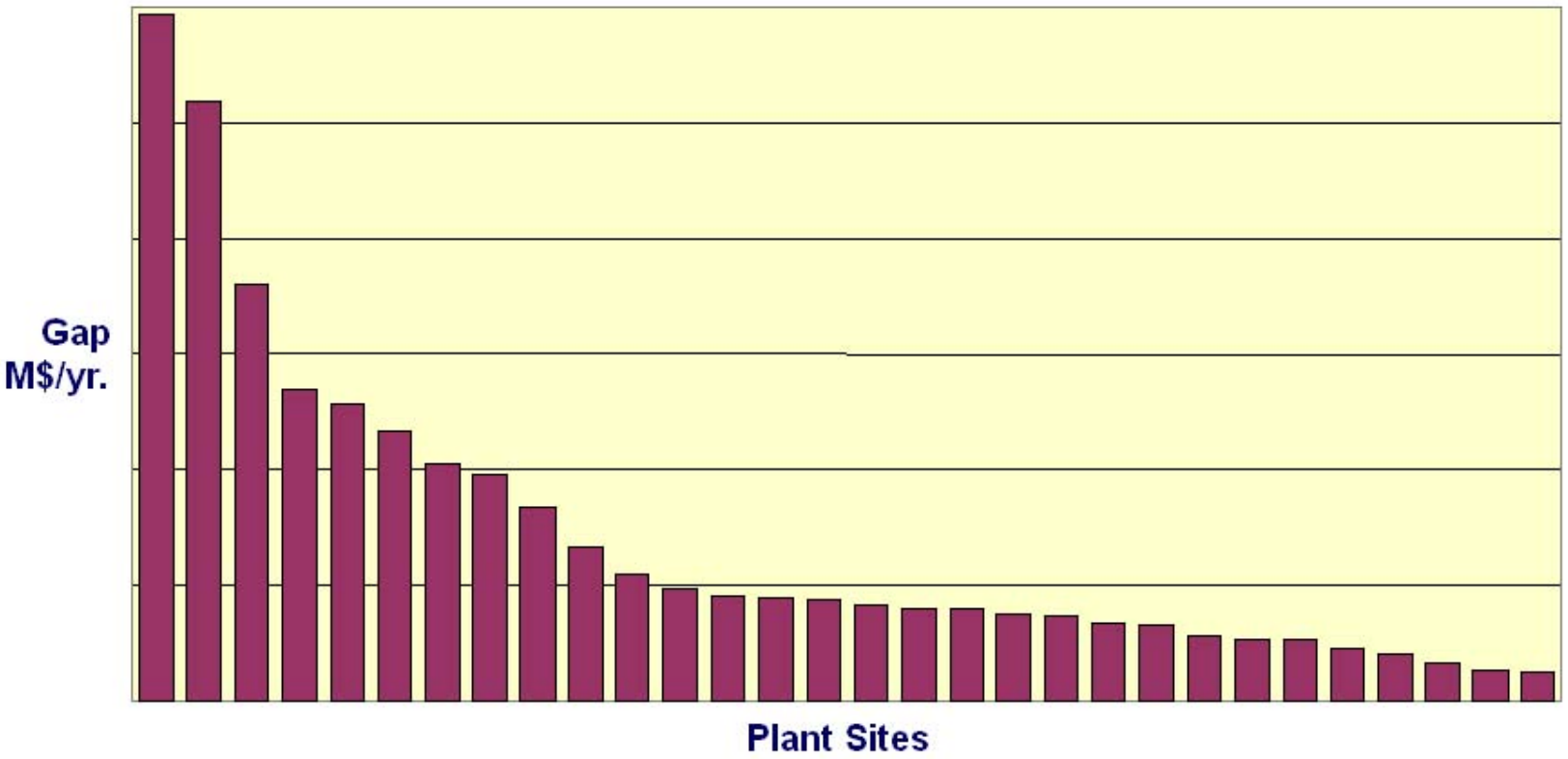


SOURCE: *Refinery Study Perspectives*, Solomon Associates, Inc., Dallas, TX, April 1997

ExxonMobil

Sound Analysis Defines Baseline

Gap Relative to Best Performing Plant Sets Goals



475 M $/Year savings estimated if each ExxonMobil refinery and olefins plant could economically achieve leading-edge efficiency

ExxonMobil

Energy & Utilities Performance Assessment

Henry C. Molise, P.E., C.E.M
Corporate Energy Manager
Pharmacia Corporation

PHARMACIA

Multi-plant Assessment

A spreadsheet of annual:

- Units of energy uses, and costs in $US
- Production units or other performance ratio denominator (for energy use/widget produced)
- Implemented savings in energy and $US
- Use uniformly understood energy units (eg. kilocalories or kilojoules if international)
- Can include calculations of:
  - Energy performance ratios (eg. kJoule/widget)
  - Emissions reductions data
  - Performance compared with corporate goals

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Site Assessments

- Various assessment approaches:
  - Site self assessment
  - Cross assessment (between similar sites)
  - Internal corporate based assessment
  - Outside contractor's assessment
- Cross assessments have minimum bias, build internal relationships, and keep knowledge gained within the company

Site Assessments (continued)

- Develop the vision up front, such as:
  - Benchmark performance ratios expected
  - Documented "Best Practices"
- Use a documented assessment process
- Find out as much as possible before a site visit (records, practices, success stories)
- Assess site energy supply before energy demand
- End with an action plan

Example vision: Managing Energy & Utilities

- Performance level examples (can be more elaborate):
  1= getting by; 2=advanced; 3=exemplary
- Performance category examples (develop descriptions):
  - Utilities system planning (capital, personnel, load forecasting, etc.)
  - Compliance (environmental, safety, other)
  - O&M personnel training
  - Reliability (redundancy, spare parts, etc.)
  - Information management (eg. utility bills, maintenance records, etc).
  - Performance benchmarking
  - Demand side management
  - Maintenance philosophy
  - Procurement of energy related items (eg. fuels, electricity, chillers, boilers)
  - Risk management
  - Continuous improvement
- Ask site management to score their system before the site visit

"Best Practices" to Document, and Use as Assessment Checklist

- Steam systems
- Chilled water systems
- Compressed air systems
- Lighting systems
- Electrical distribution systems
- Plant utilities master planning
- Production or R&D facility design
- Managing energy & utilities systems
- Site assessment process

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Continuous Improvement

- Use newly identified "best practices" seen during a site assessment to improve the "Best Practices" documents
- Those who are assessed make excellent future assessors
- Being on an assessment team is a great training experience for engineers and O&M people
- Use lessons learned in the design of new facilities

Open Discussion

Final thoughts

- Different and evolving
- Information and effectiveness
- Communication and recognition
- Continuous improvement

ENERGY STAR can help benchmark

- EPI for selected industrial plants
  - Developed for focus industries
- Portfolio Manager
  - On-line tool to track & benchmark
  - ENERGY STAR Label
  - www.energystar.gov/benchmark

Upcoming networking opportunities

- Monthly Web casts
- Networking Meetings

Thanks for participating!