

Energy Management Systems: The Next Step in Energy Performance Improvement

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Texas Industries of the Future

Introduction to Texas Industries of the Future

- Initiated in 2001 with Advisory Board representing Industry and Academia
- Located at the University of Texas, Center for Energy and Environmental Resources
- Funded by Department of Energy and SECO-extensive leveraging of federal resources
- Focus on chemical, refining and forest products sectors
- Active Chemical and Refining Sector Advisory Committee



Best Practice Trainings

- Since 2002, conducted 30 workshops for 690 industry end users. Topics: Pumps, steam, process heating, motors, etc.

Forums, Conferences and Roundtables

- Host the Texas Industrial Energy Management Forum with leading companies. 7 Forums and 800 attendees.
- Texas Technology Showcases: 2003 and 2007.
- Roundtables on selected topics, such as waste heat recovery.

Tools

- Developed a site-wide assessment tool for manufacturers which helps a facility identify and screen energy efficiency projects. Calculates CO₂, NO_x, Btus, and dollar savings.

Energy Management Systems

- Diagnostics session with 10 chemical plants.
- Working with DOE on development of a national program for a plant energy-efficiency certification program.

Join the Texas IOF Email List to find out about these events!



Texas Industries of the Future

U.S. Industrial Sector

32 quads or ~33% of total U.S. energy consumption

>200,000 sites

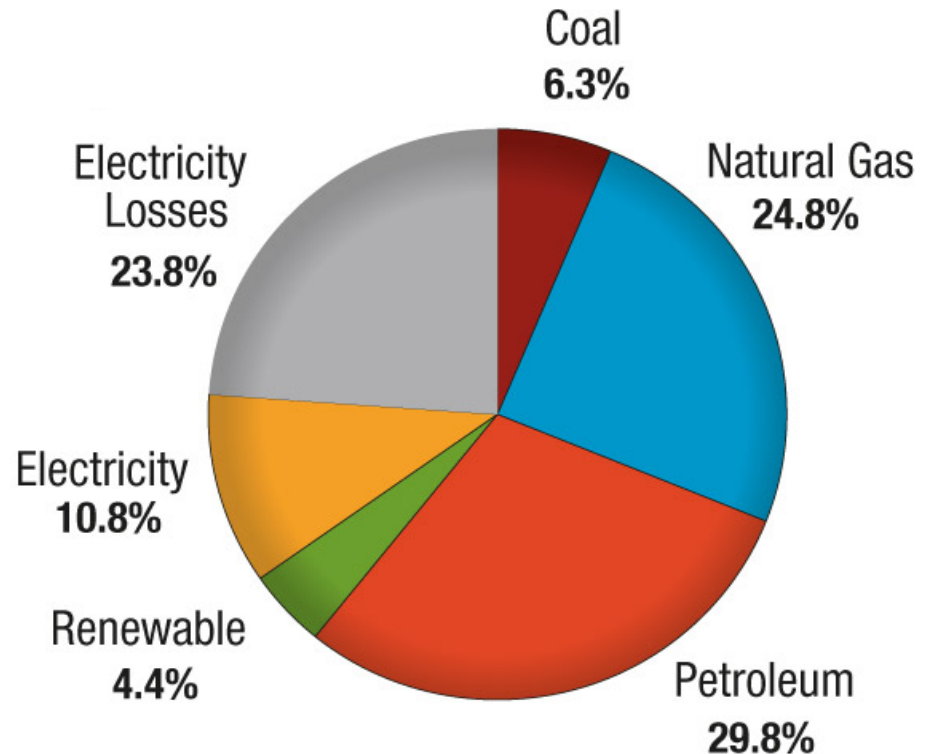
14.3 million jobs

\$5,900 billion in shipments

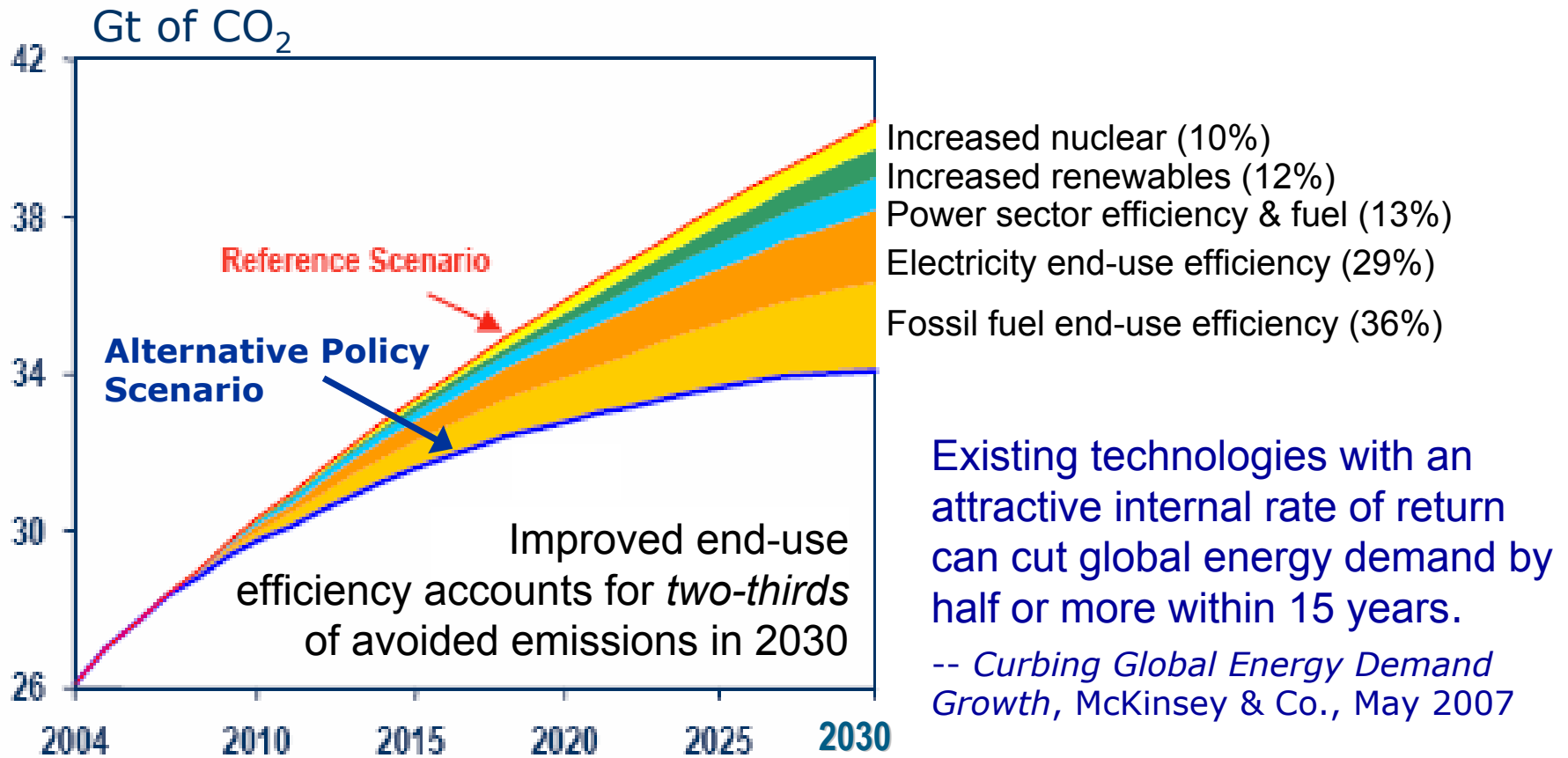
\$980 billion in exports

U.S. industry represents:

- 37% of U.S. natural gas demand
- 29% of U.S. electricity demand
- 30% of U.S. greenhouse gas emissions
- More energy use than any other single G8 nation
- Large opportunities for
 - Energy reduction
 - Emissions reductions
 - Fuel flexibility



Role of Energy Efficiency in limiting growth in global energy consumption and carbon emissions

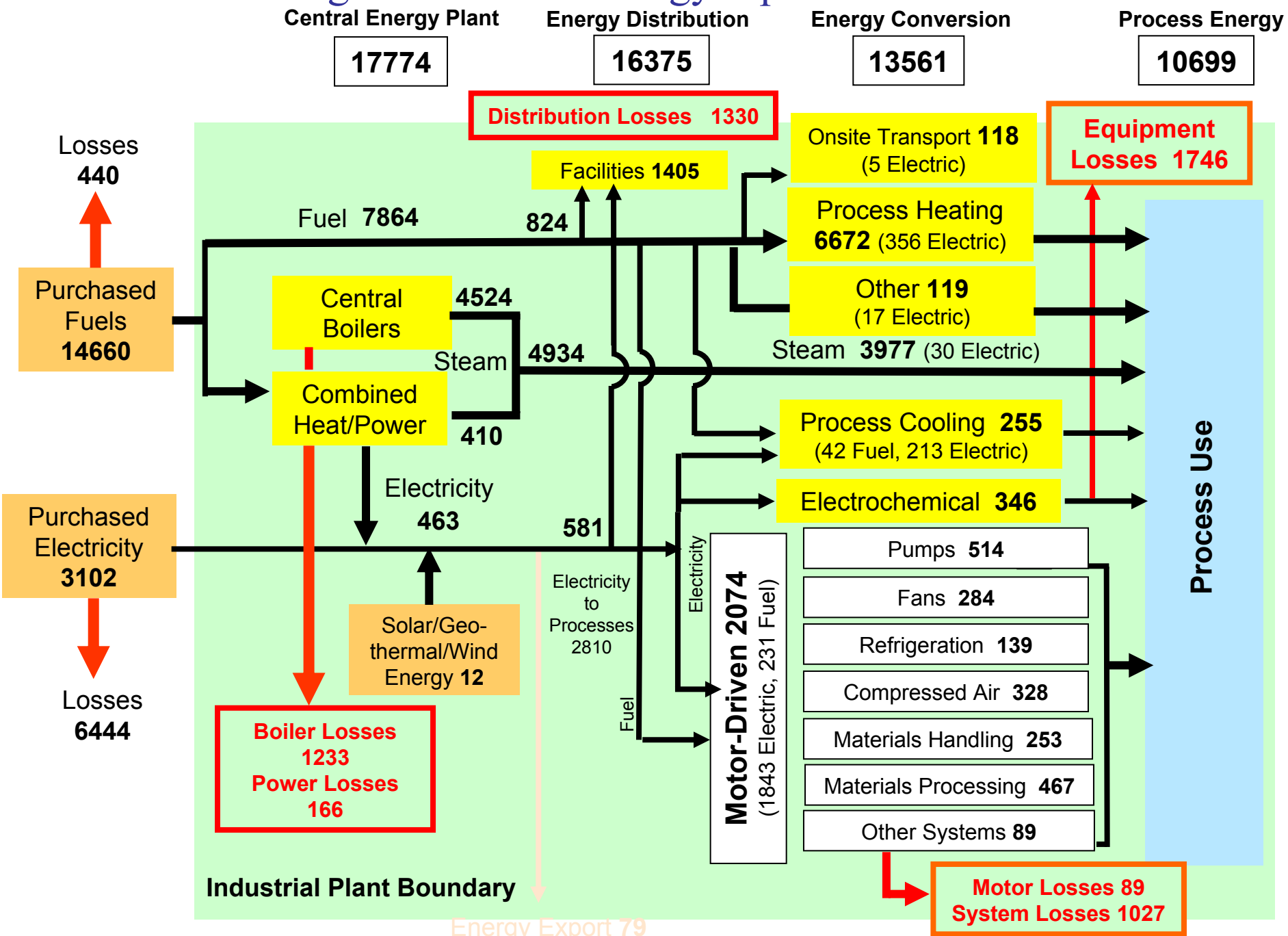


Source: International Energy Agency, *World Energy Outlook*. 2006

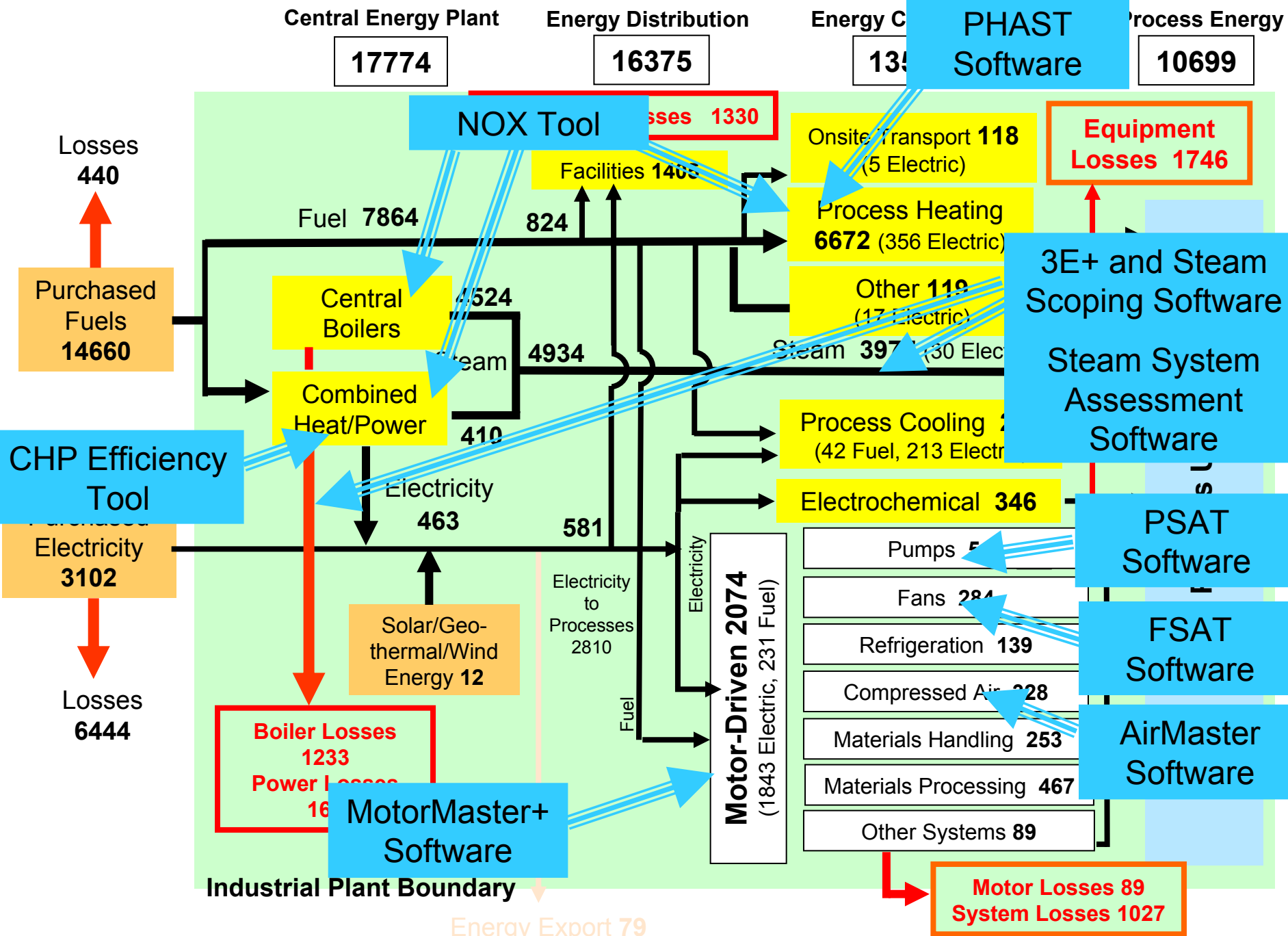


What You Can Do Today

U.S. Manufacturing Sector Total Energy Input: 24658 Trillion Btu



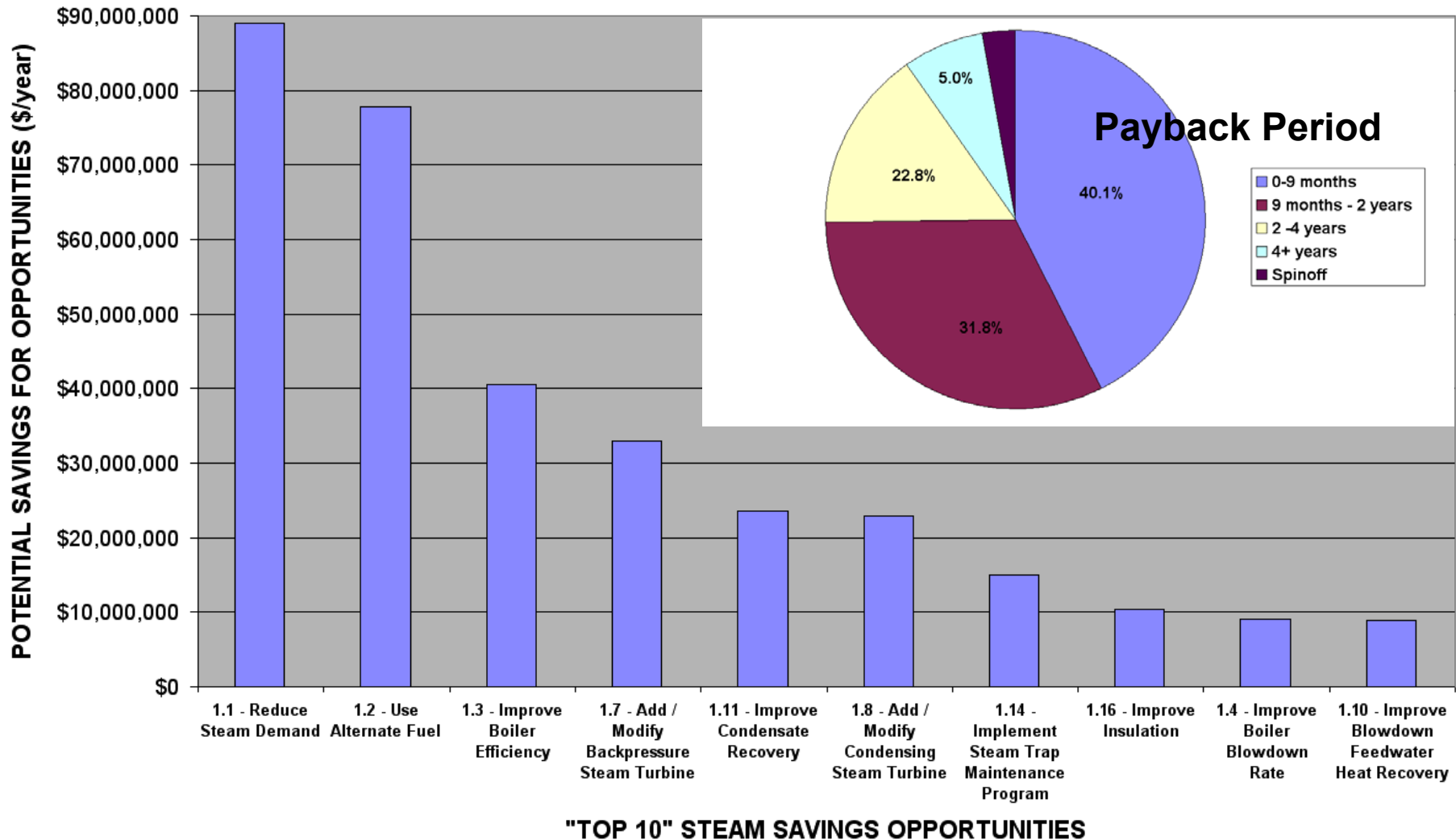
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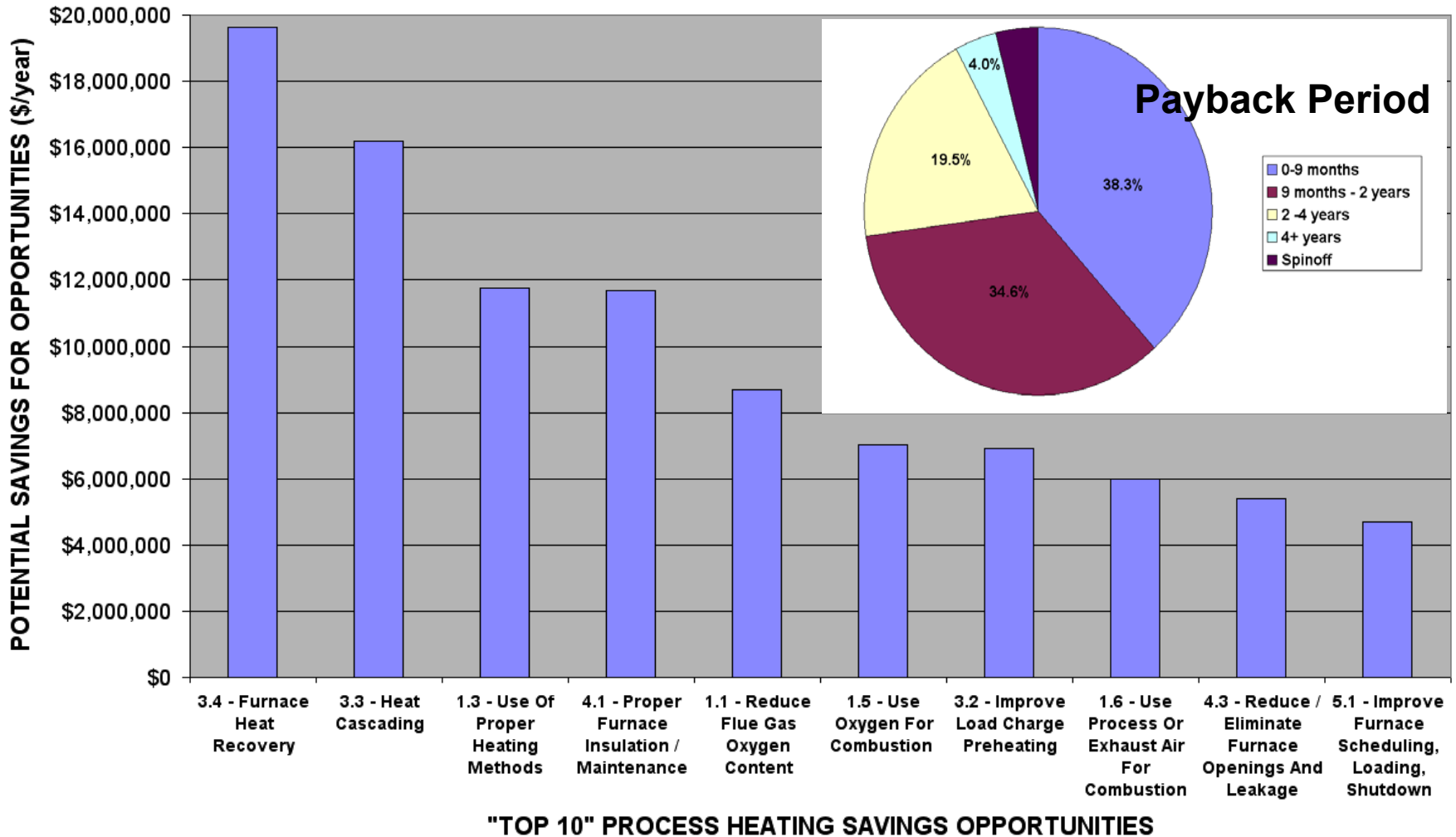
DOE Energy Savings Assessments: 2006 Results

- ESAs at 200 plants identified average savings of 10% of typical plant energy use, on average \$2.5 million per plant annually
- Identified cumulative savings opportunities of more than 50 trillion Btus of natural gas and nearly \$500 million
- If fully implemented, these identified improvements could reduce CO₂ emissions by 3.3 million metric tons annually
- Initial 6-month follow-up on 152 plants indicates 16% of recommendations were implemented immediately, 23% are in progress, and another 39% are in planning stages

The Top 10 Steam ESA Opportunities Total \$330 Million/Year in Plant Energy Savings



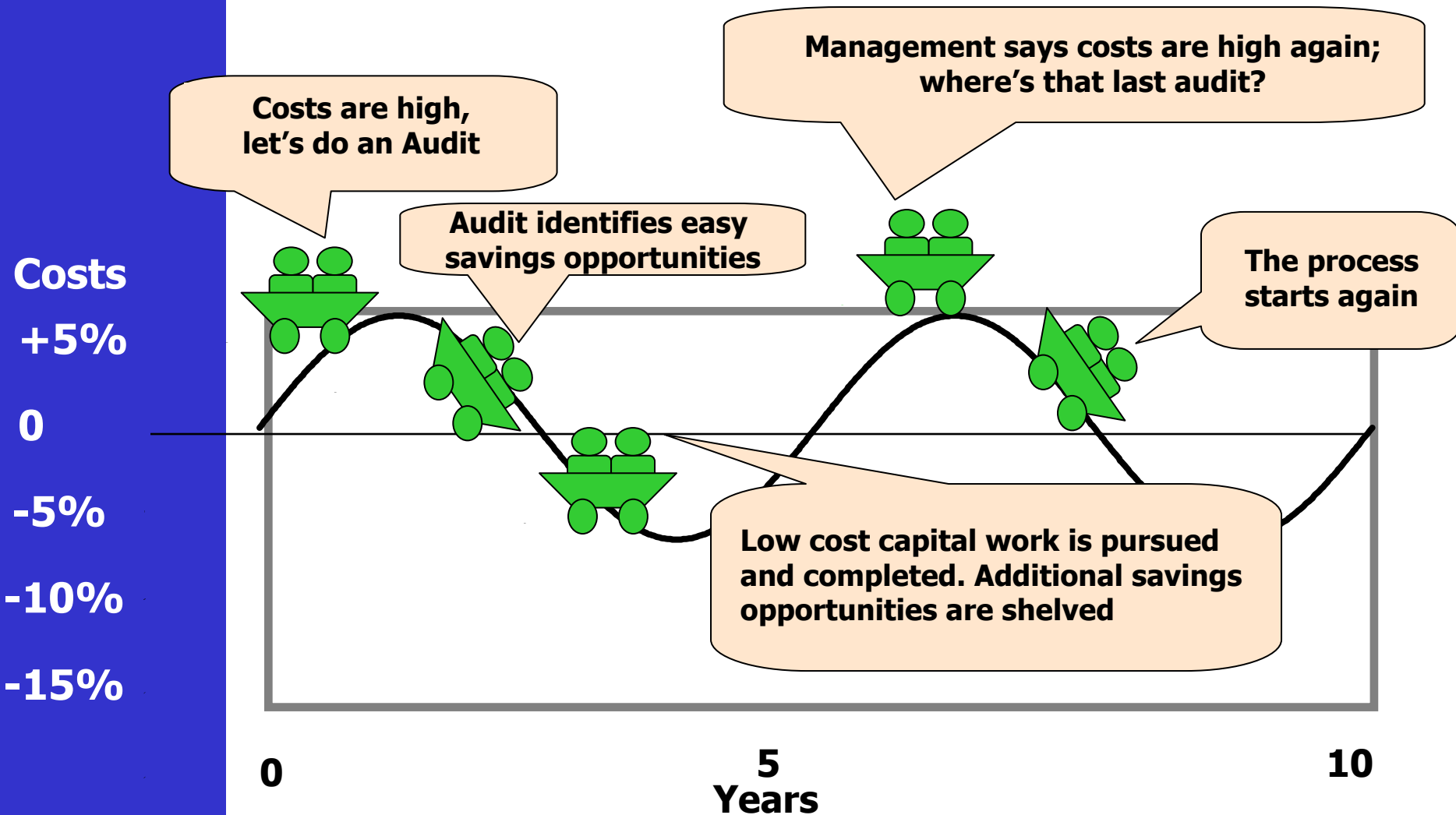
The Top 10 Process Heating ESA Opportunities Total \$98 Million/Year of Plant Energy Savings





What You Can Do for Tomorrow: Build an Energy Management System

The Traditional Approach to Energy Management



Barriers to Continuous Improvement in Energy Management

- Engineers made responsible for energy but usually not given the resources to implement solutions
- Energy is not a line accountability
- Energy not integrated with business objectives
- No context of continuous improvement
- Experience has shown:
 - Energy studies and projects often do not result in sustained savings
 - Slow uptake of energy savings projects
 - Less than half of technical recommendations implemented
 - Audits not suited to build compelling business case for senior management
 - Good practices in one unit/plant not widely diffused in organizations

What's Needed

- Engage senior management
- Break process into easy steps with clear decision points
- Implement a people-based (organizational) vs strictly technical approach
- Integrate energy into customer business processes & systems
- Leverage what you have learned in your other business improvement processes
- Re-define your energy cost as a variable cost which can be managed...it's worth the reward!

Solution

The **SAME** methodology commonly used in other areas of business.

- Quality (ISO 9000+, TQM)
- Health & Safety (OSHA Compliance Programs)
- Environmental Control (ISO 14000+)
- Supply Chain Management (APS, ERP)
- Managed Maintenance (TPM, RCM)
- Process Improvement (LEAN Manufacturing)

Applying a Management Systems Approach

Possible Energy Management Approaches

ENERGYSTAR Energy Program Assessment Matrix

- Available from
http://www.energystar.gov/index.cfm?c=industry.bus_industry
- Covers management responsibility, assessing performance and opportunities, setting goals, planning, plan implementation, evaluating progress, and recognizing achievements.
- You can apply matrix yourself.
- Applicable at the corporate level.
- No cost for use, except staff time.

ENERGY STAR Assessment Matrix

Rank Your Program in 7 Areas

- Commitment to Continuous Improvement
- Assess Performance and Opportunities
- Set Performance Goals
- Create Action Plan
- Implement Action Plan
- Evaluate Progress
- Recognize Achievements

http://www.energystar.gov/index.cfm?c=industry.bus_industry

Possible Energy Management Approaches

Management System for Energy 2000 (MSE 2000)

- Available from ANSI website for licensing cost (\$37).
- Covers the purchase and use of energy.
- Compatible with ISO 14000.
- Major categories address management responsibility, energy planning, equipment and process control, projects, document control, energy purchasing, monitoring and measurement, corrective and preventive action, record keeping, internal audits and training.

Possible Energy Management Approaches

EnVinta One-2-Five Energy Software

- Major categories address leadership, understanding, planning, people, finances, supply, operations and maintenance, plant and equipment, monitoring and reporting, and achievement.
- Benchmarks your activities against others in your sector.
- Provides list of strategic next steps, based on current ranking.
- Compatible with ISO 14000 activities

Comparison of Approaches

	MSE 2000	ENERGY STAR Matrix	EnVinta One-2-Five Energy
Self-administered	Yes	Yes	
Tiered Structure		Yes	Yes
Provides Benchmarking			Yes
Coverage	See list.	See list.	See list.
Compatible with ISO 14000	Yes		Yes
Cost for license	Very inexpensive— from ANSI	None. Matrix on the Net.	License from EnVinta. Check state/utility efficiency programs

Energy Management Case Study: Port of Houston

Background

- 1st Port to be ISO 14000 Certified.
- Air, Water and Waste Were Focus of ISO analysis.
- Added energy in 2003 as a result of SB 5.
- Continued expansion led to increasing energy demand.
- Energy projects unable to compete for funding.
- Technical assessment completed in 2003.
- Chiller project upgrade to energy-efficient model identified in assessment.
- Report sat on the shelf.



Energy Management Case Study: Port of Houston

Energy Management Diagnostic Session in 2005

The Diagnostic Session

- Got management and operations to the table to discuss energy using a structured format
- Developed list of strategic next steps
- Benchmarked their operations to other similar facilities

Port of Houston's Accomplishments

- Adopted an energy management policy and identified associated funding for projects;
- Developed baseline usage profiles for two largest facilities, which lays the groundwork for assigning accountability for costs;
- Developed procurement guidelines that incorporate energy-efficiency standards for equipment.

Fix the System, Not the Symptoms!

Preliminary Results from Pilot Program on Energy Management with Texas Chemical Manufacturers

Background

- 8 of 10 sites completed
- Purpose: to identify gaps in the sector's management practices in Texas plants
- Methodology: Conducted energy management diagnostic sessions using EnVinta One to Five software
- Limitation: Participating sites were not “randomly selected” although any chemical company that was interested could participate (up to the 10 licenses available).

Background on Rating System

- Bronze, Silver, Gold, Platinum Rating System
- Rating system applied to 22 separate elements in 10 key subject areas (leadership, understanding, planning, people, finances, supply, operations and maintenance, plant and equipment, monitoring and reporting, and achievement.)
- Participants were benchmarked against other sites in the sector by the 22 elements.
- Participants received a list of recommended actions to move their program forward.

Preliminary Results: The best and the better

Where Plants Excelled as a Group (Best in Class)

- **Purchasing Procedures**

Where the Groups' Median Exceeded the Sector's Median

- **Understanding of performance and opportunities**
- **Planning**
- **Purchasing Procedures**
- **Quality and reliability of supply**
- **Maintenance procedures**
- **Metering and monitoring**
- **Cost performance over last 12 months**

Preliminary Results of Gap Assessment

Highlights of Recommended Actions

Top 6 Recommended Actions:

- Demonstrating corporate commitment
- Setting targets, performance indicators and motivation
- Gaining access to adequate internal technical resources
- Incorporating energy efficiency into equipment operating procedures, especially during turndowns, delays, etc.
- Adequate, accurate metering
- Access to adequate reporting and feedback

Preliminary Results

- Participants found the structured approach to reviewing their management system valuable.
- Participation elevated the issue of energy management to the management and corporate level. **HIGH VALUE!**
- Participants saw how they could leverage existing business improvement processes to their energy activities (ex: ISO 14000 activities).
- All sites contacted for followup to date (4) reported taking action on one to three of the recommendations.



Conclusions

- A structured approach to establishing and improving an energy management system provides value, as it has in other plant work processes (safety, environmental, quality).
- The key, and highest value, of this approach is management engagement.
- It is difficult to quantify the benefit of these types of activities (ex: gain corporate commitment, metering) versus a technical assessment which identifies specific projects. Yet they are the foundation of a successful, sustainable program.





Achieving Superior Energy Performance in US Manufacturing

A cooperative initiative involving:

- Department of Energy's Industrial Technologies Program
- Environmental Protection Agency's ENERGY STAR for Industry
- Texas Industries of the Future
- U.S. industry
- American National Standards Institute (ANSI)
- Department of Commerce, NIST Manufacturing Extension Partnership (MEP) program



NIST



Texas Industries of the Future

Background

- Texas Industries of the Future partner companies developed the idea in 2005:
 - Build on successful OSHA Star voluntary program, through which plants get certification of their safety program
 - Create a tiered approach that facilitates continual improvement in overall plant energy management and system-level practices
- Texas industrial companies wanted future “plant energy management certification” to build upon:
 - DOE BestPractices tools and information
 - DOE Save Energy Now energy assessments
 - EPA ENERGY STAR for Industry resources and experience
- Challenge: Effectively integrate these key pieces

Proposed National Framework for “Achieving Superior Energy Performance”

- Partner Plant--Entry point for plants starting out.
- Certified Plant—Plants that have a certified energy management program in place; have identified opportunities using standard protocols applied by certified practitioners; and have achieved savings.
- ENERGY STAR Plant—Awarded to top quartile performers in sectors with Energy Performance Indicator (currently exists in 4 sectors)

Stay up to date on developments at
www.SuperiorEnergyPerformance.net

How will this framework affect plant energy performance?

