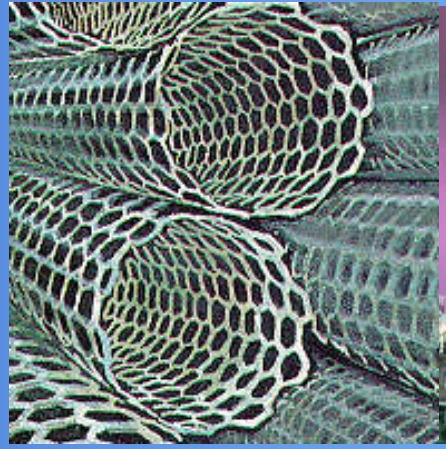
Save ENERGY Now



Introduction to the Industrial Technologies Program (ITP)

Webinar
January 15, 2009

Jim Quinn
Industrial Technologies Program
U.S. Department of Energy

Outline

U.S. Industry and Energy Use

R&D Program

Technology Delivery

Partnerships

Energy Management Approach

Opportunities

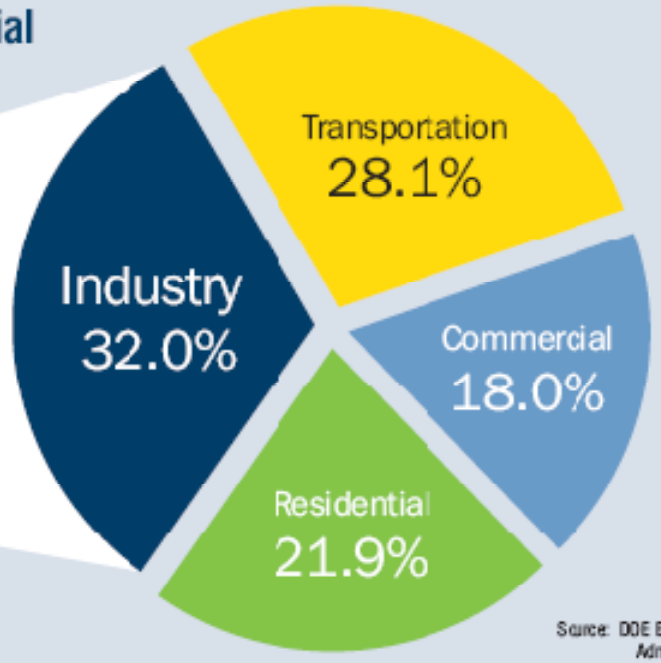
Industrial Technologies Program (ITP) Mission

Improve national energy security, climate, environment, and economic competitiveness by transforming the way U.S. industry uses energy.

Reducing U.S. industrial energy intensity is essential to achieving national energy and carbon goals

Petroleum	38.1%
Natural Gas	33.3%
Electricity*	13.5%
Coal and Coke	8.5%
Renewable Energy	6.6%

* Excludes losses

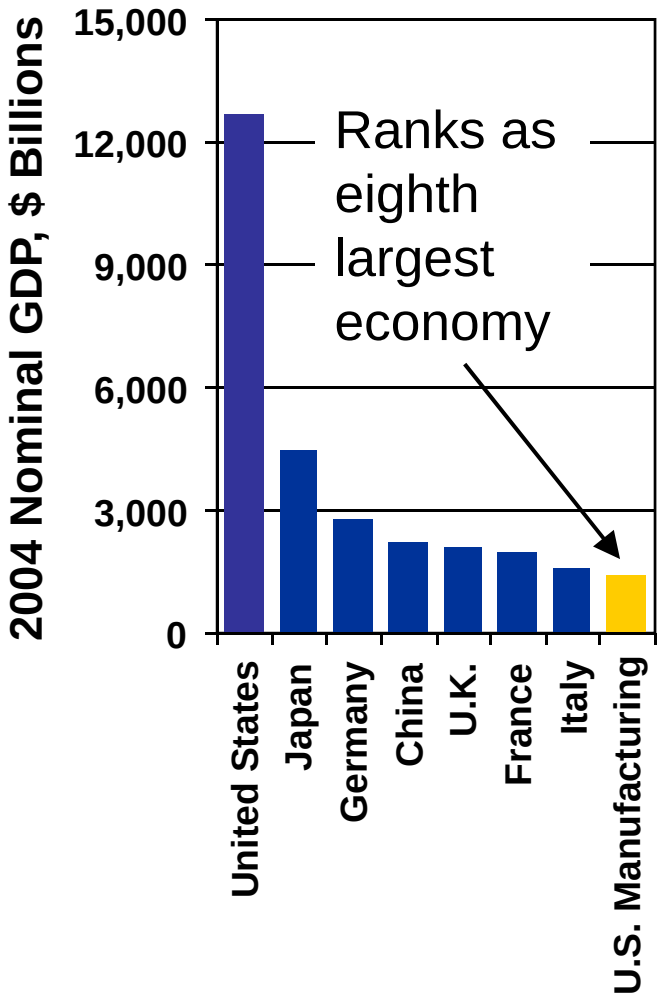


Source: DOE Energy Information Administration, 2006.

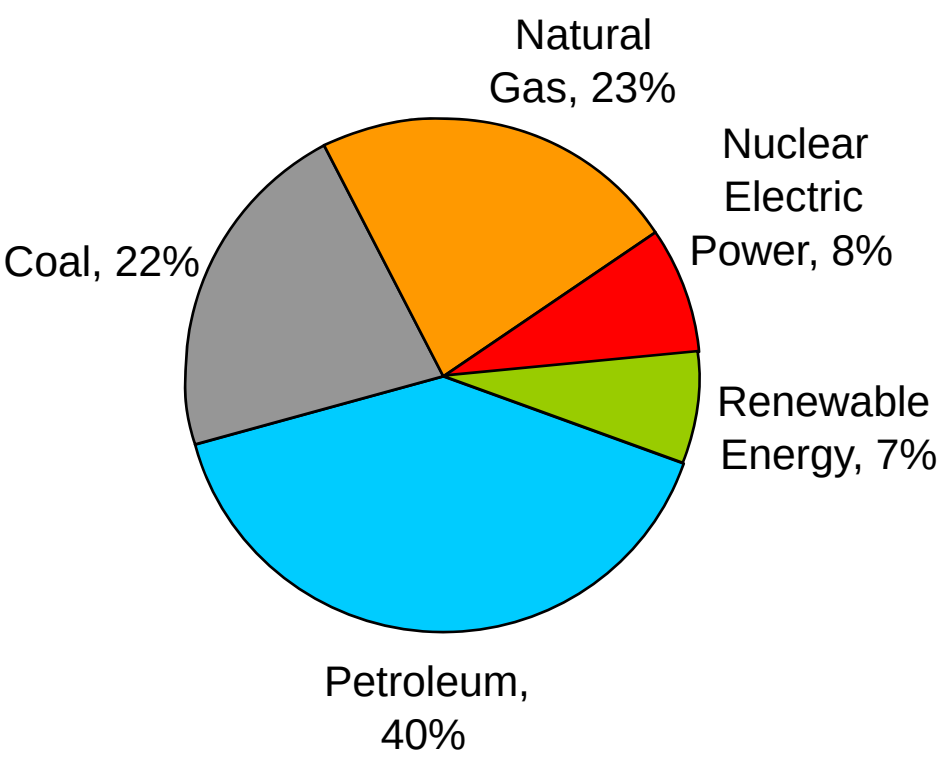
Industry: Key to U.S. Economic & Energy Security

U.S. manufacturing sector

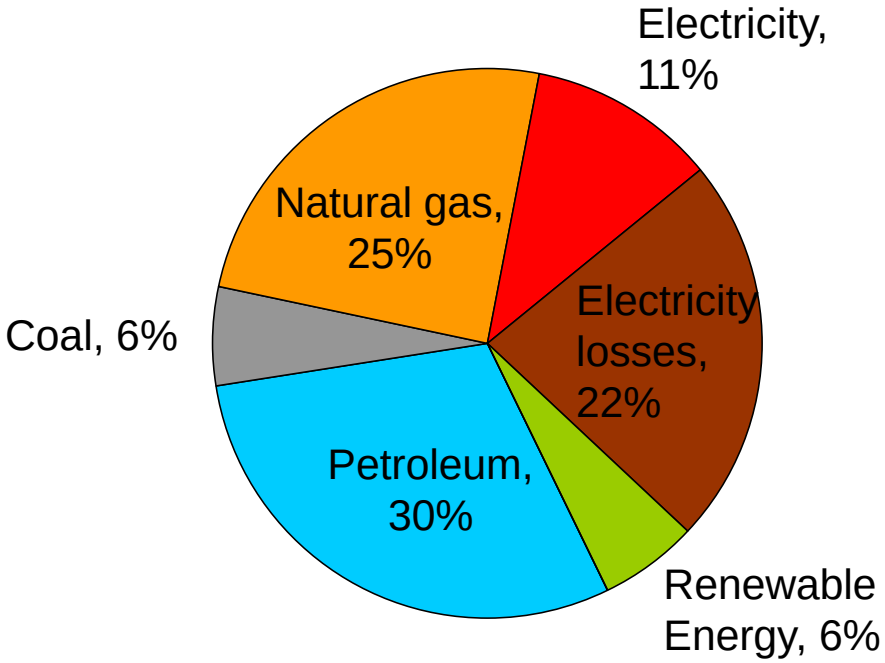
- Consumes more energy than any other economic sector (~32 quads)
- Produces about 1,670 MMT CO_2 per year from energy use
- Makes highest contribution to GDP (12%)
- Produces nearly a quarter of world manufacturing output
- Supplies >60% of US exports, worth $50 billion/month
- Employs nearly 14 million people
- Lost 791,000 manufacturing jobs in 2008 – nearly half in the last quarter



Energy Sources in 2007



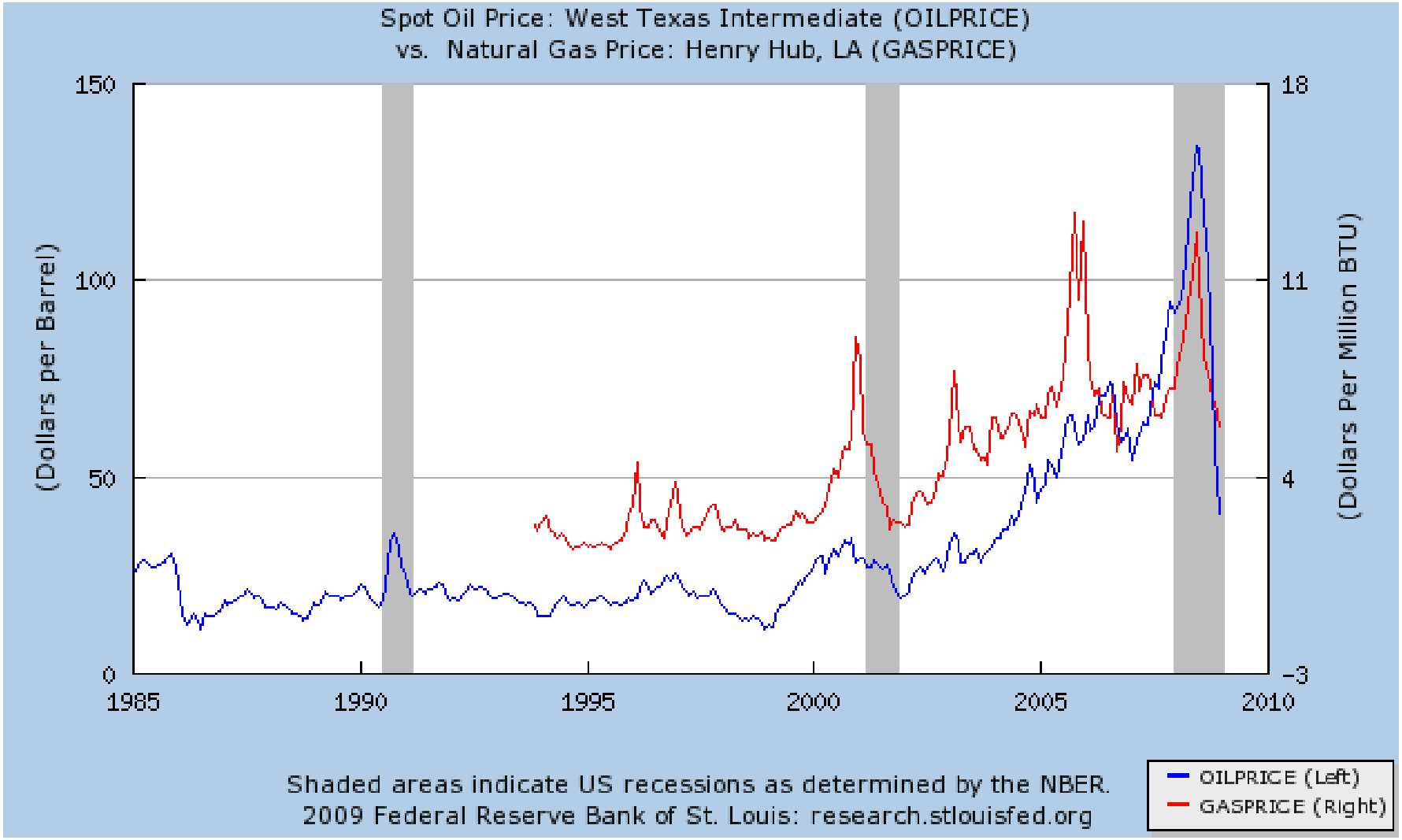
U.S. Consumption



Industrial Consumption

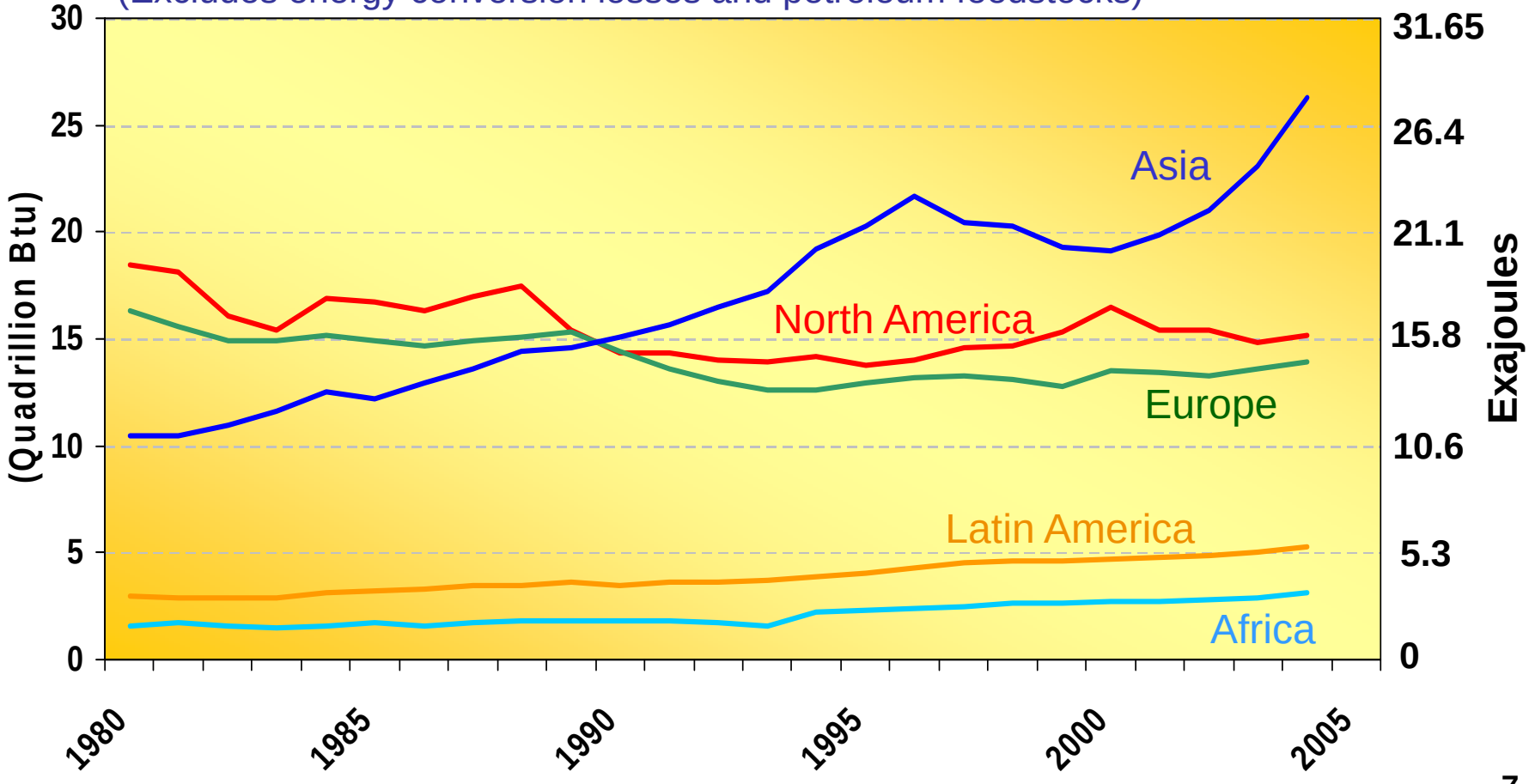
Source: Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels Chart data.

Oil and Gas Prices Are Volatile



Global Industrial Energy Consumption

(Excludes energy conversion losses and petroleum feedstocks)



Source: International Energy Agency, Online Database (Energy Balances of OECD and Non-OECD Countries
** Includes Mexico*

Energy Issues in 2009

- Change!
- Energy price volatility
- Economic downturn and reduced purchasing power
- International climate change negotiations
- T Boone Pickens Plan
- Economic stimulus policies and new legislation

COP15
COPENHAGEN
UNITED NATIONS CLIMATE CHANGE CONFERENCE 2009

Energy Efficiency a Major Opportunity

Existing technologies *with an attractive internal rate of return* can cut the growth in global energy demand by half or more within 15 years.

-- *Curbing Global Energy Demand Growth*, McKinsey & Co., May 2007

Industries around the globe can cut CO_2 emissions 19 to 31% using *proven* technologies and practices.

-- International Energy Agency, 2007

"Energy Efficiency is the most promising means to reduce greenhouse gases in the short term."

–-Yvo de Boer, Exec. Secretary UNFCC

DOE's Industrial Technologies Program
Industrial Sector National Initiative

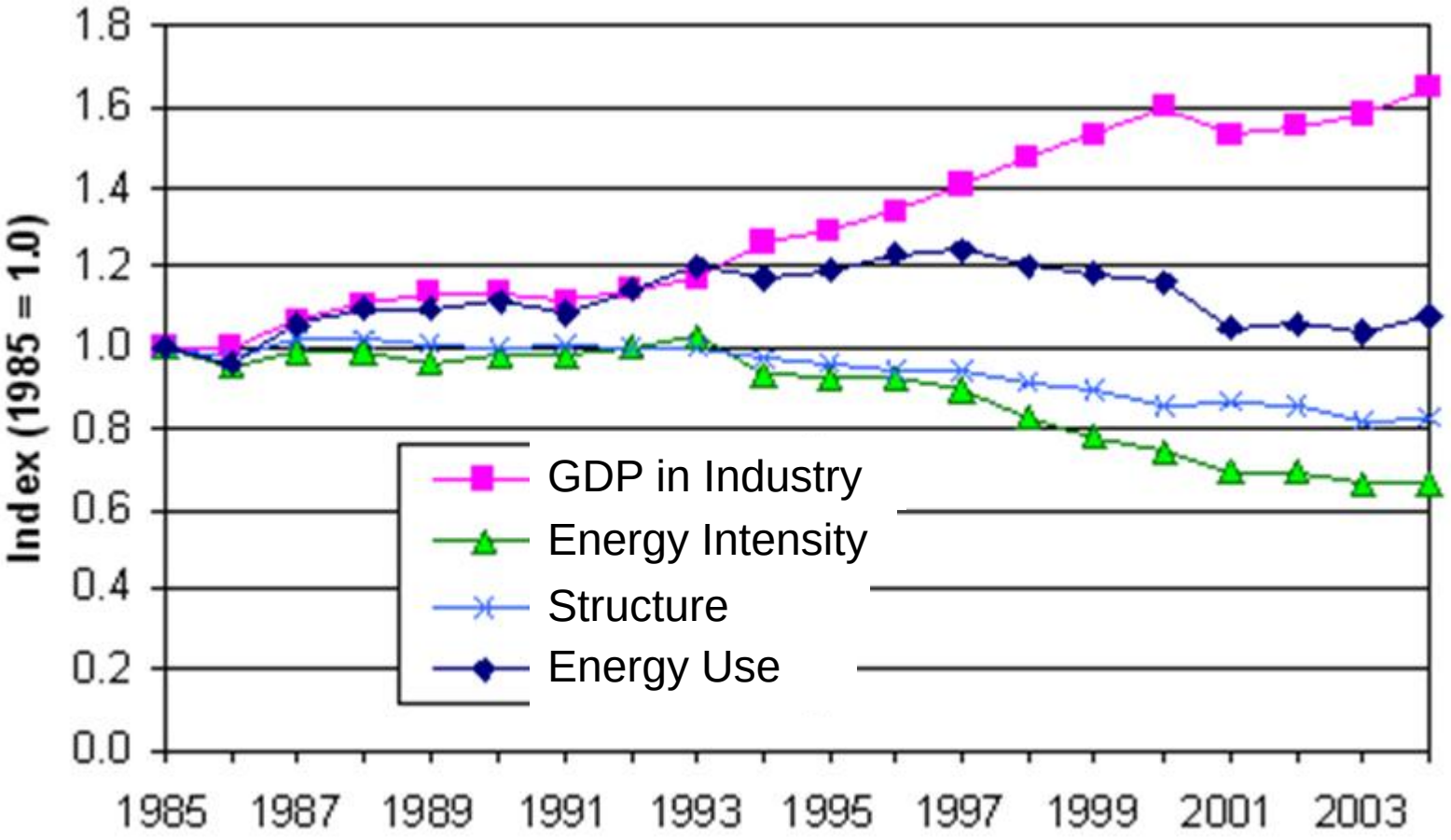
Goal:

Drive a 25% reduction in industrial energy intensity over the next 10 years

Save ENERGY Now

U.S. Trends in Industrial Energy Intensity

Industrial Sector Intensity: Delivered Energy, 1985-2004



Industrial Technologies Program Delivers Solutions

Energy Efficiency R&D

Develop cross-cutting technologies addressing the top energy savings opportunities across industry

Technology Delivery

Help plants save energy today by assessing opportunities and facilitating adoption of best energy management practices and efficient new technologies

Save ENERGY Now

Who We Work With

- **Energy-intensive industries**, such as chemicals, petroleum, forest products, and metals
- **Major value-adding industries**, such as food processing, automotive, and fabricated metals
- **High-growth industries**, such as computers and electronics
- **New energy supply industries**, such as biorefineries
- **Trade associations, States, Utilities and Supply Chain Partners**

ITP Research & Development

Industry-Specific

- Aluminum
- Chemicals
- Forest and Paper Products
- Metal Casting
- Steel

Advanced technologies for specific, energy-intensive industries

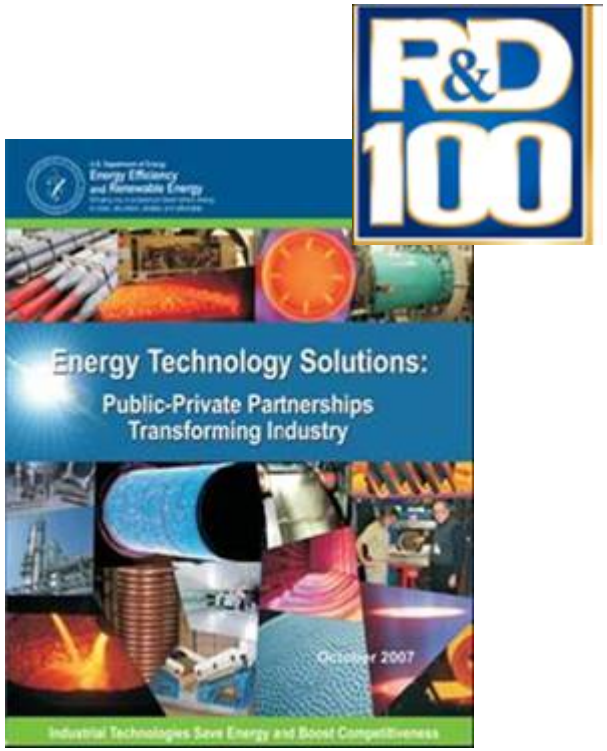
Crosscutting

- Distributed Energy (CHP and Reciprocating Engines)
- Nanomanufacturing
- Energy Intensive Processes
- Fuel and Feedstock Flexibility
- Materials
- Combustion, Sensor, IT

Technologies to use energy more productively across diverse manufacturing sectors

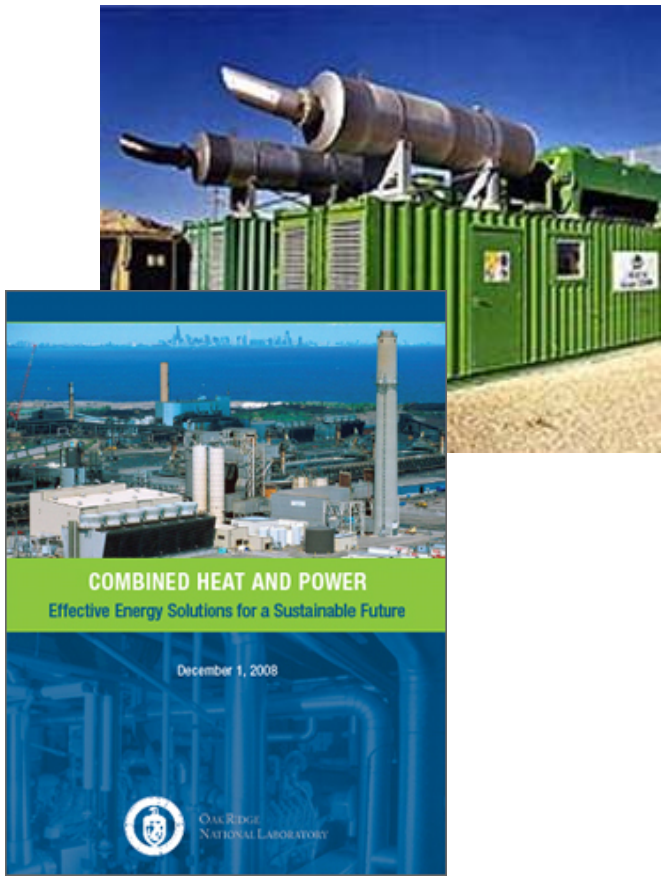
ITP Delivers Results

- 48 R&D 100 awards, 1991 - 2008
- Over 220 technologies commercialized since program inception
- 5.7 quads of energy saved
- 103 MMTCe avoided
- Since 2006, 1,900 plant energy assessments completed



Combined Heat and Power (CHP): The Opportunity

- CHP is recognized as the best means to *simultaneously*
  - Reduce GHG emissions
  - Promote use of secure domestic and renewable energy sources
  - Reduce exposure to energy price hikes and volatility
- ITP activities include
  - Facilitating deployment and addressing barriers
  - Serving as an independent, credible voice on applications and benefits
  - Conducting R&D to improve efficiency, lower costs, and extend applications



CHP offers a sizable near-term option for large energy efficiency improvements and CO_2 reduction

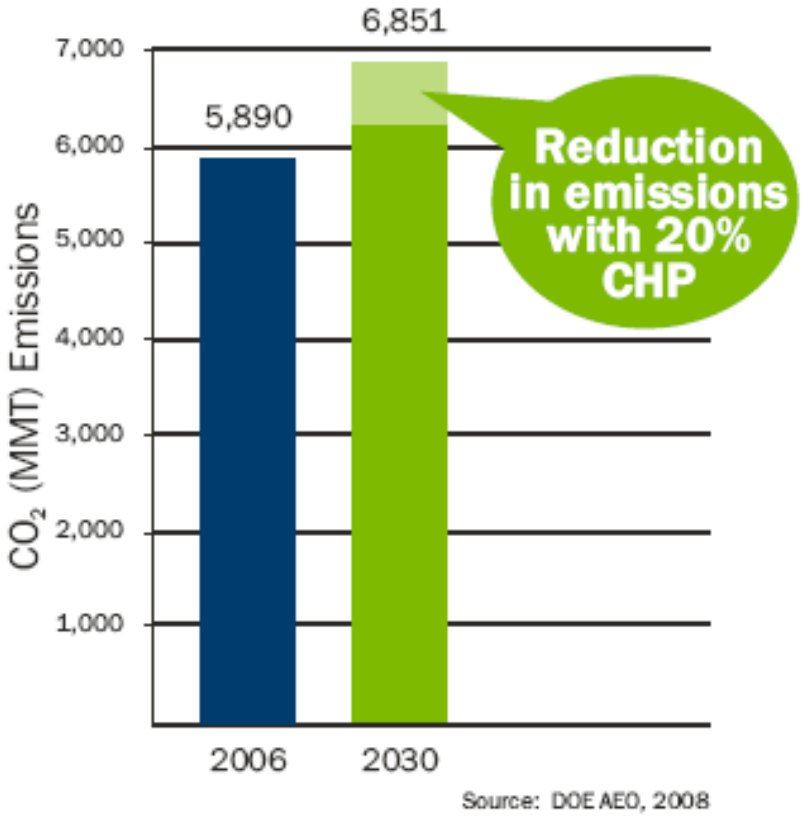
Source: EPA

Benefits of 20% CHP Capacity by 2030

- Generate $234 billion in new investments
- Create nearly 1 million skilled jobs in the United States
- Avoid the need to construct 312 additional 500-MW power plants
- Improve national energy security/resiliency

CHP is not only more affordable than other options—it provides a *net cost savings.*

Potential to Avoid 60% of Projected Growth in CO_2 Emissions

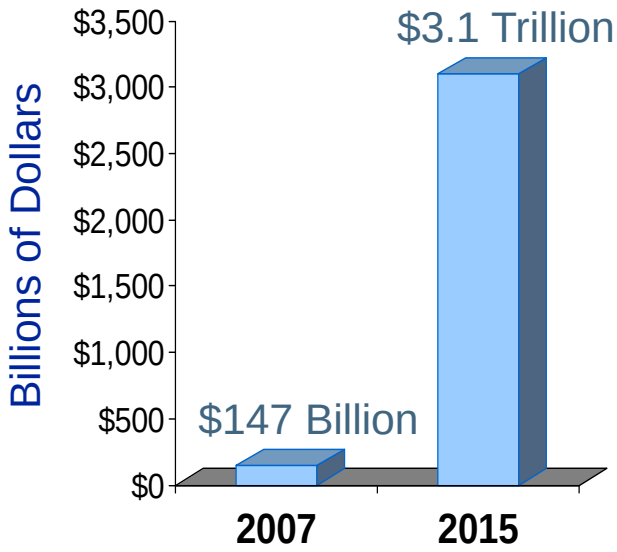


Nanomanufacturing: The Opportunity

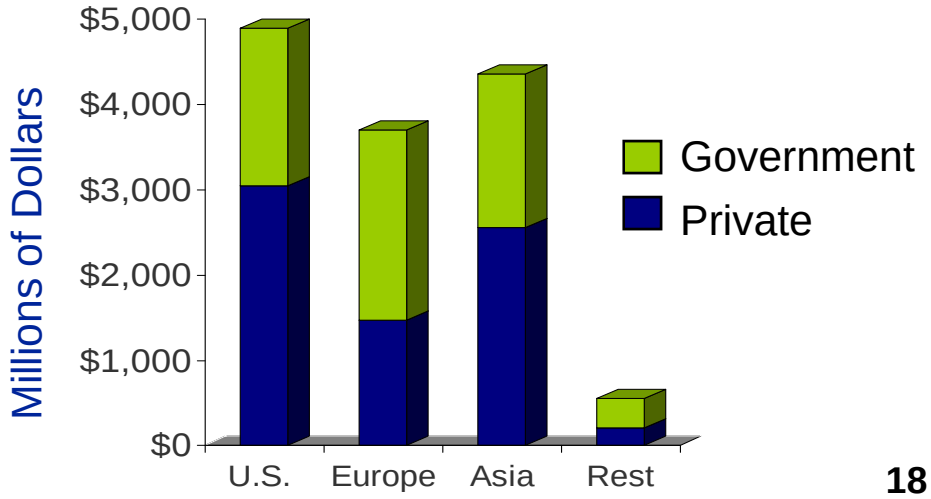
The projected growth in manufactured goods incorporating nanotechnology is tremendous.

- Global investment in nanotechnology rose to nearly $13.5 billion in 2007.
  - U.S. investment equals ~36% of total
  - The U.S. has the largest revenue from nanotechnology, but Europe is catching up
  - VC investment (not shown) is a lead indicator of potential.

Manufactured Goods Incorporating Nanotechnology



Investments in Nanotechnology

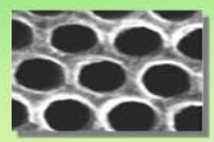


Source: Lux Research

http://www1.eere.energy.gov/industry/nanomanufacturing/

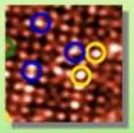
Nanomanufacturing: Diverse Energy Benefits

High-Efficiency Manufacturing



- Low-cost filters
- Advanced sensors

- Effective catalysts for chemical manufacturing



- Highly selective separation membranes

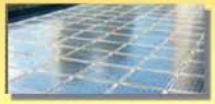
Energy-Efficient Products

- Window coatings
- Efficient insulation
- Solid-state lighting

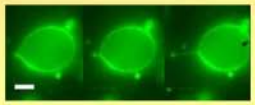
- Lightweight vehicle materials
- Catalysts to boost engine performance
- Low-friction engine coatings

- Ultra-fast computing
- Better electrostatic protection
- Electronics thermal management

Energy Supply



- Efficient and cost-effective solar cells



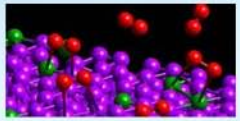
- Improved heat transfer

- Magnetic liquid coolants for higher transformer loads

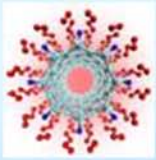
- Improved wind turbine efficiency

Energy Storage

- Improved fuel cells
- Super capacitors



- Novel cathodes to boost battery efficiency



- Reversible hydrogen storage materials

Fuel and Feedstock Flexibility : The Opportunity

ITP will accelerate the adoption of emerging technologies for the use of alternative fuels and feedstock through:

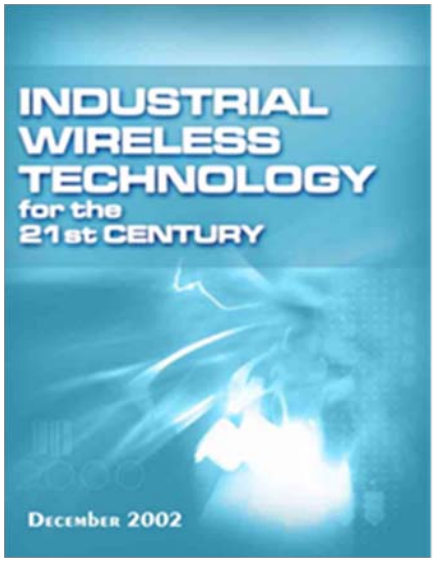
- **Undertaking technology R&D** to enable fuel flexibility in industry
- **Lowering non-technical barriers** to increased fuel flexibility stemming from the lack of awareness among industrial decision makers
- **Demonstrating and proving** effectiveness of fuel flexible technologies by supporting demos and acting as an “honest broker.”
- **Current R&D projects awarded in 2008 include:**
  - Fuel Flexible Combustion Systems for High Efficiency Utilization of Opportunity Fuels in Gas Turbines
  - Fuel-Flexible Combustion System for Refinery and Chemical Plant Process Heaters
  - Fiscalini Farms Renewable Energy Power Generation Project
  - Research, Development and Demonstration of Biomass Boiler Applications for the Food Processing Industry

http://www1.eere.energy.gov/industry/fuelflexibility/

Emerging Technology: Industrial Wireless Technology

Industrial Wireless Sensors and Networks for Energy Efficiency

- DOE has catalyzed the development of this breakthrough technology
  - Pioneered wireless sensor R&D
  - Worked with suppliers and users to create industrial wireless “vision” document
  - Selected multiple contractors for R&D
  - Most R&D projects completed in 2008
  - Currently promoting creation of wireless sensor standards



Emerging Technology: Super Boiler

First-generation package boiler

- Offers up to 25% increase in steam generation efficiency
- Requires substantially less floor space

Benefits

- Maintains fuel-to-steam efficiency of 93%-94%
- Currently undergoing 3 demonstrations at plants around the U.S.
  - Specification Rubber Products: 12.2 million Btus/hr, 13% gas savings, 2-years operational
  - Clement Pappis, under development
  - ORNL, under consideration

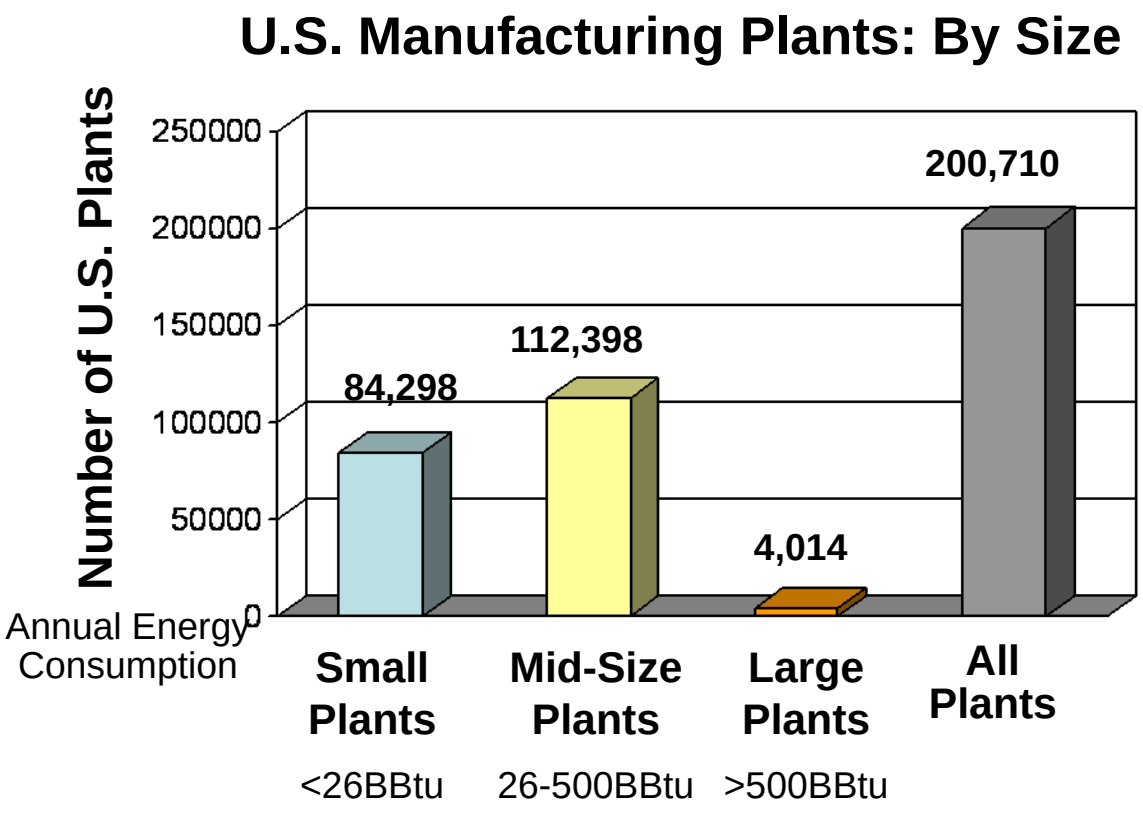
DOE predicts industry savings of more than 185 trillion Btu of natural gas by 2020 -- about **$10 billion** in annual energy costs

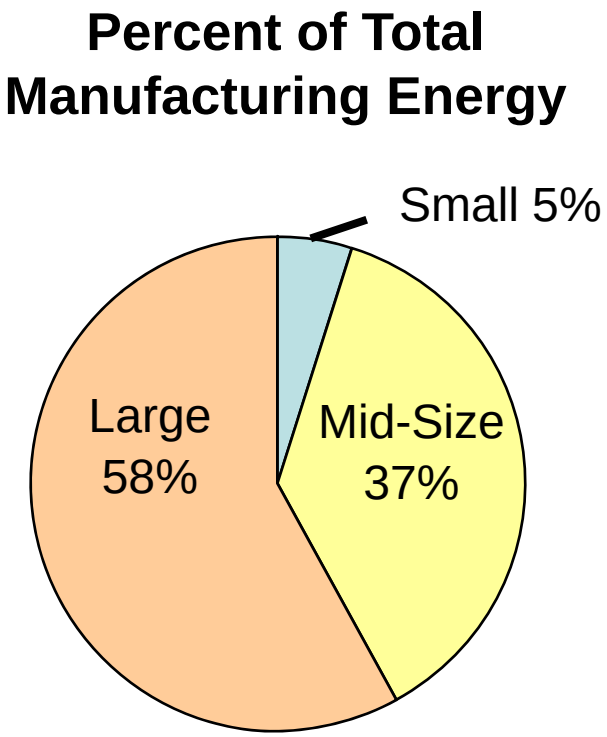
http://www1.eere.energy.gov/industry/combustion/

Technology Delivery

- Encourage industry to voluntarily reduce its energy use by working with America's largest energy-intensive plants
- Work with a wide range of industrial stakeholders to engage industry in improving energy management
- Create momentum to significantly improve energy efficiency practices throughout the manufacturing sector

ITP Works with Plants of All Sizes





Plant Assessments (2006-2008)

Total Plants Assessed:	**nearly 1,900**
Identified Cost Savings:	**$1 billion (1,644 reporting)**
Identified Energy Savings:	**130 trillion Btu(source)**
Identified CO_2 Savings:	**8.7 million metric tons**

- **Implemented approximately 1/3 of cost savings**
- **Another 1/3 is in progress and planned**

http://www1.eere.energy.gov/industry/saveenergynow/assessments.html

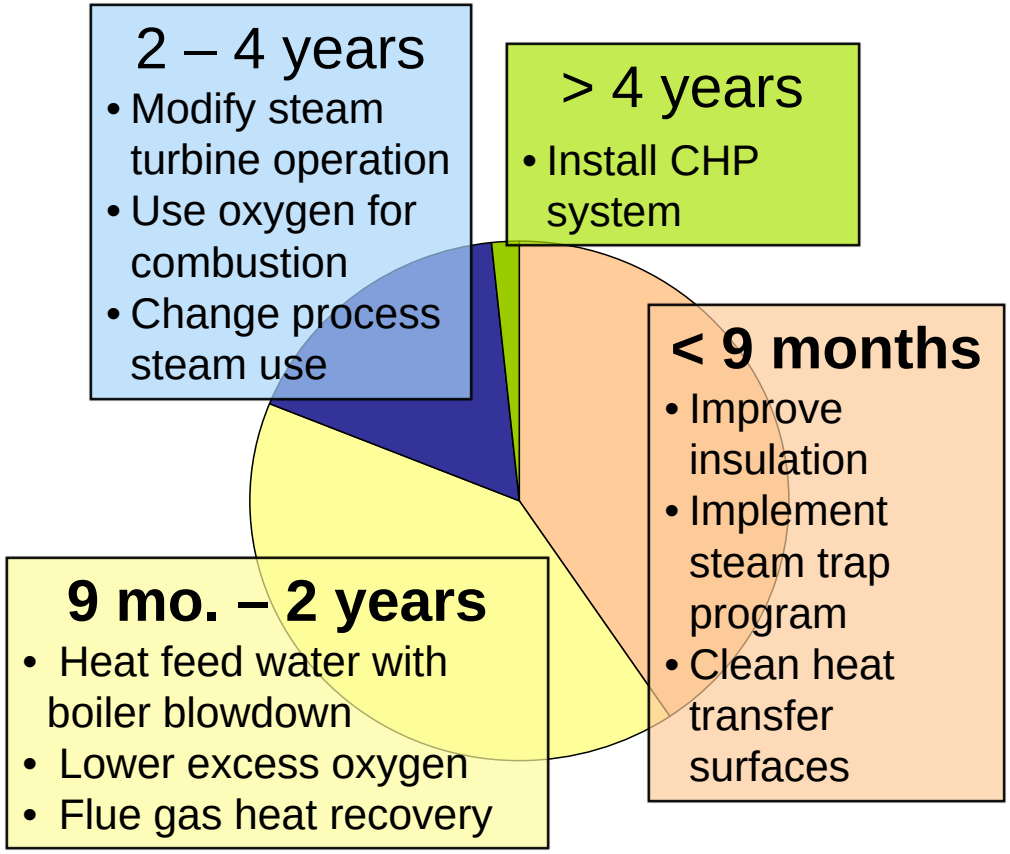
Energy Savings Assessments

Gather Preliminary Data → **Conduct Plant Visit** → **Analyze & Report Results** → **Follow-up**

Train Plant Staff

- Teams composed of DOE Energy Experts and plant personnel
- Teams focus on steam generation, process heating, compressed air, pumps, or fan systems
- Plant personnel and affiliates are trained on DOE software tools

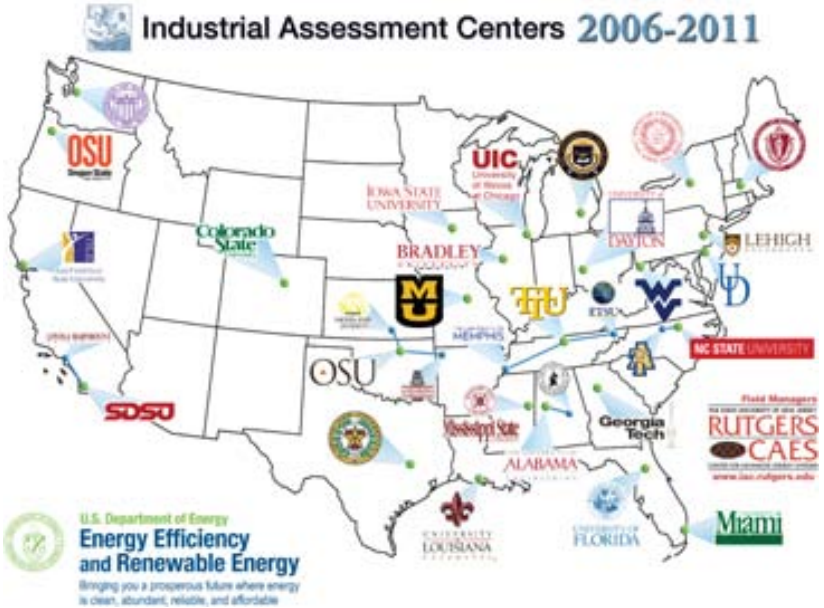
Large Plant Energy Assessments



Estimated Payback Periods for Recommended Actions

Industrial Assessment Centers

- DOE's 26 university-based Industrial Assessment Centers (IACs) train engineering students for careers in industrial energy efficiency
- IACs serve 300+ plants per year (under 1 TBtu/yr) and typically identify savings of 8%-10% or $115,000/plant
- Database of 13,500 assessment results: http://iac.rutgers.edu/database



http://www1.eere.energy.gov/industry/bestpractices/iacs.html

Save Energy Now Award Program

- Rewards companies that implement energy-saving technologies and practices identified through the assessments to achieve a high level of energy efficiency
- **Awards to date:**

  110 Energy Champion Plants:
  Saved > 250,000 MMBtu *or* 15% total energy use

  197 Energy Saver Plants:
  Saved > 75,000 MMBtu *or* 7.5% total energy use

Companies include:

- Owens Corning
- Dow Chemical
- General Motors
- General Electric
- Sunoco
- Coors/Ball Corp.
- Boise Cascade
- Goodyear
- US Steel
- Tyson Foods
- Honeywell
- JR Simplot

http://www1.eere.energy.gov/industry/saveenergynow/recognition.html

Partnerships Are Key to Implementation

Partners bring expertise, experience and resources to help ITP identify and accelerate the pace and success of technology & information delivery.

Examples:

Government Partners

- NIST, U.S. Dept. of Commerce, Manufacturing Extension Partnership
- Environmental Protection Agency (Energy Star, Climate Leader, and Green Supplier Network)
- National Nanotechnology Initiative
- State governments and organizations

Private Partners

- National Assoc. of Manufacturers
- Green Grid
- Utilities
- Supply chains
- Alliance to Save Energy, ACEEE
- Universities & National Labs

http://www1.eere.energy.gov/industry/saveenergynow/partnerships.html

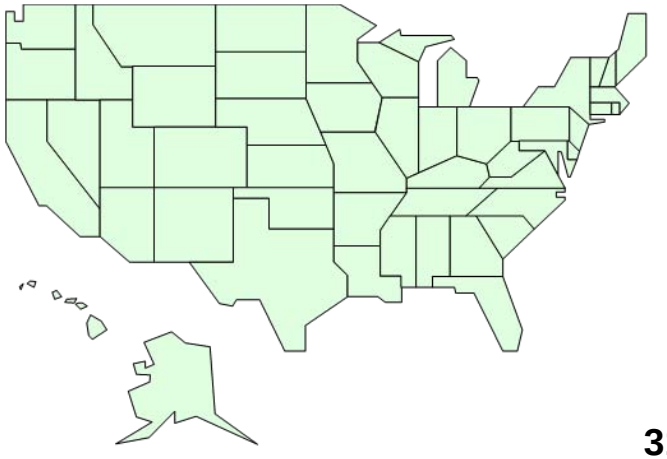
State-Level Save Energy Now

Partnering with state energy offices, regional energy efficiency organizations, academia, and private companies to:

- Establish energy assessment capability and expand success of the federal program
- Transfer ITP and other energy efficient technologies to the market
- Reduce carbon emissions through energy efficiency

2008 States Program

- 19 states were selected to participate in program to conduct 96 plant assessments



2009 State Solicitations

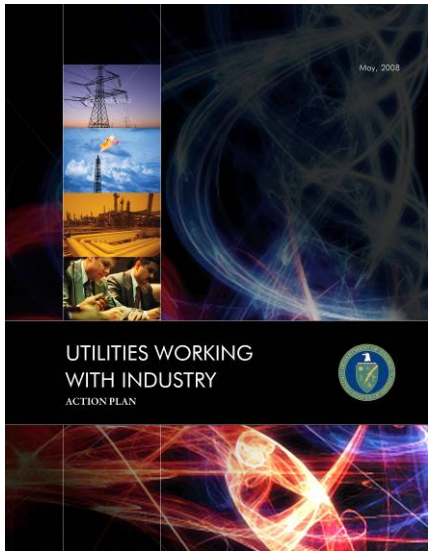
Anticipated Selection Date: 02/3/2009

- Received 35 proposals from 33 states
- Total available funding $9M (over 3 yrs.)
- Cost share funding $15.7M (over 3 years)

http://www1.eere.energy.gov/industry/about/state_activities/main_map.asp

Utility Partnerships

- DOE is reaching out to utilities to participate in Save Energy Now.
- Utilities will provide tools, materials, assessments & other support to their large industrial customers.
- DOE is working with several utility trade groups to establish a program which will utilize energy efficiency options to slow electric and gas demand.



http://www1.eere.energy.gov/industry/pdfs/utilities_working_with_industry.pdf

ITP and utility stakeholders came together for the *Utilities Working with Industry Workshop* in February 2008 to identify joint activities for ITP and the utilities.

- Outreach
- Case Studies
- Training
- Assessment Participation
- Measurement and Verification

APPA American Public Power Association

TVA

Southern California Gas Company

http://apps1.eere.energy.gov/industry/bestpractices/energymatters/articles.cfm/article_id=270

Supply Chain Initiative

A new opportunity for ITP to encourage industries to:

- Implement energy management criteria into their purchasing requirements
- Cascade energy management vision and tools down through their supply chains

Will be integrated with the SEN Leaders Pledge

Initial emphasis on partnership with the automotive industry

- USCAR and the preparation of an supply chain energy survey
- ITP discovery meeting with Volvo Truck (27 Oct 08)
- ITP partnerships with food processors and aerospace will follow

A confluence of major factors facilitate the implementation of this initiative

- Global climate change, energy costs, investor risk, corporate governance, brand distinction, competitiveness and consumer demand

Energy-Efficient Data Centers

- Accounts for 1.5% of total U.S. electricity; growth of 12% per year
- Joint DOE-ITP, DOE-FEMP and EPA ENERGY STAR program
- Promote systems approach in design, energy management and operation
- DC Pro tool (version 1.0) released
- Created awareness training curriculum.
- Performed 9 “pilot” assessments
- Raise awareness of energy efficiency opportunities; case studies (Lucas Films and Verizon); Federal showcases
- Recognize industry leaders (Uptime awards)

Energy Management Systems

Energy Management Standards

ISO International Organization for Standardization

- U.S. leading the team to develop ISO 50001 - an international energy management standard
- DOE working with industry and American National Standards Institute (ANSI) to develop standards for:
  - Facility level (comprehensive energy management)
  - System level (steam, process heating, pumps, compressed air, fans)
  - Measurement and Verification
- Testing draft energy and system standards at five TX plants from diverse sectors including: chemicals, electronics, insulation, and food processing

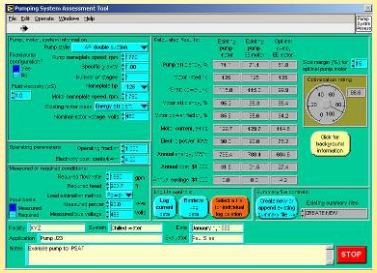
ANSI
ANSI Accredited Certification Program

Technology Delivery Resources

Bringing industry the most energy-efficient technologies and practices available.

Tools

- Plant Energy Profiler
- Process Heating
- Steam Systems
- Motors & Pumps
- Fans, and more



Training

- Tool End-User
- Topical
- Qualified Specialists

Assessments

- Large Plant Assessments
- Industrial Assessment Centers (IACs)
- State/Partner Assessments

Information

- Tip Sheets
- Case studies
- Source Books
- Website/webcasts
- E-Bulletin
- States Website

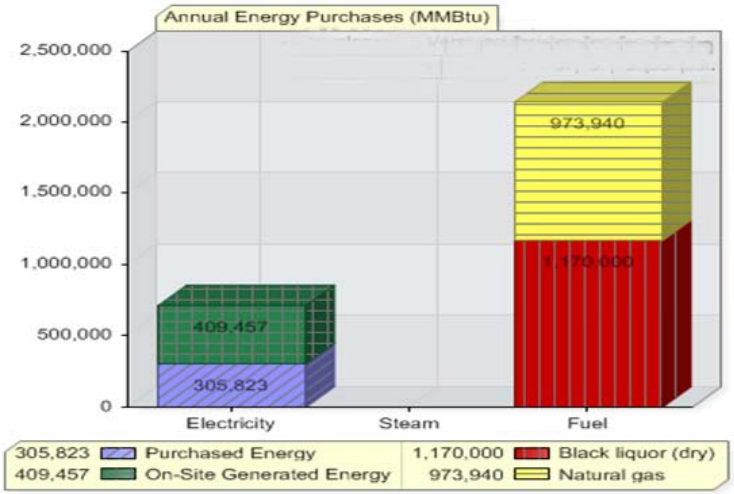
www.eere.energy.gov/industry

ITP Software Decision Tools

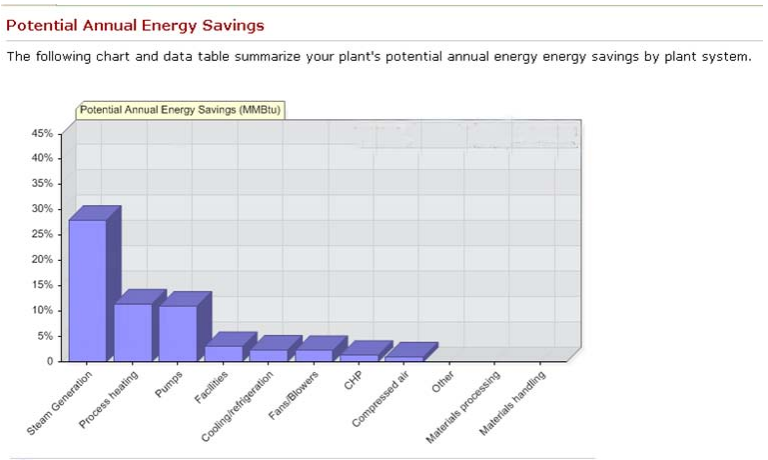
- **Quick Plant Energy Profiler** profiles plant energy supply along consumption streams and identifies energy saving carbon reduction opportunities
- **Pumping System Assessment Tool** Assesses the efficiency of pump system operations.
- **Fan System Assessment Tool** quantifies potential benefits of optimal fan systems
- **Air Master+** Assesses compressed air systems for energy saving opportunities
- **Process Heating Assessment and Survey Tool** Assesses energy use in furnaces, ovens, dryers, and kilns along with performance improvements
- **Steam System Assessment Tool** Assesses potential benefits of specific steam-system improvements.

http://www1.eere.energy.gov/industry/bestpractices/software.html

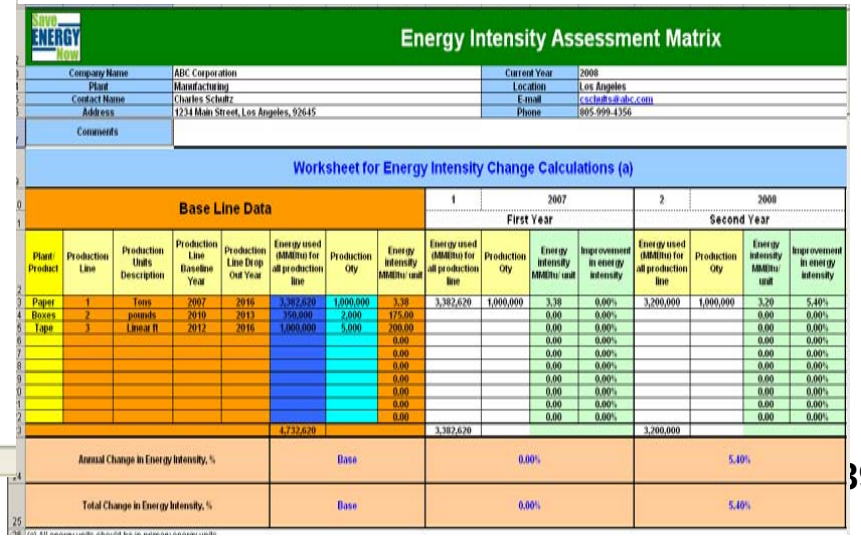
Plant Energy Profiler (QuickPEP 2.0)



Energy Type	Energy (kWh)	Energy (MMBtu)	Cost	$/MMBtu	$/kWh
Electricity	209,628,044	715,281	$10,800,000	$15.10	$0.05
Fuel		2,143,940	$9,437,400	$4.40	
Steam			$0		
Total		2,859,220	$20,237,400	$7.08	



Energy-Carbon Footprint and Energy Baseline Calculators



Training

Plant managers and consulting engineers can use ITP's system- and component-specific training sessions that focus on improving energy management and the use of the software tools.

End-User Training

- Hands-on, one- and two-day **trainings** at different locations around the country are taught by expert instructors
- **Webcasts** provide an introduction to energy management and other special topics
- **Data Center Workshops** provide information on state-of-the-art strategies to improve data center energy intensity

Specialist Training

- Interested Federal personnel can take training to become a **Qualified Specialist**.

http://www1.eere.energy.gov/industry/bestpractices/training.html

Save Energy Now Webcasts

ITP offers free Webcasts on tools, technologies, Save Energy Now assessments, and resources that can help save energy and reduce costs.

Future ITP webcasts

January 22:	Energy Management
January 29:	Emerging Steel Technologies
February 5:	State and Utility Partnerships
February 12:	Energy Assessments: What Are the Benefits to Large Facilities?
February 19:	Energy Assessments: What Are the Benefits to Small-and Medium-Sized Facilities?
February 26:	Quick PEP Tool Demonstration and Results

http://www1.eere.energy.gov/industry/newsandevents/events.html

New Directions

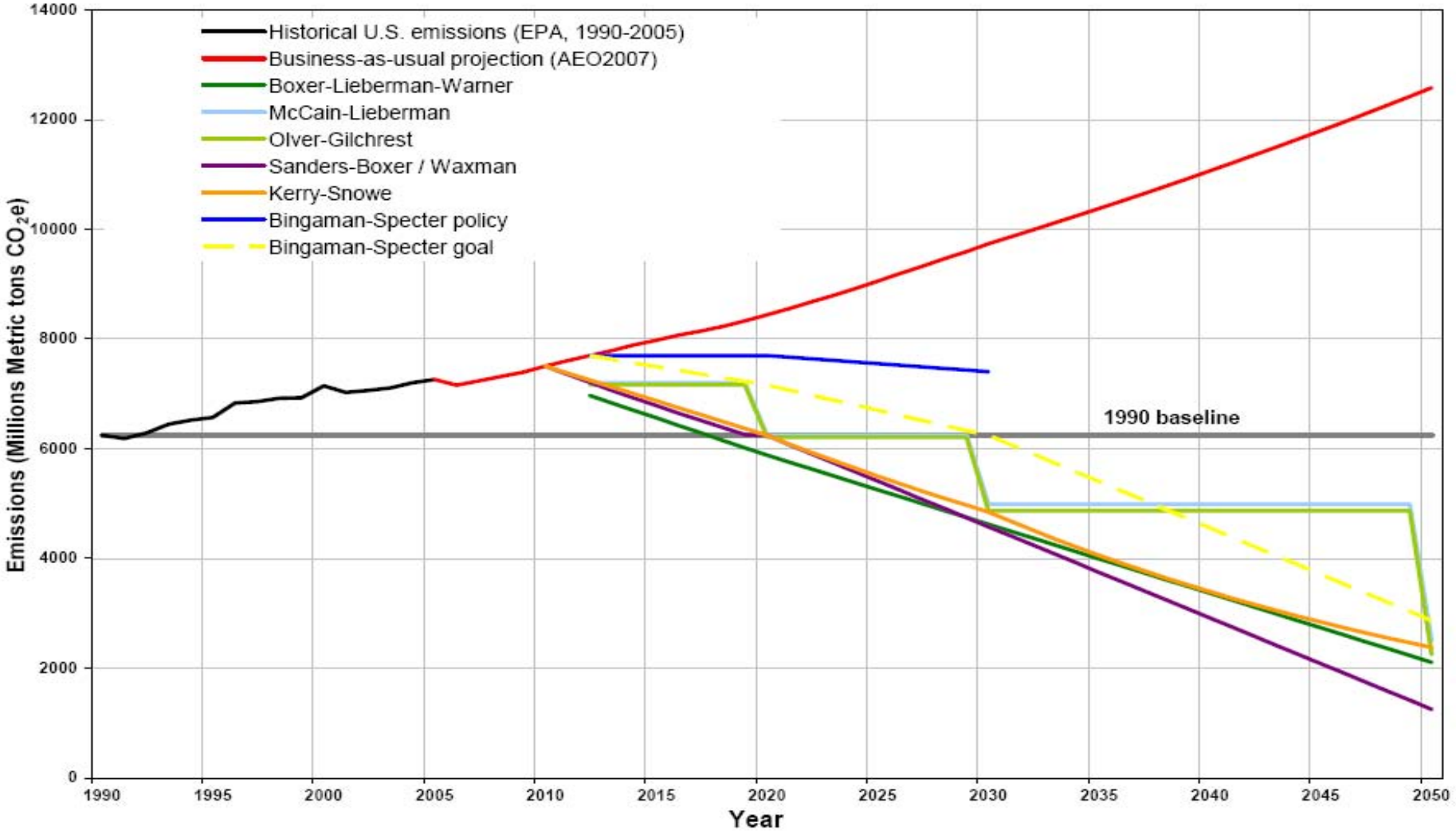
New DOE management likely to conduct in-depth analysis and develop new policies, strategies, and plans to:

- Create jobs
- Revive the economy
- Improve energy efficiency
- Reduce GHG emissions

President Obama and the 111th Congress

- The President Elect is expected to make energy a key priority in the new Administration
- The Administration and Congress are likely to work on a framework for a strong domestic GHG reduction program, possibly with a GHG cap-and-trade system, in 2009.
- Economic Stimulus Package with Energy/Infrastructure initiatives within the next 6 months
- EISA/EPAct implementation and new energy legislation

GHG Emissions Targets for Proposed Legislation



Source: Pew Center on Climate Change, Economy-wide Cap-and-Trade Proposals in the 110th Congress

Global Outreach

Asia Pacific Partnership – new technology demonstrations, plant assessment and other projects in steel, cement and other industries

Collaboration with China (MOU) to assist Chinese industry in meeting China's 2010 energy/carbon intensity reduction goal

Collaboration with India in areas of improved energy efficiency in manufacturing

International Energy Agency (IEA): Industrial Energy Technologies and Systems Implementing Agreement & District Heating/CHP activities

Save ENERGY Now

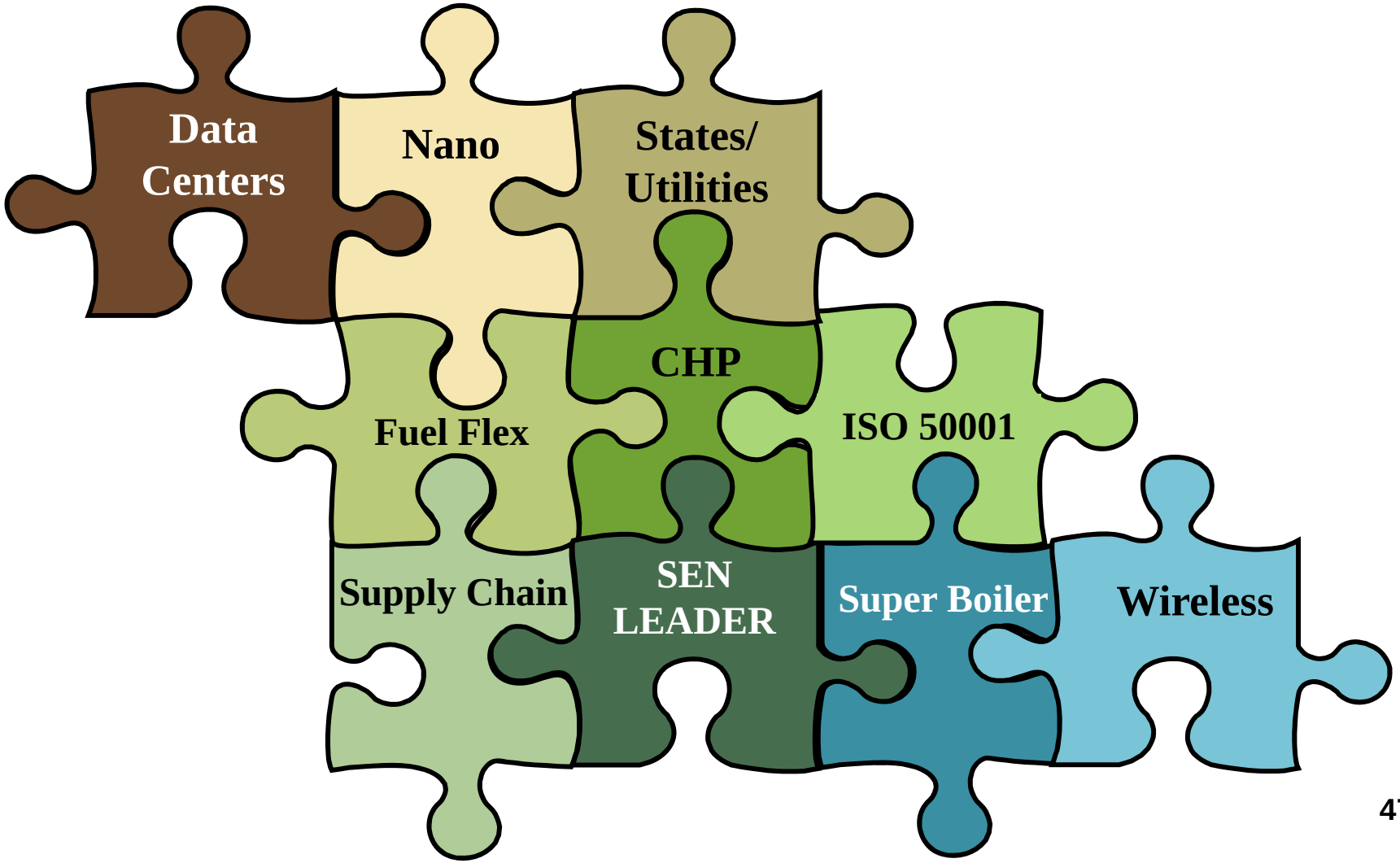
SEN LEADER Pledge

The Pledge: Voluntarily agree to reduce energy intensity by 25% or more over 10 years

Why Take the Pledge?

- Reduced energy costs and smaller carbon footprint
- Minimize risk related to volatile energy costs
- Enhanced competitiveness
- Promote energy security
- Be recognized as an energy and environmental leader

ITP Ready to Contribute to Innovative Solutions



Links and Resources

Learn More

To learn more about the Industrial Technologies Program, Save Energy Now, and read/download a wide range of software tools, information and resources, please visit ITP's Web site: http://www1.eere.energy.gov/industry

Stay Informed

Sign up to receive ITP's free monthly e-newsletter, *E-Bulletin*, BestPractices quarterly journal e-magazine, *Energy Matters*, and partner with ITP to Save Energy Now:

http://apps1.eere.energy.gov/industry/saveenergynow/partners/

EERE Information Center:
1-877-EERE-INF(1-877-337-3463)