Industrial Technologies Program Update

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Energy Efficiency & Renewable Energy
U.S. Department of Energy

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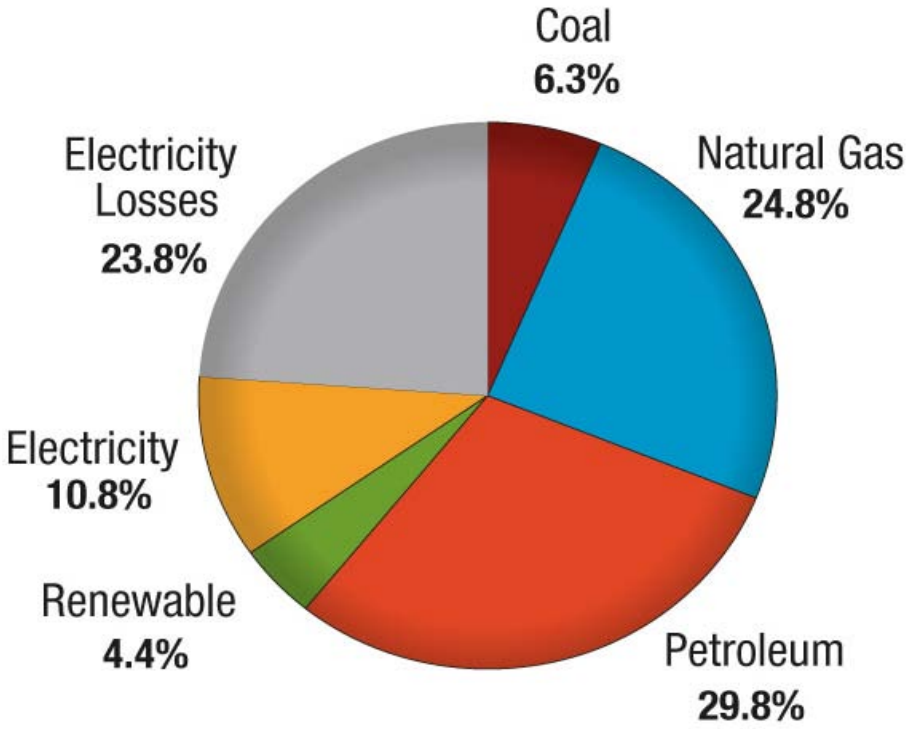
U.S. Industry: Key to energy picture



Industrial Energy Use by Fuel Type

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

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

Industrial Technologies Program

Goal:

Drive a 25% reduction in industrial energy intensity by 2017.

- Helps *all* industrial companies– no matter where they currently stand in terms of energy efficiency
- Provides resources to the **200,000 U.S. manufacturing plants** to identify and implement cost-effective measures

Industrial Technologies Program Budget

	Funding ($ in millions)		
Activity	FY07 Approp.	FY08 Approp.	FY09 Request
Industries of the Future (specific)	16.6	11.2	11.4
Industries of the Future cross-cutting)	39.2	53.2	50.7
TOTAL	55.8	64.4	62.1

Industries of the Future (Specific)
FY09 Budget Request

	Funding ($ in millions)		
Activity	FY07 Approp.	FY08 Approp.	FY09 Request
Forest and Paper Products	2.9	1.7	1.4
Steel Industry	3.6	3.6	2.3
Aluminum Industry	2.3	1.7	2.1
Metal Casting Industry	1.0	.2	1.0
Chemicals	6.8	3.7	4.3
SBIR/STTR	0	.3	.3

Industries of the Future (Cross-cutting)
FY09 Budget Request

Activity	Funding ($ in millions)		
	FY07 Approp.	FY08 Approp.	FY09 Request
Industrial Materials of the Future	9.9	4.7	4.7
Combustion	2.4	.6	.6
Sensors and Automation	3.1	1.8	0
Industrial Technical Assistance			
Industrial Assessment Centers	4.0	4.0	4.0
Best Practices	19.8	8.8	15.5
Energy-Intensive Process R&D	0	7.2	14.9
Fuel and Feedstock Flexibility	0	2.8	3.9
Nanomanfacturing and Other Inter-Agency Manufacturing R&D	0	4.8	4.9
Industrial Distributed Energy	0	14.5	1.5
Energy Efficient Information Tech.	0	2.9	0
SBIR/STTR	0	1.0	.8

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 ethanol production and biorefineries
- Trade associations, States, Utilities and Supply Chain Partners

Save Energy Now: Voluntary Agreements

- Voluntarily pledge to reduce energy intensity by 25% or more over 10 years
- Make continuous improvements in energy efficiency and carbon reduction as part of robust business strategy
- Gain enhanced access to enabling resources: tailored technical assistance, training, assessments, and more
- Receive recognition for participation and achievements

Save ENERGY Now

Industrial Technologies Program Delivers Solutions

Energy Efficiency R&D

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

Fuel and Feedstock Flexibility

Accelerate market penetration of CHP and emerging options for alternative fuels and feedstock

Technology Delivery

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

ITP's R&D Program Structure

IOF-Specific

- Aluminum
- Chemicals
- Forest and Paper Products
- Metal Casting
- Steel
- Cement and Other*

Sector-specific technologies for specific, energy-intensive industries

Crosscutting

- Energy Intensive Processes*
- Materials
- Combustion
- Sensors and Automation
- Next-Generation Manufacturing*
- Fuel and Feedstock Flexibility*
- Combined Heat and Power (CHP)*

Crosscutting technologies for diverse, energy-intensive manufacturing processes

*New starts in FY08





Industry-Specific Priorities

- Continue developing technologies for
  - High efficiency pulping and innovative wood drying
  - Next-generation steelmaking
  - Oxidation reactions, hybrid distillations, and microreactors
  - Efficient casting & aluminum melting
- Identify transformational technology concepts in energy-intensive sectors

Industry-specific activities remain central to ITP's goals

- Re-engage with industry stakeholders, focus on sector-specific technology agenda
- Identify needs in cement and other carbon- and energy-intensive industries

Limited FY08 R&D budget for Aluminum, Chemicals, Forest and Paper Products, Metal Casting, and Steel industries

Crosscutting: Energy Intensive Processes

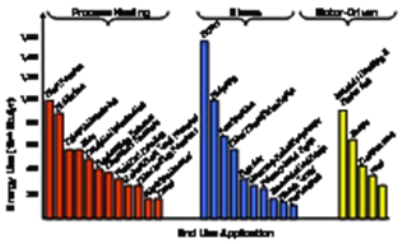
Four Technology Platforms:

Maximize energy and carbon reduction throughout industry

- **Industrial Reactions & Separations**
- **High-Temperature Processing**
- **Waste Heat Minimization & Recovery**
- **Sustainable Manufacturing**

Selection criteria included alignment with:

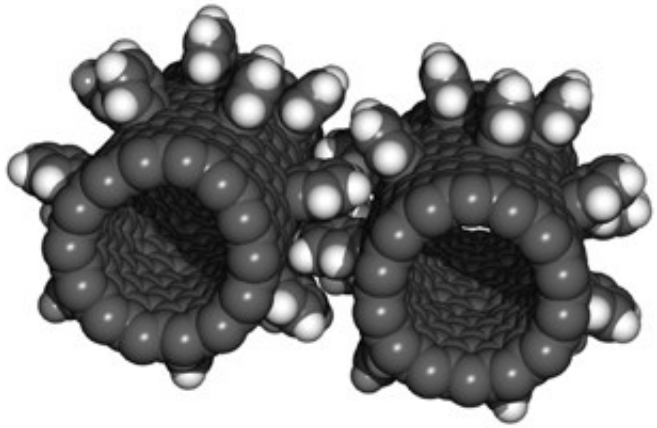
- Industry's top energy-saving opportunities
- ITP mission and goals
- Industry priorities
- Existing R&D projects



Crosscutting: Next-Generation Manufacturing

ITP will coordinate with other government agencies on next-generation research activities, with a focus on nanotechnologies

- ***Nanomanufacturing:***
  - Develop efficient techniques and manufacturing processes for **nano-enabled products**
  - Enable mass production and application of **nanotechnologies that could transform industrial processes**
- ***Next-Generation Manufacturing Concepts:***
  - Improve yield
  - Reduce waste
  - Improve energy efficiency throughout the supply chain
  - Reduce environmental impacts



ITP's Multi-Year Distributed Energy/ Combined Heat and Power Strategy

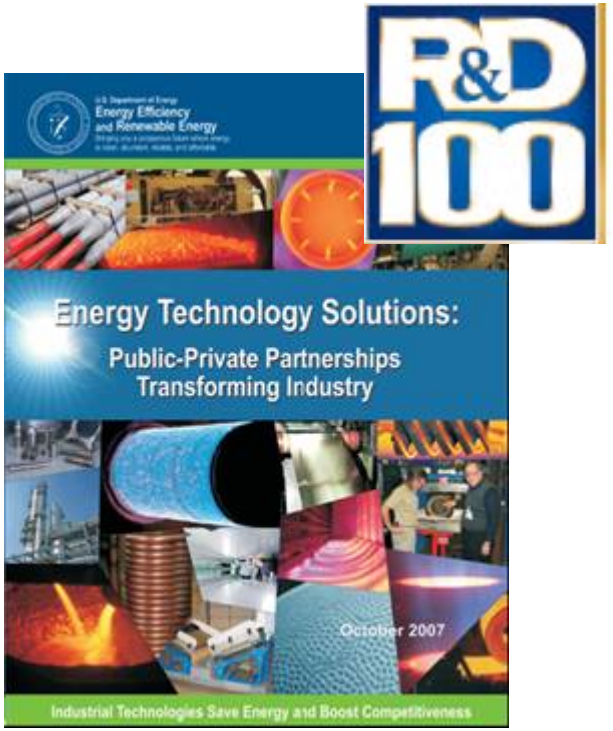
ITP has developed a multi-year strategy to promote the deployment of DE/CHP systems in the industrial sector

- Facilitate deployment of technologies to reduce energy and carbon intensity and improve industry competitiveness
- Address barriers inhibiting industry
- Serve as an independent, credible voice on the applications and benefits of DE/CHP in industry
- Develop a strong communications strategy to promote DE/CHP and its potential to save energy and reduce carbon emissions

ITP Delivers Results

Together with industry, we have successfully put cutting-edge technologies and energy-saving measures into practice

- Commercialized over 220 technologies since program inception
  - 5 quads of energy savings
  - 86 MMTCe reduction
- Obtained 156 patents between 1994 and 2005
- Received 42 R&D 100 awards between 1991 and 2007 (8 in 2006 alone)
- Over 16,000 U.S. manufacturing plants using ITP software and best practices



Technology Delivery Products and Services

Standards

- Plant Certification

Tools

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

Training

- Basic
- Advanced
- Qualified Specialist

Information

- Website
- Information Center
- Tip Sheets
- Case studies
- Webcasts
- Emerging Technologies

Assessments

- Energy Savings Assessments
- Industrial Assessment Centers

Save ENERGY Now

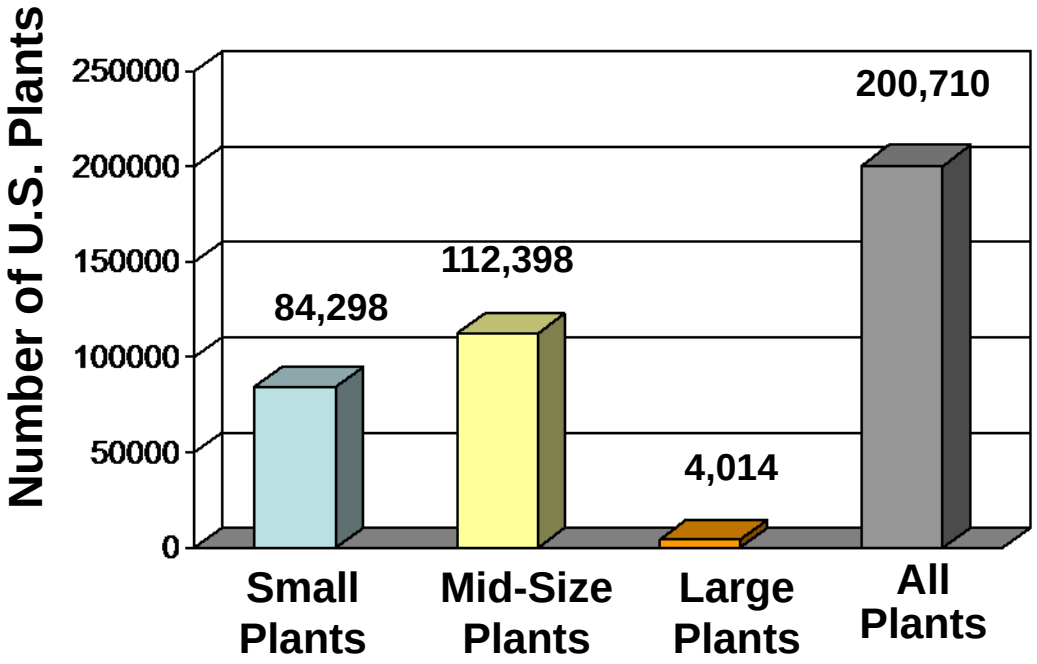
- Encourage industry to voluntarily reduce its energy usage in a period of tight supplies by working with America's largest energy-intensive plants
- Create momentum to significantly improve energy efficiency practices throughout the manufacturing sector

"Our Energy Saving Teams will work with on-site managers on ways to conserve energy and use it more efficiently."

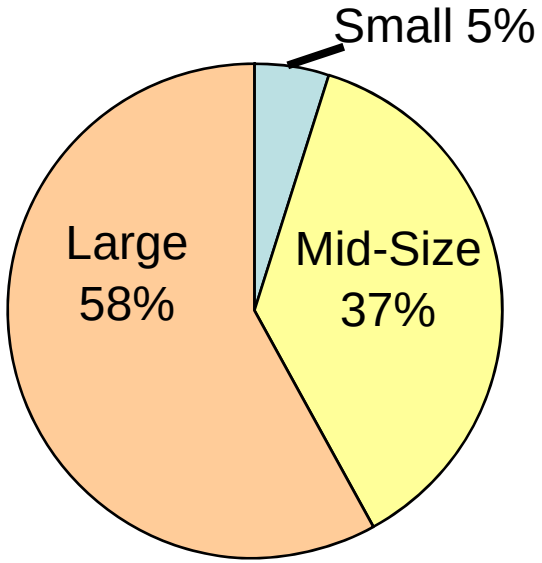
Secretary of Energy Sam Bodman
October 3, 2005

ITP Focuses on Larger Plants

U.S. Manufacturing Plants: By Size



Percent of Total Manufacturing Energy



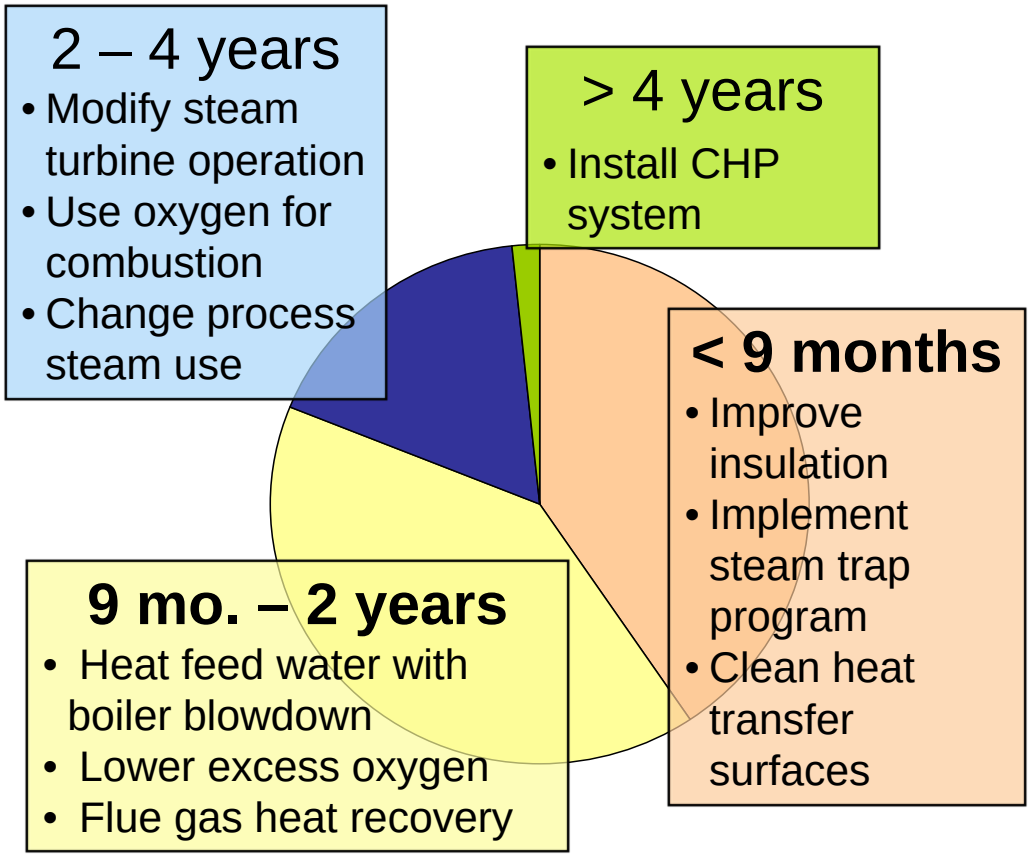
Energy Savings Assessments

Energy experts work with plant personnel to identify the best opportunities for energy savings at large industrial facilities

- Completed 200 Assessments in 2006
- Completed 250 Assessments in 2007
- Goal is 250 Assessments in 2008

Energy Assessments Success: 2006-2007

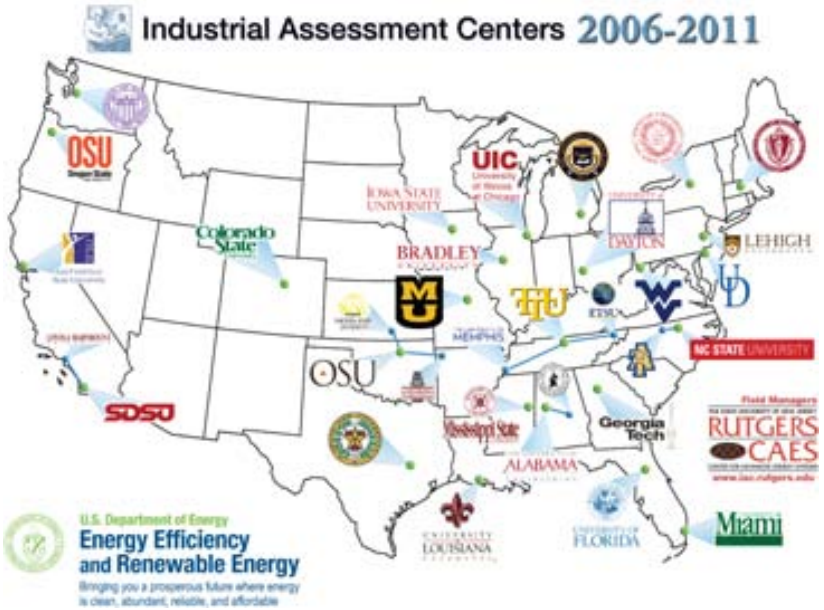
- Large Plant Assessments
- Qualified Energy Experts
- 450 assessments completed
- 350 assessments with completed reports
  - Identified energy savings
    - 71.7 TBtu/$687 million
  - Total potential carbon dioxide (CO_2) emissions reduction:
    - 5.6 million metric tons



Estimated Payback Periods for Recommended Actions

Industrial Assessment Centers

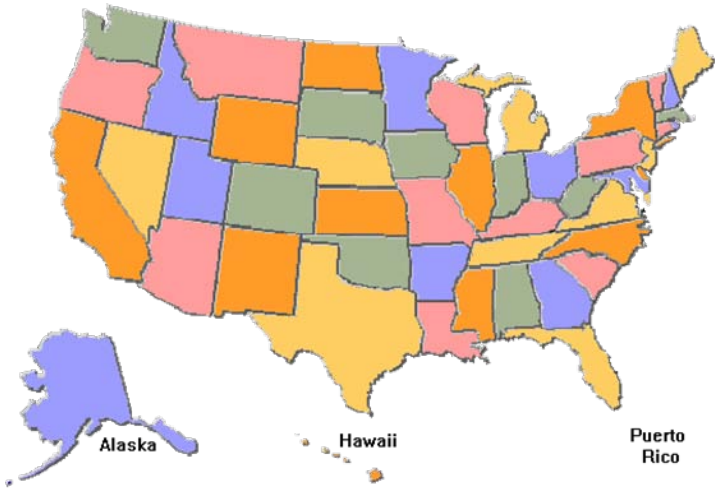
- DOE's 26 university-based Industrial Assessment Centers (IACs) train engineering students for careers in industrial energy efficiency
- IACs serve 300 plants per year (under 1 TBtu/yr) and typically identify savings of 8%-10% or $115,000/plant
- Database of 13,500 assessment results: http://iac.rutgers.edu/database



State-Level Save Energy Now

- **A partnership of state energy offices, regional energy efficiency organizations, academia, and private companies with the purpose of:**

  - Working with the states to establish energy assessment capability and expand on the success of the federal program
  - Transferring ITP and other energy efficient technologies to the market
  - Reducing carbon emissions through energy efficiency



- **In FY08, 19 states were selected for the State Industrial Assessment Projects Funding Opportunity.**
- **Planning for another funding opportunity in FY09 for more states to receive assistance to launch state-level Save Energy Now campaigns.**

ITP States Website

Repository of state-level industrial resources and information, including

- Economic data, indicators, and activity
- ESAs, Industrial Assessment Centers, events and training, research and development
- ITP project successes
- Contacts
- State incentives database

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

Supply Chain Collaborations Will Support Carbon Footprint Reductions

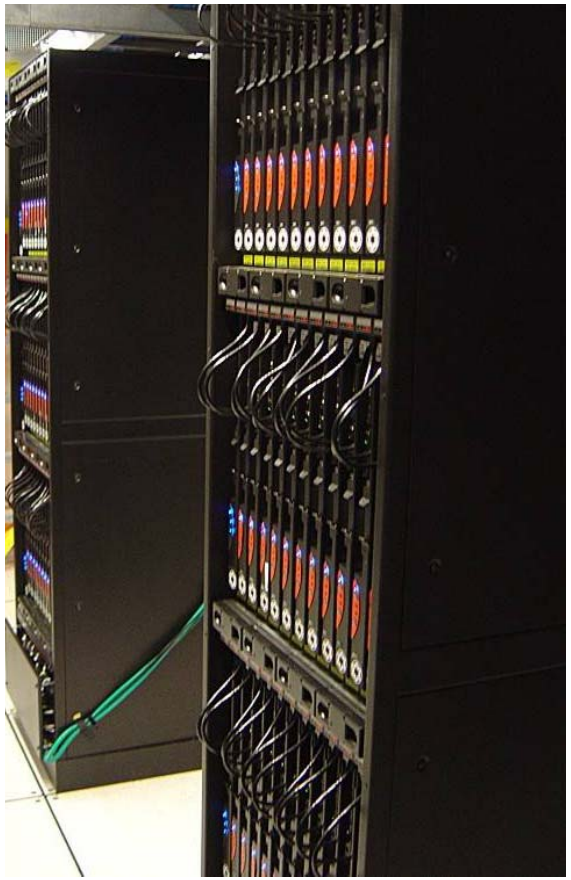
- **Industry: Key Leverage Point in Supply Chain**
  - Automotive
  - Aerospace
  - Food Processing

Plant Energy Certification Program

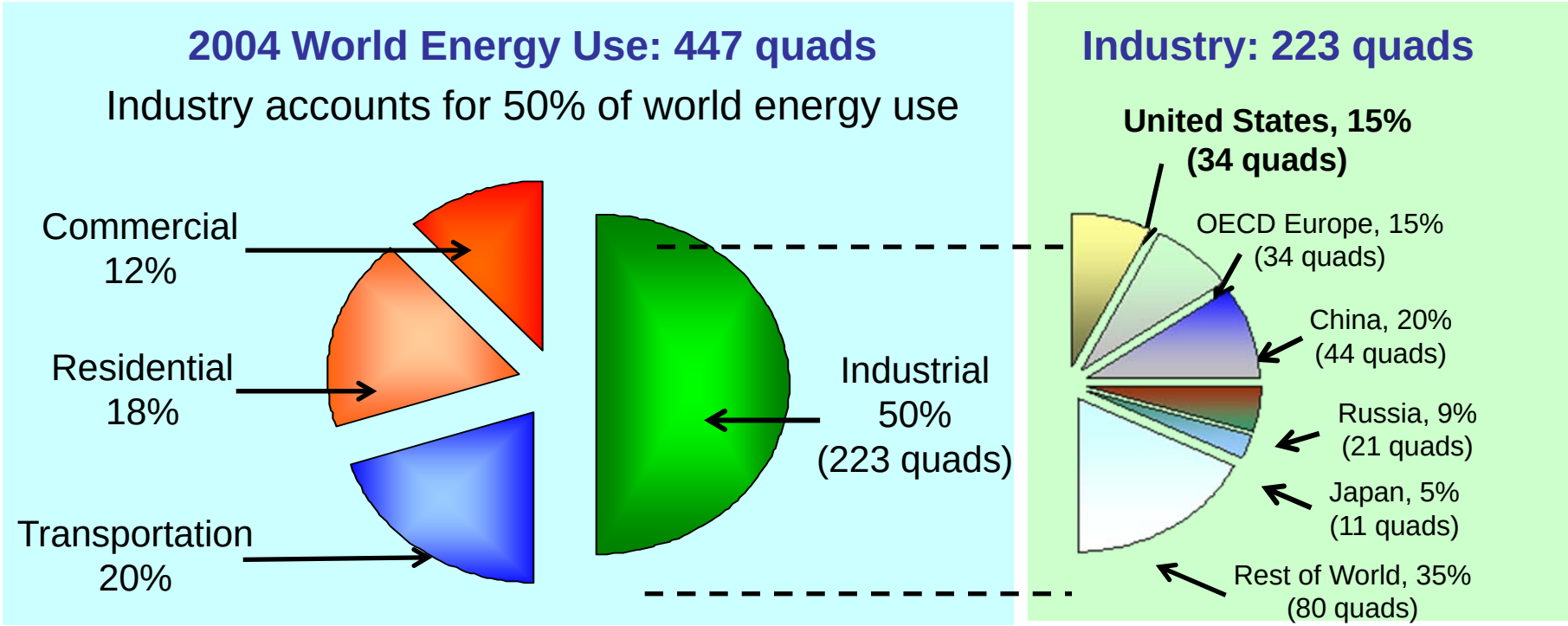
- Cooperative initiative
  - Dept. of Energy's Industrial Technologies Program
  - U.S. Environmental Protection Agency's Energy Star for Industry
  - Texas Industries of the Future
  - U.S. industry
- Goal: Create a program for independently certifying the energy efficiency performance of industrial plants
  - System level (steam, process heating, pumps, compressed air, fans)
  - Facility level (comprehensive energy management program)
- Measures and validates continual improvement in energy efficiency
- Voluntary, performance-based, flexible, and technically sound
- Timeframe for implementation: 2008-2010

Data Center Assessments

- Empower systems approach in the way data centers are designed, managed and operated
- Build tools, expertise, and strategy
- Perform “pilot” assessments
- Raise awareness of energy efficiency opportunities
- Recognize industry leaders



Industrial Energy = ½ World's Energy



15% of industrial energy is consumed in the United States

Source: EIA/International Energy Outlook 2007

Global Outreach

- International versions of major plant software decision tools
- Asia Pacific Partnership – new technology demonstrations, plant assessment and other projects in steel, cement and other industries
- Collaboration with the Chinese government in assisting Chinese industry in meeting China's 2010 energy 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

中美工业能源效率合作
US-China Collaboration on Industrial Energy Efficiency

- Conduct 6 energy assessments of Top-1,000 energy intensive industrial enterprises in Hebei and Shandong Provinces
- Develop software tools, training materials and other resources in Chinese to allow duplicate efforts in many plants
- Conduct training on tools, plant assessments and energy management
- Help match Chinese businesses with providers and financers of technology solutions

How can a State organization get involved with ITP?

- Help raise awareness, get word out, get products & services out to plants
- Co-sponsor workshops
- Get companies and plants to sign up for voluntary agreements and Save Energy Now energy assessments
- Publicize or Respond to RFPs being planned for FY08 and FY09
  - States Save Energy Now
  - RD&D Industry Call [spring 2008]
    - Energy Intensive Processes
    - Industries of the Future
  - R&D Laboratory Calls
    - Energy Intensive Processes [Feb 2008]
    - Nanomanufacturing [spring/summer 2008]
    - Fuel Flexibility [spring/summer 2008]