U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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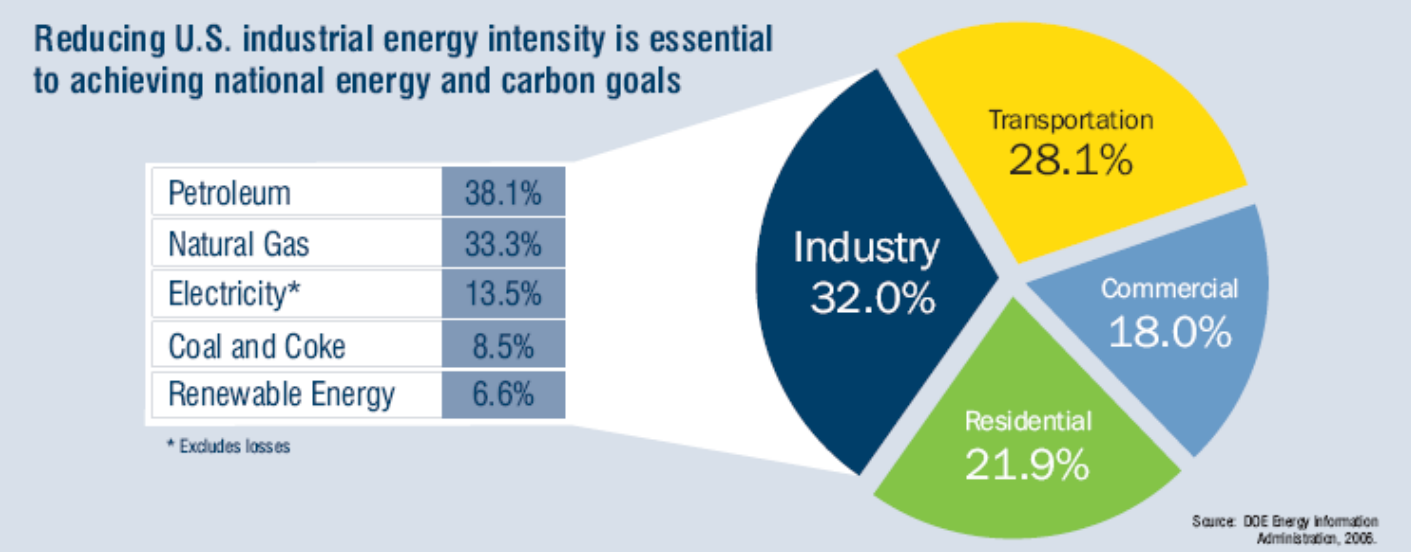
US Department of Energy
Industrial Technologies Program

December 8, 2009

Industrial Technologies Program Mission

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

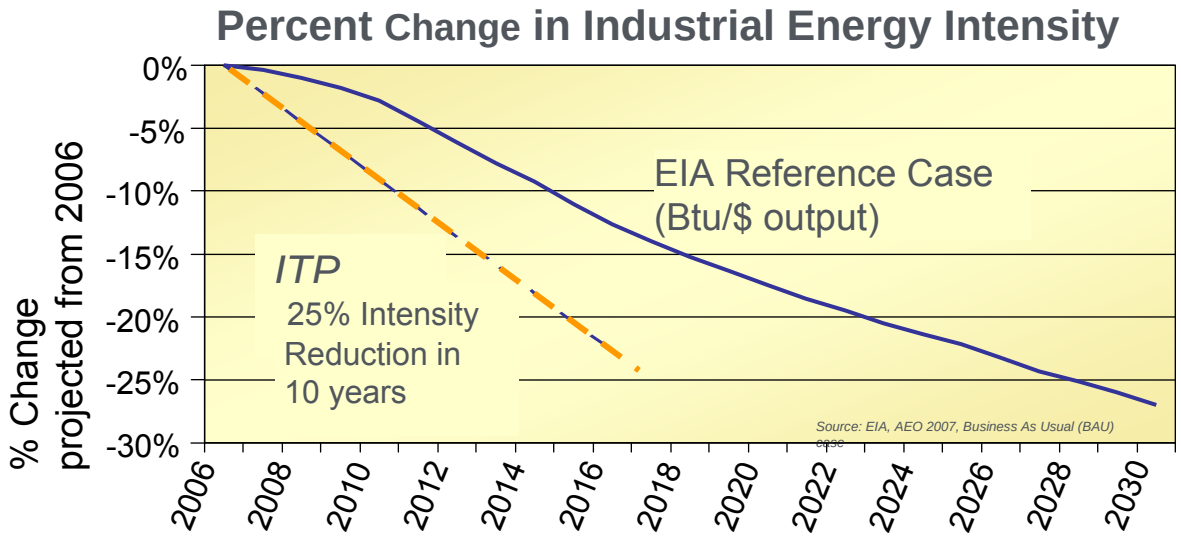
Improve national energy security, climate, environment, and economic competitiveness by transforming the way U.S. industry uses energy.



- >200,000 sites
- Over $6 trillion in goods; $1 trillion in exports
- Consumes more energy than any other economic sector (~32 quads)
- Spurs job creation and investment
- Responsible for ~1,660 $MMTCO_2$/ year from energy consumption
- Manufacturing makes the highest contribution to U.S. GDP (12%)
- Produces nearly 1/4th of world manufacturing output

ITP Strategic Objectives

- Reduce industrial energy intensity by 25% in 10 years
- Establish the U.S. as the Global Leader in Energy Management



Energy Efficiency R&D

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

Save ENERGY Now

Technology Delivery

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

Energy Efficiency R&D

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- ***Industry-specific R&D*** to address top priorities in America's most energy-intensive industries
  - Aluminum
  - Chemicals
  - Forest Products
  - Metal Casting
  - Steel
  - Information Technology and Data Centers
- ***Crosscutting R&D*** to develop technologies applicable to multiple industrial subsectors
  - Energy Intensive Process R&D
  - Industrial Materials
  - Sensors and Automation
  - Combustion
  - Fuel and Feedstock Flexibility
  - Industrial Distributed Generation
    - Advanced Reciprocating Engines
    - Clean Heat and Power (CHP)
  - Nanomanufacturing and other next-generation manufacturing

Technology Delivery Strategy

- Expand the use of proven technologies and practices
  - Plant energy assessments
  - Software tools and training
  - Plant certification (ANSI standard)
  - Technical resources and outreach
  - Incentives and recognition
  - Activities to address market barriers

- Foster strategic partnerships to expand investment, innovation, and outreach
  - Strengthen and maintain relationships with our stakeholders
  - Build collaborations across federal programs
- Promote industry-wide participation in the Save Energy Now Leaders initiative to meet the “25-in-10” goal

Highlights of New Initiative:

- Voluntarily pledge to reduce energy intensity by 25% by 2020
- 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 high-level recognition for participation and achievements

Meets EPAct 2005 requirement for voluntary industry commitments to reduce energy intensity (Section 106)

Industry Benefits:

- Reduces costs and saves money
- Enhances global competitiveness
- Helps companies respond to forthcoming carbon policies
- Eliminates waste and pollution
- Trains plant personnel in industrial energy efficiency
- Supports industry growth while reducing energy intensity

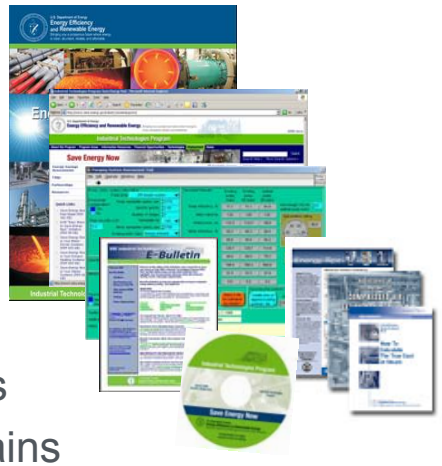
Company Commitment:

- Pledge to adopt a goal to reduce energy intensity 25% or more over 10 years. Requirements:
  - Establish an energy intensity baseline
  - Develop an energy management plan
  - Designate an energy leader/manager
- Take steps to reduce energy intensity and reduce carbon emissions
- Report energy intensity data and achievements annually to DOE

Pledge Agreement Form

DOE Commitment:

- Deliver customized resources and technical assistance
  - Work with a DOE account manager
  - Consult with an energy expert
- Priority access to plant assessments
- Technical resources & tools for energy analysis
- Training workshops
- National recognition for commitments and progress in achieving goals
- Materials to promote the voluntary agreements throughout supply chains



Save Energy Now LEADER

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Status:

- Launched 12/2 at the U.S. Capital
- Secured pledges from 32 companies

LEADER Companies

- 3M
- AT&T
- BPM, Inc.
- Bridgestone
- Briggs & Stratton
- Cummins, Inc.
- Danfoss
- Didion Milling
- The Dow Chemical Company
- Flambeau River Papers
- Honeywell
- Ingersoll Rand/Trane
- Intel
- JR Simplot
- Manitowoc Grey Iron Foundry
- Mohawk Industries
- Neenah Foundry
- Nissan North America
- Osram Sylvania
- Owens Corning
- PPG Industries
- Quad/Graphics, Inc.
- Schneider Electric
- Serious Materials
- Shaw Industries
- Sherwin-Williams,
- Spirax Sarco, Inc.
- Thilmany Papers
- ThyssenKrupp Waupaca
- United Technologies Corp.
- Verso Paper
- Volvo Trucks, Inc.

Save ENERGY Now ®

U.S. DEPARTMENT OF ENERGY LEADER INDUSTRY PARTNERSHIP

For more information:
Email SaveEnergyNow@ee.doe.gov
Contact Jeffrey Walker at 202-586-5059

President Obama signed this unprecedented effort into law on February 17, 2009:

- Jumpstarts our economy, creating or saving millions of jobs
- Puts a down payment on addressing long-term challenges, so our country can thrive in the 21st Century:
  - Modernizes our nation's infrastructure
  - Enhances energy independence
  - Expands educational opportunities
  - Preserves and improves affordable health care
  - Provides tax relief and protects those in greatest need

ITP Recovery Act Funding Projects

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Advanced Materials & Energy-Intensive Processes

- Advanced Materials RD&D: $25M
  Partner with industry to deploy emerging material technologies into the market.

- Energy-Intensive Process R&D: $25M
  - Initiate R&D projects chosen by merit review but not funded due to lack of program funding.

Funding: $50 million

Combined Heat & Power (CHP) and Industrial Equipment

Deployment projects in the following:

- Combined Heat and Power
- District Energy Systems
- Waste Energy Recovery
- Efficient Industrial Equipment

Funding: $156 million

Information & Communication Technology (ICT)

- R&D of innovative technologies to increase the energy efficiency of server-based ICT systems in data and telecommunications centers:
  - Projects that increase the efficiency of ICT equipment and software, power systems, and cooling systems
  - Demonstration and field test of pre-commercial ICT technologies as well as distributed generation or alternative power technologies used to power ICT systems

Funding: $50 million

Save Energy Now

Expand plant assessments, assistance, and partnerships

Funding: $10 million

Super Boiler Project Description

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What need is this project addressing?

- U.S. industrial and commercial steam boilers Consume over 6 quads of natural gas per year
- Wide range of steam uses from process steam to space heating
- Installed base of steam boilersLargely over 30 years old
- Average efficiency 76%
- Typical NOx emissions 85 ppmv
- Significant potential for improved technology

Replacement Boiler Technology for aging industrial boilers to achieve:

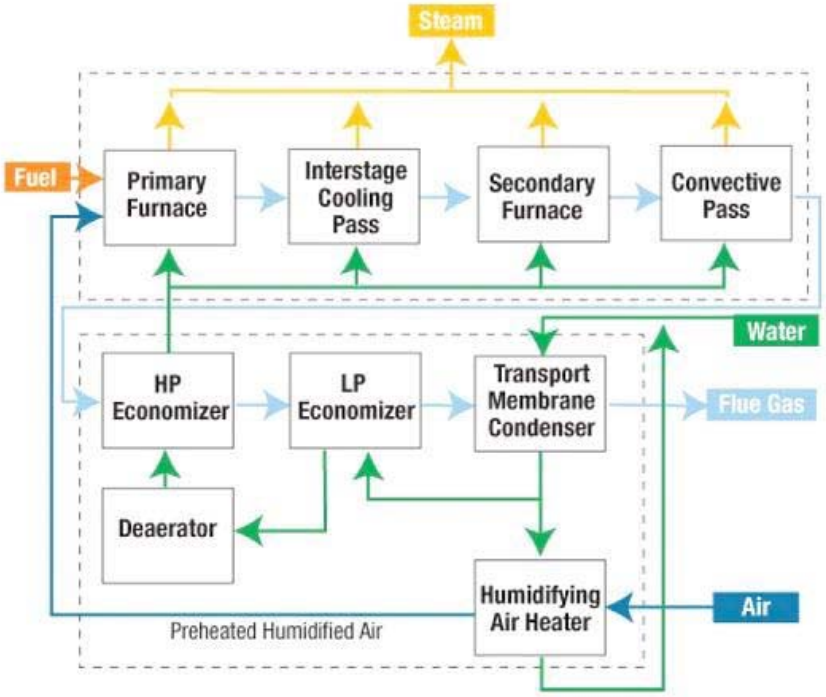
- 94 percent thermal efficiency
- Natural Gas Emissions Performance; <2 ppmv NOx, <2 ppmv CO, and <1 ppmv VOC
- 50% size and weight reduction

Super Boiler Technology Description

The super boiler incorporates several new energy saving technologies into a single design. The innovative design includes the following:

1) Two- stage fire tube design that is both compact and highly efficient
2) Transport membrane condenser (TMC)
3) Compact humidifying air heater (HAH)
4) Compact convective zones with intensive heat transfer
5) Staged/inter-cooled combustion system for ultra-low emissions

Super boiler functional diagram.



By 2020, this technology could

- Save over $1 billion a year in energy costs
- Dramatically cut NOx and greenhouse gas emissions

Super Boiler Status

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Status:

Data from demonstrations currently being collected:

- Specification Rubber Products Inc. (Alabaster Alabama): fabricated, installed, and tested a single-stage 300-HP boiler
- Clement Pappas & Company (Ontario, California): trained site personnel and transferred title to host site; fabricated, shoptested, permitted, installed, and site-tested two-stage system producing 10,000-12,000 lb/h of 150-psig saturated steam.

Designed, fabricated, and shop-tested a retrofit heat recovery system for 3rd site demonstration (Utah)

ITP's Combined Heat and Power (CHP) Program

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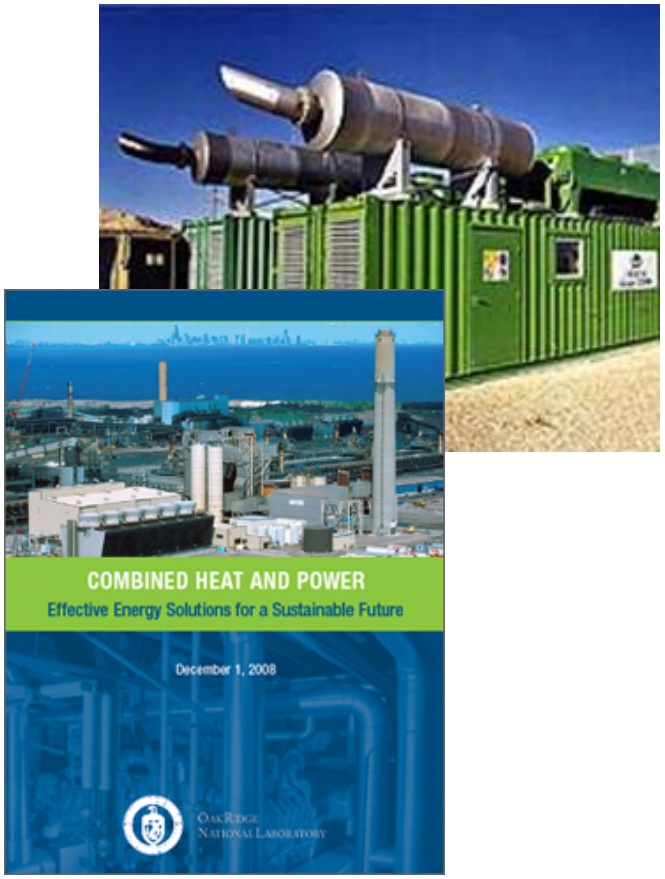
CHP is recognized as the best means to *simultaneously*

- 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

CHP - 20% of US Generating Capacity in 2030

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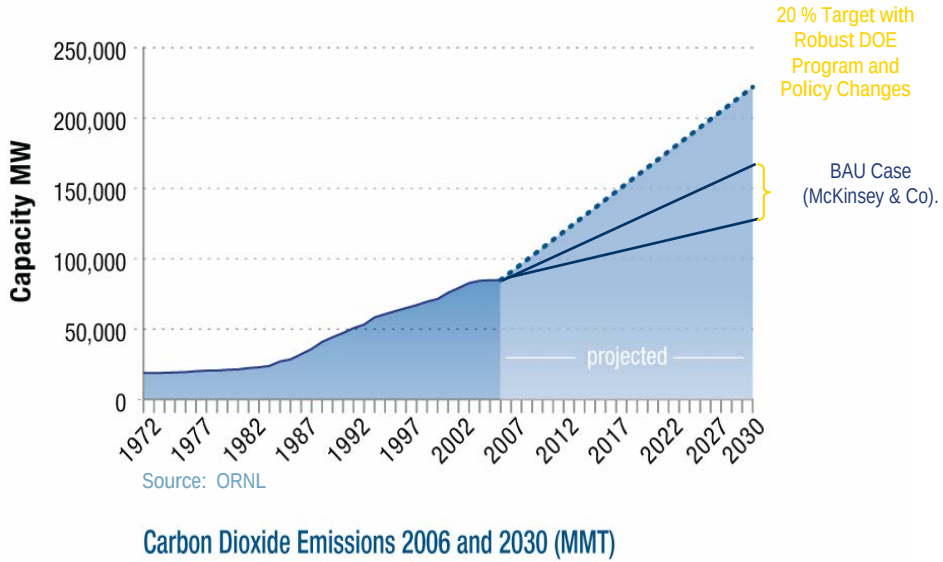
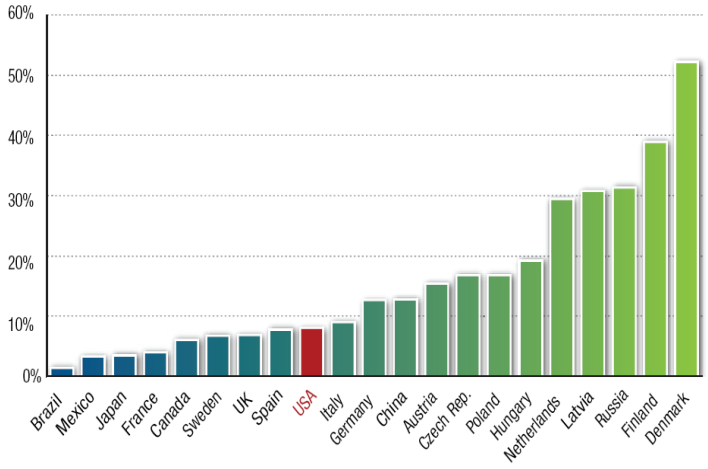
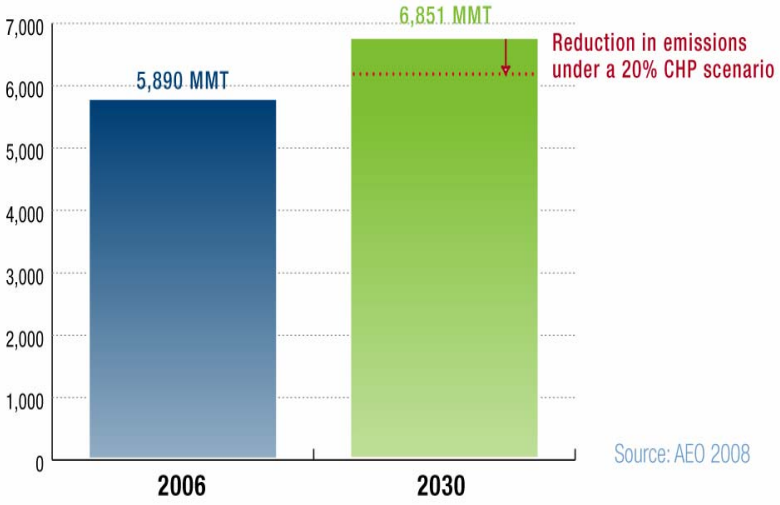
CHP	2006	2030 Target
Total Electricity Generating Capacity	85 GW (9% of current capacity)	240.9 GW (20% of projected capacity
Annual Energy Savings	1.9 Quads	5.3 Quads
Annual CO_2 Reduction	248 MMT	848 MMT
Number of Car Equivalents Taken Off Road	45 million	154 million



CHP in a Global Context – 20% Capacity Goal is Reachable



Carbon Dioxide Emissions 2006 and 2030 (MMT)



ITP's Combined Heat and Power (CHP) Program
Three Key Investment Areas

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1. Technology Research and Development

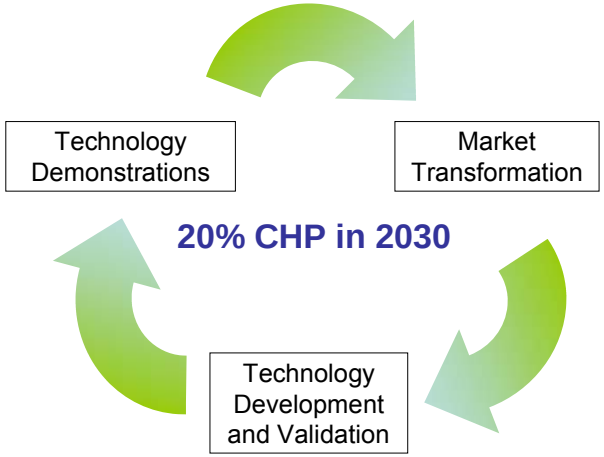
- *Alternative fuels and low-value waste heat*
- *Maximize utilization of waste streams in large industrial sector*
- *Small and mid-size systems for new markets*
- *Improve technical performance of CHP*
  - *Operating costs and installed costs*
  - *Efficiency*
  - *Reliability*
  - *Compliance with Emissions Regulations*

2. Technology Demonstrations

- *Innovative market applications*
- *Project development best practices*
- *Value to users, utilities and public*
- *Quantify CO2 reductions and energy savings*
- *Reduce technical risk*
- *Showcase systems*

3. Market Transformation

- *Targeted End-User Education and Outreach*
- *Coordination with Utilities on Technical and Regulatory Issues*
- *Regulatory/Policy Supportive Information and Analysis*
- *Accelerate the CHP Investment Decisions*
- *Demonstrate Role in GHG Reduction*



Accelerate the project develop/investment decision process and broaden range of users

RACs lead DOE's CHP outreach efforts and establish DOE RAC brand through coordinated planning and execution of regional specific activities

Clean Energy Application Centers

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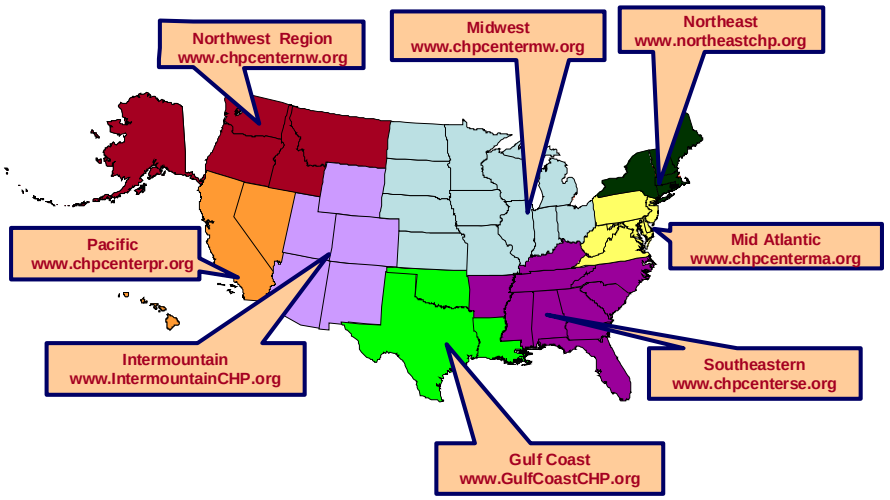
US DOE's Regional Centers to Lead Deployment and Market Transformation of CHP by:

- Educating regional players on benefits to reduce perceived risk
  - End-Users
  - Policy Makers
- Providing project specific support
- Providing feedback to DOE and industry regarding future R&D program needs

US DOE RAC Accomplishments

- End-User Education
  - Educated over 25,000 prospective end users and stakeholders
  - Coordinated over 120 workshops and 60 conference
- Information Development
  - 100 CHP project profiles
  - 67 technical papers
  - 37 market analyses
  - 14 action plans
  - 10 regional roadmaps
- RAC Websites
  - Over 5 Million Hits
  - More than 620,000 documents downloaded
    - Tools
    - Presentations
    - Application Guides

US DOE Clean Energy Application Centers



Questions????????