

Green House Gas Reduction through Cost-Effective Energy Efficiency In the Industrial Sector

Governor's Global Warming Task Force

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Session Agenda

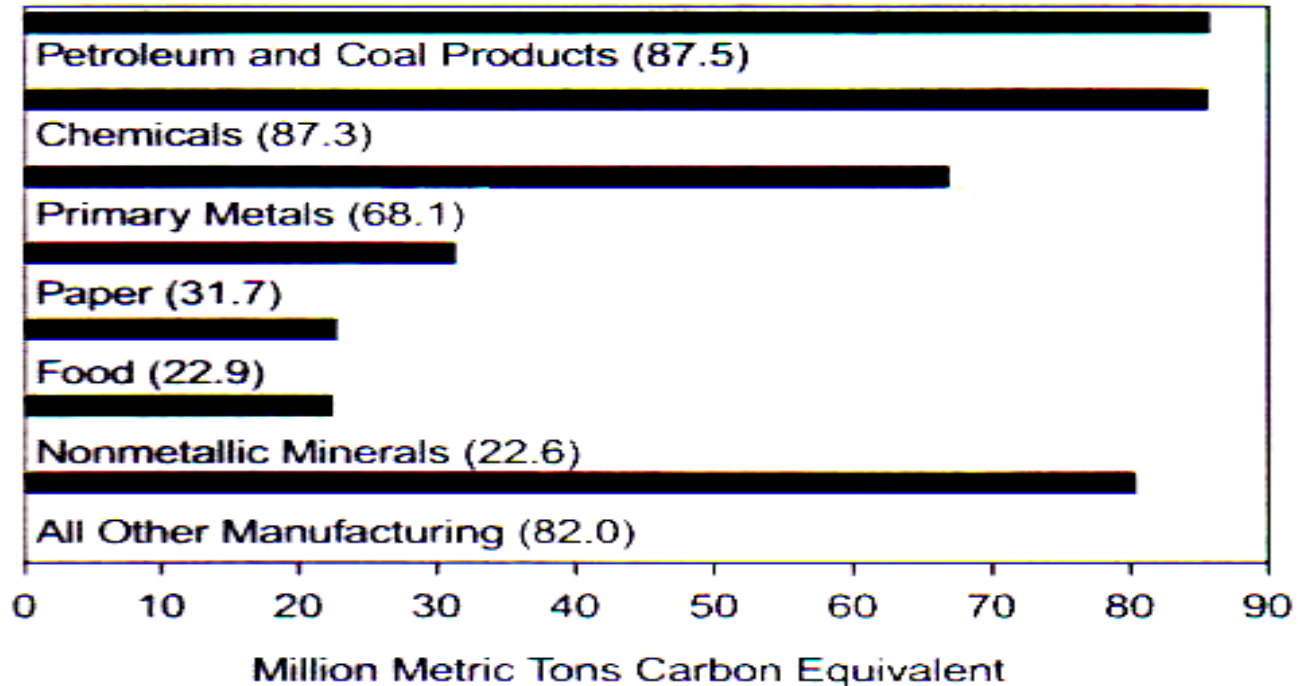
- **Speaker's Expertise and Perspective**
- **Opportunities**
- **Barriers**
- **Solutions for Industry**
- **Solutions to Accelerate Efficiency**

My Perspective

- **25 years promoting energy efficiency in commercial and industrial facilities**
- **Direct Wisconsin's Focus on Energy industrial program that provides project grants, study grants, technical support and educational tools to "tip" projects toward implementation**
- **During the last 6 years I have tried many approaches to maximize program energy savings**

Carbon Dioxide Emissions for Key Industries

**Total Energy-Related Carbon Dioxide Emissions
for Selected Manufacturing Industries, 1998**

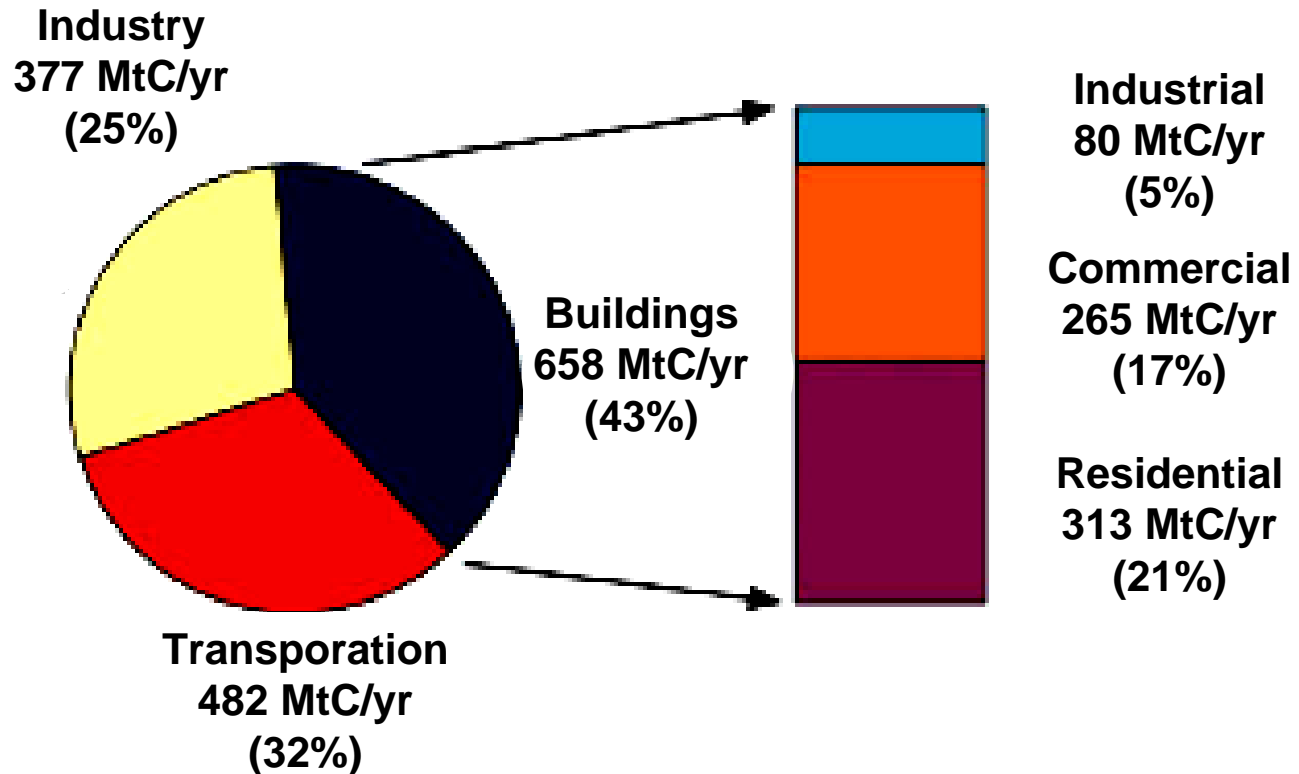


Source: Energy Information Administration, Form EIA-846, "1998 Manufacturing Energy Consumption Survey," and Form EIA-810, "Monthly Refinery Report" (1998).

Industrial Energy Use In Wisconsin

Energy Intensive Cluster	% Industrial kWh Use	% Potential kWh Savings	% Therms Use	% Potential Therm Savings
Paper	30	38	18	25
Food	13	13	18	24
Metalcasting	10	4	10	8
Plastics	5	7	10	9
TOTAL	58	62	56	66

Industrial Energy - 30% of Carbon

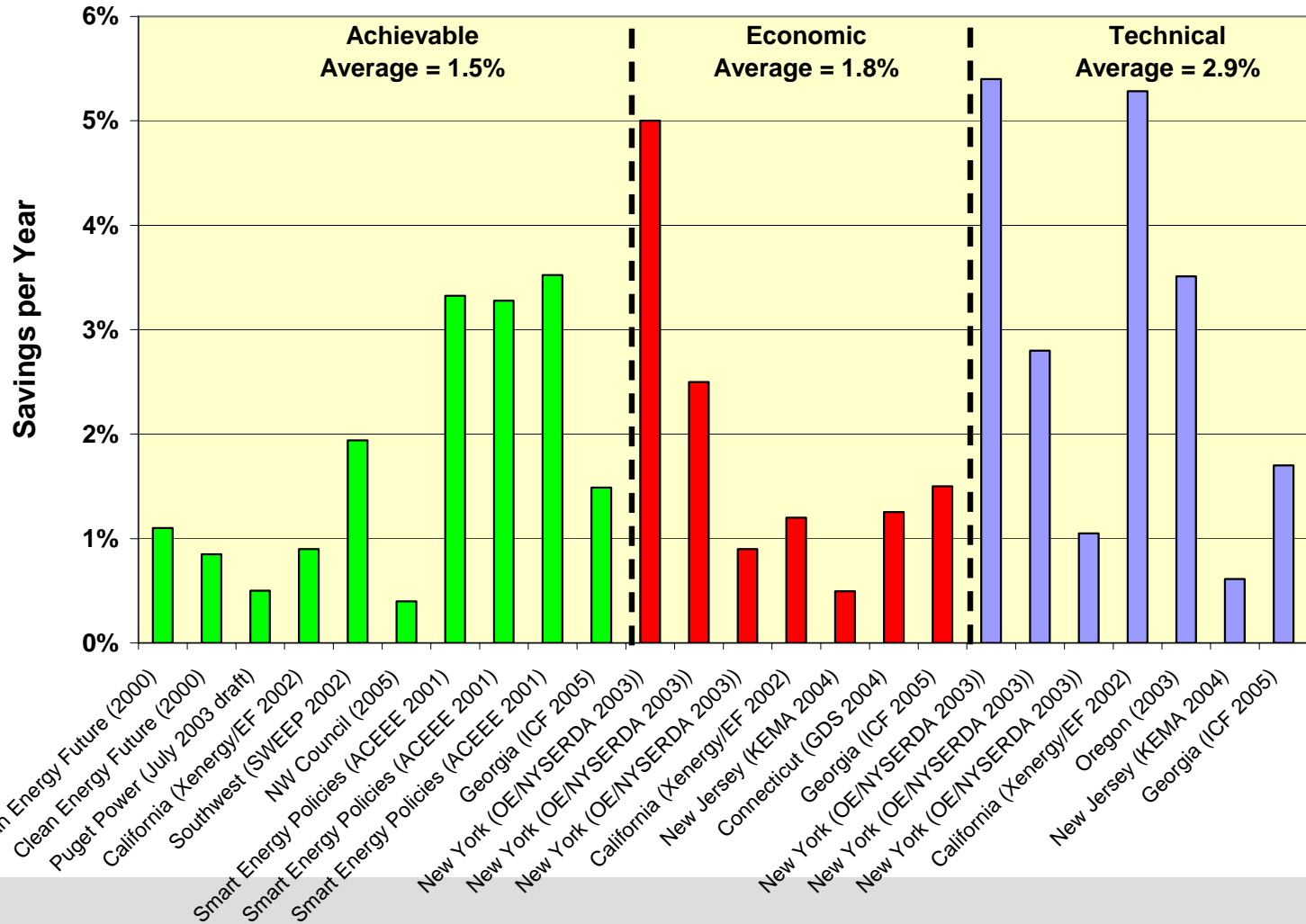


Tackling Climate Change, American Solar Energy Society, Charles F. Kutscher, January 2007

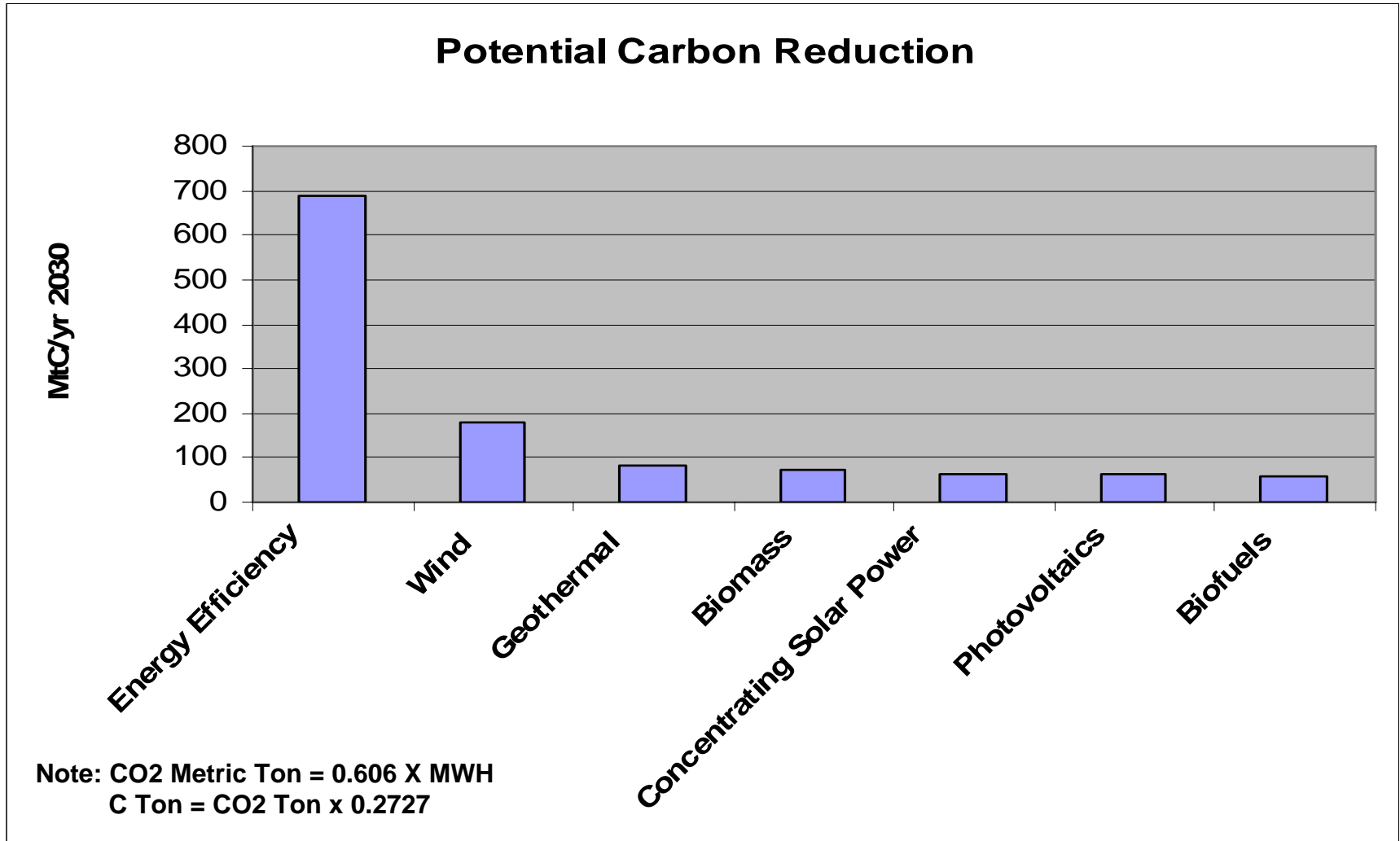
Significant Opportunities For Energy Efficiency

- Studies show significant economic potential for efficiency – 1 to 2% per year (above autonomous trend)
- Savings available in all sectors – manufacturing sector lowest cost resource opportunity
- Savings can be achieved quickly when needed – California reduced electricity by 6.5% in 2001

Industrial Potential Estimates



Cost Effective Carbon Reduction Potential



Efficiency Can Keep Carbon Emissions Level through 2030

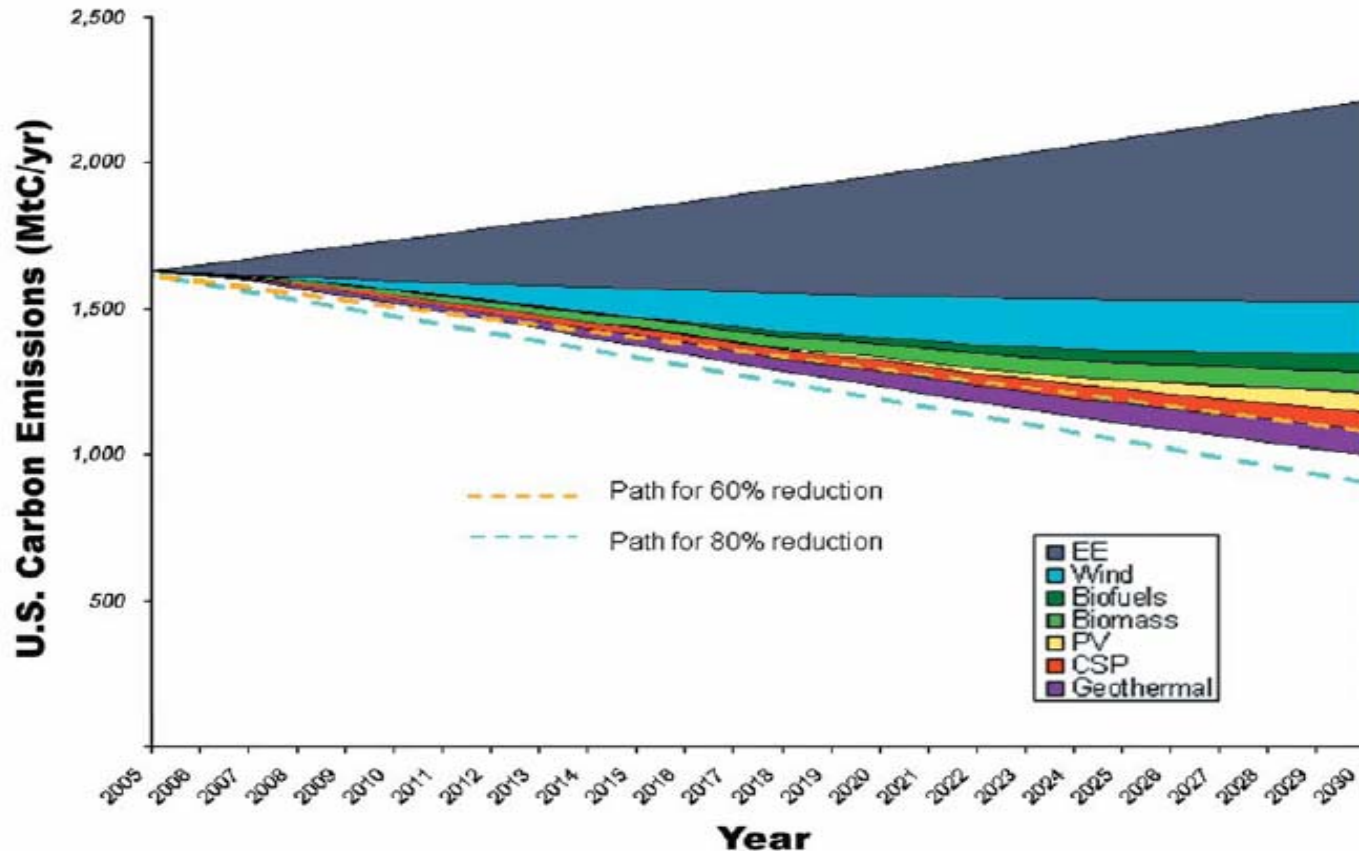


Figure 2. Potential carbon reductions in 2030 from energy efficiency and renewable technologies and paths to achieve reductions of 60% and 80% below today's emissions value by 2050.

Barriers

Increasing Industrial Efficiency

- ROI is sometimes too small (> 1 year or >2 years)
- Energy is small part of overall costs and not seen as core business
- Limited time to focus on energy
- May not trust energy savings will actually occur
- Energy costs are paid out of operation budget, not linked to capital budget (very key barrier)
- No commitment from upper management
- Company culture does not support efficiency investments

Primary Efficiency Solutions

- **Best Practices on Common Systems**
 - Steam Systems (>80% of gas use for most facilities)
 - Compressed Air Systems (10% of electric)
 - Pumping Systems (15% of electric)
 - Lighting Systems (8% of electric)
 - Process Heat (can be large use)
- **Emerging Technologies**
 - Drying/Separation
 - Process Heating/Melting
 - Gasification
 - New Motor Technologies
 - Combined Heat and Power (CHP)

Efficiency Solution Examples

■ Best Practice Examples

- Steam Systems - 10 to 20% savings from failed steam traps, blowdown heat recovery, linkage-less burner controls, stack economizers
- Compressed Air Systems - 10 to 50% savings from repairing leaks, centralized control, reduce pressure, variable speed controls
- Pumping Systems – up to 40% savings from using variable speed controls instead of valves
- Lighting Systems – up to 50% savings from using high bay fluorescent fixtures
- Process Heating – up to 80% savings from recovering waste heat. This is a significant opportunity in some industries.

Best Practice Story – Mercury Marine

■ Centralized compressed air system

- 9.2 million kWh saved
- 1.1 MW
- 135,000 therms
- 6,900 tons CO2

- \$1,850,000 project cost
- \$541,000 energy savings
- \$60,000 water savings
- \$100,000 inventory savings
- \$60,000 Focus grant



■ **2.6 year payback**

Efficiency Solution Examples

- **Emerging Technology Examples**
 - **Drying/Separation**
 - Membrane Technology (up to 55% savings)
 - **Process Heating/Melting**
 - Stack melters (up to 40% savings)
 - **Gasification (up to 100% savings)**
 - Pulp and Paper, Petroleum Refineries
 - **New Motor/Control Technologies (up to 60% savings)**
 - **Combined Heat and Power (CHP) or Cogeneration (very large potential savings)**

Emerging Technology Story – Nestle USA

■ Condensing stack economizer

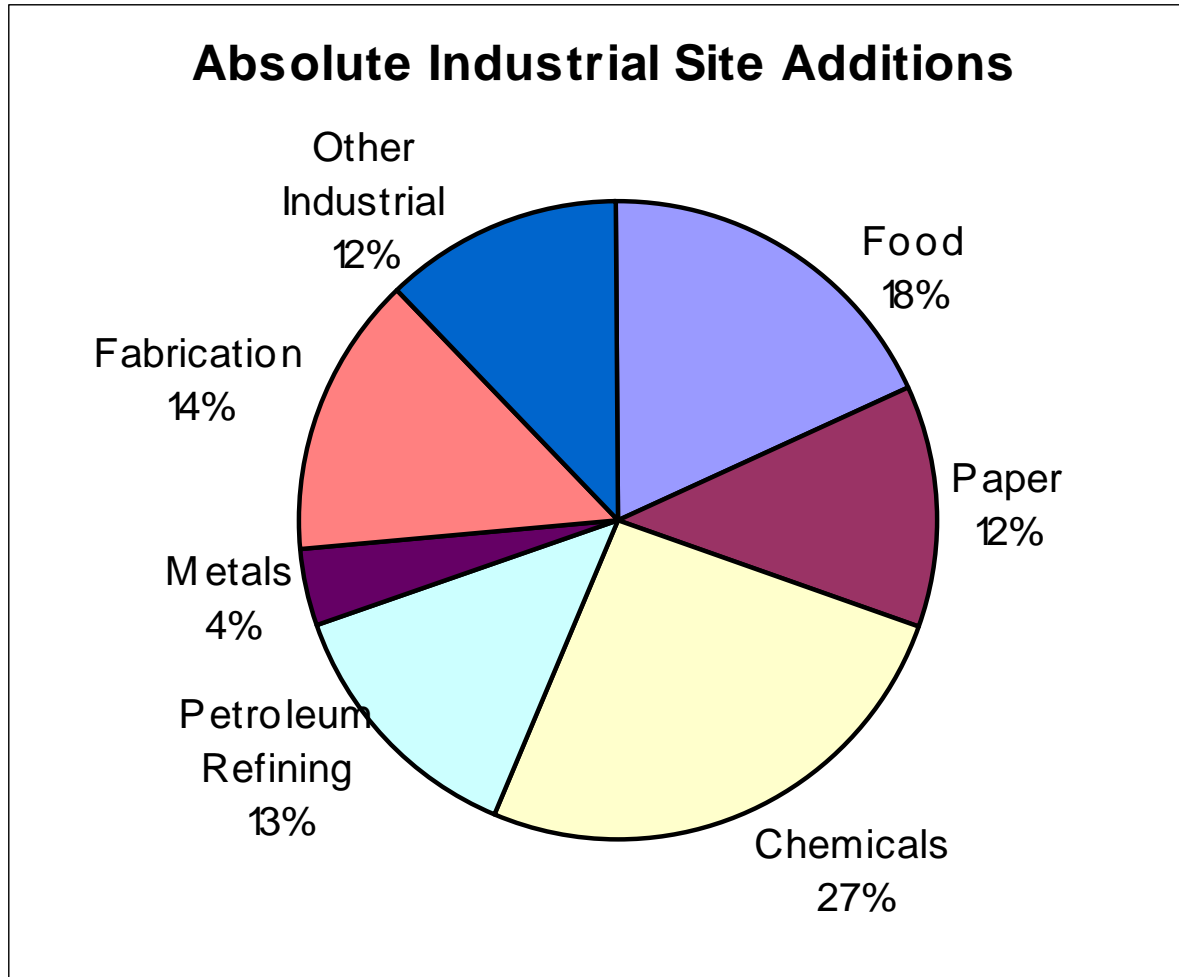
- 142,000 therms
- 826 tons CO2
- \$340,000 project cost
- \$111,000 energy savings
- \$40,400 Focus grant
- **2.7 year payback**



Combined Heat and Power (CHP)

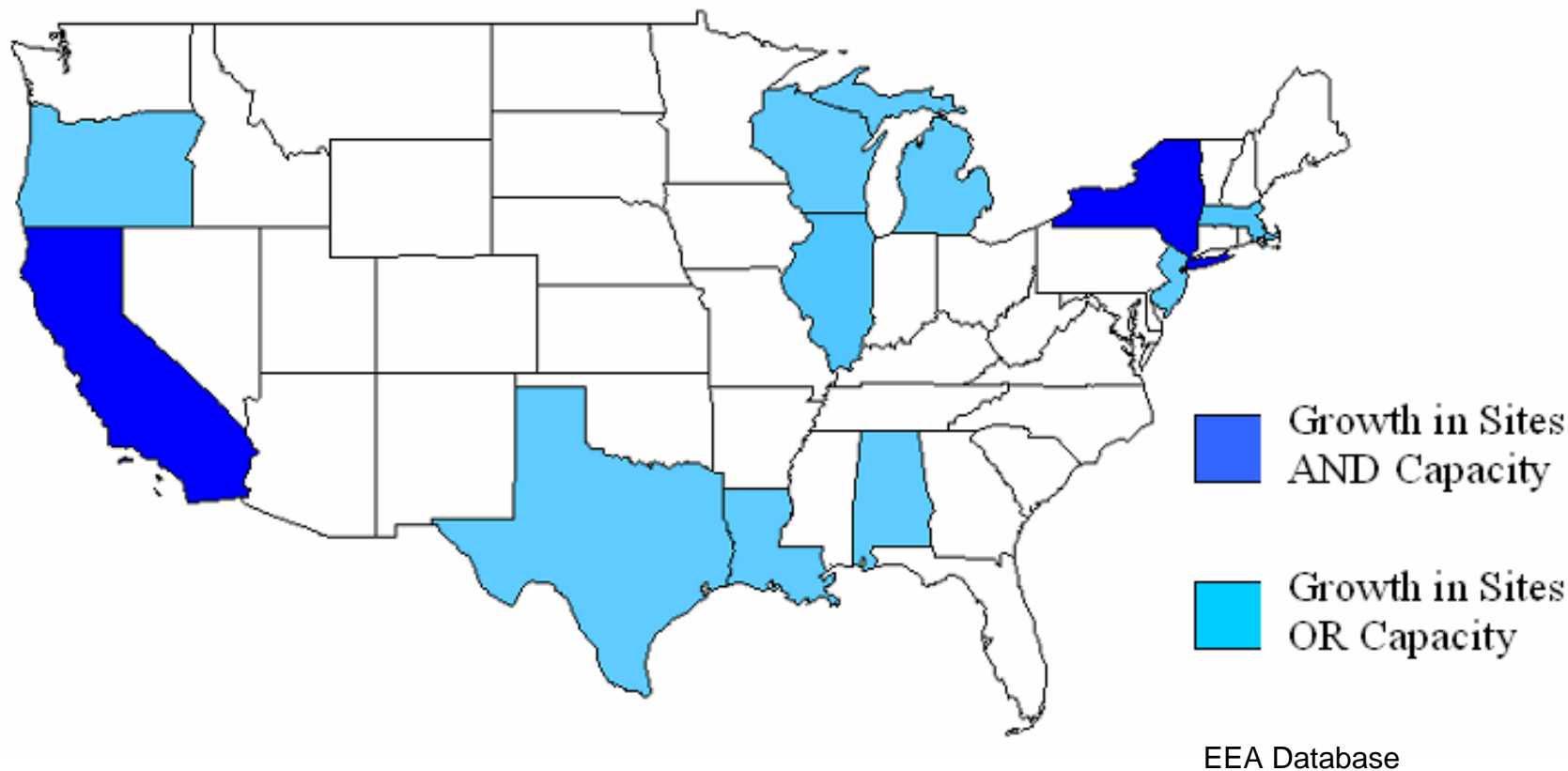
- **Produces both power and usable heat**
- **Typical power generation is 35% efficient while CHP can be 70%**
- **One of the largest industrial efficiency opportunities**
- **Is distributed within the electric grid so reduces transmission requirements**
- **80,000 MW of industrial capacity today**

Absolute Industrial CHP Additions from 2000-2005 (17,082 MW)

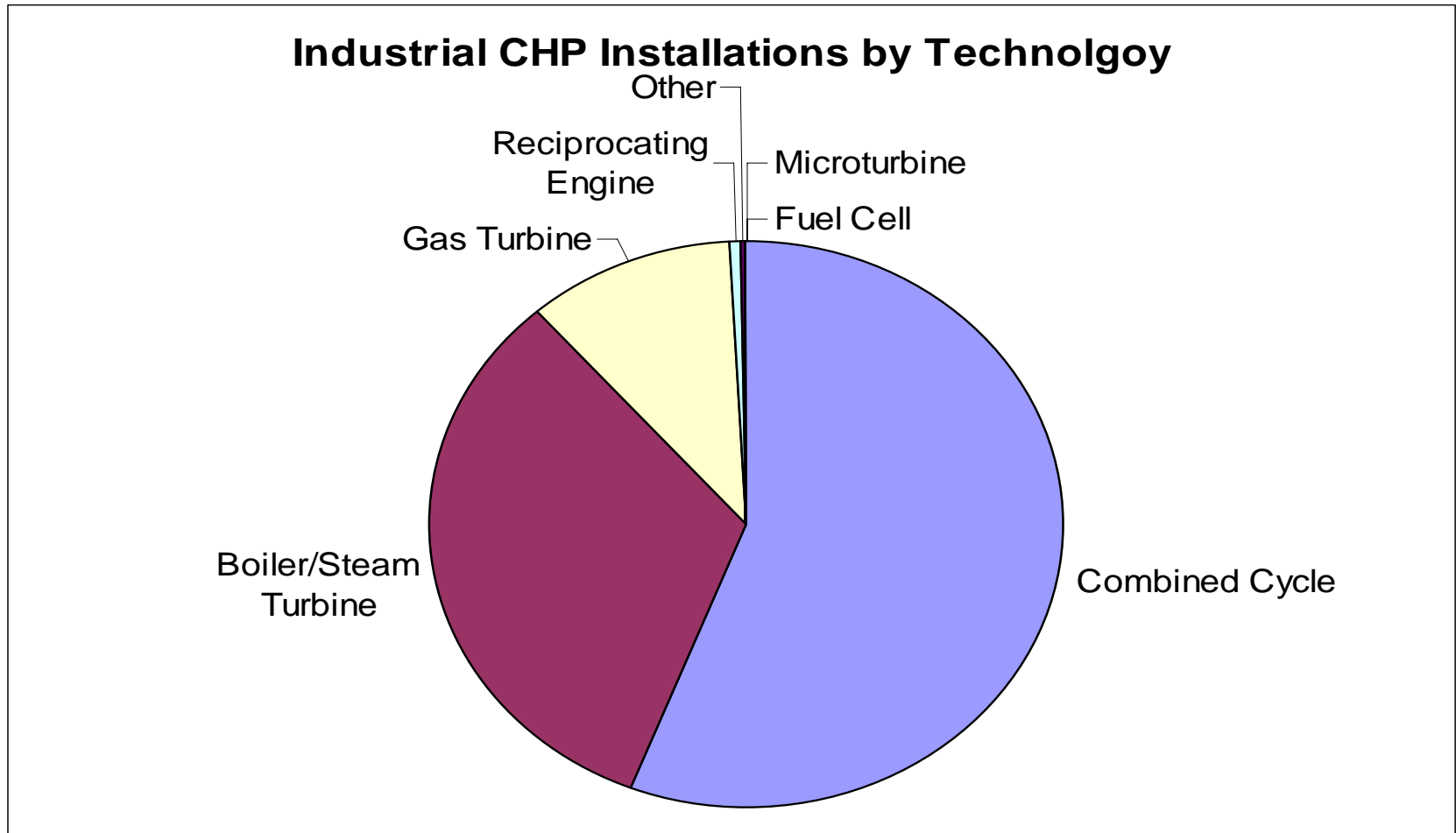


EEA Database

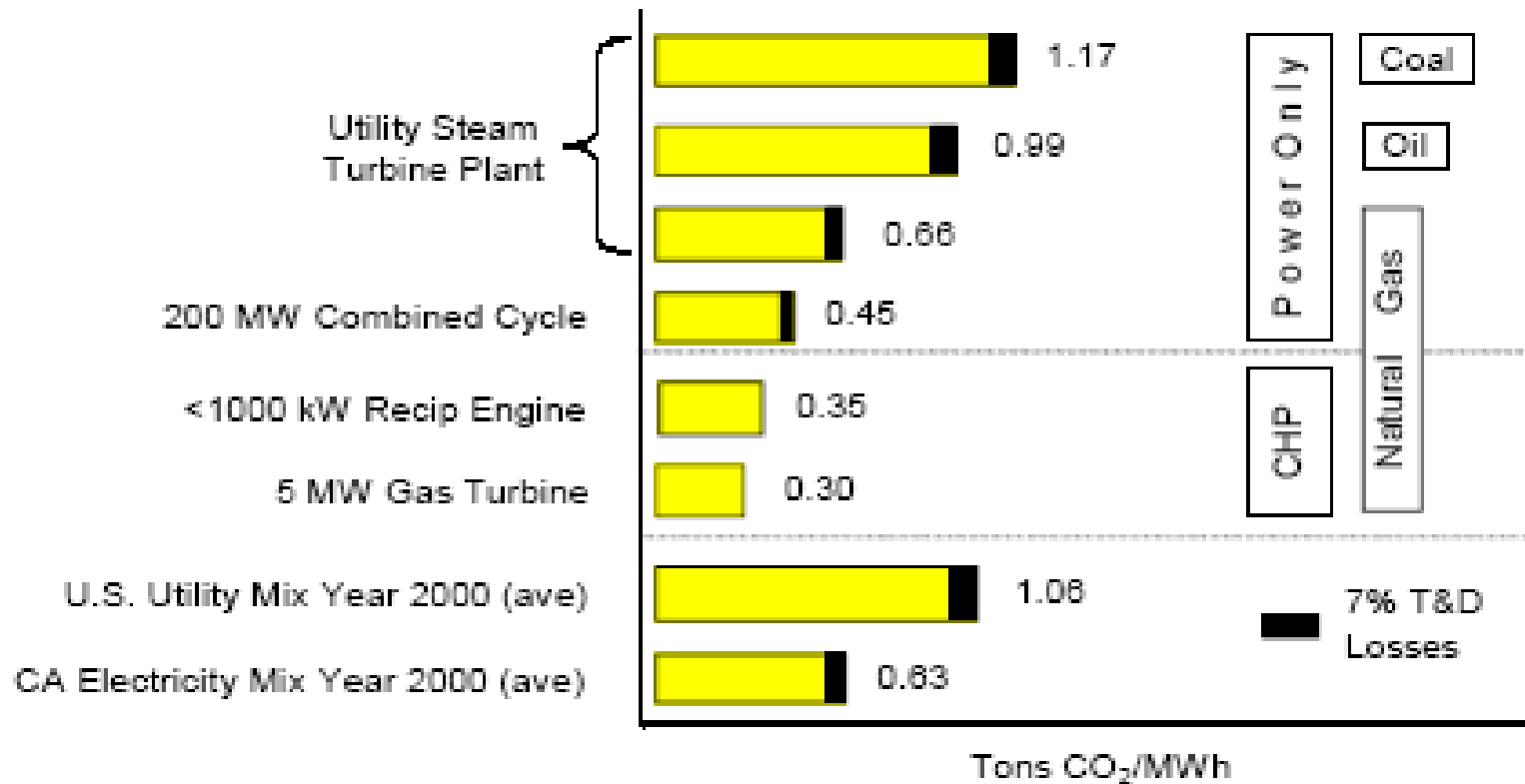
Large CHP Growth States for Sites and Capacity from 2000 to 2005



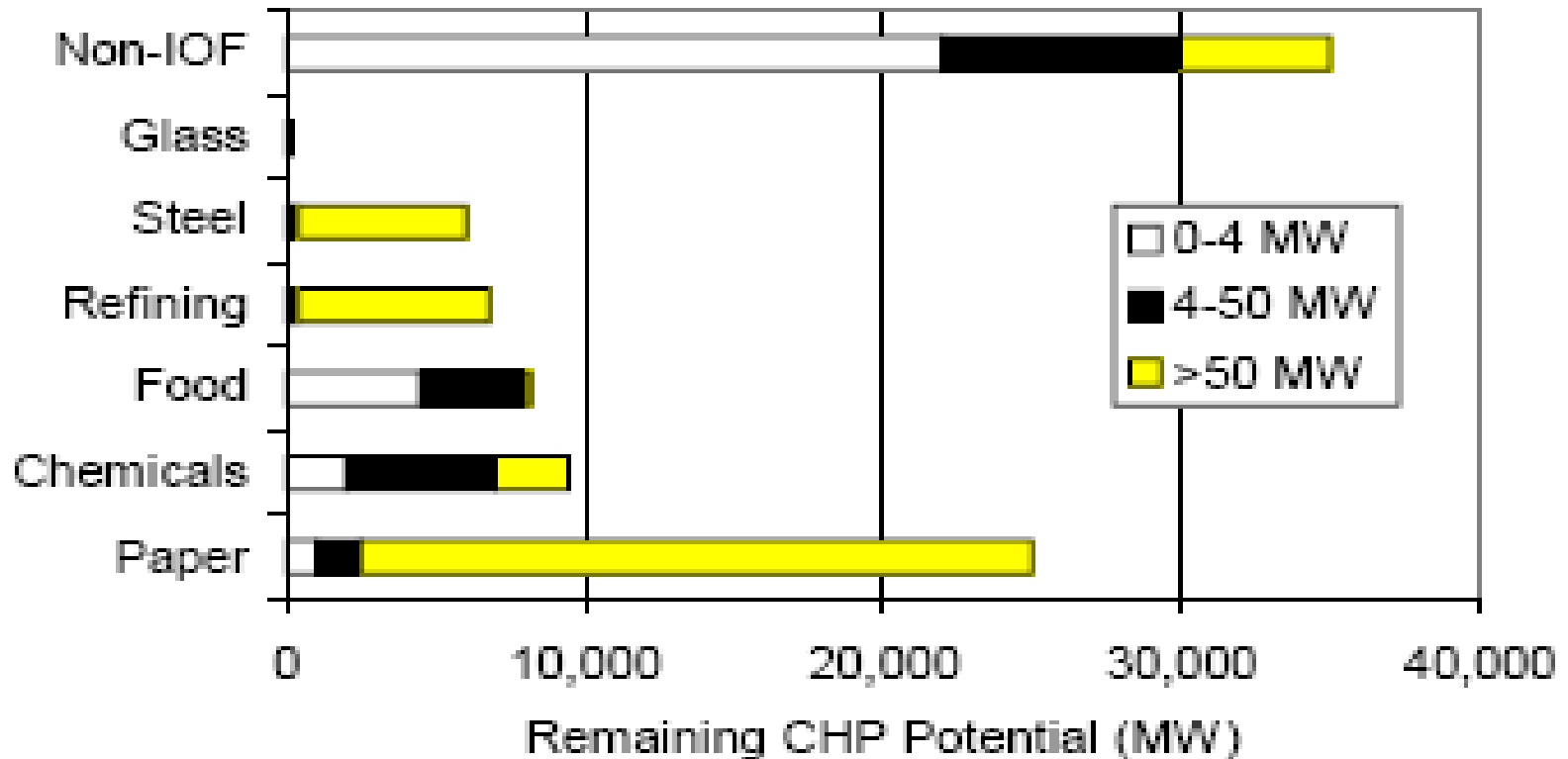
CHP Installations by Technology



Emission Reduction with CHP



Potential of CHP



CHP Benefits and Barriers

■ Key Benefits:

- 100% more efficient than conventional power
- Greatly reduces CO2 emissions per energy output
- Because it is distributed it reduces electric grid transmission costs

■ Key Barriers:

- ROI is sometimes too small (payback 2 to 8 years)
- Regulations do not provide incentive for industries to invest nor utilities to support CHP
- Benefit of reduced transmission costs is not included in economics of project
- Higher risk to capital with possible fuel price fluctuations and customer load collapse

Efficiency Benefits for Industrial Facility and Community

■ Key Facility Benefits:

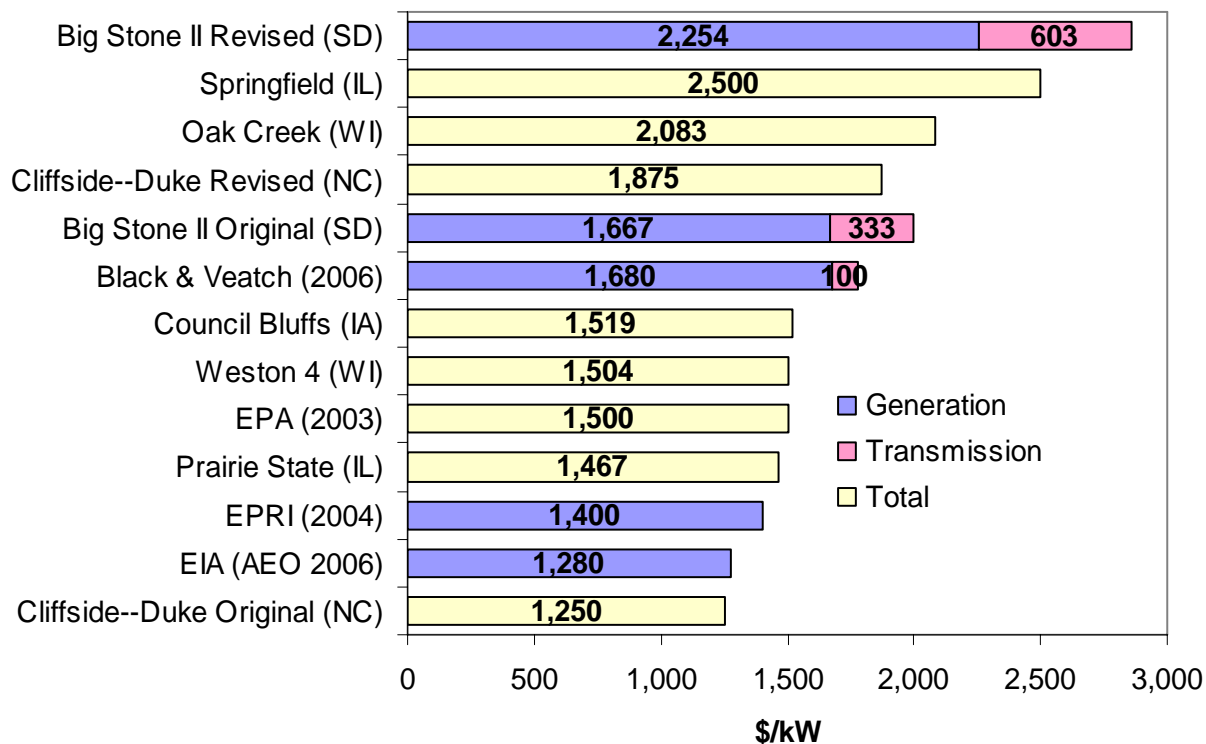
- ROI of 50% and greater on most Best Practices
- Usually other benefits such as increased production or quality
- Better competitive position

■ Key Community Benefits:

- Jobs maintained with reduced costs per unit produced
- Reduced CO₂ and other air emissions
- Reduced need to pay for new power plants and reduced pressure on fuel supplies/prices for the future

Capital Costs for New Coal Power Plants

New pulverized coal capital costs



Source: American Council for Energy Efficient Economy (ACEEE)

Solutions for Accelerating Efficiency

- **Financial Incentives**
 - **Efficiency programs that provide incentives at less than \$500/kW to link the economic benefit of reduced power plant construction at >\$2,000/kW**
 - **Loan programs that link the operating budget and capital budget with positive cash flow**

Solutions for Accelerating Efficiency

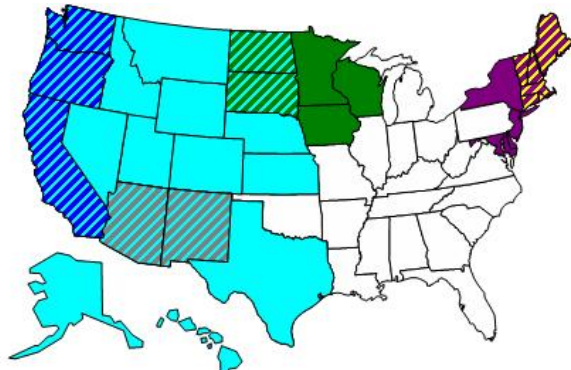
- **Direct Technical Support**
 - **Technical support to ensure understanding of opportunities. Training/tools on sustainable energy management programs and plans for companies to set goals at increasing efficiency 3 to 10% each year**
 - **Creating and facilitation of energy teams**
 - **Benchmarking similar industrial facilities**
 - **Education using proven case studies, particularly with emerging technologies**

Solutions for Accelerating Efficiency

- **Other Solutions**
 - **Integrated efficiency and demand response programs**
 - **Portfolio standards for efficiency to meet X% of load growth (many other states).**
 - **Step rate changes with baseline. Last 10% of use is charged at much higher amount being done at BC Hydro.**

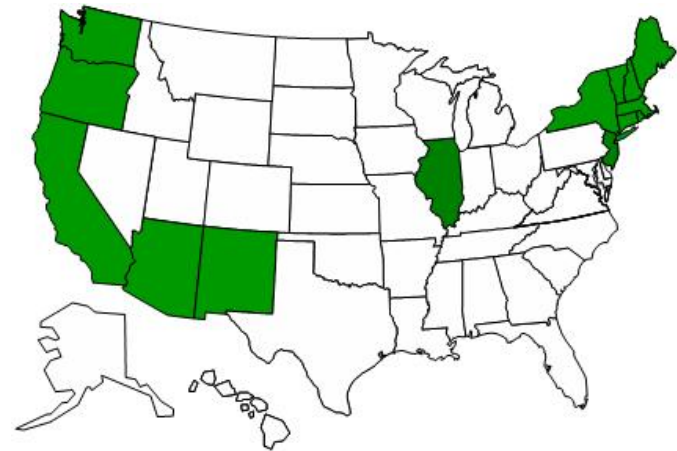
Policy response – state and regional

Regional initiatives

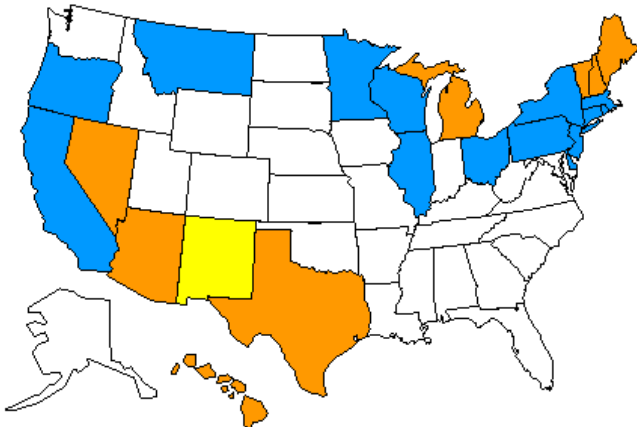


- West Coast Governors' Initiative
- Powering the Plains
- NEG-ECP
- Southwest Climate Change Initiative
- WGA
- RGGI

State global warming reduction targets

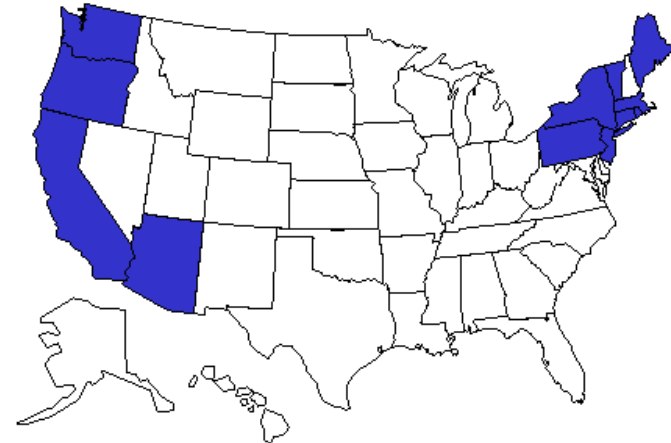


Public benefits funds



- Funds that Support Energy Efficiency and Renewable Energy
- Funds that Support Energy Efficiency
- Funds in Development

Motor vehicle emission standards



- States Poised to Follow California's GHG Emissions Standards for Vehicles

Source: Pew Center on Global Climate Change.

Contact Information

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