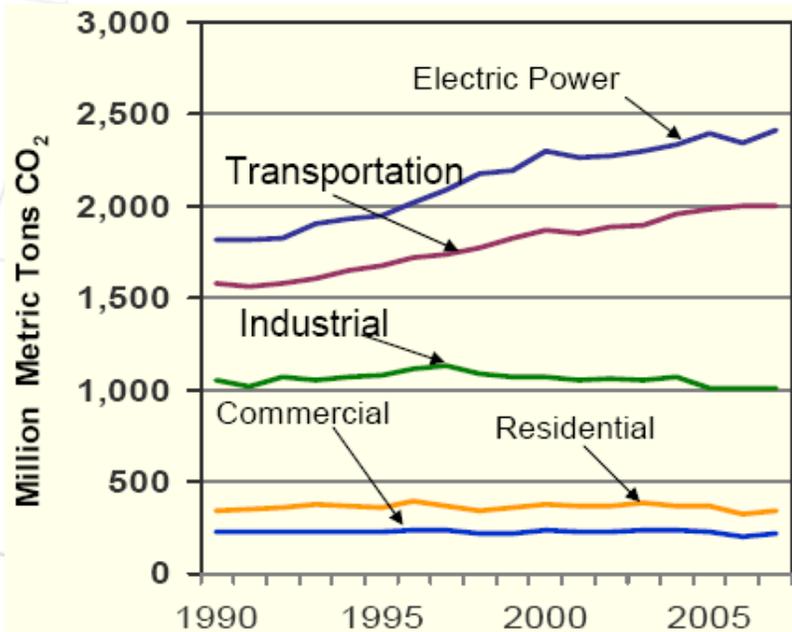


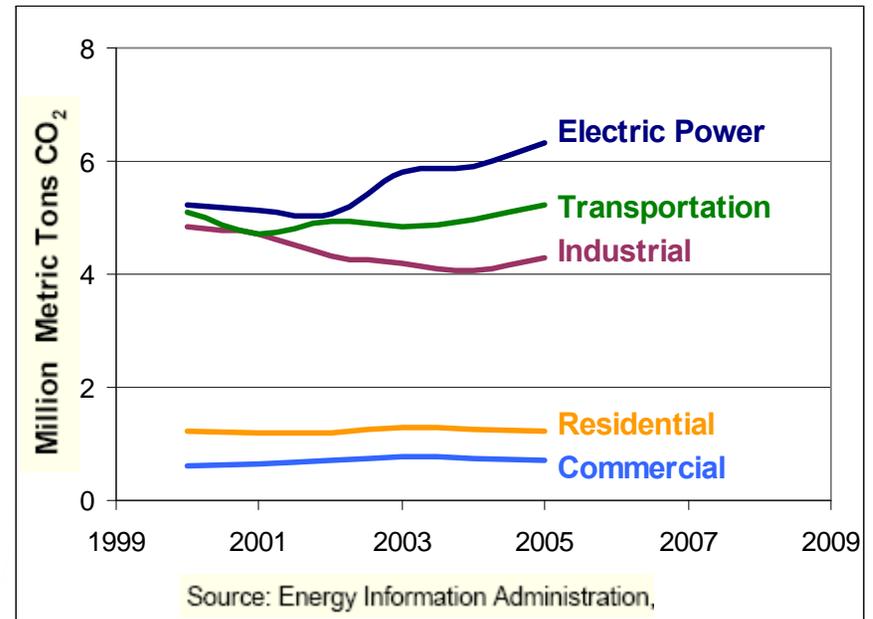
CO₂ Emissions in the US and in Delaware

US



Source: Energy Information Administration, preliminary estimate for 2007.

Delaware

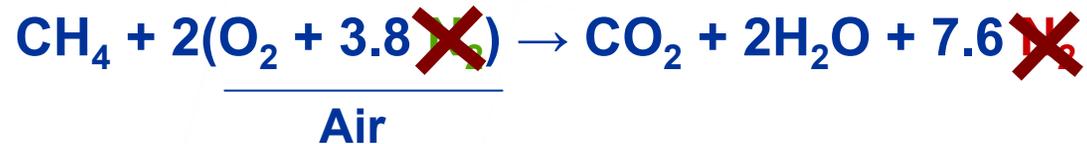


Source: Energy Information Administration,

Electric Power Generation is the biggest contributor of CO₂ emissions

Oxy-combustion for CO₂ Capture

Air Combustion:



Pollution:

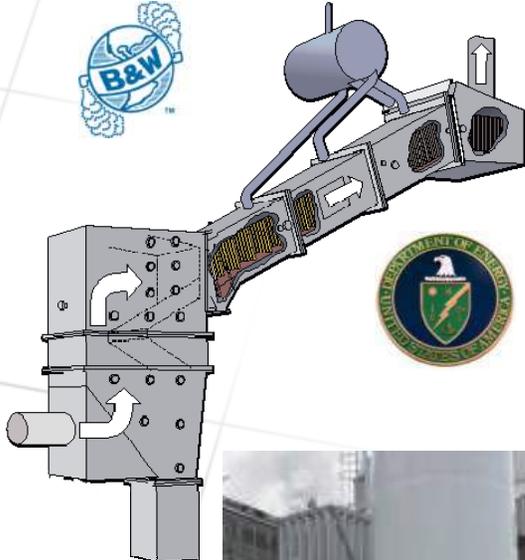


- Eliminating N₂ from air during combustion produces flue gas concentrated with CO₂
- Oxy-combustion decreases NO_x emissions

Oxy-Combustion for Coal-based Power Generation

2003-2004

1.5MW_{th} pilot-scale tests



2005-2007

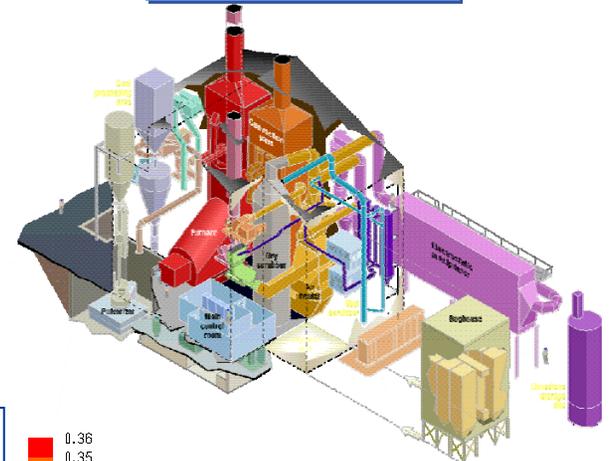
Engineering & economic studies*



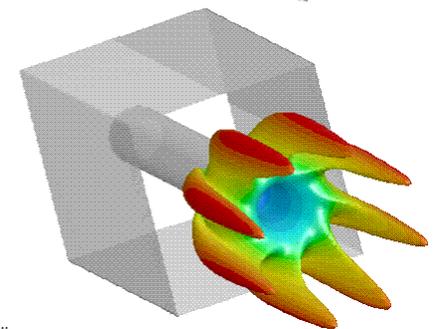
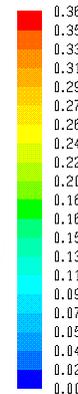
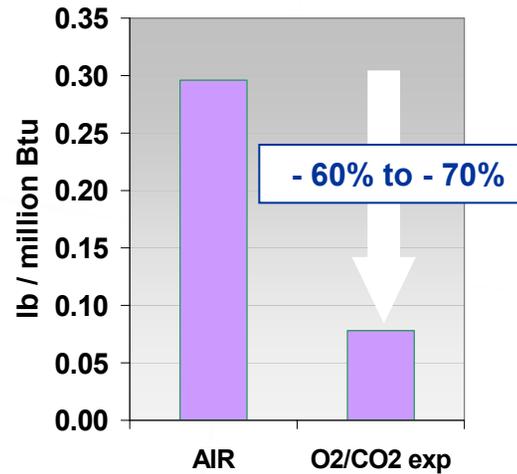
BURN OHIO COAL

2007-2008

Near-commercial scale burner tests (30 MW)



NO_x emissions



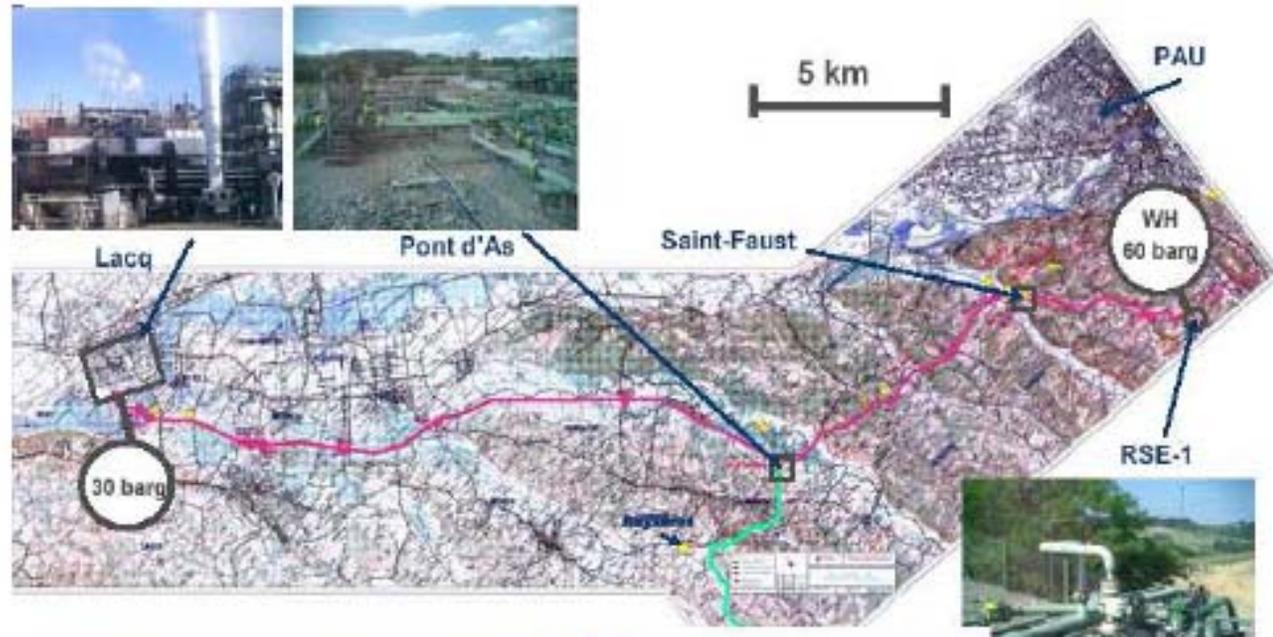
* DOE/NETL-2007/1291

Near commercial scale burner tests: 30MW_{th}

- Largest demonstration of coal oxy-combustion to-date
- Near commercial scale burners tested
- 3 coals tested successfully
- Safe and smooth transition to oxy and back



Oxy-combustion of Heavy Oil and Gas



- The first integrated oxy-combustion CCS chain: from capture to underground injection.
- Retrofitting of an existing boiler.
- 32 MWth, gas and oil.
- Commissioning end 2008.
- Injection of 150 kt CO₂ in a depleted gas reservoir in 2 years.



Oxy-burner design test rig

The Path Forward: Oxy-coal

● Priority area for DOE

● Restructured FutureGen

- Commercial deployment of clean-coal power generation
- \$290 million in FY-09
- \$1.01 billion over subsequent years

● CO₂ Sequestration

- 7 Regional Sequestration Partnerships
- Large-scale projects across the US
- \$390 million

● Commercial-scale Clean Coal Power Demonstration

● 100 MWe utility

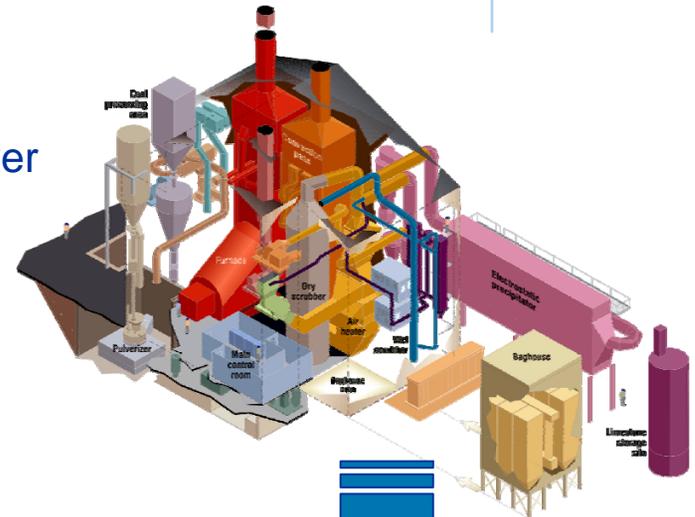
- 2500+ tons/day O₂ supply & CO₂ production
- 1 million tons/year CO₂ storage potential

● Target online – before 2015

- ~4 yrs – construction
- 2 to 5 yrs - operation

● Capital intensive

- ~\$300 Million incremental cost
- Funding required for demonstrations, first adopters



Path forward: CO₂ Sequestration

● Geological studies

- How does CO₂ interact with geological formations?
- Can other impurities be sequestered with CO₂ (e.g. SO₂, NO_x)?

● Government Policy

● CO₂ Regulation

- Tax or credit?
- Price of CO₂ to enable commercialization of CO₂ capture

● Long-term CO₂ sequestration

- Govt. role in risk-mitigation

The Path Forward: CO₂ Capture

● Demonstration of CO₂ Capture from Industrial Processes

● Technology applicable to:

- Multiple fuels
 - Solid, liquid and gaseous
- Multiple processes
 - Cement
 - Aluminum
 - Glass
 - Steel
 - Refineries
 - Etc.



Benefits to the State of Delaware

- **Leadership in technology to address climate change issues**
 - **Attract new businesses**
 - **Increase employment in high-tech fields**
- **Gain an edge in a carbon credits/trading environment**



Thank you