Future Opportunities for Coal Power

Science, Regulations, & Technology
Energy Crisis!

Bush has got to do something about the energy crisis!

... just no oil or gas drilling... that would destroy the wilderness!

Increased coal use would cause massive global warming!

... and nuclear power would melt the earth down!!

Well!...

We're waiting...
Comparing U.S. Energy Reserves

Abundant Resources Relate to Stable Prices

Source: EIA, 2000
Coal’s Stable Pricing Makes it Ideal for Generation

Delivered Fuel Cost – U.S.

Source: EIA Electric Power Monthly, February 2003
Fuel Cost

- Coal $1.34 mmbtu
- Natural Gas $5.50 mmbtu
- Oil $5.84 mmbtu

Average electric cost in the state is $0.069/kwh – 6% below the national average.
Louisiana Electric Generation Mix

- Natural Gas: 45%
- Coal-based: 26%
- Nuclear: 18%
- Renewable: 4%
- Oil: 3%
Increasingly Clean Power

Source: U.S. Environmental Protection Agency and Department of Energy, 2002
2003 Average State Coal Fired SO2 Emission Rates

Source: EPA 2003 CEMS Data
2003 Average State Coal Fired NOx Emission Rates

Source: EPA 2003 CEMS Data
Regional Transport Rule

Clean Air Interstate Rule to Address SO/NOx Emissions for Fine PM NAAQS and Regional Haze Final Utility Mercury Rule
Further Reductions Required by Texas by 2015:
SO$_2$ - 70% reduction
NO$_x$ - 65% reduction
Clean Air Interstate Rule

- **NOx**
  - 68,498 tons 2003
  - 39,444 tons 2015

- **SO2**
  - 119,930 tons 2003
  - 41,976 tons 2015
Proposed Utility Mercury Reduction Rule

- **MACT** - Up to 90% reduction by 2008
  - Facility specific control

- **Cap & Trade** - 70% reduction by 2018
  - Market-based approach
  - Reduce from current 48 tons to 15 tons
  - Estimated to save consumers $8 Billion - 2020
Foreign Contribution

- **Fact:** Wildfires, prescribed burns, and crop burning alone emit some 800 tons of mercury each year globally – National Center for Atmospheric Research

- **Fact:** 50% of the mercury found in the U.S. is from foreign sources – U.S. EPA

- **Fact:** The world’s oceans contain millions of tons of mercury which impacts the mercury in the atmosphere – National Center for Atmospheric Research
Sources of Mercury

Emissions of mercury from U.S. coal-fired power plants are small compared to global emissions sources:

- Only 1% of total world emissions comes from U.S. power plants
- 2% U.S. man-made, non-power plant sources
- 42% non-U.S. man-made sources
- 16% natural sources (biomass burning)
- 39% natural sources (oceans and volcanoes)
Global Mercury Deposition in the U.S.

Percent of mercury deposition that originates outside of the U.S.

Source: EPRI
“Given the current scientific understanding of the environmental fate and transport of this element, it is not possible to quantify how much of the methylmercury in fish consumed by the U.S. population is contributed by U.S. emissions relative to other sources of Hg (such as natural sources and reemissions from the global pool).” – EPA proposed rule
Local Deposition

- **Facts:** Only 4 – 7% of mercury is deposited locally, according to research by the Brookhaven National Laboratory.

- “Only a small percentage of the mercury would be deposited nearby as particles fall to earth, while the vast majority drifts to greater distances in the atmosphere.” Hans Friedli, National Center for Atmospheric Research.
Louisiana’s Mercury Emissions

- **Fact:** Coal-based power plants in Louisiana emit less than half a ton of mercury – U.S. EPA

- **Fact:** This equates to less than 0.01 of 1% of the total global mercury emissions – U.S. EPA

- **Fact:** Louisiana coal-fueled power plants emit 265 lbs. of oxidized mercury, with the remaining 740 lbs. in an elemental form – U.S. EPA
Health Concerns

Fact: The national Health and Nutrition Survey, which measured actual mercury levels in women and children did not find anyone approaching the lowest level that would have been associated with any measurable health effect due to mercury – U.S. Center for Disease Control

“People consume far higher levels of PCBs and other persistent environmental chemicals in other foods, including beef, poultry, and dairy products.” - National Academy of Science
Benefits of Fish

The American Heart Association predicts about 250,000 people die from sudden heart attacks each year. If 40 percent of these people ate more fish, which contains the beneficial omega fatty acids, 100,000 people would increase their odds of avoiding sudden death. Scaring the public away from eating fish can in itself be a health concern.
**Hypothetical Example**

- Houston Astrodome filled with 30 billion ping-pong balls
- 30 green “mercury” balls
- Find and remove 27 green balls for 90% Hg capture

EPA has said “So, is technology capable of getting a 90-percent reduction of mercury from coal-fired power plants in the near future?”

EPA’s answer is NO!
Fact: The estimated cost of removing mercury from a power plant is $70,000 per pound – U.S. EPA

Fact: A Tennessee Valley Authority study compared the cost of removing mercury versus other emissions:

- Sulfur Dioxide $200 a ton
- Nitrogen Oxide $2,000 a ton
- Mercury $200,000,000 a ton
One billion dollar, 10-year demonstration project to create world’s first coal-based, zero-emission electricity and hydrogen plant

President Bush, February 27, 2003
IGCC Technology in Early Commercialization

U.S. Plants in CCT Program

- **Wabash River**
  - 1996 Powerplant of Year Award*
  - Achieved 95% availability

- **Tampa Electric**
  - 1997 Powerplant of Year Award
  - First-dispatch power generator

Nation’s First Commercial-Scale IGCC Plants, Each Achieving
- > 95% Sulfur Removal
- > 90% NO\textsubscript{x} Reductions

*Power Magazine
Sequestration: A Key Objective

**FutureGen will:**
- Test new technologies to capture CO₂ at power plant
- Inject CO₂ into geologic formations
- Measure and monitor to verify permanence of storage

![Diagram](image-url)
Approximately 650 production and water injection wells on a 70-square mile oil field operated by EnCana Resources.

A 20-year enhanced oil recovery (EOR) project begun in 2000 using CO₂ from a 200-mile CO₂ pipeline from Dakota Gasification Plant — $20.5 million cooperative agreement with Canadian Federal and Saskatchewan Provincial Governments. Provides for 130 million barrels of oil and storage of about 20 million metric tons of CO₂ over 20-year lifetime.

U.S. (DOE), EU, Japan, Alberta Government, private companies (e.g., BP, Chevron-Texaco, etc.) have joined, providing another $20 million. IEA CO₂ Monitoring and Storage Project coordinated by 20 research organizations in the U.S., UK, Canada, France, and Italy.
FutureGen . . .

- Produce electricity and hydrogen from coal using advanced technology
- Emit virtually no air pollutants
- Capture and permanently sequester CO₂

Addresses three Presidential initiatives:
- Hydrogen
- Clear Skies
- Climate Change
The Future is Bright

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