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The Future of Coal

OPTIONS FOR A CARBON-CONSTRAINED WORLD

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Executive Summary

This MIT study examines the role of coal as an energy source in a world where constraints on carbon emissions are adopted to mitigate global warming. Our first premise is that the risks of global warming are real and that the United States and other governments should and will take action to restrict the emission of CO_2 and other greenhouse gases. Our second and equally important premise is that coal will continue to play a large and indispensable role in a greenhouse gas constrained world. Indeed, the challenge for governments and industry is to find a path that mitigates carbon emissions yet continues to utilize coal to meet urgent energy needs, especially in developing economies. The scale of the enterprise is vast. (See Box 1).

Our purpose is to identify the measures that should be taken to assure the availability of demonstrated technologies that would facilitate the achievement of carbon emission reduction goals, while continuing to rely on coal to meet a significant fraction of the world's energy needs. Our study has not analyzed alternative carbon emission control policies and accordingly the study does not make recommendations on what carbon mitigation measure should be adopted today. Nevertheless, our hope is that the study will contribute to prompt adoption of a comprehensive U.S. policy on carbon emissions.

We believe that coal use will increase under any foreseeable scenario because it is cheap and abundant. Coal can provide usable energy at a cost of between \$1 and \$2 per MMBtu compared to \$6 to \$12 per MMBtu for oil and natural gas. Moreover, coal resources are distributed in regions of the world other than the Persian Gulf, the unstable region that contains the larg-

BOX 1 ILLUSTRATING THE CHALLENGE OF SCALE FOR CARBON CAPTURE

- Today fossil sources account for 80% of energy demand: Coal (25%), natural gas (21%), petroleum (34%), nuclear (6.5%), hydro (2.2%), and biomass and waste (11%). Only 0.4% of global energy demand is met by geothermal, solar and wind.[1]
- 50% of the electricity generated in the U.S. is from coal.[2]
- There are the equivalent of more than five hundred, 500 megawatt, coal-fired power plants in the United States with an average age of 35 years.[2]
- China is currently constructing the equivalent of two, 500 megawatt, coal-fired power plants per week and a capacity comparable to the entire UK power grid each year.[3]
- One 500 megawatt coal-fired power plant produces approximately 3 million tons/year of carbon dioxide (CO_2).[3]
- The United States produces about 1.5 billion tons per year of CO_2 from coal-burning power plants.
- If all of this CO_2 is transported for sequestration, the quantity is equivalent to three times the weight and, under typical operating conditions, one-third of the annual volume of natural gas transported by the U.S. gas pipeline system.
- If 60% of the CO_2 produced from U.S. coal-based power generation were to be captured and compressed to a liquid for geologic sequestration, its volume would about equal the total U.S. oil consumption of 20 million barrels per day.
- At present the largest sequestration project is injecting one million tons/year of carbon dioxide (CO_2) from the Sleipner gas field into a saline aquifer under the North Sea.[3]

Notes

1. IEA Key World Energy Statistics (2006)
2. EIA 2005 annual statistics (www.eia.doe.gov)
3. Derived from the MIT Coal Study