

# Coal

## **DIRTY CHEAP ENERGY**

J.W. ANDERSON

**Despite the pollution that it causes, coal will probably continue to meet nearly one-fourth of the world's steadily rising demands for energy in the coming decades.**

**World consumption of coal, 5.3 billion tons in 2001, will go up to about 7.6 billion tons by 2025, the U.S. Energy Information Administration recently projected.**



Almost all of that increase will come from three countries—in order, China, the United States, and India. All three have large and easily accessible deposits of coal, a major consideration for governments concerned about the instability of oil prices and the insecurity of oil imports. This increase is contrasted with Western Europe and other regions, where coal use is expected to decline, partly because of a greater availability of natural gas. See the table on page 33 for projected coal use worldwide.

The policy challenges of reconciling rapid economic growth with clean air and reduced risks of climate change will be met—or evaded—with the deepest consequences for the planet's richest country and the two biggest of its poor countries.

In the United States, where it is used almost exclusively to generate electricity, coal has been competing recently with a cleaner fuel, natural gas. Partly for environmental reasons, the electric power sector swung to increased use of gas in the 1990s. One result was a rapid rise in gas prices, which have more than doubled since 1999. And that, in turn, is currently causing the power companies to swing back toward greater reliance on coal.

This shift is not without consequences to human health and the environment. Coal smoke contains fine particulates—soot, ash, and gases such as oxides of sulfur and nitrogen—that threaten the health of those who breathe them. Coal is also a prolific source of carbon dioxide, which, of all the greenhouse gases generated by human activity, is the one that contributes by far the most to global warming.

Some writers have speculated that shortages of fossil fuels might soon push the world toward cleaner sources of energy. In the case of coal, that is highly unlikely. Current production amounts to 0.5 percent a year of the world's proven and economically re-

coverable coal reserves, and the United States is in no danger of running low in the future.

A shift to renewable energy or other cleaner sources would require strenuous pushing by governments. The necessary political will and financial support will emerge only when societies decide that the negative effects of coal smoke on health, human welfare, and the environment outweigh the benefits of power at the lowest possible price.

China is beginning to consider action against the air pollution that coal causes. It has chosen Taiyuan, a city notorious for its bad air, as the site of an experiment in cutting emissions of sulfur dioxide with a cap-and-trade program based on the highly successful American model. With support from the Asian Development Bank, the Chinese government proposes to cut emissions in Taiyuan by half, allowing the sources of these emissions to trade permits among themselves to hold the cost down. One question is whether this American concept can be transferred to a country with a very different economic and political system. The 50 percent goal is ambitious and the proposal is complex, but the fact that Taiyuan is thinking seriously about reducing emissions that dramatically is itself evidence of changing attitudes.

Here in the United States, energy policies sometimes work at cross-purposes with one another. Deregulation of electricity, for example, promises lower prices to consumers. But that leads to less use of natural gas, which is cleaner but more expensive, and more use of coal, which is cheaper but dirtier.

When utilities were regulated, state authorities were able to encourage electric companies to reduce pollution by guaranteeing them a return on their outlays. But under deregulation, the competitive pressure to push down prices is relentless. It is possible to combine deregulation with policies to curb emissions, possibly through a cap-and-trade program or a federal

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## COAL CONSUMPTION, 2001 TO 2025

(in millions of tons)

REGION	2001	2025 PROJECTED	PERCENT CHANGE
United States	1,060	1,567	47.8%
Western Europe	574	463	-19.3
Japan	166	202	21.7
Former Soviet Union	446	436	-2.2
China	1,383	2,757	99.3
India	360	611	69.7
Rest of the world	1,274	1,538	20.7
<b>Total world</b>	<b>5,263</b>	<b>7,574</b>	<b>43.9</b>

SOURCE: U.S. ENERGY INFORMATION ADMINISTRATION, 2004.

carbon tax. But in either case, one effect would be to raise the price of electricity.

One popular response to rising carbon dioxide emissions is the renewable portfolio standard, which typically requires a certain level or percentage of electricity to be produced from renewable sources. In the United States, since the mid-1990s, about 20 states have imposed such standards on electricity producers or retailers. But policies to promote clean technologies such as renewables may not have a large effect on coal consumption. A renewable portfolio standard will decrease usage of natural gas more than coal, in part because of the price differential. For that reason, encouraging renewables will not have a large effect on coal use or carbon dioxide emissions from the electricity sector in the absence of other policy measures, such as a tax on carbon.

The cost of pollution reduction will be heavily influenced over the coming decades by technological developments. One promising avenue is the integrated gasification combined-cycle (IGCC) process, which chemically turns coal into a synthetic gas that can then be burned in a turbine. This method permits the segregation and capture of most of the pollutants, including carbon. In the form of carbon dioxide, it can be injected underground for permanent storage in geological formations that are com-

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mon throughout most of the United States, without harming the environment.

But the IGCC technology has yet to be shown to work reliably at the scale of a large utility power plant. In a deregulated market, investors appear unwilling to risk the cost of a big plant based on an uncertain process. Experience so far indicates that substantial public subsidies will be required to put this concept into actual practice.

To demonstrate how this would all work, the Department of Energy is currently pursuing a project it calls FutureGen, a partnership between the federal government and industry to design and build an industrial-scale electric power plant with carbon emissions pushed close to zero. It is to run on gasified coal, with the carbon dioxide to be injected into permanent underground reservoirs. When the project was announced in

early 2003, the department estimated that the investment in public and private funds would come to about \$1 billion over a decade.

According to one careful estimate, carbon capture and storage would become profitable at a price of roughly \$200 to \$250 a ton of carbon—that is, the point at which public policy, through regulatory limits or taxation, pushed the cost of emitting a ton of carbon into that range. That is approximately the price that would result from public action in this country to comply with the Kyoto

treaty on climate change, which would have required the United States to cut its emissions of carbon dioxide by about 30 percent from the amount that it would otherwise reach in 2010. The United States has dropped out of the Kyoto treaty on grounds, among others, of the cost. But Kyoto continues to set a marker, in general terms, of the cost of a serious effort to protect the global climate from accumulating greenhouse gases.

At present there are no nationwide restrictions on carbon dioxide emissions in the United States, although most of the state governments have begun to move toward controlling them. To raise the cost to \$200 per ton of carbon would require a very substantial change in national policy. But most studies indicate that the cost of carbon capture and storage is likely to come down significantly with technological improvements. The Energy Department announced in late 2004 that it would provide up to \$100 million in federal subsidies over the next four years for field-testing promising carbon sequestration technologies.

Of all the fuels, coal poses the basic policy questions in their simplest form. The first choice is between dirty and cheap or clean and less cheap — possibly a good deal less cheap. Conservation is always highly desirable, but in a society in which the demand for electricity is growing steadily, voluntary conservation alone does not offer a way out of the hard choices. A serious effort to combat regional air pollution and global climate change will require the development of new technologies, probably with public financial support. It will also require forceful public action, through regulation, to ensure that power producers, if they burn coal, adopt these new technologies. ■

## An Energy Options Matrix

Setting energy policy in the 21st century requires balancing competing factors and making tough choices. For example, framing an argument in favor of promoting coal over natural gas to produce electricity would involve weighing lower costs against greater environmental liabilities. The accompanying table (opposite) provides a framework of how various energy options stack up in terms of availability, costs, environmental and security concerns, and technological challenges. For more detailed information on RFF's work on energy issues, visit [www.rff.org/energy](http://www.rff.org/energy).

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