



By Bruce Rich

## Carbon Capture: A Dead End?

As the urgency of reducing greenhouse gas emissions grows, many policymakers and environmental groups view carbon capture and sequestration (or storage) as a way to square the circle. Indeed, many studies have identified CCS as the only viable option for reconciling continued use of coal for power production and avoiding dangerous global warming.

Yet these same analyses also emphasize the cost and the technological uncertainties of CCS. The 2007 MIT "Future of Coal" study, while recommending major pilot projects, also concluded, "The demonstration of an integrated coal conversion, CO<sub>2</sub> capture, and sequestration capability is an enormous system engineering and integration challenge."

CCS would greatly increase the capital and operating costs of new plants. According to MIT, the cost of a new 500-megawatt plant with CCS is much higher than one without, generating efficiency is reduced by a quarter, and coal consumption increases 31 percent. In terms of "levelized cost" (which includes operating expenses, debt payments, and investment returns) over the plant life, electricity is 61 percent more expensive.

A new Harvard study on "Realistic Costs of Carbon Capture" cites a 10 cent per kilowatt hour additional cost for CCS which needs to be added to a cost for new coal plants of around 10

or 11 cents per kwh, for a total of more than 20 cents — a cost greater than many estimates for new nuclear power.

But the study excludes from its calculations large costs for storage and transport. Indeed, for CCS to make a major contribution to reducing global emissions the extent of the requisite pipeline infrastructure and ship transport to carry liquefied CO<sub>2</sub> to geologically secure sequestration areas would be enormous — on the same scale as the world's existing oil and gas pipeline and shipping networks, which have taken decades to build up.

Moreover, CCS may be less of a climate solution than it appears. According to researchers at Germany's Wuppertal Institute for Climate, Environment and Energy, the entire life cycle of fuel use should be counted in examining coal plants, and particularly in looking at CCS since it requires increased coal use of up to 44 percent to achieve the same energy output.

The German researchers warn that "GHG emissions along the whole value chain can be reduced only by 67–78 percent, depending on the fuels and power station technologies used." Coal mining and power production already use large amounts of water, but adding CCS increases water use of a coal plant by another 90 percent.

The environmental and social costs of increased coal extraction associated with widespread use of CCS would be great, particularly in developing countries. In *World Energy Outlook 2008* the International Energy Agency observes that "at the local level, the water and other infrastructure demands of coal mining in arid regions of China's northwest will place enormous strains on a delicate ecosystem; in India, the loss of forests and villages, and the displacement of people, make any expansion of its largely open-cast industry politically challenging."

There have been massive protests in South Asia over the past two and a half

decades over the local social and ecological impacts of coal mining and coal power. For example, in 2008 the Asian Development Bank withdrew a proposed \$300 million investment in the Phulbari coal mine in Bangladesh in the face of violent resistance. The mine would displace 40,000 poor villagers to produce fuel for a new plant.

It is not only in the developing world where coal and CCS engenders protests. There has been unexpected public resistance to the first pilot projects in Europe. In the Dutch town of Barendrecht, municipal authorities have fought the government's first on-shore CCS project, citing the footprint of the CO<sub>2</sub> pipelines and infrastructure, and also a drop in real estate prices precipitated by fears that the gas could escape from planned underground storage reservoirs. Although Shell, the project sponsor, and the government assure that there is no danger of leakage, opponents cite a 1986 natural disaster

in Cameroon when a volcanic lake released from its depths large quantities of CO<sub>2</sub> that asphyxiated 1,700 villagers and thousands of animals living on its shores. In Germany,

the government has delayed a law to promote CCS in the face of protests from regions where it is to be developed.

The cost of CCS is such that, in comparison, rapidly maturing technologies such as wind and solar thermal are highly competitive. They should be the overwhelming priority for new energy investments, alongside scaled up energy efficiency. In the developing world, where the external environmental and social costs of coal power are especially brutal, the argument is even stronger that scarce additional international finance should go to these low carbon alternatives.

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*Studies dispute the benefits, and protests grow in rich and poor countries alike*