

# Injecting two points of view

## Experts debate carbon sequestration

By Bruce Geiselman

SAN DIEGO — The United States needs to embrace and develop carbon dioxide sequestration technology if the country is to meet President Bush's goal for reducing greenhouse gas intensity, according to a leading government scientist on the subject.

Others, however, including a scientist with the Natural Resources Defense Council, said more research on carbon sequestration is required to be certain it is safe and effective.

The technology, which would be used by the electric-generating industry, was discussed at the Air & Waste Management Association's 96th annual Conference and Exhibition June 22-26 in San Diego.

The president announced his Global Climate Change Initiative last year that included a goal of reducing greenhouse gas intensity, defined as the ratio of greenhouse gas emissions to economic output. Bush's goal is to lower the nation's rate of emissions from an estimated 183 metric tons per million dollars of GDP in 2002, to 151 metric tons per million dollars of GDP in 2012.

"This is going to be a tough target for us to reach," said Curt M. White, an expert on carbon sequestration at the National Energy Technology Laboratory, part of the U.S. Department of Energy in Pittsburgh. "It will stretch us to our capacity."

The government estimates that carbon dioxide emissions will continue to grow in coming years as demand for electricity increases. Eighty-one percent of carbon dioxide emissions in the United States can be attributed to the energy sector, White said.

The federal government estimates that worldwide demand for electricity will increase by 3 percent annually between 2005 and 2020.

The technology for capturing and storing carbon dioxide in coal seams and deep saline aquifers already exists and has been used for several years. "The problem is that it is expensive," White said.

In addition to the cost of installing the technology to capture carbon dioxide emissions, the existing technology reduces electric-generating efficiency. It can drive up the cost per kilowatt-hour by 1 to 2 cents or more, depending on the type of fuel used by power plants.

For a pulverized-coal power plant, the cost per kilowatt-hour could increase from an average of 3.7 cents to 6.4 cents, according to estimates. Increases for natural gas combined cycle plants and integrated gasification combined cycle plants would be less, going from 2.2 cents to 3.2 cents and 3.8 cents to 4.9 cents per kilowatt-hour, respectively.

"Our goal is to develop a CO<sub>2</sub> sequestration system that would not increase costs for energy generation by more than 10 percent," White said.

Technology using porous membranes for extracting carbon dioxide, now in the development stage, appears to hold the most promise for reducing costs and minimizing energy requirements, White said.

In addition, injecting carbon dioxide for storage into coalbeds could yield increased methane production, and the sale and use of the methane would offset costs, White said. In some instances, carbon sequestration projects could actually earn a profit.

In areas where coalbed or coal seam sequestration is impossible, utilities could use brinefield sequestration technology in which the CO<sub>2</sub> is injected into deep saline aquifers. One potential drawback is that injecting materials underground could lead to increased seismic activity, but science can predict safe sites for such projects, White said.

Antonia Herzog, a scientist with the Natural Resources Defense Council, said that while carbon sequestration shows promise, she's not convinced that the technology is close at hand. "I think sequestration is an option that absolutely must be considered, but a lot more research and projects need to be done," she said.

Science must still determine whether carbon dioxide can safely be stored for hundreds of years without significant leakage or other problems, she said. "It's not proven that carbon will stay down there to the scale that may be needed," she said.

Improving energy efficiency and substituting low- or no-emissions energy sources are among the most important steps the country should be taking to address climate change, Herzog said.

For more information on the National Energy Technology Laboratory's carbon sequestration efforts go to [www.netl.doe.gov/coalpower/sequestration/index.html](http://www.netl.doe.gov/coalpower/sequestration/index.html). ■

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