

Seems they CAN teach an old fuel new tricks

By Bob Sexter

Tribune staff reporter

TUSCOLA, Ill.—The old Murdock coal mine outside town has been shut for 15 years, but the future of the Illinois coal industry and the nation's quest for clean and plentiful energy could lie more than a mile beneath the cornfields here.

Tuscola, 160 miles south of Chicago, this month was placed on a short list to be the site of what the Bush administration is billing as the world's first virtually pollution-free, coal-fired electric generating plant.

The plan even seeks to solve the problem of greenhouse-gas emissions that aggravate global warming. The trick is to turn the smokestacks upside down and bury the gas in the ground.

The \$1 billion FutureGen facility, to be built by a consortium of energy companies and the U.S. Energy Department, would test the ability to use the nation's dirtiest coal to fuel a power plant without fouling the air. Conventional generating plants burn coal like charcoal briquettes and spew out sulfur, mercury and carbon dioxide. Expensive scrubbers trap some gunk, but not all, and climate-threatening carbon dioxide still gushes out.

The economic and environmental potential is huge. The U.S. already relies on coal for half of its electric-generating needs. In these times of energy

FUEL:

Coal industry in Illinois may get jump-start

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uncertainty, the domestic coal supply is abundant. There are more proven coal reserves in the U.S. than any nation on Earth, and experts say the supply could meet our energy needs for at least the next 250 years.

"For coal to be king again, it's got to be clean," said Bill Hockback, head of Illinois' coal development office. "FutureGen is the kind of technology that could accomplish that."

Instead of burning coal to release energy, FutureGen would operate more like a chemical plant that relies on an environmentally safer and more energy-efficient process called gasification. Coal is superheated under pressure to break apart molecules, setting off chemical reactions that produce gases. Some will be used to fuel the turbines that generate electricity.

Not only does gasification minimize the production of air-choking particulates, it also allows for the deconstructed building blocks of coal to be recombined into synthetic fuels and chemical compounds useful to industry. At FutureGen the plan is to tune the process to produce hydrogen, which could be used to replace gasoline in

Moving harmful gas from the air into the ground

In an effort to combat global warming, scientists are studying a method known as sequestration, which injects carbon dioxide (CO₂) emissions directly from a power plant deep into the ground for long-term storage.

Injecting for storage

CO₂ is captured, processed to remove contaminants and piped into geological formations for storage and producing other resources.

GEOLOGICAL FORMATIONS

■ Coal bed (1,000-1,500 ft.)

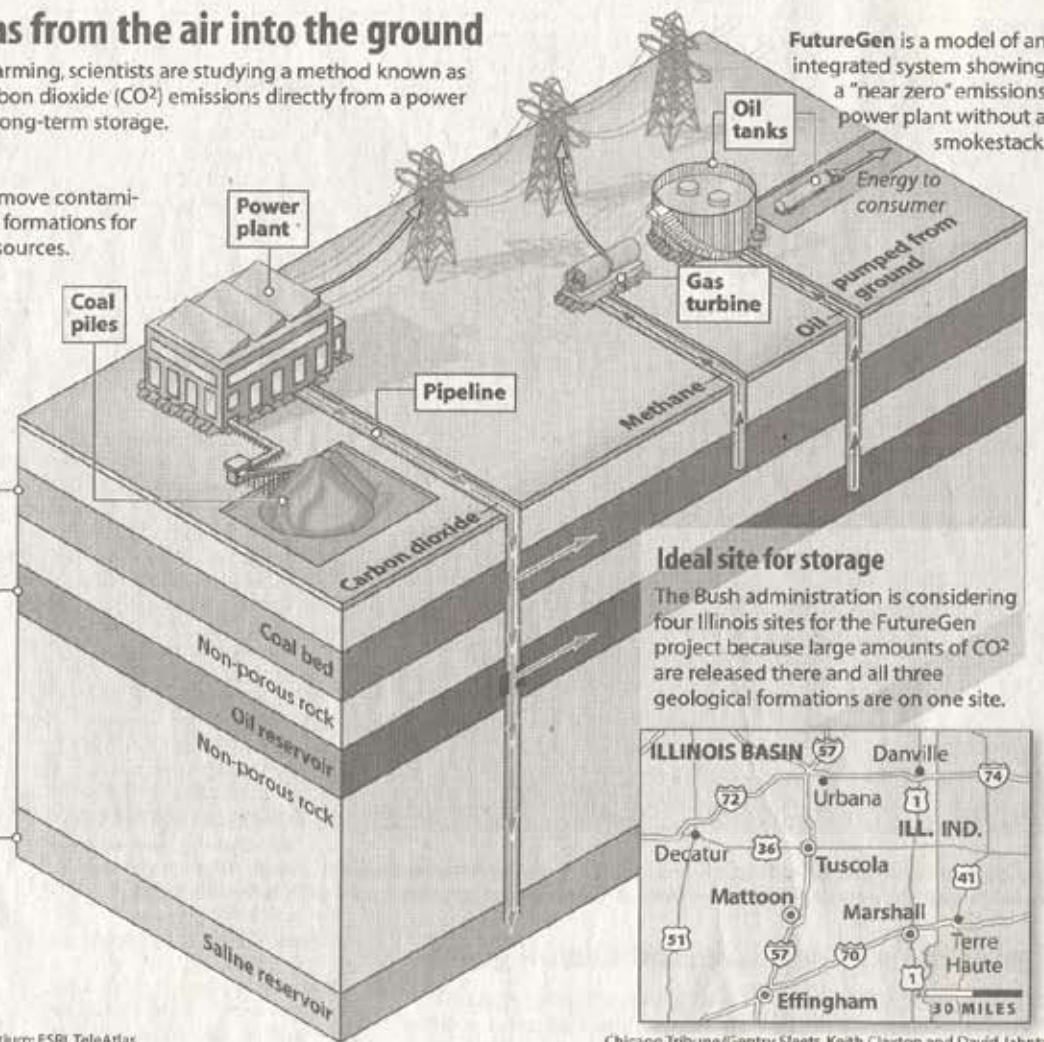
Layer acts like a sponge, absorbing the gas. A chemical bond between coal and CO₂ displaces methane in coal, allowing methane to be pumped out to power plants and gas turbines to produce more electricity.

■ Oil reservoir (2,500-5,000 ft.)

CO₂ dissolves in the oil, making it thinner, less sticky and easier to be pushed up and recovered. Leftover CO₂ would remain inert in the reservoir.

■ Saline formation (6,000-10,000 ft.)

At this depth, pressure liquefies CO₂, where it is stored in small pores of rocks.



FutureGen is a model of an integrated system showing a "near zero" emissions power plant without a smokestack.

Ideal site for storage

The Bush administration is considering four Illinois sites for the FutureGen project because large amounts of CO₂ are released there and all three geological formations are on one site.



Chicago Tribune/Gentry Sleet, Keith Claxton and David Jahntz

Sources: Illinois State Geological Survey, Midwest Geological Sequestration Consortium; ESRI, TeleAtlas

FutureGen project is American Electric Power, an Ohio-based utility. AEP is so sold on the potential of at least the gasification component that it separately

has announced plans to build two gasification-only facilities at more than \$1 billion apiece.

Melissa McHenry, an AEP spokeswoman, said the utility

expects the government eventually to tighten rules on carbon dioxide emissions and thinks spending extra on gasification plants now will prove prudent

in the long run. The plants could be retrofitted with sequestration technology in the future, McHenry said.

While applauding Future-

Gen, many environmentalists say the government isn't moving fast enough to force utilities to adopt such cleaner power producing technologies.

David Hawkins, director of the climate center for the Natural Resources Defense Council said U.S. utilities now have more than 100 conventional coal-fired power plants on the drawing boards. If built, those facilities will have a life span of 50 to 60 years, he said. "We ... don't have time to wait to carry out a demonstration and maybe 10 or 15 years from now decide that we should go ahead on a large scale."

On average, forcing utilities to build FutureGen-like coal plants would add less than 2 percent to rates, Hawkins said.

Tuscola is under consideration to host FutureGen both because of what's under its soil and what's above it. The community of 4,400 is just a 20-minute drive from the University of Illinois at Urbana-Champaign, home to the state geological survey and a magnet for engineers and scientists who would be involved in FutureGen. The town is also at the intersection of three major rail lines that would ferry in different types of coal from around the U.S. for testing.

Brian Moody, who runs Tuscola's economic development authority, said his community wants the plant both for the jobs and because of the sense that it would be playing a key role on the cutting edge of a technology that could help the world.

"If this works, it can buy us 200 years of energy independence," Moody said.

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equipped cars of the future.

For all its cleanliness, a gasification plant—like a conventional coal plant—still churns out large amounts of carbon dioxide, the main contributor to global warming.

FutureGen would liquefy that carbon dioxide byproduct and pump it into a mix of sandstone and salty water 6,000 to 10,000 feet below the surface. That is capped by an impervious layer of rock, which should keep the gases from bubbling back to the surface. The process, similar to one already in common use in the storage of natural gas, is called sequestration.

"It's kind of like a circle," explained Robert Finley, a sequestration expert with the Illinois State Geological Survey. "Carbon is locked in coal when we take it out of the ground, and we're putting it back in a different form."

Twelve sites in seven states are in the running to land FutureGen, and four are in east central Illinois. Effingham, Marshall and Mattoon are also on the list, in addition to Tuscola. The winner is expected to be picked by the fall of 2007, and the plant should be operational five or six years later. It should generate enough electricity to power 150,000 homes and be a fine plum for the host city, with an expected 1,300 construction jobs and 150 permanent jobs.

The hopes for FutureGen go well beyond the parochial, but its success could translate into big benefits for Illinois, whether or not the plant is sited here.

All coal is not equal. Some of it burns more efficiently than other coal. Some of it burns dirtier. Much of the nation's coal supply lies in Illinois, especially in the state's southern end. Illinois coal renders a potent energy wallop, but it also belches lots of sulfur when burned. That pollution factor has hurt demand for Illinois coal, a key reason for the chronic economic distress of southern Illinois.

Experts think FutureGen will work in part because it will combine proven technologies. Some industrial plants, including two in Tuscola, inject gases and waste products deep into the ground. The oil industry also pumps carbon dioxide into old wells to stimulate production.

The plan at FutureGen is to capture carbon dioxide produced by the plant and pump it into deep sandstone that underlies the Illinois basin and much of the U.S. The sandstone is pocked with pore spaces smaller than the head of a pin and filled with salt water. The saline aquifer is isolated from other subterranean water sources by a layer of impervious sealing rock like limestone or shale.

The Illinois basin covers most of Illinois and the southwest ends of Indiana and Kentucky. The sandstone layer underneath it extends for hundreds of

miles. Finley said the gases from FutureGen will barely make a dent in that space and will dissolve into the water over hundreds of years.

Gasification plants cost about 20 percent more to build than conventional coal-burning plants. Sequestration would add significantly more expense. As long as fuel prices were relatively cheap, utilities had little economic incentive to try more sophisticated approaches to power generation. Those days now appear to be over.