

Should Alberta build its next coal plants underground?

Gasifying coal underground is a hot topic around the world. Could it be the secret to making coal climate-friendly?

JIM BENTEIN
Energize Alberta

The chief executive officer of a Calgary-based company that is slated to receive \$285 million from the Alberta government to develop a deep coal gasification project says problems an Australian company has run into with a similar project, where cancer-causing chemicals were found in bores on its site, will not be repeated with its \$1.5-billion plant.

“We’ve been waiting for people to ask us this question [about whether the planned Swan Hills Synfuels project faces a similar potential],” says Martin Lambert.

(UCG) pilot project, located about 220 kilometres northwest of Brisbane, was shut down on July 16, and a government employee was suspended for not reporting earlier on underground water contamination problems with the plant.

The government ordered the project developer, Cougar Energy, to shut down the plant after it learned there were traces of the cancer-causing chemical benzene and the toxic chemical toluene found in bores near the site.

The UCG technology that Cougar is using was developed by a Canadian company, Montreal-based

in situ coal gasification to produce synthetic gas (syngas) for sale to a power plant owner. Carbon dioxide (CO₂) captured from both projects would be sold for enhanced oil recovery (EOR).

Alberta and the rest of Western Canada, where there are huge reserves of coal too deep to mine.

Both the proposed Swan Hills Synfuels and Laurus projects are



proposed Swan Hills project. It was one of four projects that received funding commitments from the government’s \$2-billion carbon capture and storage fund.

The company developed a demonstration project of its in situ gasification process, based on a technology developed at the California-based Lawrence Livermore National Laboratory in the 1960s and 1970s. That \$9-million project, still operating, was funded by the former Alberta Energy Research Institute (now Alberta Innovates).

A senior official with Alberta Innovates, who was involved in a review of the Swan Hills Synfuels technology

The key components of the project are the in situ gasification facility, associated pipelines and a syngas processing plant, similar to a conventional natural gas processing plant, and a power plant, to be located near Whitecourt, which would tap the syngas.

In addition, the company would capture CO₂, which would be transported by pipeline to oilfields in the Swan Hills area, where there is more than four billion barrels of oil in place, for use in EOR projects.

It is estimated that the project would capture 1.3 million tonnes of CO₂ emissions a year, representing 20 per cent of the Alberta government’s objective of cutting CO₂ emissions by five million tonnes a year (the equivalent of taking more than 260,000 cars off the road).

PLAYERS ON THE STAGE

1. Swan Hills Synfuels (www.swanhills-synfuels.com)
2. Laurus Energy (www.laurusenergy.com)
3. Ergo Exergy Technologies (www.ergoexergy.com)

GOING BROADER, DEEPER

1. Pembina Institute (www.pembina.org)

“We are developing a very, very different project,” he says, adding the company has operated a pilot plant for two years in the Swan Hills area and there have been no incidents.

The Australian underground coal gasification

Ergo Exergy Technologies, with whom Cougar has a licensing agreement.

Ergo Exergy’s technology has also been licensed by Houston-based Laurus Energy, which, like Swan Hills Synfuels, is proposing an Alberta project (in the Drayton Valley area) to use

UCG involves the gasification of coal in situ, which is achieved by drilling boreholes into the coal (instead of mining it) and injecting water/air or water/oxygen mixtures. It is both an extraction process and a conversion process (gasification) in one step, producing synthetic gas.

IMPLICATIONS FOR ALBERTA

The implications of what is happening in Australia spread well beyond its borders — specifically to

being reviewed by Alberta regulatory officials. The Laurus project, which would be phased but which the company says would eventually be large enough to fuel a 300-megawatt power plant — capable of supplying electricity to a mid-sized city — has not received any government funding.

Meanwhile, the Alberta government announced last December that it had signed a letter of intent with Swan Hills Synfuels to provide funding for the

but who did not want his name to be used, says he’s “absolutely confident” the company’s technology presents no danger of groundwater contamination or other serious environmental problems.

The company plans to develop the commercial-sized Sagitawah Power Project starting in 2012. The plant, which would be in service by 2015, would operate for 40 years and produce more than 17 million gigajoules of syngas annually.

IN SITU COAL GASIFICATION

The Alberta government is eyeing in situ coal gasification as a key component of a more environmentally benign fossil fuel future, with syngas and natural gas eventually replacing coal-fired power plants, the largest single source of greenhouse gas (GHG) emissions in the province.

Lambert, the chief executive of Swan Hills Synfuels, says he is aware of the Kingaroy plant shutdown in Australia but isn’t concerned about



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it affecting prospects for his company's plant development.
 "Our project operates at such depths that we are isolated from ground-water," says Lambert, a former chief executive officer of law firm Bennett Jones LLP.
 He notes the high pressure used is also a factor, as are other aspects of its process.

company proposing an in situ coal project in Alberta, along with one in Alaska and several in Texas, says the independent firm that tested underground water samples at the Kingaroy site made a mistake and the government will have to withdraw its objections.
 "It's virtually impossible for contaminants to enter the groundwater [with the

"There was no contamination, zero," he says.
 Laurus chief executive officer Rebecca McDonald says the company still believes in the Ergo Exergy technology and is planning to go ahead with its Tomahawk project in Alberta and with other in situ coal projects, calling the Australian incident "much ado about nothing."

He says Pembina sees merit in some aspects of UGC, especially compared with surface coal mining projects — even those with a CO₂ capture ability. Surface mining projects bring with them huge problems with soil disturbance and with their overall environmental footprint, the report concluded.
 UGC projects, on the other hand, usually involve minimal surface disturbance. In addition, the fact that they produce a relatively clean-burning syngas and also allow for the cost-effective capture of CO₂ led to Pembina taking a somewhat favourable view of the technology.

"But there are risks that need to be addressed," McCulloch says. "A lot of those risks are site-specific."
 The Pembina report looked specifically at Ergo Exergy's technology and not at the Swan Hills technology. The report identified groundwater contamination as the "most serious risk" with UGC technology.

"Two UGC pilots out of 34 pilots conducted in North America have resulted in groundwater contamination," the authors of the report wrote. "These two projects required considerable remediation efforts."
 The authors concluded that widespread commercialization of the technology in Alberta would require the wide-scale development of expertise not now available.
 Pembina concluded that electricity generation linked to UGC would result in GHG emissions 25 per cent lower than conventional coal-based electricity



Martin Lambert, chief executive officer of Swan Hills Synfuels

PHOTO: LISA KRITZEL

FOUR KEY POINTS TO PONDER

1. Proponents say in situ coal gasification, combined with carbon capture and storage, will create a new clean energy industry in Alberta.
2. Underground coal gasification is a gasification process applied to unmined coal seams, using injection and production wells drilled from the surface, which enables the coal to be converted in situ into product gas.
3. Air or oxygen is added to the injection well and the coal ignited underground. There, the coal is partially oxidized; the gas that escapes from the production well is a mixture of syngas (carbon monoxide and hydrogen) and carbon dioxide and a little methane.
4. On the surface, the syngas can be burned in a turbine to produce electricity, while the carbon dioxide can be liquefied for underground storage or for use in enhanced oil recovery projects.

"We're looking at a project that gasifies coal at a depth of 1,400 metres," he explains. "The majority of UGC projects in the world operate at depths of 100–400 metres, where groundwater contamination is an issue."
 He says the Kingaroy project in Australia is operating at 300 metres, while other UGC projects in Queensland operate at 600 to 700 metres.

Lambert says the advancement of horizontal drilling technology in the oil and gas industry made the Swan Hills project possible.
 "We couldn't have done this 10 or 12 years ago," he says. "What has made it possible are the horizontal drilling advances."

Simon Maev, senior vice-president in charge of project development for Laurus Energy, the other

Ergo Exergy process]," says Maev. "They [the carcinogen and other toxic chemicals] could have been in the soil."

He says drilling for the project is deep enough so that the wellbores won't intersect with underground aquifers. Also, the technology is designed to eliminate the threat.

ERGO EXERGY'S TECHNOLOGY

Michael Blinderman, chief executive officer of Ergo Exergy, blamed the Cougar plant shutdown on "hysterical media coverage" and Australian state politicians who overreacted to initial water sampling tests that were incorrect.

"The media has crucified the government for mismanagement of environmental issues and that has created a hysterical situation," he told *Energize Alberta*.

She says the company has selected a site and is waiting for government approval of a demonstration project.
 "We have two billion tonnes of coal at our site in Alberta," says McDonald, who adds Laurus hopes to team up with a power plant developer.

A spokesperson for Calgary-based environmental group the Pembina Institute, which was hired last year by Laurus to assess the company's technology — and which concluded there might be some merits in the approach — says he wasn't surprised about the problems in Australia.

"They [developers] have to pick the right site and operate the technology properly," says Matt McCulloch, director of corporate consulting services for Pembina.

generation, but 75 per cent higher than natural gas electricity generation.

However, the authors go on to point out that it is less costly to extract CO₂ from a UGC project than from other electricity-generating facilities and this would actually mean an underground coal gasification project would produce fewer GHG emissions overall than a natural gas combined cycle power plant.

According to the report, UGC projects, while having surface impacts far less than mines, would still

have some impacts, which are likened to in situ oil-sands projects.

But Pembina concluded that because there are no commercial-sized UGC operations in North America, not all risks have been quantified and it's necessary to conduct more research.

McCulloch says UGC project developers must prove to governments and the public that the risk of groundwater contamination is minimal.

"The onus is on the developers to illustrate that the risk is zero," he says.

FEEDBACK

What's your opinion on underground coal gasification? Send your comments to yourenergy@energizealberta.com

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