

# Coal Cleaner Cheaper Liquid Fuel from Coal

*A new conversion process promises zero carbon emissions during production—but some question whether it will scale.*

BY PETER FAIRLEY TECHNOLOGY REVIEW – PUBLISHED BY MIT - FRIDAY, JANUARY 6, 2012

**SRI International** is developing a process that combines coal and natural gas to produce liquid transportation fuels that are substantially cleaner and cheaper to make than existing synthetic fuels.

SRI claims its process addresses three liabilities that have slowed the commercialization of the technology. By blending some natural gas into the conventional coal-to-liquids (CTL) process, the private research lab, based in Menlo Park, California, claims to have eliminated CTL's carbon footprint, slashed water consumption by over 70 percent, and more than halved its capital cost.

Chan Park, a gasification and synthetic fuels expert at the **University of California, Riverside's Center for Environmental Research & Technology**, cautions that SRI's work is at an early stage. But Park says the process "could be really exciting" as a domestic alternative to petroleum fuel in coal and gas-rich countries such as the U.S.—if it can be demonstrated at pilot scale.

SRI's process is the fruit of a 2008 solicitation by the Pentagon's Defense Advanced Research Projects Agency (DARPA) seeking a cheap, carbon-free CTL process for producing jet fuel. DARPA awarded SRI \$1,612,905 to pursue a novel concept: using methane from natural gas as a hydrogen source instead of water in a new CTL process.

Conventional CTL plants blend pure oxygen, steam, and coal at high temperatures and pressures, generating carbon monoxide and hydrogen gas that can be catalytically combined to synthesize liquid hydrocarbon fuels. The gasification also generates carbon dioxide, partly from the combustion of some coal with the pure oxygen, and partly through undesirable reactions between water and carbon.

In SRI's process, methane preheated to 600 °C displaces much of the water required, thus reducing the unwanted reaction with the coal. The methane also reduces the amount of heat absorbed by the gasification process, eliminating the need for oxygen and combustion to maintain the 1,400 to 1,500 °C temperatures the process requires. As a result SRI says it can eliminate the use of oxygen-fired combustion that the process requires, making do with zero-carbon renewable or nuclear power instead.

Skipping oxygen not only eliminates a source of carbon dioxide, but contributes substantial cost savings by eliminating the need for an oxygen plant. Further savings are achieved through more efficient fuel synthesis

SRI estimates that its zero-carbon process will generate jet fuel for \$2.82 per gallon, which is under DARPA's \$3 target. SRI's projected capital cost for a 100,000 barrel/day plant—\$3.2 billion—is well below the \$6 billion cost of a CTL plant, but still well above DARPA's \$1.5 billion target.

Park says SRI needs to prove its process beyond its "bench-scale" demonstrations in order to provide such cost estimates with any degree of certainty. Based on experience with his own oxygen-less gasification scheme—which is being developed for waste-to-energy plants by Riverside-based spinoff [Viresco Energy](#)—Park is skeptical that electrical heating will prove feasible at larger scale.

Eric Larson, a research engineer with [Princeton University's Energy Systems Analysis Group](#), says SRI's zero-carbon process could prove to be "technically doable" and still suffer from a critical flaw: producing a carbon-based fuel that will release carbon dioxide when it is burned. "On a life-cycle basis, the fuel is no better than petroleum fuel on greenhouse-gas emissions," says Larson.