Coal-to-liquids projects make economic sense, but have struggled to put together an environmental and technical case. A look at the financing challenges of the technology from Todd Alexander, Richard Susalka, and Jeff Kogan, Chadbourne & Parke

Back in black?

High oil prices, the United States' plentiful coal reserves, and current political interest in increasing its domestic share of oil production have contributed to a favourable economic climate for coal-to-liquids (CTL) projects in the US. The US has the world's largest known coal reserves, and given current estimates, CTL would be profitable if oil production costs remain at $45 to $55 per barrel.

CTL involves the conversion of coal to liquid fuels either directly or indirectly. Direct liquefaction is not yet commercially proven, but the indirect method, which involves an intermediate gasification stage, followed by liquefaction, has a proven track record. The most common version of this technology is the Fischer-Tropsch process, which uses a catalyst such as iron or cobalt to turn synthesis gas into liquids.

The most widespread user of CTL technology is South Africa, where an estimated 300,000 barrels of gasoline and diesel are produced per day. China is an emerging CTL player with a series of plants under development, and its first large-scale CTL plant is scheduled to come on-line in the first half of 2008. China's nonconventional oil supply from coal-to-liquids plants is estimated to reach 750,000 barrels per day by 2030, according to the International Energy Agency.

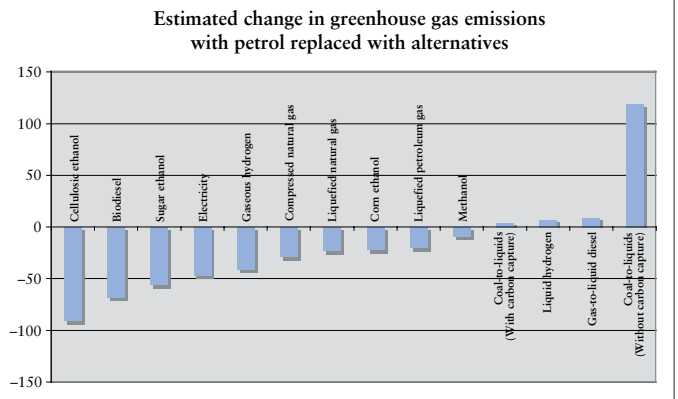
In the US, there are several plants under development, including Rentech's plants in Montana and Mississippi, DKRW's plant in Wyoming and Baard Energy's plant in Ohio. CTL enjoys considerable support from the United States Air Force, which has already begun certifying its fleet of aircraft for a blend using 50% CTL fuel, and expects to be fully compatible with the blend by 2016. If current expectations hold true, the US military will being purchasing 400 million gallons of CTL fuels annually by 2016.

CTL's challenges

But the technology faces a variety of obstacles in the United States, the foremost of which is environmental. In many respects, fuel produced from CTL is cleaner than fuel from crude oil, because the inherent impurities of crude oil, such as sulphur and nitrogen oxide, can be filtered from the coal in the gasification process and in post-gasification treatment.

However, the CTL process produces relatively high carbon emissions. According to a recent study funded by the National Energy Technology Laboratory (NTEL), the US Department of Energy (DoE) and the US Air Force (USAF), the carbon dioxide emissions of CTL, on a well-to-wheels basis, are 1.8 times more than petroleum, due to the energy used in the conversion process and the high carbon content of the coal feedstock. Given the current political climate in the United States, the CO_2 issue is a leading political obstacle to CTL development.

Comparing CTL to the alternatives



Source: US Environmental Protection Agency

The large capital outlay required for a CTL project presents another significant challenge to such a project's development. To be efficient, CTL projects must produce upwards of 15,000 to 25,000 barrels a day, and the capital cost of such a project is measured in the billions of dollars.

In addition to the size, the complexity of CTL projects presents a significant challenge to financeability. A typical indirect coal liquefaction plant requires the seamless integration of roughly seven separate functions, including not only the gasification technology and the liquefaction technology, but often an on-site power plant as well. The perceived technology risk is not only the sum of the risks presented by each technological component, but also the risk that the components will not integrate harmoniously. Although a number of creditworthy contractors are active in this area, these contractors are reluctant to bear full responsibility for these risks and, as a result, significant guarantees of overall performance and schedule are not yet available.

Because of the size and complexity of CTL plants, full commercial operations may not commence until five years after the start of construction. As a result, projects that utilize debt financing are likely to incur significant interest expense during construction. This not only increases the overall project cost, but also reduces the attractiveness of bond and term loan B-type financing structures, which customarily require the borrower to draw down all or a significant portion of the funds available under their credit facility at financial closing.

Developers of CTL projects must also contend with commodity risk. Although the volatility of the oil market is a challenge to all forms of alternative fuels, this challenge is significantly greater in the CTL context given the length of CTL plants' construction and ramp-up phases. The use of

coal also presents a commodity risk because the price of coal is not highly correlated with the price of synthetic fuel.

Overcoming these challenges

The early developments in the United States CTL industry have informed the dialogue as to how developers can overcome these challenges. Thus far, developers have proposed to address the CO_2 challenge primarily by sequestering CO_2 in the gasification stage and disposing of it through enhanced oil recovery. There are several enhanced oil recovery operations currently in operation in the US, several of which already accept CO_2 by pipeline. However, the capacity of these operations to accept CO_2 is limited, and CTL will compete with other suppliers of CO_2, including coal-fired power plants.

Promising studies have shown that the carbon emissions of a CTL project can be reduced beyond those of a conventional petroleum refinery by co-gasifying a modest amount of biomass with coal. According to a study funded by the NTEL, DoE and USAF, a 20% reduction in carbon emissions can be achieved through CTL (as compared to the production of low-sulphur fuel from an existing conventional petroleum refinery) by co-processing coal with 10-18% (by weight) of biomass, such as switchgrass, poplar trees and maize leaves and stalks.

The high capital costs of these projects can be partially mitigated through proper tax structuring. Currently, the federal government offers six subsidies that will pay anywhere from 30% to 55% of the capital costs of CTL projects. First, depreciation can account for anywhere from 17 cents to 30 cents per dollar of capital costs. Second, developers can deduct 50% of the cost of the Fischer-Tropsch liquids train immediately in the year the plant is placed in service, which accounts for another 2.6 cents per dollar of capital costs. Third, there is a refined coal credit of $5.88 per ton that is available to developers that convert coal into some sort of gaseous liquid or synthetic fuel that will be resold for the purposes of making steam. Fourth, there is also a potential 20% investment credit that could be applied towards the gasification component of the plant. Fifth, transportation fuels collected through the Fischer-Tropsch process can qualify for an excise tax credit of 50 cents. This credit can only be claimed through 30 September 2009 on output, although an extension is currently being considered by Congress. Sixth, and finally, CTL projects can take advantage of a government inducement to encourage Americans to manufacture at home. Currently, 6% of the income of domestic manufacturers is not subject to federal tax, and starting in 2010, the incentive will be increased to 9%. Although few developers have the income to take full advantage of these tax benefits, developers can use structures such as a sale-and-leaseback, a partnership flip structure, a master limited partnership or a prepaid fuels contract to better monetize their benefits.

The technology and completion risks involved in developing CTL projects are expected to drastically reduce as the United States market becomes more familiar with CTL technology. In the interim, and in the absence of creditworthy contractors willing to offer guarantees of performance and schedule on a complete facility, these risks represent an additional cost that must either be built into the project as a contingency or supported by the sponsor. These additional costs can be significantly reduced by obtaining guarantees for the individual components that make up the plant, such as the gasifier, the air separation unit and the Fischer-Tropsch unit. Although some risks will remain – integration, cost overrun, labour coordination and the like – the costs associated with these risks are more limited and less likely to pose an obstacle to financing.

Given CTL's promise, it is likely that the US will see several CTL projects under construction before the end of the decade. As these projects become more routine, we expect that a financing template will develop that will enable the obstacles to their development to become more manageable.

The commodity risk challenges with respect to oil have been addressed through a variety of approaches. One strategy is to enter into futures contracts based on the price of diesel. This would provide predictability to a portion of a project's revenue stream, although this strategy tends to be prohibitively expensive in volatile markets, such as the diesel market, if implemented for the longer term. Another strategy is to enter into long-term fixed-price contracts, for at least a portion of the facility's output, similar to those used in the ethanol and biodiesel industries. This approach has the benefit of providing a more predictable revenue stream, but would probably require the owners of the project to forego much of the upside potential of the project. Although the Department of Defense (DoD) would appear to be a prime candidate for these types of contracts, given the USAF's projected need for synthetic diesel and jet fuel, the value of this opportunity is limited by US government restrictions that limit the DoD's ability to enter into binding agreements with a term in excess of five years. A third method is to capitalize on the flexibility of the CTL process by designing the facility to produce co-products for which long-term fixed-price offtake contracts are available.

With respect to coal, CTL developers could ensure the availability of predictably priced coal by purchasing a coal mine or entering into long-term coal supply contracts at a fixed price or with a cap. A similar approach was taken by the independent power industry to resolve the lack of correlation between the price of natural gas and electricity.

Conclusion

Given CTL's promise, it is likely that the US will see several CTL projects under construction before the end of the decade. As these projects become more routine, we expect that a financing template will develop that will enable the obstacles to their development to become more manageable. ■

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