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TECHNICAL REPORT

Federal Financial Incentives to Induce Early Experience Producing Unconventional Liquid Fuels

Frank Camm, James T. Bartis, Charles J. Bushman

Prepared for the United States Air Force and the
National Energy Technology Laboratory of the
United States Department of Energy

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Summary

This technical report explains an analytic way to design and assess packages of financial incentives that the government can use to cost-effectively promote early experience with coal-to-liquids (CTL) production of liquid fuels in the face of significant uncertainty about the future. It provides technical support to Bartis, Camm, and Ortiz (2008), which places early CTL production experience in a broader policy context.

Analytic Methods

The report applies two complementary analytic methods. The first uses observations from successful voluntary agreements in the commercial world to identify principles that the government can use to design a relationship with a private investor that is likely to ensure that early CTL production experience occurs cost-effectively. Such a relationship yields investor and government behavior that, in turn, generates a set of cash flows to and from investor and government over time. The second analytic method takes these cash flows as given and assesses their effects on the investor and the government. It measures effects on an investor in terms of changes in the investor's real (adjusted for inflation) after-tax internal rate of return (IRR). It measures effects on the government in terms of changes in the real net present value (NPV) of cash flows to and from the government when assessed at the discount rate set by the Office of Management and Budget (OMB) for investments of this kind.

Principles for Designing Incentives

The principles identified in the first half of the analysis and their implications for public policy are the following (see pp. 3–5):

- The more control a specific party to an agreement has over a particular risk, the greater responsibility that party should have to mitigate that risk. For us, all else equal, the more control an investor has over the design, construction, and operation of a CTL production plant, the more the investor should benefit from success or pay for failure in each of these phases.
- The more risk averse a specific party to an agreement is relative to other parties, the more the agreement should shift risk from the risk-averse party to others. For us, all else equal, because the government will typically be less risk averse than an investor will, public policies should seek opportunities to shift risk to the government.

- An agreement should seek opportunities to limit the cost of managing the agreement itself. For us, all else equal, the government should seek to use existing government structures and organizations that implement incentives (such as the tax code and Internal Revenue Service) instead of designing incentives that will require new government structures and organizations.
- Where one party to an agreement has some cost advantage over the others, the agreement should seek to exploit that advantage. For us, all else equal, because OMB prescribes a government discount rate that is likely to be lower than an investor's costs of capital are, the government should seek opportunities to help an investor as early as possible in a project, potentially in exchange for rewards to the government later in the project.
- Parties with a larger stake in an agreement should give special attention to the performance of those with a smaller stake. For us, all else equal, the government should increase its oversight, in source selection and project execution, as an investor uses more debt to finance the project and increase it still further if the government offers a loan guarantee.
- An agreement should seek to adjust to external changes in ways that encourage all parties to remain in the agreement as long as adjustments can be made that allow all to continue benefiting from it. For us, all else equal, the government should not design policies that could force an investor to repeatedly lose money during operations or allow an investor to receive, through a government program, what could easily be perceived to be excessive profits over a long period.

Taken one at a time, these principles often point in different directions. The best policy design seeks to apply these six principles in a balanced way.

Analysis of Cash-Flow Effects in Alternative Futures

The cash-flow analysis focuses on a hypothetical CTL combined-cycle production plant that uses a Fischer-Tropsch (FT) technology to convert coal into about 30,000 barrels per day (bpd) of diesel and naphtha; significant amounts of electricity, some of which can be sold off site; and carbon dioxide, which can be sequestered or sold for use in enhanced oil recovery (EOR) off site. We take the engineering details on the plant from a recent Southern States Energy Board (SSEB) report and add our own assumptions about construction and operational costs; project financing; tax treatment; future prices for coal, oil, electricity, and carbon dioxide; and so on. The analysis yields a set of cash flows over five years of plant construction and 30 years of plant operation that we can use to assess effects on an investor and the government. Because significant uncertainties exist, the analysis considers these effects across a broad range of potential values for real average oil prices and carbon dioxide costs and project costs over the life of the project.

Using this cash-flow analysis, we seek packages of financial incentives with the following characteristics: They increase returns to investors in futures in which cash flows would not induce an investor to pursue early CTL production experience. They limit public-policy effects on investors in futures in which cash flows are likely to induce anyone to invest without government intervention. They seek to emulate a kind of insurance policy in which (1) the government pays companies to invest if private cash flows alone are not sufficient to induce private investment and, in return, (2) companies pay the government a share of their profits when private cash flows alone do induce private investment. Packages with these characteristics

allow the government to achieve its primary goal while limiting the expected taxpayer cost of doing so.

The analysis allows us to assemble financial-incentive packages from the following policy components and compare their joint financial effects on investors and the government in different futures:

- a purchase guarantee with a preset purchase quantity and fixed price for the CTL fuel
- a price floor with preset purchase quantity for CTL fuel
- various subsidies that reduce the private firm's investment cost
- a subsidy that reduces the private firm's operating cost
- an agreement to share net income, under preset, specified circumstances, between the private firm and the government when oil prices are high
- a government loan guarantee for a preset portion of the private firm's debt financing.

One particular metric proves to be especially helpful in the design and adjustment of incentive packages to meet these goals. For any change in an incentive package, it measures the cost to the government of raising real private after-tax IRR by one percentage point in any future. Using this metric to compare the government's costs of increasing private IRR in different ways facilitates comparing specific incentive-package changes and ultimately allows designing packages that embody these characteristics.

Policy-Relevant Findings and Recommendations

A balanced package of a price floor, investment subsidy, and income-sharing agreement would allow the government to achieve its primary goal of ensuring early CTL production experience at a reasonable cost to the government. (See pp. 43–49.) The investment subsidy is a cost-effective way to raise private after-tax IRR in any future. A price floor can cost-effectively provide an additional boost in futures in which oil is especially inexpensive. And an income-sharing agreement can effectively complement any investment subsidy and price floor to create a kind of insurance agreement between the investor and government. In such an agreement, the government effectively offers an investment subsidy and price floor to insure the investor against loss during years with low prices in exchange for a share of investor profits for years with prices high enough to justify such sharing.

Among investment incentives, those that convey benefits to an investor early are the most cost-effective for the government. (See pp. 27–31.) The cash-flow analysis confirms the expectation just described, that OMB's low government discount rate favors the use of investment subsidies. Investment subsidies, such as tax credits, take advantage of this difference to help investors finance their investments. Accelerated tax depreciation is not nearly as cost-effective. And subsidies tied to production are still less cost-effective than any of the investment subsidies examined. Production subsidies prove useful only if required to maintain investor interest in production after the plant is built. Net revenues from our hypothetical project were high enough across all considered futures to sustain production with no additional government support.

Loan guarantees can strongly encourage private investment. But they encourage investors to pursue early CTL production experience only by shifting real default risk from private

lenders to the government. (See pp. 33–42.) By their very nature, the more powerful their effect on private participation in a project, the higher their expected cost to the government. And loan guarantees encourage private investors to seek higher debt shares that, by increasing their default risk, raise the government's expected cost of any loan guarantee. The government should use loan guarantees to promote early CTL production experience only with great care and with a full appreciation of their potential costs to the Treasury and the extent to which government oversight of guaranteed loans effectively limit those costs.

Because the exact form that a balanced package would take depends on expectations about project costs, the government should wait to finalize its design of an incentive package until it has the best information on project costs it can get without actually initiating the project. (See pp. 43–48.) We strongly advise that an incentive agreement not be finalized until both government and investors have the benefit of improved project-cost and performance information that is provided after a front-end engineering design (FEED).

Some investors will be significantly more likely to achieve early CTL production experience than will others. For example, we expect more technologically sophisticated investors with more experience building and operating first-of-a-kind chemical plants and that have a long-term stake in exploiting the knowledge gained from early CTL production experience to be more likely to succeed than investors looking primarily for an investment opportunity that fits well in a broader financial portfolio. (See p. 14.) They would certainly be more likely to succeed than small and disadvantaged businesses in general.

The government should clearly pursue a preference for investors that are more likely to achieve its primary goal—early CTL production experience—in the acquisition strategy it builds for choosing investors to support. That strategy should include thorough due diligence regarding the technological, management, and financial capacity of all competitors. It might go further and allow offerors, as part of their proposals in source selection, to design parts of the incentive package the government uses to oversee and reward the chosen investors. (See pp. 51–52.) That is, using the performance-oriented approach that the federal government now prefers in source selection, this strategy would substitute a statement of objectives, which states what the government values in a new investment in a CTL plant, for a statement of work, which specifies how the government would reward the winner of such a source selection. Properly designed and implemented, such an approach to source selection could give the government valuable insights about each potential investor's priorities, beliefs, and capabilities and help it choose a package of financial incentives best meeting the mutual interests of each investor and the government.