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Policy Issues for Coal-to-Liquids Development

JAMES T. BARTIS

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Testimony presented before the Commonwealth of Kentucky House Appropriations and Revenue Committee on June 28, 2007

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**Statement of James T. Bartis¹
The RAND Corporation**

Policy Issues for Coal-to-Liquids Development²

**Before the House Appropriations and Revenue Committee
Commonwealth of Kentucky**

June 28, 2007

Mr. Chairman and distinguished members, thank you for inviting me to testify on the key issues associated with developing a domestic coal to liquids industry and the approaches that the Federal government and the Commonwealth of Kentucky can take to address these issues. I am a Senior Policy Researcher at the RAND Corporation with over 25 years of experience in analyzing and assessing energy technology and policy issues. At RAND, I am actively involved in research directed at understanding the costs and benefits associated with alternative approaches for promoting the use of coal and other domestically abundant resources, such as oil shale and biomass, to lessen our nation's dependence on imported petroleum. My remarks today are based on RAND research, some of which is ongoing, sponsored by the National Energy Technology Laboratory, the United States Air Force, the Federal Aviation Administration, and the National Commission on Energy Policy. I have also submitted to the committee my testimony given on May 24 to the Energy and Natural Resources Committee of the United States Senate.

Our nation has before it the two major energy challenges: First, what to do about excessive wealth transfers from oil consumers to foreign producers who have market power and whose interests may be hostile to ours. And second, how can we reduce our greenhouse gas emissions. Kentucky, as one of the top three coal-producing states, has a major stake in how these two challenges are resolved.

OPEC revenues from oil exports are currently about \$500 billion per year and are heading higher. These high revenues raise serious national security concerns because some OPEC member states are governed by regimes that are not supportive of U.S. foreign policy objectives. Oil revenues have been and are being used to purchase or to develop weapons. Moreover, the higher oil prices rise,

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the greater the chances that oil-importing countries will pursue special relationships with oil exporters and defer joining the United States in multilateral diplomatic efforts. We see this happening right now in South America and Africa.

No less pressing is the importance of addressing the threat of global climate change. The longer-term threat this poses to US interests, both in terms of the impacts of climate change on the US and the international security impacts of climate change in developing countries, requires US participation in a robust international program for reducing global emissions. However, without measures to address carbon dioxide emissions, the use of coal-derived liquids to displace petroleum fuels for transportation will roughly double greenhouse gas emissions. This is clearly not consistent with mitigating the threats of climate change.

The emphasis of RAND's research on unconventional fuels has been on these two potentially conflicting policy objectives. We have concentrated our efforts on coal-to-liquids because that option is one of only two approaches that are commercially ready and capable of displacing significant amounts of imported petroleum. The only other technical option that meets these criteria is ethanol production from food crops. Moreover, only the coal-to-liquids approach produces a fuel suitable for use in heavy duty trucks, railroad engines, and commercial aircraft, or military vehicles and weapon systems. Ethanol from food crops is relatively costly, limited in quantity, likely to cause dislocations in global food markets, and likely to have other undesirable environmental impacts. Other ethanol opportunities from "cellulosic" feedstocks may be promising over the longer term but are nowhere near commercial development status.

And when we look to the future, the only near-term, low-risk options are variants of the same technology that is used for producing liquids from coal, namely, gasification and Fischer-Tropsch synthesis as applied to biomass, such as crop residues, or a combination of biomass and coal. As I will discuss shortly, these two approaches involving biomass offer liquid fuels production and use that entail near-zero emissions of carbon dioxide.

Producing large amounts of coal-derived liquid fuels will cause world oil prices to decrease. Our research shows that under reasonable assumptions, this price reduction effect could be very large and would likely result in large benefits to U.S. consumers and large decreases in OPEC's revenues. Savings by the average household in the United States would range from a few hundred to a few thousand dollars per year. OPEC export revenues could decrease by hundreds of billions of dollars per year.

We also examined whether a coal-to-liquids industry can be developed consistent with the need to manage carbon dioxide emissions. If we are willing to accept emission levels that are similar to those associated with conventional petroleum, the answer is definitely yes. Two technical approaches are available that allow this level of control. The first approach involves the capture and geologic sequestration of carbon dioxide at the plant site. This approach appears feasible, but it has not been proven, and it will not be proven until multiple large scale demonstrations are successfully conducted. Fortunately, the second approach is a very low-risk approach, namely, using a combination of coal and biomass in a Fischer-Tropsch plant. Now given the large demand on OPEC oil that we anticipate over the next 50 years, this is a good answer. We can at least address a major economic and national security problem while not worsening environmental impacts.

If, however, we demand a significant reduction in emission levels as compared to conventional petroleum, the answer is a qualified yes. The only way we know of reaching this level of carbon dioxide control when making coal-derived liquids is to use a combination of coal and biomass as the feed for the plant and to capture and sequester most of the carbon dioxide generated at the plant site. The reason I give a qualified yes is that there remains considerable uncertainty regarding the viability of sequestering carbon dioxide in geological formations.

Now I would like to raise some issues that I believe are very relevant to the prospects for coal-to-liquids production in Kentucky, and more broadly, the United States. Specifically, we see three uncertainties that are impeding private sector investment.

The first uncertainty centers on the cost and performance of coal-to-liquid plants. Our current best estimate is that coal-to-liquids production is not competitive unless crude oil prices are in the range of \$50 to \$60 per barrel. However, this estimate is based on highly conceptual engineering designs that are only intended to provide a rough estimate of costs. At RAND, we have learned that, when it comes to cost estimates, it is often the case that the less you know, the more attractive the costs.

The second uncertainty concerns the future direction of world oil prices. And the third uncertainty I have already touched upon, namely, whether and how greenhouse gas emissions might be controlled in the United States.

Just as these three uncertainties are impeding private sector investment, they should also deter an immediate national commitment to rapidly put in place a multi-million barrel per day coal-to-liquids industry. However, the traditional hands off or research only approach is not commensurate with the continuing adverse economic, national security, and global environmental consequences of relying on imported petroleum.

For these reasons, in my testimony to the United States Senate I suggested that Congress should consider a middle path that focuses on reducing uncertainties and fostering early commercial operating experience by (1) providing federal cost-sharing of front end engineering designs for a few commercial plants and (2) promoting the construction and operation of a limited number of commercial-scale plants by establishing an flexible incentive program capable of attracting the participation of America's top technology firms. We at RAND characterize this middle path as an insurance strategy, since for modest payments it significantly improves the ability of the private sector to respond efficiently to future market developments as both government and industry learn more about the future course of world oil prices and as the policy and technical mechanisms for carbon management become clearer.

An essential component of this insurance strategy is a major increase in federal support for the development and multiple large-scale demonstrations of carbon capture and sequestration.

In concluding my remarks, I would like to raise four issues that I believe are especially important to the Commonwealth of Kentucky.

First, as a major coal-producing state, I suggest that the government of Kentucky give very high priority to promoting an early large-scale demonstration of carbon capture and sequestration in Kentucky or in a neighboring state. This is essential not only for the future of coal-to-liquids, but to the future of Kentucky's entire coal industry. By large scale, I mean a demonstration of the capture and sequestration of at least one million tons of carbon per year. In this regard, I note that Kentucky is represented in two of the seven regional partnerships sponsored by the U.S. Department of Energy and charged with evaluating alternative approaches for capturing and permanently storing gases that cause climate change.

Such a demonstration would be a major endeavor and would involve extensive technical efforts to properly characterize and monitor the storage site over many years. A key component of a large-scale demonstration is a large source of carbon dioxide, which could come from an advanced coal-fired power plant or from a plant designed to convert coal or a combination of coal and biomass to liquid fuels.

My second suggestion focuses on an approach that I believe can help the government of Kentucky to better understand the prospects of coal-to-liquids and better posture itself as a candidate site for a first-of-a-kind plant for producing liquids from coal. As I mentioned earlier, our recommendation to the U.S. Congress is that they consider cost sharing the front-end engineering design of a few

commercial plants. I estimate that a site-specific front-end engineering design of a multi-billion dollar plant will cost between \$20 and \$30 million dollars. It is also my understanding that a few of the pending bills in the U.S. Congress contain provisions for subsidizing such design efforts.

If the Commonwealth of Kentucky is interested in promoting coal-to-liquids development within its borders, the government of Kentucky should consider accelerating the development of at least one site-specific front-end engineering design by cost-sharing with the private sector in the initial activities associated with such a design. These initial design activities would include site selection and characterization, technology selection, plant layout, product characterization and marketing, and associated economic analyses. This work would better posture a Kentucky site to receive federal cost sharing, if the U.S. Department of Energy obtains the authority and budget to provide such cost sharing.

The third issue I raise with this Committee concerns the risks involved in building a coal-to-liquids plant. If the government of Kentucky is considering subsidizing the construction or operation of a coal-to-liquids plant, it should make sure that it is dealing with firms that have the technical, managerial, and financial expertise to properly execute a mega-project. Because when we are talking about coal-to-liquids, we are talking about a multi-billion dollar, first-of-a-kind plant, and these projects can easily result in large cost overruns and performance shortfalls, unless they are properly managed.

And finally, it would be remiss of me not to remind you that world oil prices have a long history of volatility. The high oil prices that we are experiencing today may not persist beyond a few more years. These high oil prices have resulted in a very large global effort to find and develop new sources of petroleum. While we cannot confidently predict that these investments in new oil production will cause world crude oil prices to significantly drop, the chance that world oil prices will drop presents a major risk to private investors and should be a cause for restraint on government subsidies, be they federal or state.

This concludes my remarks. Thank you.