

Testimony

Submitted to the

United States House of Representatives  
Committee on Energy & Commerce, Subcommittee on Energy and Power

On the Topic of

The American Energy Initiative: A Focus on Alternative Fuels and Vehicles,  
Both the Challenges and the Opportunities

By

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## Summary of Testimony

Recent studies have shown that coal-to-liquids (CTL) technologies can produce super clean synthetic gasoline, diesel, and jet fuels devoid of sulfur, nitrogen, and other polluting compounds that would be commercially competitive with oil at \$100 per barrel. Advanced concepts that integrate CTL with electric power production and enhanced oil recovery (EOR) could produce 6.5 million barrels of liquid fuels per day by 2030, thereby reducing oil imports, creating jobs, and enhancing our environment through carbon management technologies that result in fewer emissions than regular petroleum based fuels. The National Coal Council reported in June 2012 on an “Aspirational Case” study that projected annual benefits of \$200 billion in industry sales and \$60 billion in earned federal, state, and local tax revenues, along with the creation of almost one million new jobs. However, we will need next-generation technologies to continue competing successfully with oil. Minimizing carbon emissions will continue to be important. Therefore, federal investments are recommended for advanced research in fuels development and deployment, for next-generation EOR technologies, and for buying down the first-of-a-kind costs for pioneer plants. These investments will keep CTL alternative fuels viable in our national energy mix for transportation by beating oil both on price and on carbon. Deploying a national CTL program would help meet the goals of H. R. 2036, which four of the members of this Subcommittee have co-sponsored. A similar bill, S.937, has been introduced in the Senate. The goals of these bills are to decrease risks to national security, lower domestic energy prices, reduce trade deficits, and create jobs in the U.S. Advanced CTL with EOR will help us attain these goals.

## Main Text of Testimony

Chairman Whitfield and Members of the Subcommittee:

Mr. Chairman, I thank you and members of your subcommittee for the opportunity to offer testimony on the topic of coal-to-liquids, commonly abbreviated as CTL.

### Background

In my role as director of a university-wide energy and environmental center, I have enjoyed an opportunity to work with a research team of five universities called the Consortium for Fossil Fuel Science led by the University of Kentucky. Our consortium focused on finding ways to produce liquid fuels and chemicals from coal and other feedstocks such as biomass and recyclables such as plastics and rubber. I welcomed this opportunity to work with the University of Kentucky's Dr. Jerry Huffman. Since very early in my 30-year career as a research administrator, it seemed to me that we could do more with our abundant coal resource than only making electricity. Our consortium's research focused on applied technology development. My personal involvements have also been in the area of advocating for polygeneration. Polygeneration is a technology that includes a combination of coal-based electricity generation and liquid fuels production to satisfy our nation's need for power and petroleum.

We know that industrial deployment of technologies like coal gasification and Fischer-Tropsch, or F-T, processes can produce super clean synthetic gasoline, diesel,

and jet fuels that are almost sulfur free, have almost no carcinogenic compounds compared to petroleum, produce fewer particulate emissions, and outperform petroleum fuels. The gasification process results in a mixture of carbon monoxide and hydrogen gases, which are the simple chemical compounds that serve as building blocks for multiple plastics and polymers used in products ranging from household goods to industrial-grade materials. Through F-T we not only can make liquid fuels, but also chemicals and other useful products such as fertilizer or ammonia, and even some commonly used over-the-counter medicines such as aspirin.

Gasification and Fischer-Tropsch are well known technologies that can be cost-competitive with conventional petroleum fuels production when the price of oil is high. Our challenge is to make coal-derived products competitive with the price of oil in present and future markets. A more recent challenge is to make these products with reduced CO<sub>2</sub> emissions. We can make coal-to-liquids with reduced carbon emissions through carbon storage – capturing the CO<sub>2</sub> generated in making the fuels or chemicals and storing it in geologic formations. Or, we can reduce CO<sub>2</sub> emissions by adding biomass to the feedstock mix, which is a way of naturally reusing atmospheric CO<sub>2</sub> since biofuels are produced from the existing inventory of CO<sub>2</sub> in the atmosphere rather than by adding additional carbon from mined coal or other fossil fuels. The F-T process inherently requires CO<sub>2</sub> extraction to produce the fuels, so the cost to capture the CO<sub>2</sub> is incorporated into the process and is very low, perhaps only 15 cents per gallon.

### Opportunities for CTL Technologies

The International Energy Agency (IEA) and the Energy Information Agency (EIA) and similar organizations predict petroleum prices to be in excess of \$100 per barrel, and as much as \$200 per barrel in twenty years, depending on the economies of developing nations such as China. China is aggressively pursuing its own CTL strategies out of necessity because they have insufficient petroleum reserves. We believe that we can produce super clean fuels and chemicals in the U.S. at costs of \$94 per barrel for CTL with carbon storage and \$104 per barrel with carbon storage and 15% biomass in the feed.<sup>1</sup> These estimates are based on using today's technology; next-generation technologies would be even more cost competitive. Fuels produced with combinations of coal and biomass feedstocks would emit 25% less CO<sub>2</sub> than is emitted by today's petroleum fuel-based system over its life-cycle.<sup>2</sup>

Another benefit of CTL fuels would be using the CO<sub>2</sub> captured in the production process to stimulate new petroleum production through enhanced oil recovery, or EOR operations. After primary and secondary production technologies are used on an oil reservoir, as much as 60% of the original oil in place remains behind. Here, the CO<sub>2</sub> would be used to liberate stranded oil. The CO<sub>2</sub> would remain behind in the reservoir after doing its job to make the oil flow more freely.

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<sup>1</sup> Production of Zero Sulfur Diesel Fuel from Domestic Coal: Configurational Options to Reduce Environmental Impact, DOE/NETL-2012/1542 December, 2011

<sup>2</sup> Affordable, Low-Carbon Diesel Fuel from Domestic Coal and Biomass, January 14, 2009, US DOE – NETL Report

I want to share with you the results of a study conducted by the National Coal Council that were presented to Secretary of Energy Steven Chu last month.<sup>3</sup> I served as the Chair of the Study Group that developed the report. The U.S. has a four million barrel per day CO<sub>2</sub> / EOR potential to produce stranded oil using tertiary recovery processes like CO<sub>2</sub> injection. Suppose our nation were to undertake a plan to produce 2.5 million barrels per day of F-T fuels from coal and biomass. If we used the CO<sub>2</sub> from these CTL plants plus the CO<sub>2</sub> from one hundred gigawatts of advanced coal-based electricity plants with carbon capture capability, we could liberate 4 million barrels per day of stranded petroleum through EOR. Overall, we would produce 6.5 million barrels of liquid fuels per day. Considering our nation's goal of importing no more than 7.4 million barrels of petroleum per day by 2035, we would reduce our imports to only one million barrels per day. Incidentally, 61% of our trade deficit in 2011 was due to imported oil, so you can see what a large impact this plan could have on our trade deficit.

If we embark on this goal, or Aspirational Case as described by the National Coal Council, by 2030 we would see nearly \$200 billion in industry sales and \$60 billion in federal, state, and local government taxes annually, and be employing about one million people in new jobs in coal mining, fuels production, oil production, and the associated spin-off industries. This Aspirational Case "Company" would rank fifth on the Fortune 500. The jobs would be high paying, and we would need to train and expand our workforce. Oil prices would be stabilized, and by 2035 we would produce

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<sup>3</sup> Harnessing Coal's Carbon Content to Advance the Economy, Environment, and Energy Security, June 2012

what would be 6% of the world's oil supply of 110 million barrels per day here in the U.S. instead of competing for it in a demanding global marketplace. For example, the large amount of stranded oil in the Midwest could be recovered with the CO<sub>2</sub>, thereby bringing jobs to the Rust Belt states.

A CTL industry also would allow the U.S.' transportation sector to be more resilient to climate impacts as well. CTL plants could be located in many regions of the country. A powerful hurricane hitting the Gulf Coast right now could devastate our refinery capacity whereas widely distributed CTL plants would give us a measure of security from such natural catastrophic events.

#### Other Considerations

In my testimony today, I have focused on the benefits of employing CTL technology rather than the technical details of how it works. While gasification and F-T processes are known technologies, much new research remains to be done in improving these processes to stay ahead of the oil price curve. CO<sub>2</sub> EOR tests need to be conducted in strategic areas of the U.S. to validate next-generation technologies to reduce the amount of oil we leave behind in a reservoir. We also need to demonstrate the feasibility of operating highly interconnected power and fuels production facilities with EOR operational systems in the field. Gasification and F-T plants must be built at large scale to operate economically. Large scale means high capital costs for such plants. If we don't reduce risk and uncertainty in costly systems such as CTL – EOR operations, bankers will not provide the financing. The increased taxes earned from

this enhanced oil industry would repay federal investments in launching the Aspirational program.

### Recommendations

Analysts have concluded that both the U.S. and the global community will depend on petroleum and the internal combustion engine well into the future. The United States should use cost effective technologies to produce our needed liquid fuels domestically. Development of a U.S. CTL industry coupled with power generation and the recovery of stranded U.S.-based petroleum is a business model that has the added benefits of improving the environment and job creation.

Federal support is needed to reduce the financial risks of deploying these integrated technologies. Investments in developmental research would bring about both evolutionary and revolutionary changes in technology that would reduce costs. Incentive programs to help buy down the technology deployment risks are needed to encourage first-of-a-kind plants. We need to be attentive to the global marketplace where other countries such as China are making large investments in CTL production. We will be buying our technology from overseas if the U.S. falls behind in advanced research or demonstration in advanced coal technologies.

### Closing Comments

I believe that deploying a national CTL program would help meet the goals of H. R. 2036, which four of the members of this Subcommittee have co-sponsored. A similar

bill, S.937, has been introduced in the Senate. The goals of these bills are to decrease risks to national security, lower domestic energy prices, reduce trade deficits, and create jobs in the U.S. CTL will help us attain these goals.

Mr. Chairman, this concludes my testimony. I would be pleased to answer any questions you may have.