Testimony of David K. Garman
Under Secretary
U.S. Department of Energy
Before the
Committee on Energy and Natural Resources
United States Senate
Washington, DC
May 1, 2006

Thank you for this opportunity to testify before the Committee on the subject of industrial scale gasification in the context of implementation of the Energy Policy Act of 2005.

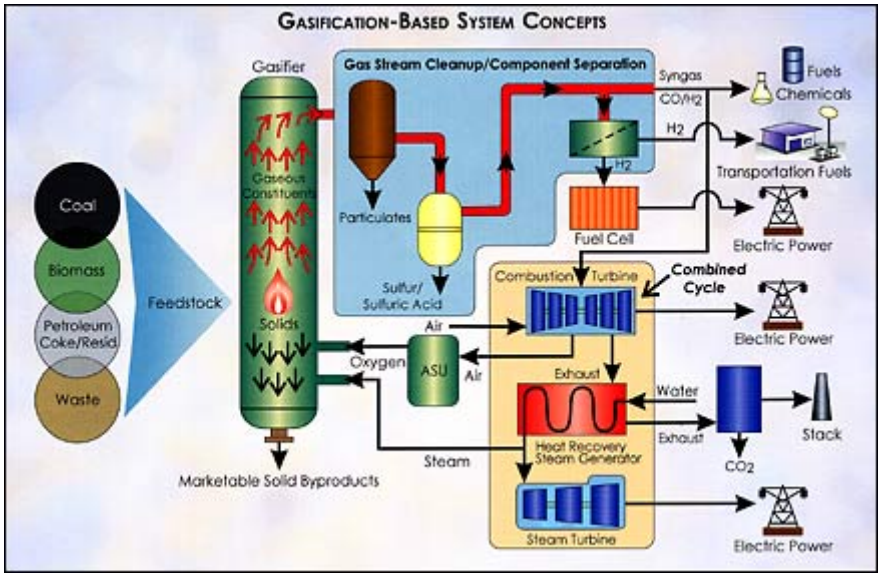
Gasification technology is poised to make a revolutionary impact in the U.S. and global marketplace, so this is an extremely timely topic for the Committee's consideration. Simple combustion technologies have served us well since early humans first employed fire for warmth, light, and cooking. But it is appropriate that we in the 21st century transition toward large industrial and utility-scale gasification in the quest for greater efficiency and the cleaner use of combustible energy resources, particularly in light of the abundant supplies of coal and renewable biomass we have available.

The Department of Energy and industry have been investing in gasification systems research for decades. Very early in our work, we realized that commercially mature gasification-based power systems could nearly double the efficiency of the current combustion-based fleet. The average efficiency of today's combustion-based coal power plant fleet is 32 percent and state-of-the-art coal-fired power plants operate at about 38 percent efficiency. We believe commercially mature gasification-based power plants can achieve efficiencies in the 55 to 60 percent range. To the extent that any of the remaining waste heat can be channeled into process steam or heat, perhaps for nearby factories or district heating plants, the overall fuel use efficiency of future gasification plants could reach as high as 70 to 80 percent.

However, the potential efficiency gains only tell part of the story. Today, new gasification applications have emerged that were not even imagined at the start of our research efforts. For example, near-zero atmospheric emission systems, emitting minimal pollutants and carbon dioxide, are within our technical reach. In addition, gasification-based systems can be configured to produce clean hydrogen or liquid fuels, or a variety of petrochemicals, synthetic natural gas, or any combination of these products and electricity. Gasification-based systems are also projected as having the potential to produce these products at reasonable cost while using some of our most abundant domestic fuel resources—coal and biomass.

This simple diagram describes gasification-based system concepts. A variety of feedstocks, including coal, biomass, petroleum coke and residuals, or even waste can be gasified into a synthesis gas (or syngas) comprised mainly of carbon monoxide and hydrogen. From there a variety of pathways leading to a number of products are possible. But whether you are generating liquid fuels, electricity via combustion turbines, electricity via steam turbines,

electricity via fuel cells, or hydrocarbon based products, gasification is the common technology at the heart of the process.



Of course, the prototype for the ultimate gasification based system, FutureGen, is now under way led by a Government/Industry Consortium that is dedicated and committed to its success. Other governments and international companies have expressed strong interest in joining the FutureGen effort (and some have already joined), which will pave the way for the global deployment of gasification based zero emission systems.

In the State of the Union address, President Bush announced the Advanced Energy Initiative. The initiative's technology focus includes both power and transportation technologies, and it is important to stress that gasification has important contributions to make in each of these areas. For example, just as gasification can dramatically increase the efficiency and lower the environmental impact of power production as mentioned earlier, it can also be a pathway to the production of clean diesel, ethanol, synthetic crude, and other fuels and help reduce our dependence on foreign sources of energy—one of the key goals of the Advanced Energy Initiative.

The challenge that confronts the broader introduction of gasification-based systems is the same challenge that confronts many energy systems—the up-front capital costs are substantial. Lenders lack experience with these projects, so they are less willing to assume the extra risks involved in early generation commercial deployments of gasification technologies. In addition, combustion-based systems have been the beneficiary of centuries of incremental improvement and cost reduction, so they understandably enjoy some "first cost" advantages. We have every reason to expect that the costs of gasification-based technologies will decline as experience with the technology increases—the 10^{th} plant will be more affordable and reliable than the first. We are also encouraged by the fact that manufacturers are beginning to offer performance

warrantees, management and operating contracts, fixed-price construction contracts, and other instruments to diminish risk.

Gasification technologies offer benefits such as lower emissions and greater efficiencies. The widespread deployment of utility and industrial gasifiers may provide an economic alternative to natural gas for consumers who are able to switch to syngas, thereby increasing availability of natural gas for other residential, industrial, and commercial consumers who find it more challenging to change fuel or feedstock.

The industrial sector is the largest consumer of natural gas in the United States, accounting for a third of U.S. consumption. Bulk chemicals and petrochemical refining are the largest consumers of natural gas by volume, and natural gas is also a significant cost component of many other industrial sectors. Natural gas is used in the industrial sector as a feedstock in the production of chemicals, fertilizers, and refined petroleum products, and in the production of process heat. Among the industries that rely heavily on natural gas for process heat are paper and other forest products; food and beverage; primary metals, including steel, aluminum, and metal castings; and glass and other non-metallic production industries. All of these commodity industries are characterized by globally competitive markets with low margins. Thus for some plants, rising natural gas prices have increased the cost of domestic operations.

Much of industry is looking to gasification as an important element in reducing the impact of rising natural gas prices on their production costs. They believe that gasification of the Nation's abundant domestic energy feedstocks can play a significant role in creating a more affordable substitute for natural gas. Gasification of coal, petroleum coke, black liquor, and biomass can be used to create a synthetic gas suitable for providing either process heat or as a feedstock source for chemicals and fertilizers.

As mentioned earlier, gasification can be linked with other processes to produce liquid fuels. Liquid fuels used in transportation comprise about 27 percent of total U.S. energy use. Some industrial interests are looking at liquid fuels based on gasification as a source of energy. Co-production of some mix of power, chemicals, fertilizer, synthetic gas, process heat and steam, and liquid fuels may yield resilient business opportunities and greater energy security.

The ongoing gasification RD&D program and complementary programs now underway across the Department of Energy have the potential to accelerate commercial use of gasification technologies in the industrial marketplace, providing a substitute syngas suitable for relieving pressure on both fuel and feedstock availability and cost. These programs are actively pursuing advancements in membranes for more efficient separation of gas mixtures, catalysts for conversion of syngas into substitute natural gas, and fuel gases for combined cycle power production. At the same time, we support R&D underway in the hydrogen fuel initiative, which is looking at technologies for the production of hydrogen. The gasification program also is coordinated with major efforts now underway to address the issues of carbon management. It is the goal of the long term program to develop essentially emission free processes for the production of power, industrial feedstocks, and substitute fuels.

We are fulfilling our responsibilities with respect to EPAct 2005 tax credits that provide incentives to help bring these technologies into early commercial use and, eventually, widespread adoption across the American economy if they prove economic. In this regard, working with industry, the Department of Defense, and the Environmental Protection Agency, we are studying the business risks associated with industrial gasification and are performing financial modeling to understand the impact of EPAct 2005 incentives on early commercial plants.

.Let me turn now to the topic of loan guarantees. Loan guarantees are only one part of a toolkit—one best used after the technology development cycle is complete. The toolkit established in EPAct 2005 contains several tools, including authorization of R&D for developing technologies, tax credits to reduce the cost of plants that utilize them or improve cash flows, and loan guarantees.

We are confident in the underlying technology behind gasification plants. Indeed, some gasification plants in certain applications have worked well for years. But early gasification plants face "first mover" issues such as permitting delays, longer shakedown periods, and higher costs since learning curves in fabrication, construction, and operations have not yet taken hold. Therefore, the business risks of the first plants remain greater than combustion plants.

Therefore, consistent with the new authorities provided us in the Energy Policy Act of 2005, we are establishing a loan guarantee program within DOE. We are mindful that the Department does not have an enviable record of accomplishment with loan guarantees issued in the past, but we will follow the Federal Credit Reform Act of 1990 (FCRA) and Office of Management and Budget (OMB) guidelines issued since our last experience with loan guarantees, and we will emulate the best practices of other federal agencies. We will move prudently to ensure that program objectives are achieved while meeting our responsibilities to the taxpayer. Toward that end:

- We have established a small loan guarantee office under the Department's Chief Financial Officer.
- We have detailed staff from other programs and may soon be detailing staff from other agencies with some of the necessary experience in Federal loan guarantee programs.
- We are drafting program policies and procedures.
- We are establishing a credit review board.
- We will employ top outside experts for financial evaluation, construction engineering evaluation, and credit market analysis to assist us in our evaluations of applicants.

We are proceeding, but we are doing so with no small measure of caution and prudence. While the provisions of the Energy Policy Act provide a "self pay" mechanism that, in theory, reduces the need for appropriations, it does not eliminate the taxpayer's exposure to the possible default of the total loan amount.

It is possible that the ultimate cost to the taxpayer could be significantly higher than the cost of the subsidy cost estimate. Therefore, DOE's evaluations of loan guarantee applications will entail rigorous analysis and careful negotiation of terms and conditions.

It is also our view that the Federal Credit Reform Act of 1990 contains a requirement that prevents us from issuing a loan guarantee until we have an authorization, such as a loan volume limitation, to do so in an appropriations bill. We do not believe we have the authority to proceed with an award absent having explicit necessary authorizations in an appropriations bill.

Again, I thank you for this opportunity to appear today, and I welcome your questions either today or in the future.