STATEMENT OF

ALEXANDER KARSNER

ASSISTANT SECRETARY FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY

U.S. DEPARTMENT OF ENERGY

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Mr. Chairman, Ranking Member Domenici, Members of the Committee, thank you for the opportunity to appear before you today to discuss the sustainable contribution that biofuels can make to the Nation's fuel supply in the context of the U.S. Renewable Fuel Standard (RFS) and the food versus fuel debate. All of us recognize that high food prices and high gasoline prices are important "pocketbook" issues for American consumers. We also recognize the national and economic security importance of reducing our dependence on oil as well as the urgency of developing new fuels that will reduce greenhouse gas emissions. Our biofuels policy makes important contributions to each of these goals.

Federal Commitment to Sustainable Biofuels Development

As part of the 2007 State of the Union Address, President Bush called on Congress to significantly increase the use of advanced biofuels as part of the Twenty in Ten Initiative. Congress passed and the President signed into law the Energy Independence and Security Act of 2007 (EISA), requiring that U.S. transportation fuels contain at least nine billion gallons of renewable fuels in 2008, growing to 36 billion gallons in 2022. Of the quantity required in 2022, at least 21 billion gallons must be advanced biofuels (non-corn), and of that 21 billion, 16 billion gallons must be cellulosic biofuels; ethanol from corn is capped at 15 billion gallons. The Department of Energy is committed to the goal of developing cost-competitive cellulosic ethanol by 2012. Our efforts will help spur the resources, technologies, and systems at the rate and scale needed to enable this mandate to be met, and impact climate change. To that end, DOE and other federal agencies are working to develop diverse, non-food feedstocks that require little water or fertilizer, and to foster sustainable agricultural and forestry practices. The Administration is also committed to developing a methodology, as required by EISA, to assess the life-cycle impacts of biofuels production, from feedstocks to vehicles, and analyze the impacts to land use and soil health, water use, air quality, and greenhouse gas emissions. Many of these issues are also being addressed through the senior-level Biomass R&D Board Sustainability Working Group, which the Departments of Energy (DOE) and Agriculture (USDA) and the Environmental Protection Agency (EPA) jointly chair.

Together, DOE, USDA, and EPA continue to be committed to collecting and presenting accurate data, projecting potential impacts, and initiating the necessary and appropriate actions to ensure the sustainable growth of biofuels. To that end, DOE, USDA, and EPA have significantly ramped up our analytical efforts to ensure that we proceed with caution but also determination. The agencies will continue to work together as we undertake our respective responsibilities under Title II of EISA.

DOE is also leveraging other partnerships to support the RFS goals. The Department is investing up to $385 million total over four years (FY 2007-FY 2010, subject to appropriation) in cost-shared, integrated commercial-scale biorefineries that are projected to produce up to 130 million gallons of ethanol from cellulosic biomass in four years when they are fully operational. In addition, DOE is investing up to $200 million over five years (FY 2007-FY 2011, subject to appropriation) in smaller (10% of commercial scale) cost-shared biorefineries that will demonstrate a wider range of advanced biochemical and thermochemical conversion technologies and use a wide array of cellulosic feedstocks.

In addition, the Department's Office of Science has recently established three major new DOE Bioenergy Research Centers—led by the University of Wisconsin-Madison, Oak Ridge National Laboratory, and Lawrence Berkeley National Laboratory, respectively—which are bringing together top scientists and researchers in an effort to accelerate the transformational breakthroughs in basic science needed to make next-generation cellulosic biofuels cost-effective. The Department plans to invest over $400 million in total in this effort through FY 2012.

Misconceptions about Biofuels: Environment, Gasoline Prices, and Food Supply

Recent press coverage of ethanol and food prices has created a number of misconceptions about biofuels. The most prominent of these misconceptions are that ethanol does not improve the energy balance, that it has a negative impact on the environment, and that it contributes to rising food prices. We appreciate the opportunity to address these views. We believe biofuels are not creating a food security issue and are only a small part of increased food prices. In addition, biofuels offer a number of important energy and environmental benefits that will grow as the technology for next generation biofuels comes online.

Today's corn-based ethanol has a positive energy balance—that is, the energy content of ethanol is greater than the fossil energy used to produce it—and this balance is constantly improving with new technologies. According to Argonne National Laboratory, each gallon of ethanol produced from corn today is estimated to deliver on average 25 percent more energy than would the fossil energy that is used to produce it.[1] Over the last 20 years, the amount of energy needed to produce ethanol from corn has significantly decreased because of improved farming techniques, more efficient use of fertilizers and pesticides, higher-yielding crops, and more energy-efficient conversion technology.[2] A few scholars have conducted studies that allege a negative energy balance for ethanol; however, these fail to take into account the energy use avoided because of the production of co-products such as Distiller's Grain, a high-protein animal feed.[3]

DOE's current estimates find that ethanol also results in fewer greenhouse gas (GHG) emissions than gasoline, and is fully biodegradable, unlike some fuel additives. DOE's analysis shows that today, on a life-cycle basis, corn ethanol produces approximately 20 percent fewer GHG emissions than gasoline. According to Argonne National Laboratory, with improved efficiency and use of renewable energy, this reduction could reach 52 percent.[4] The positive energy balance and the potential GHG reduction from

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[1] Source: Wang et al, "Life-cycle energy and greenhouse gas emission impacts of different corn ethanol plant types," *Environmental Research Letters*, May 2007.

[2] Source: May Wu, Center for Transportation Research, Argonne National Laboratory, "Analysis of the Efficiency of the U.S. Ethanol Industry 2007."
http://www.ethanolrfa.org/objects/documents/1656/argonne_efficiency_analysis.pdf.

[3] See metaanalysis supportive of this statement: Farrell et al, "Ethanol Can Contribute to Energy and Environmental Goals," *Science Magazine*, January 2006.

[4] Source: Wang et al, "Life-cycle energy and greenhouse gas emission impacts of different corn ethanol plant types," *Environmental Research Letters*, May 2007.

cellulosic ethanol is far greater, as I will discuss later in this testimony. It is important to note that the lifecycle greenhouse gas emissions estimates discussed here do not reflect indirect land use impacts requirements as specified in EISA. Life-cycle analyses involve a number of complicating factors, such as direct and indirect land use effects, and DOE is working with EPA as they develop a lifecycle methodology that meets the EISA definition.

Further evidence of ethanol's environmentally sound contribution to the fuel supply is that vehicles fueled with the ethanol-blended fuels currently in the market—whether E10 or E85—must meet EPA's stringent tailpipe emission standards. Ethanol has proven to be a safe, high-performance replacement for fuel additives such as MTBE.

Blending ethanol and gasoline has led to questions on its potential impact on gasoline prices. However, evidence from an Iowa State study suggests that without ethanol, gasoline prices would be higher.[5] According to this analysis, even during the period in which MTBE was being phased out (2006) and ethanol prices were very high, had ethanol not been available, gasoline prices would have been even higher.[6]

Ethanol is currently less costly than the refiner's average mix of gasoline components. The cost of ethanol to refiners has been lower than the wholesale cost of conventional gasoline.[7] In fact, as of the week of May 26, 2008, the gap was close to a $1.00/gallon difference; even adjusting for energy content, ethanol is cost-competitive. According to EIA, if we had not been blending ethanol into gasoline, gasoline prices would be between 20 cents per gallon to 35 cents per gallon higher.[8]

With regard to food price impacts, our preliminary analysis suggests that current biofuels-related feedstock demand plays only a small role in global food supply and pricing.[9] Moreover, the impact of biofuels on U.S. consumers is even smaller since the farm price of commodities accounts for less than 20 percent of U.S. consumers' food costs.[10]

Numerous studies have found that world food prices have increased due to many factors, including high oil prices (used both in transportation and production of food); droughts in some key exporting countries, including Australia; increased demand as emerging economies grow and their populations consume better diets and eat more meat; a reduction of global agricultural R&D; and other factors.

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5 Source: http://www.card.iastate.edu/publications/DBS/PDFFiles/08wp467.pdf.
6 Historical spot conventional regular gasoline data from EIA 2003-2007, Spot ethanol prices at Chicago Board of Trade 2003-2007, Oil Price Information Services (OPIS).
7 Based on Oil Price Information Service data for spot prices of ethanol (after rebate) and conventional gasoline.
8 This estimate relies on data on the current price difference between ethanol and gasoline and the elasticity of supply for petroleum. Consequently, a range is presented.
9 Source: http://www.usda.gov/wps/portal/!ut/p/_s.7_0_A/7_0_1OB?contentidonly=true&contentid=2008/05/0130.xml, http://www.afpc.tamu.edu/pubs/2/515/RR-08-01.pdf.
10 Source: USDA's Economic Research Service.

In 2007, about a quarter of the U.S. corn crop went to biofuels production, but this fact can be misleading in isolation. Only the starch from the corn kernel is used to produce the fuel, leaving the co-product Distiller's Grain. These Distiller's Grains are used as animal feed which is valued by its protein content, which is significantly higher by weight than the protein content of corn. As a result, almost one-third of each ton of corn used for ethanol production is recovered as a livestock feed. Thus, in actuality, only about one-sixth of the U.S. corn crop by mass is used in fuel production. Moreover, it is important to note that U.S. corn exports have been stable throughout the past decade, and have, in fact, increased recently.[11]

Furthermore, our Nation's enhanced farming techniques and continued improvement in plants and seeds will likely enable our supply to grow. Yield increases could enable us to double our corn based ethanol production over the next ten years while maintaining corn availability for other uses.[12]

Finally, increased global food demand as living standards and diets improve is an important factor in explaining increases in commodity prices, and is unrelated to biofuels. According to the UN, global economic growth has driven up prices for all commodities.[13]

The Potential for Cellulosic Ethanol and Other Advanced Biofuels

Evidence suggests that corn ethanol is not the primary driver affecting worldwide food prices. To help meet our long-term energy needs, the Department's biomass research and development activities are designed to move toward non-food feedstocks that have the potential to have an even greater positive environmental impact.

The biomass feedstocks of today include grains (corn, sorghum, wheat), as well as oilseeds and plants (such as soybeans). The feedstocks of tomorrow will come from a variety of sources such as wastes and residues and fast-growing energy crops. These future feedstocks will consist of agricultural residues like stalks, stems, and other crop wastes, as well as forest resources such as wood waste, forest thinnings, and small-diameter trees. Examples of energy crops include switchgrass, miscanthus, and hybrid poplar trees, in addition to oilseeds and oil crops like algae and jatropha. Some of these promising energy crops can grow on marginal soils, and they can actually sequester carbon. Forest resources, green wastes, and sorted municipal solid waste will also play a role.

As I noted earlier, research to date suggests that today's ethanol has a positive energy balance—that is, the energy content of corn ethanol is greater than in the fossil energy used to produce it. In the future, cellulosic ethanol is expected to improve upon this by

[11] Source: USDA National Agricultural Statistics Service.
[12] Source: Historical Trend data from USDA.
[13] Source: UNCTAD database: http://www.unctad.org/Templates/Page.asp?intItemID=1584&lang=1.

delivering four to six times as much energy as needed to produce it.[14] Additionally, DOE research has shown that cellulosic feedstocks can reduce life-cycle greenhouse gas emissions by 86 percent compared to gasoline.[15]

A number of market and technical barriers to advanced biofuel production exist. Fortunately, Congress and the Administration have taken steps to diminish these obstacles, and we are poised to make even more progress. Market barriers include a lack of cellulosic feedstock market and high capital costs. The main technical barriers are a lack of cost-competitive conversion technologies, a lack of feedstock collection equipment, the absence of standard cellulosic biofuels production blueprints, and the lack of fully integrated large-scale systems. As part of the effort to overcome these hurdles, EISA helps establish a market demand for cellulosic biofuels. EISA also provides grants for research and development projects; and demonstration and commercial application of biofuel production technologies, including important research on plants, enzymes, and microbes. These efforts are working toward cost reductions in conversion technologies, and cost-shared biorefinery projects will help validate approaches.

We have made significant advances, but there is more that would be helpful to support the development of biofuels—for example, expansion of the use of woody biomass and increased penetration of flex-fuel vehicles into the market. Additionally, when developed in parallel to E85 infrastructure, intermediate ethanol-gasoline blends (those between E10 and E85) could also help enable continuous uninterrupted growth in production. The research we are supporting today to produce advanced biofuels beyond ethanol and biodiesel may also eventually help the industry. With continued technological advances at all levels, ethanol can help our Nation reap greater benefits in the future, complementing the President's bold energy initiatives, which seek to increase our Nation's energy and economic security.

Conclusion

The food and fuel pricing issues about which you have raised questions are important and complex. We would again caution, therefore, against hasty judgments. Many analysts both within and outside of Government are currently working to analyze these issues and the one certainty is that our data will improve substantially in the months ahead.

Mr. Chairman, thank you again for holding this important hearing. I appreciate your leadership in this matter as well as this opportunity to address the current debate over the role of biofuels in our Nation's energy portfolio. This concludes my prepared statement, and I would be happy to answer any questions the Committee Members may have.

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[14] Source: Wang et al, "Life-cycle energy and greenhouse gas emission impacts of different corn ethanol plant types," *Environmental Research Letters*, May 2007.
[15] Ibid.