Testimony of

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Mr. Chairman and Members of the Committee, I appreciate the opportunity to appear before you today to discuss developments in energy markets and their possible implications for agriculture.

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Energy Use in Farming and Farming-Related Sectors

Agriculture is a major user of energy. For 2006, EIA estimates that energy use on farms totaled about 910 trillion British thermal units (Btu) or almost 1 percent of total U.S. energy consumption of 99.5 quadrillion Btu. The components of farm energy consumption are as follows: diesel accounts for 51 percent of total use, motor gasoline accounts for 16 percent, natural gas accounts for 9 percent, liquefied petroleum gas (LPG or propane) accounts for 9 percent, electricity accounts for 13 percent, and other fuels account for 2 percent. In addition to direct farm use of energy, agriculture is indirectly affected by energy requirements in the fertilizer industry, specifically in nitrogenous fertilizers. In 2002, the energy requirements of this industry, in terms of thermal content, were about 500 trillion Btu, of which 97.5 percent (471 billion cubic feet) was natural

gas and virtually all of the remainder (3.5 billion kilowatthours) was electricity. Domestic nitrogenous fertilizer production, however, fell by 20 percent from 2002 to 2006. Consequently, energy inputs are likely to have fallen a similar amount.

Based on energy use on farms and in closely-related sectors, every dime added to the price of gasoline and diesel oil, sustained over a year, costs U.S. agriculture $400 million annually. Every dollar added to the price per thousand cubic feet of natural gas costs agriculture over $75 million annually in direct expense. Every penny increase in the price per kilowatt-hour of purchased electricity costs agriculture about $343 million annually in direct expense. The farm sector would probably also incur increased nitrogenous fertilizer costs as the higher prices incurred by the fertilizer industry are passed through to end users.

Agriculture as an Energy Supply Source

Testimony on the interaction between energy markets and agriculture would once have focused exclusively on agriculture's demand for energy. Today, however, the recent increase in the use of ethanol in motor fuels has focused attention to agriculture's current and potential role as an energy supplier. Ethanol use in motor fuels has grown from 1.7 billion gallons per year (bgy) in 2001 to an estimated 6.9 bgy in 2007. This growth has had a substantial impact on corn demand, commodity and land prices, and planting decisions. However, notwithstanding its recent growth, ethanol still accounts for a relatively small share of overall fuel use by gasoline-powered vehicles, which is

projected at about 140 billion gallons in 2007.

While ethanol from grain is by far the most important current energy supply activity in agriculture, other energy supply opportunities are also receiving increasing attention. Production of biodiesel fuel from oilseed crops has grown substantially in recent years, supported by Federal incentives. Farm wastes are increasingly being recognized as an energy resource, and their development is being promoted by Federal incentives and renewable energy portfolio mandates in many states. Farm operators are also benefiting from the growth of wind power, which is providing extra income from leases and royalties to farm operators in areas with attractive wind resources.

The forward-looking sections of this testimony, which follow, offer EIA's perspective on the future for ethanol and other energy supply opportunities in agriculture.

Short-Term Energy Outlook

Turning first to the outlook through the end of 2008, I will be relying on EIA's *Short-Term Energy Outlook*, which is updated each month. The October edition, which was released last week, also includes our annual *Winter Fuels Outlook*.

Global Oil Markets. The current world oil market is characterized by rising consumption, moderate supply growth in the non-Organization of Petroleum Exporting Countries (OPEC), falling inventories, and rising demand for OPEC oil. However, the

combination of OPEC's recent announcement of increased supply and lower seasonal crude demand in the United States over the next 2 months points to crude oil prices easing slightly over the winter. Although some OPEC members, including Angola and Saudi Arabia, are expected to raise production capacity next year, spare capacity levels are expected to remain fairly low once demand growth is considered. As a result, if consumption growth continues at recent levels, as expected, tight global oil market conditions will likely persist through 2008. Continued low surplus production capacity, weak petroleum inventories, and strong demand worldwide have all contributed to recent high crude oil prices.

Crude Oil Prices. While crude oil prices are projected to decline from their recent peak above $80 per barrel, monthly average prices are expected to remain above $70 per barrel through the end of 2008. The main reason for the year-over-year increase is the tight world oil supply and demand balance. West Texas Intermediate (WTI) crude oil prices are projected to average over $73 per barrel in 2008, up from a projected average of under $69 per barrel in 2007. Assuming continued tight global supplies, slower U.S. economic growth of 1.9 percent projected for both 2007 and 2008 (compared to 2.9 percent in 2006) may be a mitigating factor for even higher crude prices.

Diesel Fuel and Heating Oil Prices. Turing to distillate fuels, retail diesel fuel prices in 2008 are projected to average $2.96 per gallon, up from a projected $2.82 per gallon in 2007, while residential heating oil prices are projected to average $2.88 per gallon during the 2007-2008 winter season compared to $2.48 per gallon last winter. The projected

increase is consistent with higher crude oil prices and projections of lower distillate fuel inventories than last year going into the heating season. As of September 30, the start of the winter fuel season, distillate fuel inventories were an estimated 136 million barrels, down 13 million barrels from the previous year, but close to the average of the last 5 years. Total distillate inventories at the end of March 2008 are expected to be 115 million barrels, down 4.5 million barrels from March 2007 but still within the normal range. However, if refiners produce more gasoline than expected over the next few months to rebuild gasoline inventories, this could result in lower distillate supplies.

Natural Gas Production, Inventories, and Prices. Total U.S. marketed natural gas production is expected to rise by 1.3 percent in 2007 and by 0.9 percent in 2008. Working gas inventories by the beginning of November are projected to reach 3,444 billion cubic feet, slightly below the all-time high for natural gas storage inventories recorded at the end of November 1990.

The Henry Hub spot price averaged $6.26 per thousand cubic feet (mcf) in September, which marked the fourth consecutive decline in the monthly average spot price since May. On an annual basis, the Henry Hub spot price is expected to average about $7.21 per mcf in 2007 and $7.86 per mcf in 2008.

Propane. Spot propane prices are strongly influenced by both crude oil and natural gas prices. Retail propane prices are projected to average $2.13 per gallon in 2007 and $2.20 per gallon in 2008. With current inventories well below year-ago levels, however,

propane markets are likely to remain relatively tight this winter, with the potential for additional upward pressure on residential propane prices if the U.S. experiences severe weather. As of September 30, U.S. inventories of propane were an estimated 59.3 million barrels, 7 million barrels below the average over the last 5 years. These inventories are expected to recover as higher prices draw in imports, ending the winter season at 27.7 million barrels--near the average over the last 5 years.

Ethanol. EIA projects that the market for ethanol will continue to grow. In July 2007, the ethanol industry produced an average of 421,000 barrels per day, providing about 4.5 percent of 2007 average daily gasoline consumption volume, or about 3 percent of the energy consumed by gasoline-fueled vehicles. Ethanol plants operated at or near their design capacity limit during this period.

Based on plants currently under construction, ethanol production capacity is expected to increase substantially over the next 15 months. Actual ethanol production is also projected to increase, but at a slower rate than capacity, reaching a projected average level of 570,000 barrels per day (8.7 billion gallons per year) in December 2008. The projected average monthly increase in ethanol production over the period from August 2007 through December 2008 is 8,700 barrels per day per month, compared with an average increase of 9,300 barrels per day per month over the first 7 months of 2007.

The projected slowdown in ethanol demand growth reflects the existence of several distinct segments in the fuel ethanol market, each with a different sensitivity to market

price and infrastructure limitations. The reformulated gasoline market, which is subject to the strictest environmental limits, is the least price-sensitive market segment for ethanol. Demand for ethanol in this type of gasoline, where it is used in blends of 6 to 10 percent, increased significantly with the phase-out of methyl tertiary butyl ether (MTBE), which was completed in 2006. Since that time, virtually all reformulated gasoline has been blended using ethanol.

The next most attractive market segment for ethanol is as a volume extender for conventional gasoline in blends of 10 percent. Current and projected high oil prices, the availability of a 51-cent-per-gallon blenders' tax credit through 2010, and the "consumer illusion" that leads choices between gasoline blended with and without low percentages of ethanol to be made purely on the basis of their price per gallon without consideration of the lower miles-per-gallon using fuel incorporating ethanol, all support the use of ethanol as a volume extender in excess of requirements of the currently enacted Renewable Fuel Standard (RFS). While the current level of 140 billion gallons per year in national sales for all types of gasoline could, in theory, accommodate roughly 14 billion gallons of ethanol in blends of 10 percent or less, many regions currently lack the transportation and blending infrastructure to use ethanol. EIA's projection of ethanol demand in 2008 reflects this limitation.

The final market segment for ethanol is use in high-percentage blends such as E85. Currently, high-percentage blends account for well under 1 percent of the overall U.S. market for fuel ethanol. Expanded use of high-percentage blends is necessary if total

ethanol use is to grow beyond the level of 12 to 15 billion gallons per year that would saturate the market for low-percentage blends. Based on the Brazilian experience, consumers would generally expect high-percentage ethanol blends to be price-competitive with petroleum-based alternatives on an energy-content basis.

One implication of the slower rise in ethanol production rates relative to capacity is that the average capacity utilization factor for ethanol producers is likely to decline substantially in 2008. Although farmers should continue to benefit from increasing corn demand, the availability of underutilized ethanol production capacity will tend to put downward pressure on the margin earned by ethanol producers over their variable production cost.

Energy Trends to 2030

Turning now to the longer-term outlook, I will be relying on EIA's *Annual Energy Outlook 2007* (*AEO2007*) and on several recent EIA analyses of energy and environmental policy proposals that could have a significant impact on agriculture's role as an energy supply source.

Overview. Longer-term trends in energy supply and demand are affected by many factors that are difficult to predict, such as energy prices, U.S. economic growth, advances in technologies, changes in weather patterns, and future public policy decisions. It is clear, however, that energy markets are changing gradually in response to such readily

observable factors as the higher energy prices that have been experienced since 2000; the greater influence of developing countries on worldwide energy requirements; recently enacted legislation and regulations in the United States; and changing public perceptions of issues related to the use of alternative fuels, emissions of air pollutants and greenhouse gases, and the acceptability of various energy technologies.

The *AEO2007* reference case projects increased consumption of biofuels (both ethanol and biodiesel) and other non-hydroelectric renewable energy sources, some growth in nuclear power capacity and generation, and accelerated improvements in energy efficiency throughout the economy. The growth in biofuels and other non-hydroelectric renewable energy consumption roughly offsets the projected decline in the share of total primary energy supplied by nuclear power and hydroelectricity between 2005 and 2030. Therefore, oil, coal, and natural gas still are projected to provide roughly the same 86-percent share of the total U.S. primary energy supply in 2030 that they did in 2005, assuming no changes in existing laws and regulations.

Alternative Fuel Use. The use of alternative fuels, such as ethanol, biodiesel, and coal-to-liquids (CTL), is projected to increase substantially in the reference case as a result of the higher prices projected for traditional fuels and the support for alternative fuels provided in recently enacted Federal legislation. Ethanol use grows in the *AEO2007* reference case from 4 billion gallons in 2005 to 11.2 billion gallons in 2012--exceeding the required 7.5 billion gallons in the RFS that was enacted as part of the Energy Policy Act of 2005 (EPAct2005)--and to 14.6 billion gallons in 2030 (about 8 percent of total gasoline

consumption by volume). Ethanol use for gasoline blending grows to 14.4 billion gallons and E85 consumption to 0.2 billion gallons in 2030. Domestically-grown corn is expected to be the primary ethanol source, accounting for 13.6 billion gallons of ethanol production in 2030. Consumption of biodiesel, also supported by tax credits in EPAct2005, reaches 0.4 billion gallons in 2030.

Renewable Fuel Consumption and Supply. Total consumption of marketed renewable fuels in the *AEO2007* reference case (including ethanol for gasoline blending, of which 1.2 quadrillion Btu in 2030 is included with liquid fuels consumption) is projected to grow from 6.2 quadrillion Btu in 2005 to 9.9 quadrillion Btu in 2030. The robust growth is a result of State renewable portfolio standard programs, mandates, and goals for renewable electricity generation; technological advances; high petroleum and natural gas prices; and Federal tax credits, including those in EPAct2005.

The Potential Impact of Possible Future Policies on Energy Supply From Agriculture

As previously noted, the *Annual Energy Outlook* reference case assumes that current laws and policies continue indefinitely. Other recent EIA analyses suggest that various policy proposals, including caps on greenhouse gas emissions, an increased renewable fuel standard, or a renewable portfolio standard for electricity sellers, could significantly increase reliance on biomass as an energy source. Agricultural products and residues, as

well as dedicated energy crops, are a key part of the overall supply of biomass in some of our recent policy cases.

The two main concerns that appear to motivate many recent policy proposals are energy security and reduction of greenhouse gas emissions. Our recent policy analyses suggest that there are both synergies and conflicts between these objectives. For example, improvements in vehicle efficiency would advance both objectives. In contrast, the adoption of coal-to-liquids conversion without carbon capture and sequestration would advance energy security while increasing emissions.

The situation with respect to agriculture and biomass is particularly complex. A policy focused on energy security would likely emphasize the use of biofuels to reduce our reliance on imported petroleum. Such a policy also would serve to reduce greenhouse gas emissions. However, if greenhouse gas emissions were the primary policy focus, biomass could be used as a substitute for coal-fired electricity generation to provide significantly larger emissions reductions. While biomass from agriculture and other sources has an important role to play in either case, the way in which biomass can best be deployed will depend on how the objectives of energy security and emissions reduction are prioritized.

This concludes my statement, Mr. Chairman, and I will be happy to answer any questions you and the other Members may have.