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Mr. Chairman and Members of the Committee, I am pleased to appear before you today to discuss the Department of Agriculture's (USDA) efforts to advance biomass energy and thereby contribute to the energy security of our nation.

My remarks will focus largely on the economics of biomass energy, followed by a brief discussion of USDA programs that promote biomass energy. At the outset, I want to emphasize two underlying themes throughout this discussion: the ongoing role of research as biomass energy systems are developing technologies, and the overall need for coordination – among federal agencies, as well as government partnerships with the private sector, academia and others – to conduct research effectively.

I also want to stress the strong support of this Administration – as documented in the President's National Energy Policy – for developing biomass energy as part of efforts to increase domestic energy supplies to satisfy America's growing demand for energy. Within this framework, one of USDA's goals is to increase the use of biomass energy. By doing so, we have the potential to create jobs, stimulate economic activity, reduce dependence on foreign oil and cut back on environmental pollution.

USDA is involved in many aspects of biomass energy that contribute to its increased use. Our programs support production of biomass energy. We also support research, development, and

pre-commercial work to advance biomass technology and to reduce costs. USDA also monitors the role of biomass energy in energy markets and U.S. agriculture markets, and conducts economic analyses that alert us to both roadblocks to greater biomass energy use and opportunities for expansion.

USDA biomass energy activities address an array of energy forms, such as starch and cellulosic ethanol, biodiesel from agricultural oils, biomass, and anaerobic digestion for power.

Methane Digesters

One area of focus for us is the development of methane digesters for the production of electricity. This technology has positive environmental effects, and excellent economic potential for producers as well. More than a year ago, the USDA Natural Resources Conservation Service (NRCS) developed practice standards for methane digesters. These anaerobic systems break down animal waste, producing methane as a fuel source for the generation of electricity. The digesters can now be funded through the NRCS Environmental Quality Incentives Program. The agency has had excellent successes with assisting producers to incorporate digesters as part of an overall nutrient management approach. In turn, if market issues can be resolved we believe the future holds a bright potential for widespread utilization of digesters and conversion to power.

Ethanol

The ethanol industry is experiencing tremendous growth due, in large part, to government support policies. Currently, seventy-three ethanol plants are operating in 20 states, with a total production capacity of 3.1 billion gallons per year. With 15 ethanol plants now under construction, total production capacity will increase to 3.7 billion gallons per year by early 2005.

Last year, U.S. ethanol producers converted more than 1 billion bushels of corn and sorghum to more than 2.8 billion gallons of ethanol. This was an increase of 680 million gallons – or 32 percent – over 2002. As new plants come on line and as current plants operate at higher levels, we project this year's production to reach 3.3 billion gallons. We believe ethanol demand will continue increasing in the United States. Moreover, if the energy bill is passed and the renewable fuels standard implemented, ethanol production will increase to at least 5 billion gallons per year by 2012.

Ethanol demand increased significantly in 2003 when California, New York, and Connecticut replaced methyl tertiary butyl ether (MTBE) in their gasoline with ethanol. More than 900 million gallons of ethanol are required annually to replace MTBE in California and about 450 million gallons are required in New York and Connecticut. With this greater demand, ethanol prices rose to over $1.60 per gallon during November and December 2003. Seventeen states have now banned MTBE in their gasoline, an important factor in ethanol's growth.

In terms of production inputs and expense, corn accounts for 95 percent of feedstock used to produce ethanol. Although corn prices are higher this year, these price increases are offset by higher prices paid for ethanol production inputs. Following corn, fuel – mainly natural gas – is the second

largest cost item in producing ethanol. Natural gas prices increased from $2.50 per million British thermal units (Btu) in 1999 to $5.50 per million Btu in 2003, and energy experts expect the price of natural gas to remain high during the next five years. There are no economic alternatives to natural gas for existing ethanol plants. Using petroleum products instead of natural gas would require additional capital investment and prices for both have been moving together.

Historically, estimates of the energy efficiency of ethanol have been the subject of debate. Some past studies estimate that there is a net energy loss and an environmental loss from ethanol. Although it takes energy to produce ethanol, we emphasize that repeated USDA studies, using robust corn yields and increasingly efficient fertilizer and alcohol conversion processes, show a positive net-energy balance of corn ethanol: we believe that the energy in ethanol exceeds the amount of energy used to produce it, and that this energy balance has improved over time.

Technological innovations in corn production and ethanol conversion are important factors in this improvement. Corn yields have improved, and ethanol plants are rapidly adopting innovations which substantially reduce the energy required to convert corn into ethanol. Our most recent estimate of the energy ratio is 1.67, up from 1.22 in 1995. This indicates that the energy content of ethanol is 67 percent greater than the energy used to grow, harvest, and transport corn, and to produce and distribute the ethanol. We are estimating similar positive energy ratios for biodiesel.

Research directed at lowering both feedstock and production costs is key to improving ethanol's competitiveness as a fuel or fuel additive. To achieve these cost reductions, USDA research is targeting several areas: the development of organisms that will convert multiple, mixed substrates; superior product recovery and separation technology; high-value co-products; more efficient technologies and processes for co-product recovery and separation; and better fractionation of

feedstocks. We also have scientific work focused on developing varieties of corn that would be easy to mill and provide optimum levels of fermentable substrate and co-products. Complementing DOE work, USDA is conducting research on cellulosic feedstocks and conversion.

The USDA Forest Service, Forest Products Laboratory (FPL) is researching ways to derive ethanol from biomass other than corn starch. Currently, researchers are studying the conversion of sugars to ethanol. The key to converting wood to energy is converting five and six-carbon sugars to ethanol.
The process for converting six-carbon sugars is well established but five- carbon sugars, which make up about 30% of the sugars in wood, have presented a problem. FPL has developed the capability to ferment the once problematic five-carbon sugars to ethanol and is working toward a process that will convert five- and six- carbon sugars simultaneously. This capability will make it possible for a much wider variety of materials to be converted to ethanol. Researchers estimate that ethanol from wood can make a significant contribution to the liquid fuels market.

Additional Biomass Energy Sources

Biodiesel, lubricants, chemicals, and solvents produced from agricultural fats and oils, offer an opportunity to supplant petroleum derivatives in the coming decade. In the process, “new uses” for agricultural fats and oils may expand, giving farmers new outlets for their crops and bringing them into high-volume markets producing high-value nonfood products.

As these markets develop, they have important national policy implications. Because

agricultural fats and oils are very energy efficient to produce, our calculations show that their emission of greenhouse gases is much lower than petroleum-based fuels on a net emissions basis. They also represent a sustainable source of domestic liquid transportation fuels.

Selected niche market opportunities for biodiesel are emerging. USDA assessed the life-cycle costs of alternative fuel technologies to determine whether biodiesel is cost competitive for urban bus use. We found that while biodiesel and biodiesel blends have higher total costs than some alternative fuels, they have the potential to compete with compressed natural gas and methanol as fuels for urban transit buses.

The major obstacle to the widespread use of fats and oils for biodiesel manufacture is the relatively high cost of biodiesel from food-grade oils: about $2 per gallon (B 100) compared to $1 per gallon for petroleum diesel on a pre-tax basis. Tallows, yellow and white greases (often termed waste vegetable oil), and true wastes, such as sewage trap grease, are cheaper to use than food-grade oils.

A focused research program is critical to creating economically viable sustainable fuels and chemicals markets based on renewable fats and oils. USDA's research is aimed at lowering the cost of production, optimizing the properties of feedstocks used to produce biodiesel, and developing conversion and utilization technologies which take advantage of the unique properties of the fats and oils. Biomass crops, such as poplar, willow, and switch grass, have the potential to become important feedstocks for electric power, liquid fuel, and chemical production. They can offer significant environmental benefits over fossil fuels. As long as there is no net energy loss, the energy produced from

biomass crops does not add greenhouse gases to the atmosphere during the life cycle of the production and use of the crops.

Analysis by USDA and the Department of Energy (DOE) suggests that, with an aggressive research program aimed at boosting crop yields and developing appropriate power and chemical conversion technologies, biomass might compete with fossil fuels for a broad range of uses. Higher fossil fuel prices make biomass-derived fuels more competitive. A key assumption in our analysis is the development of improved production, harvesting, delivery, and utilization systems. Much hard engineering, organizational, and research work will be required to demonstrate the workability of these systems.

USDA Biomass Energy Activities

USDA has a wide variety of ongoing renewable energy programs. Now, I would like to focus on what we are doing to implement new authorities provided in the energy title of the Farm Security and Rural Investment Act of 2002 (Farm Bill). Section 9002, Federal Procurement of Biobased Products, requires federal agencies to increase their procurement of qualifying biobased products. When fully implemented, the program should stimulate development of a broad range of high performing and environmentally friendly biobased products. This section also provides for a voluntary labeling program and use of a "USDA Certified Biobased Product" label. A proposed rule was published in the *Federal Register* on December 19, 2003, and the comment period ended on February 17, 2004. Once we have considered the more than 270 public comments received, a final rule will be published.

Section 9006, Renewable Energy Systems and Energy Efficiency Improvements, authorizes loans,

loan guarantees, and grants to farmers, ranchers, and rural small businesses to purchase renewable energy systems and make energy efficiency improvements. We are developing a proposed rule for this program to operate it on a long-term basis. Last year, we selected 114 applications to receive funding to help develop renewable energy systems, including 30 applications totaling $7 million for anaerobic digesters and 16 totaling $3.9 million for ethanol plant/anaerobic digesters, direct combustion, and fuel pellet systems.

Section 9010, the Commodity Credit Corporation (CCC) Bioenergy Program, provides payments to eligible processors to encourage increased purchases of eligible commodities to expand bioenergy production and support new production capacity. For the 2004 program year, up to $150 million has been authorized by Congress. Energy crops are included as eligible feedstocks. I also want to mention that USDA has an ongoing program of research to improve the economics of biomass energy. Our goals are two-fold: to overcome the technical barriers to developing biomass energy, and to strengthen coordination with other federal agencies and with universities, private sector companies, and environmental organizations.

Biomass Research and Development Program

I would now like to turn to a section of the Energy Title in which the Natural Resources and Environment Mission area of the Department is cooperating with the Department of Energy in implementation. Section 9008 of the Farm Security and Rural Investment Act of 2002 reauthorized the Biomass Research and Development Act of 2000 and provided USDA with $75 million in funding from the Commodity Credit Corporation (CCC) for fiscal years 2002 through 2007. In addition, Section 2306 of the Energy Policy

Act provides authority and requirements for financial assistance for programs covered by Titles XX through XXII of that Act. In 2003, Title II of the Healthy Forests Restoration Act Restoration Act (PL 108-148) expanded the scope of this initiative, integrating silvicultural activities and authorizing an additional $20 million through FY 2007. Through this Biomass Research and Development Initiative, grants are available to eligible entities to carry out research, development, and demonstrations on biobased products, bioenergy, biofuels, biopower, and related processes.

In March 2003, the U.S. Department of Agriculture released the request for proposals (RFP) for the 2003 USDA/DOE Joint Solicitation for the Biomass Research and Development Initiative.. USDA received approximately 400 proposals in response to the solicitation. All eligible proposals were competitively evaluated in a process that included a joint USDA/DOE technical merit review as well as cost analysis and programmatic review based on the respective independent priorities of the departments as published in the solicitation. Although the solicitation stated that $21 million would be awarded, an addition of $2 million from DOE resulted in $23 million in grant awards.

In FY 2004, USDA and DOE jointly released a request for proposals on December 22, 2003, with pre-applications due at the end of January 2004. The solicitation was modified from FY2003 to accommodate suggestions from a federal advisory committee, and to meet new statutory changes to the Biomass Research and Development Act that were contained in the Healthy Forests Restoration Act of 2003. The agencies intend to award up to $24 million, combining $14 million of USDA funds with $10 million DOE appropriated funds.

We are very pleased with the outcome of the Biomass Research and Development program. The initiative has resulted in cooperative funding for a diverse and innovative array of projects including anaerobic digestion, biorefineries, biomass focused forest management training, and innovative use of feedstocks. We are optimistic about the future of this program and look forward to continued collaboration and mutual progress with the Department of Energy.

Continued implementation of the Biomass Research and Development Act of 2000 is a key vehicle for improving coordination. The Act creates a structure led by USDA and DOE to coordinate federal biomass research activities and develop more effective plans. I also want to acknowledge the outstanding support DOE has provided USDA in implementing Section 9006 of the Farm Bill. DOE experts were instrumental in helping us evaluate the technical merits of grant applications. In addition to the ongoing activities, energy is a component of the new Conservation Security Program. We are currently developing ways to include energy activities as CSP enhancement payments. NRCS is also developing a web-based tool to assist farmers in assessing energy consumption and energy use efficiency in crop production. The tool will be semi-quantitative and will provide farmers with another perspective on their energy consumption patterns and assist them in exploring ways to improve the efficiency of their operations.

Taken together, our programs, our research, as well as our direction and focus, will help advance agriculture's key role and realize its potential in meeting the demand for clean, affordable renewable energy. It is our conviction that this process will contribute both to the vitality of rural communities and energy stability of our nation.

That completes my statement Mr. Chairman. I would be happy to respond to any questions the Members of the Committee might have.