



Energy and Agriculture Executive Summary August 2006

This paper is the fourth in a series of briefing papers that assess general themes advanced at the 2007 Farm Bill Forums held during 2005 by Secretary Mike Johanns as well as related issues that have emerged in recent months. This paper describes the current role of U.S. agriculture in energy production and efforts to conserve energy use in agriculture, discusses and evaluates current key energy programs administered by the Department of Agriculture (USDA), and concludes with a discussion of policy approaches to address issues associated with energy and agriculture. The alternatives are not recommendations but are presented for further discussion for the 2007 Farm Bill.

Energy and U.S. Agriculture

Agriculture is a major user of energy, with energy consumed directly and indirectly, through production inputs such as fertilizer. While both agricultural and fertilizer production have made significant improvements in energy efficiency over time, energy-related expenditures (electricity, fuels and oils, and fertilizers) make up an important share of farm production expenses, accounting for 15 percent of total cash expenses. For 2006, energy-related expenses are forecast to climb to nearly \$30 billion, up 50 percent since 2003.

Agriculture also plays a growing role in meeting our Nation's demand for energy. Agriculture and forest products have the potential to become increasingly important sources of renewable energy and provide significant economic opportunities for farmers and ranchers. In 2005, 4 billion gallons of ethanol and 91 million gallons of biodiesel were produced. While these levels represent a small share of U.S. gasoline and diesel use, research may provide technological breakthroughs that lead to significant opportunities for expansion.

In addition to ethanol and biodiesel, biomass and animal wastes are being used to produce renewable energy. Biomass is used to generate electric power by direct burning, using gasification systems, or mixing biomass with coal in coal-fired electrical generation facilities. Animal waste can be turned into methane gas through anaerobic digestion.

Another emerging approach to reducing U.S. fossil energy use is to replace petroleum-based products with products made from biomass. Agricultural feedstocks can be used to produce non-traditional products, such as

chemicals, plastics, hydraulic fluids, and pharmaceuticals.

Over the years, government incentives have been necessary to help ethanol and biodiesel compete with less costly petroleum-based fuels. However, the recent surge in oil prices has made biofuels much more cost competitive, and these industries are attracting substantial new investment.

In the longer term, demand for energy is expected to grow. The U.S. Department of Energy forecasts that by 2030 energy consumption in the U.S. will increase by over 30 percent from current levels, with the growth in energy to meet the needs of the transportation sector forecast to increase by over 40 percent. Therefore, the supply of renewable energy, such as ethanol and biodiesel, must also grow simply to maintain its current share of the overall energy market, and it must grow even faster if it is to reduce fossil-energy dependence.

USDA's Renewable Energy and Energy Efficiency Programs

USDA's renewable energy and energy efficiency programs span the various activities of the Department. During FY 2001-05, USDA spending on biobased products, bioenergy and other energy-related programs totaled \$1.4 billion. USDA spending in FY 2006 on these programs is estimated at \$272 million.

Research. USDA's Agricultural Research Service conducts research on renewable energy and the Cooperative State Research, Education, Extension Service funds additional research. USDA's Forest Service also actively participates in promoting development and use of biobased products and bioenergy through research on enhancing opportunities to use forest biomass to produce energy and other value-added products. Forest Service research also works with science partners in universities, industry, other Federal agencies, and forest landowners and managers to address the issues of biomass management and utilization. Research solicitations are also carried out jointly between USDA and the Department of Energy under the Biomass Research and Development Act of 2000.

Financial and Technical Support. USDA provides financial support to encourage renewable energy

production and the adoption of energy saving practices. The Rural Development mission area is responsible for implementing several renewable energy-related programs. For example, the Renewable Energy Systems and Energy Efficiency Improvements Program provides grants and loan guarantees to agricultural producers and rural small businesses to assist with purchasing renewable energy systems and make energy efficient improvements.

The Natural Resources Conservation Service provides technical and financial assistance to help farmers adopt energy-saving technology, such as no-till planting; improved nutrient and pest management; and improved application, timing, and placement of nitrogen fertilizer.

From December 2000 to June 2006, the Commodity Credit Corporation (CCC) Bioenergy Program, administered by the Farm Service Agency, made cash payments to bioenergy producers who increased their annual bioenergy production from eligible agricultural commodities.

Forestry. The Forest Service is working to increase production of all energy sources in an environmentally sound manner, capitalizing on the potential of woody biomass as a renewable energy resource, and contributing to the improvement of infrastructure for transmitting energy across the country. These efforts include providing energy facility corridors, making lands available for energy mineral development and production, developing renewable energy resources such as woody biomass, wind, solar power, and geothermal energy, and participating in the re-licensing of hydropower facilities on National Forest lands.

Information. The Office of Energy Policy and New Uses administers the USDA Certified Biobased Product Labeling Program, implements and provides procurement information for the Federal Biobased Products Preferred Procurement Program, and conducts the Biodiesel Education Program (BEP). Under BEP, grants were awarded to educate the public, and government and private entities that operate vehicle fleets on the benefits of using biodiesel.

Economic and Policy Issues for Energy and Energy Efficiency Programs

Federal and State governments have helped create markets for renewable energy through tax incentives and mandates. Ethanol production increased over 120 percent between 2001 and 2005. Biodiesel production increased nine-fold over that period. In addition, the Energy Policy Act (EPACT) of 2005 mandates that 7.5 billion gallons of renewable fuels be used in motor vehicles by 2012, guaranteeing a future demand for the renewable fuels. Other factors contributing to the robust growth in renewable fuels production since 2001 include high oil prices and the phase out of MTBE. USDA

programs also contributed positively to growth in ethanol and biodiesel production.

Rural Development grants, loans, and loan guarantees supported the planning and construction of new production facilities and energy conservation projects, creating jobs and additional wealth-enhancing opportunities in rural America. In total, 650 energy projects have been funded during FY 2001 to FY 2005,

at a program level of \$356 million. In addition, matching and funding by the private sector supporting these projects totaled another \$1.3 billion.

During the period USDA rural development programs supported 132 ethanol and biodiesel, 130 wind, 22 solar, 4 geothermal, 2 hydrogen, and 11 hybrid projects; 92 anaerobic digesters and 7 landfill gas recovery systems; 168 energy efficiency projects; and other projects including solid fuel and research.

The Natural Resources and Conservation Service has helped farmers adopt no-till practices on about 62 million acres of cropland, apply nutrient management on 2.9 million acres and pest management on 3.5 million acres, and provided technical and financial assistance to help producers conserve energy use and produce energy using anaerobic digesters.

From December 2000 to March 2006, the CCC bioenergy program reimbursed bioenergy producers \$537 million for 2.5 billion gallons of increased ethanol production, 173.1 million gallons of biodiesel production. This program terminates in 2006, and USDA has not supported extension, arguing that market and other policy incentives are sufficient to encourage expansion of biofuels.

While these programs have contributed to renewable energy production, issues for consideration for the future include the level of funding that should be allocated in a tight budget environment, the effectiveness of the projects funded, the impacts of renewable production on agricultural product output and use, and the role the public sector should play in supporting or subsidizing markets and in conducting research, particularly when market incentives are high. In addition, program design must consider World Trade Organization obligations. Most 2002 Farm Bill energy programs meet the green box criteria for general services, would not be classified as agricultural programs, or could be classified as environmental programs.

Alternative Approaches to Enhancing Renewable Energy and Energy Efficiency

In a competitive market, market prices usually provide the best stimulus to meet consumer demand in the most cost-effective way. Even so, there is a strong economic rationale for increased government support for the

development of domestic alternative energy supplies. The rationale is based on several benefits of increased use of renewable fuels that are not reflected in the market price of renewable fuels. Key benefits of greater use of renewable energy that are not reflected in price include:

Environmental benefits—Renewable energy provides a range of environmental benefits compared with fossil energy, including reduced emissions of toxic chemicals and greenhouse gases.

Energy security—Renewable energy can reduce the dependency on imported oil, making the United States less vulnerable to sudden reductions in oil availability that would disrupt the economy and impose costs on U.S. citizens.

The balance and exercise of geopolitical power—Record-high oil prices have increased the resource value of oil exporting nations. For some, this increase has been an incentive to expand state control of energy resources and to support positions that run against U.S. interests. Greater use of renewable energy could lessen the impacts of such activities on the United States.

Two alternative approaches are presented to expand renewable energy production and energy conservation. One approach is to expand the use of direct government intervention to change market incentives. Direct market approaches include the use of taxes, subsidies, or mandates on energy market participants to change their behavior. The second approach is to expand the use of indirect government support, such as research and demonstration projects, technology transfer activities, access to credit, outreach and education, and similar activities. Each approach has both advantages and disadvantages, discussed in the full theme paper. They are offered for the purpose of generating discussion and ideas for the 2007 Farm Bill. The options are not meant to be exhaustive or to represent specific farm bill proposals.

Alternative 1: *Expand Federal Direct Market Intervention to Support Renewable Energy.* Many direct market incentives exist now. This alternative offers a range of ideas for public consideration, with the understanding that jurisdiction for any suggestions requiring legislation may not be under the agriculture committees. These ideas are also limited to areas where USDA would likely be involved in design or implementation. Other ideas, beyond the scope of USDA (such as CAFE standards, etc.) are not considered. Possible expansions of direct market intervention include:

Raise the level of the Renewable Fuel Standard (RFS). Because biofuel production now far exceeds the RFS, the RFS is not expected to be binding and thus provides limited incentive to produce biofuels. The RFS could be raised to provide a greater production incentive.

The cellulosic requirement under the RFS could also be expanded and accelerated so as to begin before 2012.

Extend renewable energy tax credits to 2015 or later. This change would apply to biofuels and wind energy credits, thereby reducing investment uncertainty created by the current expiration date on the credits.

Reduce biofuel tax credits when they are not effective in increasing biofuel supply or are not needed. This change would avoid excessive use of credits and save Federal budget resources. Such reductions could be accomplished by limiting tax credit eligibility for biofuel production in excess of the RFS, because the credits are not needed to ensure production up to the RFS level. Also, the rate of the credits could be linked to the price of oil—the higher the price of oil, the lower the credit rate—or to the cost of producing ethanol.

Provide accelerated depreciation on renewable energy equipment and facility investment. This preferential tax treatment could help spur new investment in specialized production, handling, and processing equipment and facilities for biopower, biofuels, and bioproducts.

Provide a depreciation allowance on certain land. Examples of this suggestion are lands on which high voltage transmission, wind or solar generation, geothermal generation, land fill gas, and coal field methane development occurs. This allowance could be considered similar to the oil industry depletion allowance and would help increase the return on investment. Cropland used to produce biomass could also be considered for such an allowance, or a conservation payment, to help protect wildlife habitat or limit soil erosion.

Use more land enrolled in the Conservation Reserve Program (CRP) for biomass harvesting and wind energy. CRP land was used for pilot programs in the late 1990s when farmers were allowed to harvest biomass for energy use with a reduced rental rate in Iowa, New York, Minnesota, Pennsylvania, Oklahoma and Illinois. The 2002 Farm Bill allowed the Secretary to permit the managed harvesting of biomass and the installation of wind turbines, consistent with the conservation of soil, water, water quality, and wildlife habitat.

Refocus the CCC Bioenergy Program. The CCC Bioenergy Program, which directly subsidizes feedstocks for biofuel production, is expiring in 2006. With the RFS and tax credits, the program is no longer needed. However, the CCC Bioenergy program could be recast to support only cellulosic ethanol feedstocks, including dedicated energy crops or agricultural/forestry residues to be made into cellulosic ethanol. The program could be simplified to provide a per gallon payment rate, consider a payment limit per eligible entity, and be

terminated as cellulosic ethanol becomes commercially feasible.

Alternative 2: *Expand Federal Indirect Support for Renewable Energy.* Indirect support for renewable energy would help overcome research and technology barriers, problems with access to credit, increase public awareness, and other measures that do not involve direct taxes, subsidies, or mandates. Possible expansions of indirect Federal support include:

Expand the national cellulosic ethanol research initiative. Some have suggested that the public benefits of large-scale, cost-effective cellulosic ethanol production are so great that a major research and development initiative between the government and private sector is warranted. Such an effort could involve a substantial increase in biological and engineering research that promotes the development of economically viable raw materials, processing technologies, and products. The effort could involve Federal research facilities, competitive grants, public-private partnerships, and Federally supported demonstration projects.

Expand creative financial engineering to support development of the biobased economy. Private sector firms engaged in development of the bioeconomy indicate the need for public sector support beyond grants, loans, and loan guarantees, such as some form of equity funding that could be leveraged with their own equity and debt financing. This need appears important when starting the first generation of commercial-scale demonstration or production plants using a technology without a proven record of commercial operation, such as cellulosic ethanol plants and biorefineries. Until the technology has been proven at a commercial scale, equity financing may be difficult to obtain, and debt financing alone is insufficient to launch most projects. A first step to developing new financing approaches is to evaluate the existing public sector development assistance programs to improve the effectiveness of current programs and recommend new financial products that could fill financing gaps. One financing mechanism to consider is to enable Farm Credit System institutions and commercial banks to create investment subsidiaries to invest in non-farm rural businesses. Other ideas would be to provide insurance to a start-up enterprise for specified losses through its first production cycle and to create a development program for new products and markets that provides data bases, forums for interaction between entrepreneurs and financing entities, and business start-up counseling.

Bridge the gap between Federally-funded basic research and industry-funded applied research and development. This funding gap, the so-called “Valley of Death,” often involves proving a concept at a sufficient scale to encourage full-scale production, which is necessary to attract private investment. One approach is public-private partnerships. Another approach is to

use Federal facilities (or develop joint public-private facilities) to establish the proof-of-concept. Such facilities would contain large-scale processing equipment and qualified personnel.

Expand education and outreach for the bioeconomy. Educating the public on the bioeconomy would facilitate the transition to greater use of biofuels and other bioproducts. There is still limited public understanding of economic, environmental, sustainable development, and energy security value of biofuels and other biobased products. Issues and benefits need to be better defined in consumer terms. An outreach and education program with clearly defined and measurable goals could increase interest in renewable and biobased products and support new biomass products and applications. Integration into schools could help to stimulate support for future bioproducts as well as interest young people in careers in this area. The pool of trained people is limited in areas such as natural products chemistry and carbohydrate chemistry.

Meet expected new demands for rural electric generation and transmission. Demand for new electric power generation capacity is building, after many years of little or no new base load capacity being added. Substantial increases in loan guarantee demands are expected. While USDA loan guarantees typically are for 95-100 percent of the loan, consideration may be given to develop a more traditional loan guarantee program for private lenders and use partial loan guarantees or create a mechanism for lenders to bid for the level of guarantee they would require to provide financing. Loan guarantees and planning grants could be targeted to support the development of distributed generation facilities using biobased fuel, wind, solar, or geothermal resources. Often the distribution grid must be augmented to accommodate the renewable or distributed generation power. Loan guarantee authority to support projects to upgrade the grid would help build renewable energy capacity. High voltage transmission capacity to move renewable energy from its source to demand locations is a serious constraint to renewable power development. Clarifying access rights and pricing for high voltage transmission could also be helpful in facilitating needed transmission development.