USDA NRCS

NRCS Program and Technology Assessment – Renewable Energy, Energy Management and Conservation

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Executive Summary

Growing concerns over increasing dependence on imported energy supplies spurred Congress to add a first-ever Energy Title to the 2002 Farm Bill. Responsibility for carrying out the congressional mandate in the Farm Bill was distributed among eleven USDA agencies. Government-wide responsibility for renewable energy and bio-based products is distributed among ***five Federal departments and seventeen agencies***. This report is an outgrowth of NRCS' management to assess its role in this area in the context of government-wide efforts on energy conservation, renewable energy and bio-based products.

The NRCS has a long history of providing technical and financial assistance to U.S. agriculture. The added responsibilities arising from the 2002 Farm Bill in combination with existing authority offers the agency an opportunity to utilize its structure and expertise to make an important and meaningful contribution to the nation's energy and natural resource base. That ability is a critical attribute in view of the likelihood that federal resources will be constrained, or declining as Congress grapples with the federal budget deficit. In addition to the ability to utilize the existing program structure, another area in need of examination was that of identifying technology and resources that might be available outside of the NRCS to accomplish program goals. Under that backdrop, central to the examination and assessment were three core principles:

- Any new program or initiative should fit within the existing NRCS program structure and mission;
- Initiatives should be identified that have the greatest potential for achieving conservation of energy and natural resources and promoting the development and use of renewable energy and biobased products; and,
- Current or new initiatives should be evaluated for their potential to involve partners from outside the NRCS in order to leverage existing technological expertise and agency resources towards the goal of maximizing the effect of energy and natural resource conservation, renewable energy, and biobased product initiatives.

This report outlines the government-wide and USDA roles, including NRCS, and identifies "superior" opportunities for focused efforts by the NRCS. Those "superior" opportunities identified include:

Superior Opportunities -- NRCS Programs

- **Conservation Security Program (CSP)** – Implement the farm energy audit enhancement activity in a cooperative effort utilizing external groups with experience in energy audits and energy management, such as the National Rural Electric Cooperative Association (NRECA), the National Association of State Energy Officials (NASEO), the National Association of Regulatory Utility Commissioners (NARUC) and local Resource Conservation and Development (RC&D) organizations

- **Environmental Quality Incentives Program (EQIP) –Irrigation Water Management** – Research and practical experience has demonstrated substantial savings in water use, and sometimes in energy use, are still possible through more intensive management practices and in some cases, switching to drip, trickle and low-flow micro sprinklers. There is increasing concern among experts over water depletion in the Great Plains Aquifers and in western states with growing populations and

limited water resources. A carefully constructed initiative, within the EQIP framework, but with targeted incentives (such as a higher cost share) to encourage the adoption of appropriate technologies and methods (i.e.,Subsurface Drip Irrigation "SDI") has the potential to reduce the drawdown in aquifers, and the demand for surface applied irrigation water. Potential energy savings in addition to the water savings gives this initiative a major impact potential in the irrigated areas of the U.S.

- **EQIP – Precision farming –**Emergence of readily available technology that utilizes the Global Positioning System (GPS) with geographic information systems (GIS) for applications including site specific application of fertilizers and pesticides, and guidance for tractors that avoids equipment overlap in tillage, planting, and chemical application offers great promise in energy conservation, and nutrient and pesticide management. NRCS should consider developing a Precision Farming Initiative to provide incentives to accelerate the utilization of precision application technology and equipment.

- **Resource Conservation and Development Councils (RC&D's)–** Additional responsibilities gained from the Energy Title of the 2002 Farm Bill offers an opportunity to utilize the coordinative function of RC&D councils and potentially leverage NRCS program funding. RC&D councils are logical partners for outreach with CSP and EQIP programs through promoting the programs to farmers and ranchers in their respective council areas, and seeking creative ways to amplify the impact of the programs through incorporating individual on farm projects into broader based community resource development efforts.

- **Use of biobased products and fuels by NRCS** – On January 11, 2005, USDA published the final rule to implement a program of preferred procurement of biobased products by federal agencies. Highlights of the final rule were described in a press release from the Office of Communication:

> **"**This final rule establishes provisions for the Federal Biobased Products Preferred Procurement Program. This program, authorized by section 9002 of the 2002 Farm Bill, requires all federal agencies to preferentially purchase biobased products that have been designated by USDA as eligible under this program. The new rule establishes the process by which the Department of Agriculture will designate "items" for preferred procurement by federal agencies. Items are generic groupings of biobased products, such as biobased greases, biodiesel and ethanol when used as additives, hydraulic fluids, biobased polymers, industrial solvents, biobased fertilizers and cutting oils. Federal agencies must assure within one year after the publication of this final rule that their procurement specifications require the preference of biobased products consistent with this rule. USDA plans to soon begin issuing a series of proposed rules that will designate specific items for program eligibility. After considering public comments, final rules will be promulgated. This process of designating items by rulemaking is expected to extend over the next three years. While this program is still being implemented, many federal agencies are already incorporating biobased products in their acquisition orders." (News Release, USDA Office of Communications, January 9, 2005).

To date, USDA has identified 83 items on which it is developing test information to support designation by rulemaking. Additional information on purchasing environmentally friendly or biobased products is available through the General Services Administration (GSA) and the Office of the Federal Environmental Executive:

- General Services Administration
  http://www.gsa.gov/Portal/gsa/ep/channelView.do?pageTypeId=8207&channelPage=/ep/channel/gsaOverview.jsp&channelId=-12972

- Office of the Federal Environmental Executive (http://www.ofee.gov/gp/gp.htm)

NRCS has a vehicle fleet of roughly 10,000 vehicles, and 400 General Services Administration (GSA) vehicles. Certain types of fuels, such as E85 that have significant environmental benefits in addition to coming from renewable sources, are difficult to obtain in many areas. The Defense Logistics Agency's (DLA's) Defense Energy Support Center (DESC) provides information and support to Defense agency affiliates and the military, but also extends that service to Federal government agencies. DESC staff have indicated willingness to meet with NRCS staff to assist in developing a program to expand the use of renewable fuels by the NRCS fleet.

Partnership and Outreach Opportunities

- **Outside partners –** A significant number of national organizations and associations exist that have excellent potential to partner with NRCS. The national associations of state energy, agriculture, utility regulatory officials, and cooperative and investor owned utility associations have many common purposes with NRCS regarding renewable energy, and soil and water conservation. Partnering with such groups offers the opportunity to leverage resources and to do a more effective outreach to NRCS customers.

- **Inter and intra-agency coordination –**
  - **USDA specific -**The Biobased Products and Bioenergy Coordination Council (BBCC) is an intra-agency task force comprised of eleven USDA agencies formed to facilitate the sharing of information on programs and technology related to furthering the use of renewable energy and biobased products.

  - **Federal government level -** Two interagency coordinating groups exist for purposes of broader coordination and information sharing; the joint USDA-DOE Biomass Research and Development Initiative, and the Climate Change Science Program (USGCRP). Recently, the Department of Energy (DOE) joined USDA and the Department of the Interior (DOI) in the formation of a Woody Biomass Utilization Group.

  - **Environmental credit trading –** The EPA recently finalized rules calling for a 70-percent reduction in emissions of SO_2 and NOx in an area covering 28 states. Utilities faced with compliance will need to either reduce emissions, or purchase credits generated by others who reduce emissions. Farming practices such as "no till" reduce the output of greenhouse gases (GHG). In addition, construction of livestock waste handling facilities with methane digesters can also reduce the emission of GHG. The recently deployed COMET program for calculating carbon sequestration from various practices could potentially provide data for use in calculating individual farm credits. Additional technology should be explored to assist in calculation of farm and ranch level SO_2, $NIO_{x,}$ and mercury credits.

The NRCS, renewable energy and biobased products initiatives

The NRCS should take a more active role in Federal agency and USDA interagency working groups organized to share information and engage in joint efforts on renewable energy and biobased products. The level of responsibility given to the agency through the 2002 Farm Bill, and the opportunities to utilize the NRCS program delivery structure and technical expertise justifies the creation of a focused coordinative effort at the upper leadership level of the agency on energy conservation, renewable energy and biobased products initiatives.

Author's note: The views expressed in this paper are those of the author only, and do not necessarily reflect the views of the NRCS or its staff.

Introduction

The heritage of the NRCS began in 1933 when Congress created the Soil Erosion Service, and located it within the Department of the Interior. Two years later, in 1935, the Congress created its immediate predecessor, the Soil Conservation Service. As part of a Department-wide reorganization in 1994, the agency's name was changed from the Soil Conservation Service to the Natural Resources Conservation Service; in recognition of the fact that the agency's conservation mission encompassed water, air, plants, and animals in addition to soil. From those beginnings, the NRCS has faced the challenge of protecting and enhancing America's natural resources on private lands. The ravages of soil erosion on U.S. agriculture led policy makers to realize the critical need to stop the growing damage of soil erosion, and the need to train and educate farmers and ranchers on the principles of soil and water conservation. For over 70 years, NRCS and its predecessor agencies have managed programs and disseminated technical information that has protected and enhanced the Nation's agriculture and natural resource base.

Seven decades after its beginnings, the NRCS faces an expanded set of challenges that has grown beyond the initial primary concerns about soil erosion. The new and expanded challenges include water quantity and quality, wildlife habitat management, invasive species, global climate change, energy conservation, and renewable energy issues. With its experience, expertise, and well developed infrastructure, the NRCS is positioned to play a major role in addressing the challenges.

Major changes have occurred in the U.S. and global economy during the time the NRCS has been in existence. Energy prices have increased dramatically in recent years. The globalization of the energy marketplace and increasing dependence on imported petroleum has left the U.S. with very limited ability to control prices for petroleum and transportation fuels. Coupled with the energy issues, population growth and economic activity have put pressure on water resources for crop production and human consumption in many parts of the country. In response to concerns over increasing dependence by the United States on imported petroleum, and political instability in the Middle East, Congress sought to address energy concerns in the 2002 Farm Bill. The Farm Security and Rural Development Act of 2002 (H.R. 2646/P.L. 107-171), signed into law May 2002, was the first Farm Bill to contain an energy title. This legislation was designed to promote the development of bio-based products by encouraging federal procurement of them, providing grants and loans for renewable energy projects, and funding vital research and development in bioenergy. In particular, the Natural Resources Conservation Service (NRCS) developed and implemented initiatives beyond existing conservation programs arising from the energy title in the form of the Conservation Security Program (CSP) and emphasis on the Environment Quality Incentives Program (EQIP) that affect water conservation and livestock waste management.

In addition to the responsibilities given to the NRCS by Congress' action in 2002, responsibility for carrying out the energy mandate in the Farm Bill was distributed among 11 agencies within the USDA. Adding in all Federal energy legislation, responsibility for renewable energy and bio-based products is distributed among ***five Federal departments and 17 agencies***. NRCS leadership has directed that a program and technology assessment be conducted on NRCS programs and initiatives developed under the 2002 legislation with a view towards directing efforts within the scope of NRCS in ways that compliment the government-wide efforts on energy conservation, renewable energy and bio-based products.

The NRCS initiated this examination of its energy and biobased product efforts with a view towards identifying ways to more effectively address those areas. This report was developed following an assessment of NRCS programs and technology support in the areas of renewable energy, energy management and conservation. It outlines Federal department and agency roles, and identifies opportunities for focused efforts with superior opportunity to contribute to energy conservation, renewable energy and biobased products initiatives.

The NRCS is in a strong position to make a major contribution to addressing the energy-related challenges. With an experienced and technologically competent staff, and an infrastructure experienced in program and technology delivery that reaches the national Tribal, farmer and rancher managed resource base, adding additional support for renewable energy, energy management and conservation should be possible within the current structure. That ability is a critical attribute in view of the likelihood that Federal resources could be constrained as Congress grapples with the Federal budget deficit. In addition to the ability to utilize the existing program structure, another area in need of examination was how to identify and utilize technology and resources from outside the NRCS to accomplish program goals. Under that backdrop, central to the examination and assessment were three core principles:

- Any new program or initiative should fit within the existing NRCS program structure and mission; and,
- Initiatives should be identified that have the greatest potential for achieving conservation of energy and natural resources and promoting the development and use of renewable energy and biobased products; and,
- Current or new initiatives should be evaluated for their potential to involve partners from outside the NRCS in order to leverage existing technological expertise and agency resources towards the goal of maximizing the effect of energy and natural resource conservation, renewable energy, and biobased product initiatives.

The scope of the evaluation was to include the following actions:

- Assess the range of energy-related activities and initiatives across the USDA and NRCS
- Identify opportunities to use existing authorities to expand the Agency's role in energy management
    - Opportunities in the Conservation Security Program
    - Opportunities in the Environmental Quality Incentives Program
    - Opportunities with the Resource Conservation and Development Program
- Identify interagency coordination needs (Rural Development; Office of the Chief Economist; Department of Energy; Economic Research Service; Environmental Protection Agency; Cooperative State Research, Education, and Extension Service; Agricultural Research Service)
- Assess how Federal laws such as the Clean Air Act, energy legislation, and state and local regulations could affect the Agency
- Identify outside groups that could partner with NRCS
- Assess the public and private capacity for doing on-farm comprehensive energy audits including technology needs, and potential for cooperation with the Rural Development energy audit program (currently unfunded).
- Identify ways for expanding the use of bio-based products and fuels by NRCS

Chapter 1

Federal Agency Scope

Federal Agency Involvement in Renewable Energy, Bio-Based Products, Energy Management and Conservation

The President's Energy Policy

The President has called on Congress to pass a comprehensive energy bill aimed at four major objectives: 1) promoting conservation and efficiency; 2) increasing domestic production; 3) diversifying the Nation's energy supply; and 4) modernizing the Nation's energy infrastructure. The President's policy statement also stressed that the goals must be pursued while also upholding our responsibility to be good stewards of the environment. Specific goals related to renewable energy are:

The President's Energy Policy – Renewable Energy

- Promote energy efficiency and conservation through new efficiency targets for the Federal government, increased funding for state efficiency programs, and new efficiency standards for consumer products.

- Provide tax incentives to promote hybrid and fuel-cell vehicles, residential solar energy systems, combined heat and power projects, and electricity produced from alternative and renewable sources such as wind, solar, biomass, and landfill gas.

- Authorize a wide range of energy technology research and development programs to develop energy efficient next-generation energy technologies.

- Increase the use of domestically produced ethanol and biodiesel as transportation fuel through a flexible national renewable fuel standard and credit trading system.

http://www.whitehouse.gov/news/releases/2005/03/20050309-4.html

Federal Role in Renewable Energy and Bio-based products

Federal government agencies have been engaged in research, development and deployment of renewable energy technology since the oil embargo of 1973. Most definitions of renewable energy link the energy source ultimately to solar activity and natural geological mechanisms, i.e.:

> "Renewable energy is any energy resource that is naturally regenerated over a short time scale and derived directly from the sun (such as thermal, photochemical, and photoelectric), indirectly from the sun (such as wind, hydropower, and photosynthetic energy stored in biomass), or from other natural movements and mechanisms of the environment (such as geothermal and tidal energy). Renewable energy does not include energy resources derived from fossil fuels, waste products from fossil sources, or waste products from inorganic sources."

Department of Energy (DOE) – Energy Efficiency and Renewable Energy (EERE)

The EERE mission is to strengthen America's energy security, environmental quality, and economic vitality in public-private partnerships that:

- Enhance energy efficiency and productivity;
- Bring clean, reliable and affordable energy technologies to the marketplace; and
- Make a difference in the everyday lives of Americans by enhancing their energy choices and their quality of life.

The EERE program of work includes technologies aimed at dramatically reducing energy demand in the residential, commercial, industrial, government, and transportation sectors; increasing and diversifying energy supply, with a focus on renewable domestic sources; upgrade the reliability of our national energy infrastructure; facilitating the emergence of hydrogen technologies as a part of the United States energy future; and reducing reliance on imported oil. EERE's renewable energy projects include:

- **Biomass Program**
- **Distributed Energy Program**
- **Solar Energy Technologies Program**
- **Weatherization & Intergovernmental Program**
- **Wind & Hydropower Technologies Program**
- **Joint DOE/USDA "Billion Ton Vision on Biomass" study and report (released April 25, 2005)**

http://www.eere.energy.gov/office_eere/mission.html

National Renewable Energy Laboratory (NREL)

The National Renewable Energy Laboratory (NREL) is the Nation's primary laboratory for renewable energy and energy efficiency research and development. Established in 1974, NREL began operating in 1977 as the Solar Energy Research Institute. It was designated a national laboratory of the U.S. Department of Energy (DOE) in September 1991 and its name changed to NREL. NREL is the principal research laboratory for the DOE Office of Energy Efficiency and Renewable Energy which provides the majority of its funding. Other funding comes from DOE's Office of Science and Office of Electricity Transmission and Distribution.
http://www.nrel.gov/overview/

Environmental Protection Agency (EPA)

The EPA has a multifaceted approach to technical assistance and promotion of "clean energy." The EPA defines "clean energy" as "energy derived from highly efficient, clean technologies, including renewable energy and combined heat and power." EPA's Clean Energy Programs are designed to help consumers improve their knowledge about their Clean Energy options by providing objective information, creating networks between the public and private sectors, and providing technical assistance. EPA also offers recognition to leading organizations that adopt Clean Energy practices.

EPA Clean Energy Programs

- Combined Heat and Power Partnership
    - o Works with industry, states and local governments, universities, and other institutional users to facilitate the development of efficient combined heat and power projects. Combined heat and power systems generate electricity and capture waste heat, which is then used to heat and cool buildings or provide steam in industrial processes
- Green Power Partnership
    - o Enlists commercial, nonprofit, and public organizations to purchase a portion of their power as renewable energy, thereby reducing the emissions associated with power generation
- Emissions Data
    - o Generation Resource Integrated Database (GRID) integrates 23 different federal data sources, provides information on air pollutant emissions and resource mix for individual power plants, generating companies, states, and regions of the power grid.
- State and Local Governments -- EPA is working to help share their successes among state and local governments, and to provide technical assistance that helps partners reap the many benefits these technologies offer.

  http://www.epa.gov/cleanenergy/

Department of the Interior (DOI)

The Department of the Interior (DOI) and the Department of Energy (DOE) work collaboratively on renewable energy development. The Departments of the Interior and Energy are also working with USDA and other agencies to encourage the development of renewable energy sources, such as

biomass. In February 2003, the Department of the Interior's Bureau of Land Management (BLM) and Department of Energy's EERE Office published a report, ***Assessing the Potential for Renewable Energy on Public Lands that*** identified the potential for geothermal, wind, solar, and biomass resources on BLM lands in the Western United States, excluding Alaska. This GIS-based report identified renewable energy potential by land management planning units and found that 20 BLM planning units in seven western states have high potential for power production from three or more renewable energy sources. The report (available at www.osti.gov/bridge) also identified the top 35 sites having high potential for near-term geothermal development. DOE continues to work with the BLM to further define the potential for renewable energy development on public lands. Recently, the DOE joined USDA and DOI in the formation of a Woody Biomass Utilization Group designed to further the use of biomass from federal lands. Work efforts of DOI include:

- **Interagency Memorandum on Woody Biomass Utilization** – The Secretaries of Agriculture, the Interior, and Energy signed an interagency Memorandum of Understanding (MOU) in June, 2003 to promote the use of woody biomass byproducts that result from forest, woodland and rangeland restoration and hazardous fuels treatment projects, consistent with locally developed land management plans. Under the MOU, the agencies agreed to:

    - promote understanding among local communities, interested parties and the general public in forest restoration and fuels treatment projects, biomass quality and quantity and seek input on woody biomass utilization strategies;

    - develop and apply the best scientific knowledge pertaining to woody biomass utilization and forest management practices for reducing hazardous fuels and improving forest health;

    - encourage the sustainable development and stabilization of woody biomass utilization markets;

    - support Indian Tribes as appropriate, in the development and establishment of woody biomass utilization within tribal communities as a means of creating jobs, establishing infrastructure and supporting new economic opportunities; and

    - explore opportunities to provide a reliable, sustainable supply of woody biomass and develop and apply meaningful measures of successful outcomes in woody biomass utilization.

- The BLM has prepared a Draft Programmatic Environmental Impact Statement (EIS) to evaluate issues associated with wind energy development on Western public lands (excluding Alaska) administered by the BLM.

- The BLM has completed a biomass utilization strategy for increasing the utilization of biomass from BLM lands.

- The Bureau of Indian Affairs (BIA) is analyzing options for Tribal involvement in biomass energy production. The U.S. Fish and Wildlife Service (Fish and Wildlife Service) and the National Park Service are considering appropriate actions in wood biomass utilization.

http://www.doi.gov/initiatives/energy.html

Department of Defense – Defense Energy Support Center (DESC)

Alternative Fuel Information Station (AFIS)

To ensure that DESC customers are trained on the various facets of alternative fuels from procurement to consumption, the Alternative Fuels Information Station (AFIS) website (http://www.desc.dla.mil/DCM/DCMPage.asp?PageID=591) was developed to effectively disseminate information on alternate and renewable fuels worldwide. The AFIS system was deployed early Summer 2004 and contains interactive tutorials on all of the major alternative fuels from a DESC perspective. The AFIS website contains tutorials on compliance with the Energy Policy Act of 1996 (EPAct), E85, biodiesel, synthetic fuels, and has a separate alternative fuel logistics tutorial.

Opportunities Exist at Federal Agency Level for Communication and Collaboration

NRCS programs could benefit from increased communication and collaboration with the Federal agencies identified in this chapter.

- DOE, EERE directs an extensive research and development effort on renewable energy technology including biomass, solar, wind, and partners with USDA on the Joint Biomass Initiative. NRCS participants in the Conservation Security Program (CSP) and the Environmental Quality Incentives Program (EQIP), as described in Chapter 3 of this report could potentially benefit from technology developed through EERE.

- EPA's work in the area of clean energy and assistance in environmental impact statement preparation for wind energy sites could be valuable to NRCS customers contemplating such systems.

- DOI and USDA Forest Service agencies could serve as valuable sources of information on biomass utilization and as potential partners with NRCS efforts in those areas.

- DOD's DESC has the ability to provide planning support for NRCS implementation of increased use of biobased fuels for the agency fleet.

- NREL's extensive research base, their partnerships with the National Laboratories as well as the private sector could serve as a source of technology transfer to NRCS customers, and as a template for future collaboration by NRCS with outside entities.

Closer collaboration with these Federal agencies would likely lead to many more opportunities for technology sharing and leveraging of resources to the benefit of both sides, and ultimately to NRCS customers in the form of access to more information on the latest technology in renewable energy, new applications, and more ways to develop and utilize renewable energy by Tribal units, farms and ranches. NRCS should move to develop regular communication and idea sharing sessions to identify and implement collaborative efforts with other Federal agencies working in the area of energy conservation, renewable energy and biobased products.

Chapter 2

USDA Scope

USDA Agency Involvement in Renewable Energy, Bio-Based Products, and Energy Management

USDA Agency Involvement in Bioenergy and Bio-Based Products

Eleven USDA agencies and offices provide significant funding for bio-based products and renewable energy related programs with an estimated 2005 budget of just under $247,000,000. Department-wide cooperation and information sharing is facilitated by the Bio-based Products and Bioenergy Coordination Council (BBCC),established by the Secretary of Agriculture to provide a forum through which USDA agencies will coordinate, facilitate and promote research, development, transfer of technology, commercialization, and marketing of bio-based products and renewable energy using renewable domestic agricultural and forestry materials. This includes promoting information sharing, strategic planning and providing policy advice to the Secretary.

USDA BBCC Members include:

Office of the Chief Economist (Two members):

- Office of Energy Policy and New Uses (OEPNU)
- Global Change Program Office (GCPO)

Rural Utilities Service (RUS)
Rural Business-Cooperative Service (RBS)
Cooperative State Research, Education and Extension Service (CSREES)
Agricultural Research Service (ARS)
Natural Resources Conservation Service (NRCS)
Farm Service Agency (FSA)
Forest Service (FS)
Agricultural Marketing Service (AMS)
Foreign Agricultural Service (FAS)

BBCC Support and Oversight

Office of Budget and Program Analysis
Office of the Assistant Secretary for Administration
Office of the Under Secretary for Research, Education and Economics

Office of the Chief Economist - Office of Energy Policy and New Uses

USDA's Office of Energy Policy and New Uses (OEPNU) assists the Secretary of Agriculture in developing Departmental energy policy and coordinating Departmental energy programs and strategies. The Office provides economic analysis on energy policy issues, coordinates USDA energy-related activities within and outside the Department, and studies the feasibility of new uses of agricultural products.

Office of the Chief Economist - Global Change Program Office

The Global Change Program Office (GCPO) operates within the Office of the Chief Economist and functions as the Department-wide coordinator of agriculture, rural, and forestry-related global change program and policy issues facing USDA. The Office ensures that USDA is a source of objective,

analytical assessments of the effects of climate change and proposed mitigation strategies, including biomass energy production and bio-based products use.

Rural Utilities Service

The Rural Utilities Service (RUS), under the Rural Electrification Act of 1936, as amended, is able to finance projects developed by eligible non-profit utility organizations, such as electric cooperatives and public utility districts, but cannot provide capital to individuals. The Agency is continuing to develop options for eligible organizations to expand the use of renewable energy, and has financed both photovoltaic and wind powered renewable energy projects developed by current borrowers.

Rural Business-Cooperative Service

The Rural Development Business-Cooperative Service (RBS) promotes a dynamic business environment in rural America and helps fund projects that create or preserve quality jobs and/or promote a clean rural environment. RBS sponsors the Biobased Products and Bioenergy Program with the goal of financing technologies needed to convert biomass into biobased products and bioenergy in a manner which is cost-competitive in large national and international markets. The focus of this program is to promote national economic interests through conversion of renewable farm and forestry resources to affordable electricity, fuel chemicals, pharmaceuticals, and other materials. Loans for biomass conversion into biobased products and bioenergy are eligible for financing under the Business and Industry Guaranteed Loan Program.

Cooperative State Research, Education and Extension Service

The Cooperative State Research, Education, and Extension Service (CSREES) emphasizes partnerships with the public and private sectors to maximize the effectiveness of limited resources. CSREES programs increase and provide access to scientific knowledge; strengthen the capabilities of land-grant and other institutions in research, extension and higher education; increase access to and use of improved communication and network systems; and promote informed decision making by producers, families, communities, and other customers. CSREES advances research and development in new uses for industrial crops and products through its Agricultural Materials program, National Research Initiative, Small Business Innovation Research Program, and other activities. Areas of interest include paints and coatings from new crops, fuels and lubricants, new fibers, natural rubber, and bio-based polymers from vegetable oils, proteins and starches.

Agricultural Research Service

The Agricultural Research Service (ARS) conducts research to develop solutions to agricultural problems of high national priority. This includes fundamental, long-term, high-risk research that the private sector does not undertake, as well as more applied, focused, problem-solving research. Research related to biobased products focuses on developing feedstocks and industrial products, including biofuels and bioenergy, which expand markets for agricultural materials, replace imports and petroleum-based products, and offer opportunities to meet environmental needs. This includes developing, modifying and utilizing new and advanced technologies to convert plant and animal commodities and by-products to new products and by developing energy crops as well as new crops to meet niche market opportunities.

Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) helps people conserve, enhance, protect, and sustain the Nation's natural resources and environment. NRCS' technical experts work through conservation districts to help land managers take a comprehensive approach to resource use and conservation. NRCS has stressed two priorities for the bio-based products and bioenergy initiative: First, expanded production of feedstocks for biomass/bioenergy should occur with due consideration and protection of natural resources; and second, local communities should be instrumental in

organizing bio-based product and bioenergy enterprises which are environmentally, economically, and socially sustainable. The primary response to the energy and bio-based products initiative is carried out via the Conservation Security Program (CSP) and the Environmental Quality Incentives Program (EQIP).

Forest Service USDA's Forest Service (FS) manages 192 million acres of National Forests and Grasslands, provides resource science and technology development, and assists states and private landowners in forestry activities. Forest Service Research and Development (FS R&D) has a broad research program in the management and use of these resources for biobased products and bioenergy.

Healthy Forests Restoration Act --President Bush signed the Healthy Forests Restoration Act of 2003 (P.L. 108-148) (HFRA) in December 2003. HFRA, as it is known, contains a variety of provisions to speed up hazardous-fuel reduction and forest-restoration projects on specific types of Federal land that are at risk of wildland fire and/or of insect and disease epidemics. The HFRA helps States, Tribes, rural communities and landowners restore healthy forest and rangeland conditions on State, Tribal, and private lands. Through HFRA, a total of $4.4 million is available for grants that increase the use of woody biomass from National Forest lands. Submission of an application is required for the grants, which will not be less than $50,000 or more than $250,000 each. Successful applicants are targeted to be announced by June 1, 2005. This grant program is intended to help improve utilization and create markets for small-diameter material and low-value trees removed from hazardous fuel reduction activities. Solutions that best address the nationwide challenge and the program goals will receive higher consideration. The goals of the program are:

- Help reduce management costs by increasing value of woody biomass and other forest products generated by hazardous fuel treatments.
- Create incentives and/or decrease business risk for increased use of woody biomass from National Forest lands (i.e., must include National Forest System lands but may also include other lands such as Bureau of Land Management, tribal, state, local, and private).
- Institute projects that target and help remove economic and market barriers in using small-diameter trees and woody biomass.

Additional HFRA functions:

- Encourages biomass removal from public and private lands
- Provides technical, educational, and financial assistance to improve water quality and address watershed issues on non-Federal lands.
- Authorizes large-scale silvicultural research
- Authorizes the acquisition of Healthy Forest Reserves on private land to promote recovery of threatened and endangered species, and improve biodiversity and carbon sequestration.
- Directs the establishment of monitoring and early warning systems for insect or disease outbreaks

The **Forest Products Research Laboratory** conducts research on expanding biobased products and bioenergy from forest biomass. Areas of research include:

- Biorefining Components of Woody Materials
- Fermentation of Wood Sugars to Ethanol
- Biobased Products From Low-Valued Sources
- Economic Potential of Short-Rotation Woody Crops for Biobased Products

Farm Service Agency
The Farm Service Agency (FSA) supports the enhancement of America's agriculture and the environment. FSA administers two programs related to Bioenergy: the Bioenergy Program and the Conservation Reserve Research Pilots. The FSA Bioenergy Program seeks to expand industrial consumption of agricultural commodities by promoting their use in production of bioenergy (ethanol and biodiesel).

- Eligibility -- Ethanol producers who have authority from the Bureau of Alcohol, Tobacco and Firearms (ATF) to produce ethanol or Biodiesel producers who are registered and in good standing with the Environmental Protection Agency (EPA)
- Have an approved Bioenergy Agreement and a Bioenergy Agreement number assigned by Kansas City Commodity Office (KCCO).
- Increase bioenergy production in the current year as compared to the previous year using an approved commodity.
- Submit quarterly applications, Form CCC-850A, certifying production and commodity used.

Agricultural Marketing Service

The Agricultural Marketing Service (AMS) mission is to provide market-related services, some fair-marketing regulation, and oversight of authorized agriculture industry programs. AMS does not have the legislative authority to directly promote or market biofuels, biomass conversion to fuels, or any other product.

AMS' Federal-State Marketing Improvement Program (FSMIP) does provide matching funds to State Departments of Agriculture and other appropriate State agencies to assist in exploring new market opportunities for food and agricultural products, and to encourage research and innovation aimed at improving the efficiency and performance of the marketing system. FSMIP funds can be requested for a wide range of marketing projects, including, but not limited to: 1) developing and testing new or more efficient methods of processing, packaging, handling, storing, transporting, and distributing food and other agricultural products; 2) assessing customer response to new or alternative agricultural products or marketing services, and evaluating potential marketing opportunities for U.S. producers, processors, and agri-businesses, in domestic and international markets; and 3) identifying problems and barriers in existing channels of trade and exploring improvements to marketing practices, facilities, or systems to address such problems.

In fiscal year 2004, the FSMIP program funded a project in Alabama to analyze the market for power generated from agricultural by-products as an alternative for coal, and another in Michigan to assess the economics and marketing opportunities for agricultural residues such as corn cobs and distiller's grain.

AMS also has oversight of the National research and promotion program for soybeans, administered by the United Soybean Board. The Board sponsors research to develop soy products for use in five major market segments that use petroleum products: plastics, coatings and inks, lubricants, adhesives and specialty products such as solvents. The Board's current goal is to develop eight new industrial uses by 2005 that increase the utilization of U.S. soybeans by 10 million bushels per year.

Foreign Agricultural Service
The Foreign Agricultural Service (FAS) maintains 80 overseas posts with the overall goal of supporting expanded U.S. exports of agricultural, forest, and fish products.
FAS works through private industries to identify overseas market opportunities for new products such as vegetable oil lubricants, soy ink or biodegradable textile material made of corn. FAS activities also

indirectly help reducing production cost of corn-based ethanol fuel in the U.S. through the promotion and expanding the exports of ethanol by-products (DDG and corn gluten meal) to overseas markets. FAS supports these activities through the Market Access Program (MAP), the Foreign Market Development (FMD) program and the scientific exchanges sponsored by the International Cooperation and Development (ICD) programs.

Opportunities Exist at USDA Interagency Level for Communication and Collaboration

Like the situation involving Federal agencies, NRCS programs could benefit from increased communication and collaboration with USDA agencies identified in this chapter.

- Significant opportunities exist for "cross fertilization" among USDA agencies in the areas of research, demonstration and dissemination of technology.
- Potential partnerships between and among USDA agencies should be explored.

Similar to the situation with the NRCS and Federal agencies, a stronger and more focused effort with other USDA agencies could lead to many more opportunities for technology sharing and leveraging of resources. Again, NRCS customers would be the beneficiaries of such a coordinated effort. NRCS should take a more active role in interagency groups and organizations working on renewable energy and biobased products.

Chapter 3

NRCS

Bioenergy, Bio-Based Products and Conservation Initiatives

NRCS Initiatives in Conservation, Bioenergy and Bio-Based Products

Conservation Security Program (CSP)

The Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance for the conservation, protection, and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on Tribal and private lands. The program provides payments for producers who practice good stewardship on their agricultural lands and incentives for those who want to do more. The program is designed to reward the best conservation stewards of the most environmentally sensitive areas in targeted watersheds.

CSP Program Fundamentals – Three Tiers of Participation

- For the Tier 1 program participation level, producers must qualify by addressing water and soil quality concerns on part of their operation.
- For the Tier 2 program participation level, producers address the above two concerns on the entire operation, and agree to address an additional resource concern by the end of the contract period.
- For the Tier 3 program participation level, producers must address all resource concerns (the above two, plus all other applicable resource concerns identified by the local Field Office Technical Guide, including water quantity and wildlife concerns on their entire operation). In addition, all riparian corridors within the agricultural lands or incidental parcels offered for CSP contracts are buffered to restore, protect, and enhance riparian resources.

Contract Payment Components

- An annual stewardship component for the existing base level conservation treatment.
- An annual existing practice component for the maintenance of existing conservation practices (maintenance payments).
- An enhancement component for exceptional conservation effort and additional, exceptional conservation practices or activities.
- A one-time new practice component for additional needed practices.

Program Payment Limitations (Contract life can vary from five to 10 years.)

- For Tier 1, contracts have a maximum annual payment limit of $20,000.
- For Tier 2, contracts have a maximum annual payment limit of $35,000.
- For Tier 3, contracts have a maximum annual payment limit of $45,000.

Five Types of Enhancement Activities

- Improvements exceeding non-degradation requirements, such as in energy, soil, nutrient, pest, habitat, grazing and air management enhancements.
- Improvement in a priority local resource concern.

- On-farm conservation research, demo or project.
- Cooperation in conservation plans that involve at least 75% of producers in target areas.
- Implementation of assessment and evaluation activities.

Energy Enhancement Features

- Energy audits
- Energy conservation opportunities
- Recycling of farm lubricants
- On-farm energy generation possibilities
- Petroleum-based liquid fuel replacement with soy-bio-diesel and ethanol

Energy Enhancement Incentive Levels (Levels may vary slightly across states)

- $500 per farm for energy audit.
- Incentive payment will vary depending on the level of reduction in soil disturbance Index, fertilizer use, legume rotation, and over-all energy use,
- $200 per year for recycling farm lubricants
- $2.50 per 100 kWh of energy produced by wind, solar, geothermal and methane.
- $25 per 100 gallons (on bio-component of liquid fuel).

Budget Note: CSP was funded at $41.4 million in 2004. For 2005, the funding is estimated at $202 million. The 2006 President's budget proposes $ 274 million for CSP.

CSP Superior opportunity -- on-farm comprehensive energy audits

AGRICULTURAL ENERGY AUDITS
Drafted by Stefanie Aschmann and Felix Spinelli

BACKGROUND:

The Conservation Security Program provides for a one-time payment to eligible farmers and ranchers to support the cost of conducting an energy audit of farming and ranching operations. In the early stages of CSP, the response to the farm energy audit provision has been limited. One major constraint noted by NRCS staff and field personnel was lack of access to reliable auditors.

PROBLEM:

The limited number of individuals and organizations offering agricultural energy audits and the lack of consistency in what is supplied by these audits has become an urgent concern for NRCS field offices working in CSP watersheds. An attempt to identify auditors in Maryland, for example, located four companies in three states, none of which had actually worked in Maryland and most of which focused on residential or industrial applications. Since there are no general standards for energy audits, the quality of the audits provided is unknown. Several utilities, state energy offices, and private firms have indicated a willingness to conduct audits on farms, but have asked for guidance as to what the audit should entail. Some states may have certification programs for energy auditors. Others may not. To ensure consistent quality of agricultural energy audits, the minimum qualifications for certification of an energy auditor and/or the standards for a certified agricultural energy audit must be established.

ACTION:

The following immediate actions are underway

1) Bring together an interdisciplinary team of engineers and agricultural specialists to specify the minimum requirements for a certified agricultural energy audit. Expected results of these efforts include an interim technical note or practice standard. Those immediate needs are being addressed at this time. (Aschmann and Spinelli)
2) Explore opportunities for partnering with other groups to locate and/or train agricultural energy auditors. These groups could include:
    a. Cooperative Extension Service
    b. State Departments of Energy (NASEO)
    c. Utility Companies (NARUC)
    d. State Departments of Agriculture (NASDA)
    e. Land Grant Universities (especially agricultural engineering departments)
    f. RC&D's
    g. County Level Governments
3) If an interim standard is adopted it should provide the minimum qualifications necessary to conduct a certified agricultural energy audit.
4) In the longer run, NRCS will explore the need for a conservation activity standard for the farm energy audit and/or other means to standardize a method to recognize certified energy audits and auditors. One means being discussed is to ask the American Society of Agricultural Engineers (ASAE) to construct standards for energy audits.

Environmental Quality Incentives Program (EQIP)

The Environmental Quality Incentives Program (EQIP) was created by the 1996 Farm Bill and was reauthorized in the 2002 Farm Bill. EQIP was designed to provide a voluntary conservation program for farmers and ranchers to make physical changes on working lands to assist eligible participants in the installation or implementation of structural and management practices on eligible agricultural land.

EQIP offers contracts with a minimum term that end one year after the implementation of the last scheduled practices with a maximum term of ten years. The contracts provide incentive payments and cost-share payments to implement conservation practices on working lands. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP activities are carried out according to an EQIP plan of operations. The plan is developed in conjunction with the producer, and it identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.

EQIP may cost share up to 75 percent of the costs of certain conservation practices (90 percent cost share for limited resource producers and beginning farmers and ranchers). Incentive payments may be provided for up to three years to encourage producers to carry out management practices that they may not have otherwise implemented without the incentive. Farmers and ranchers may elect to use a certified third-party provider for technical assistance. An individual or entity may not receive, directly or indirectly, cost-share or incentive payments that, in the aggregate, exceed $450,000 for all EQIP contracts entered during the term of the Farm Bill.

Budget note: EQIP was funded at $902.8 million in 2004. For 2005, the funding is estimated at $1.017 billion. The 2006 President's budget proposes $1 billion for EQIP.

Ground and Surface Water Conservation

"The 2002 Act also added a provision to EQIP which specifically addresses ground and surface water conservation with dedicated funding. Section 1240I of the 1985 Act provides the Secretary authority to promote ground and surface water conservation by providing cost-share payments, incentive payments, and loans to producers to carry out eligible water conservation activities including improvement to irrigation systems; enhancement of irrigation efficiencies; conversion to the production of less water-intensive agricultural commodities or dryland farming; improvement of the storage of water through measures such as water banking and ground water recharge; or mitigation of the effects of drought. NRCS seeks comments regarding how to administer a loan program in accordance with this section." (Excerpted from Federal Register, February 10, 2003)

Example of EQIP Implementation Plan - Klamath Basin

Section 1204I(c)(2) of the 2002 Act dedicates an additional $50 million for ground and surface water conservation activities in the Klamath Basin located on the California/Oregon border. Pursuant to the 2002 Act, NRCS intends to use EQIP to implement this provision in accordance with the statutory requirements for ground and surface water conservation, such as improved irrigation systems, enhanced irrigation efficiencies, and improved water storage, with a goal of an overall ``net savings" for agricultural operations. However, due to the complexity of resource issues in the Klamath Basin, a reduction of water usage may not always be the only appropriate solution available. Improving the quality of Klamath Basin water resources makes more ``usable" water available, thus resulting in a net savings related to agricultural uses. Water conservation activities in the basin can therefore include water quality improvements as well as a reduction in water usage by agricultural operations.

Increased Emphasis on Irrigation Water Management – Promise for Water and Energy Conservation and Better Nutrient Management

"The Ogallala Aquifer is the major water supply for irrigation in the Central Great Plains. However, in many parts of the Ogallala Aquifer, groundwater levels are declining due to withdrawals greater than the recharge. Many regions face a future without irrigation water supplied by the Ogallala Aquifer. Trends in irrigated and non-irrigated cropland use in Texas from 1964 to 1982 showed that as groundwater supplies became inadequate, irrigated cropland reverted to dryland (Crosswhite et al. 1990). To deter this potential change in agriculture, some regions within the Central Plains have instituted regulations that restrict the amount of pumping. As groundwater declines occur, areas that previously had good producing wells have seen declines in their output. With these changes in well output or regulations, management practices for irrigation must change." (Paper presented at the 2002 Central Plains Irrigation Shortcourse and Symposium by Joel Schneekloth, Regional Extension Water Resource Specialist, Colorado State University)

The combination of the expected continuance of high energy prices coupled with declining water supplies are forcing producers to re-examine their irrigation management techniques, their entire systems, and their crop selection and rotations. One technology that is showing especially high potential to reduce water use and give substantial nutrient control is sub-surface drip irrigation (SDI). While other irrigation systems (for example, low energy precision application (LEPA) center pivot and other drip, trickle and low-flow micro sprinklers) which are

managed comparably can produce similar productivity gains, subsurface drip irrigation (SDI) provides a stark example for the kinds of savings found in trials. "When properly managed, subsurface drip is one of the most efficient irrigation methods with typical application efficiencies exceeding 90 percent. In a review, Camp (1998) found that yields for subsurface drip irrigated crops were equal to or greater than yields from other methods of irrigation. He also found that the water requirement for SDI systems was generally similar to or slightly less than for any efficient, well-managed irrigation system. Some investigators reported irrigation water requirements as much as 40 percent less than for other irrigation methods." (*Proceedings of the 4th Decennial National Irrigation Symposium, Nov 14-16, 2000, Phoenix AZ*).

The increased emphasis on irrigation water management extends not only to areas such as the Great Plains Aquifer, where water supplies are increasingly limited, and expensive to obtain, but also in areas where regulations restrict water use.

NRCS EQIP program managers report that irrigation related projects accounted for approximately 11 percent of total EQIP spending over the past three years, or approximately $100 million annually. Of that amount, approximately two thirds of the program support goes to above ground irrigation practices, and one third towards drip, trickle and low-flow micro sprinklers.

Opportunity - NRCS is in a unique position through EQIP to have a significant impact on water and energy conservation, and nutrient management by increasing emphasis and support for SDI. Ways should be examined to increase the number of SDI systems supported under EQIP, such as increasing the cost share percentage for SDI systems, thus reducing the cost differential between above ground sprinkler and flood irrigation systems and SDI. ***Pilot Program –*** One possible approach would be the establishment of a pilot program focused on one or several areas where water table depletion is of greatest concern. The pilot porgram would offer, for example, higher cost share for SDI systems in those targeted areas. Such an approach would provide additional valuable information on the applicability of SDI to a broader emphasis on water and energy conservation.

Future Opportunity -- Conservation Innovation Grants

Conservation Innovation Grants (CIG) is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection, in conjunction with agricultural production. Under CIG, Environmental Quality Incentives Program funds are used to award competitive grants to non-Federal governmental or non-governmental organizations, Tribes, or individuals. CIG enables NRCS to work with other public and private entities to accelerate technology transfer and adoption of promising technologies and approaches to address some of the Nation's most pressing natural resource concerns. CIG will benefit agricultural producers by providing more options for environmental enhancement and compliance with Federal, State, and local regulations. Additional information on the national CIG program can be found at the link below.
http://www.mt.nrcs.usda.gov/programs/cig/index.html

State Component of CIG

The State component of CIG is being piloted in 12 States and the Pacific Basin area in fiscal year 2005. State CIG competitions will be announced through public notices, separate from the national competition. State competitions may have unique application requirements and

submission deadlines. Information on each State competition can be obtained by clicking on the link below.
http://www.nrcs.usda.gov/programs/cig/statecomponent.html

EQIP Superior opportunity – Precision Farming Initiative

Definition of Precision Farming

"Precision Farming is the title given to a method of crop management by which areas of land/crop within a field may be managed with different levels of input depending upon the yield potential of the crop in that particular area of land. The benefits of so doing are two fold:

- The cost of producing the crop in that area can be reduced and,
- The risk of environmental pollution from agrochemicals applied at levels greater than those required by the crop can be reduced" (Earl et al, 1996).

“Precision farming is an integrated agricultural management system incorporating several technologies. The technological tools often include the global positioning system, geographical information system, yield monitor, variable rate technology, and remote sensing.” (Randall J. Covey, Iowa State University)

The tools of precision agriculture give farmers the ability to more effectively use crop inputs including fertilizers, pesticides, tillage and irrigation water. More effective use of inputs means greater crop yield and(or) quality, without polluting the environment.

Precision agriculture can address both economic and environmental issues that surround production agriculture today. For many farmers with the sufficient level of managment that they can benefit from precision management, EQIP assistance could help them overcome any knowledge and financial barriers to adopt new technologies to conserve resources. For example, conventional tillage, fertilization and pesticide application are typiclly subject to an application overlap of from 10 to 20 percent (Virginia Cooperative Extension Service Bulletin http://www.ext.vt.edu/pubs/bse/442-501/442-501.html). Thus, application of precision farming techniques to tillage and application practices alone promises similar reductions in fuel consumption, fertilizer and pesticide usage approaching the same magnitude. Through the implementation of more exact soil testing, weed mapping and water use monitoring that precision farming provides, input costs should be reduced even further as fertilizer and pesticide applications are more accurately targeted to soil and topography conditions.

Opportunity - The EQIP program is the most likely vehicle from which to deliver a Precision Farming Initiative. Along with existing nutrient management programs, a Precision Farming Initiative would serve to further the use of technology and methods and could result in substantial gains in the area of promoting more effective use of inputs and dramatically reduced risk of environmental harm that can occur from excessive or improper application of fertilizer and pesticides. These initiatives could be developed in a manner similar to cost share aspects of other EQIP programs such as manure management, irrigation, and nutrient management.

EQIP Superior opportunity – Partnering with electric cooperatives and /or utilities in "manure to electricity" projects

A potential model of farm to utility energy generation and distribution is an innovative pilot program recently created by a Wisconsin rural electric power cooperative. Dairyland Power Cooperative based in La Crosse, Wisconsin provides the wholesale electrical requirements and other services for 25 electric distribution cooperatives and 20 municipal utilities. Together they serve more than half a million people in four states (Wisconsin, Minnesota, Iowa and Illinois). This cooperative is assisting farmers with the installation of a methane digester and marketing of their electricity through a program where the farmer owns the methane digester while Dairyland constructs and owns the generating equipment on the producers' premises. In effect, Dairyland purchases the methane gas produced by the digester and generates and markets the electricity while producers operate and maintain the facility over the life of the project. EQIP assistance provided to the producer would lower the cost of the actual digester for the producer while the Dairyland arrangement reduces the contractual risk associated with energy sales. Dairyland estimates that approximately 30 methane digester projects will eventually be developed on its system at dairy and swine farms. Dairyland has signed agreements with five farmers to purchase methane gas produced by the farm based digesters under 30-year contracts, each farm generating 750 kilowatts of renewable power. Combined, the methane produced from the five farms will generate enough energy to power 3,000 homes within the Dairyland system. The first project is coming on stream in June, 2005.

Opportunity – Energy generation and marketing models, such as that presented above, may be necessary for farmers and ranchers to overcome certain technical and financial hurdles associated with many energy generation technologies. For example, the model above overcomes one of the most common problems faced by farmers and ranchers seeking to enter the renewable energy marketplace—connection to the electricity grid. Such models have the potential of turning an environmental management problem into an economically and environmentally sound benefit. This approach might also be appropriate for RC&D councils, discussed in the next section.

Superior opportunity –Resource Conservation and Development Program (RC&D)

Resource Conservation & Development Program (RC&D)

The purpose of the Resource Conservation and Development (RC&D) program is to accelerate the conservation, development and utilization of natural resources, improve the general level of economic activity, and to enhance the environment and standard of living in designated RC&D areas. It assists local governmental units and non-profit organizations' efforts to plan, develop and carry out programs for resource conservation and development. The program also plays a coordinative role in rural areas. Program objectives focus on improvement of quality of life achieved through natural resources conservation and community development. RC&D areas are locally sponsored areas designated by the Secretary of Agriculture for RC&D technical and financial assistance program funds. RC&D staff work to encourage and improve the capability of volunteers, as well as local elected and civic leaders in designated RC&D areas to plan and carry out projects for resource conservation and community development.

Opportunity - One example of a collaborative role for RC&D councils lies in coordinating multiple farm wind energy generators into a consolidated power supplying entity and supplying community based processing or manufacturing development projects, or serving as the interface between

farm based renewable energy providers and local electricity grids as noted in the previous discussion involving the Wisconsin electric cooperative, Dairyland Power.

Opportunity – Woody biomass for energy programs represent another opportunity for RC&D councils to facilitate cooperative efforts among agencies including NRCS, USDA Forest Service, DOI Forest Service and others. The development of a "sustainable forestry standard" for inclusion in the NRCS Handbook to provide guidance on woody biomass production on farms, ranches and woodlands could be supported by information gathered in the process of RC&D collaborative efforts, among those of other ares within NRCS.

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Opportunity - Yet another opportunity occurs in the development of the environmental credit trading marketplace. The unit size of an SO_2 or NO_x contract is 25 tons on the Chicago Climate Exchange, far larger than even a large farm might generate in credits. There will be a need for an "aggregator" to accumulate the smaller credits into a "market size" package in a manner similar to how commercial banks "bundle" individual loans to a larger size for sale into the secondary market. RC&D's would be a logical aggregator for the environmental credits.

Chapter 4 Interagency Coordination

Federal Interagency Organizations – Bioenergy, Biobased Products, Environment

USDA Biobased Products and Bioenergy Coordination Council

The Biobased Products and Bioenergy Coordination Council (BBCC) was established by the Secretary of Agriculture to provide a forum through which USDA agencies will coordinate, facilitate and promote research, development, transfer of technology, commercialization, and marketing of biobased products and Bioenergy using renewable domestic agricultural and forestry materials. This includes promoting information sharing, strategic planning and providing policy advice to the Secretary.

Membership Includes

- Agricultural Marketing Service
- Agricultural Research Service
- Cooperative State Research, Education and Extension Service
- Farm Service Agency
- Foreign Agricultural Service
- Forest Service
- Global Change Program Office
- Natural Resources Conservation Service
- Office of Budget and Program Analysis
- Office of Energy Policy and New Uses
- Office of the Assistant Secretary for Administration
- Office of the Under Secretary for Research, Education and Economics
- Rural Business-Cooperative Service
- Rural Utilities Service

Joint Biomass Research and Development Initiative (USDA-DOE)

The joint USDA-DOE Biomass Research and Development Initiative brings together DOE and USDA programs on biomass. The Biomass Research and Development Technical Advisory Committee recently completed its fourth year of activities. During the 2004 work year, the Committee consisted of 30 members from academia, non-profits, state government, agriculture, forestry, and other industry sectors. The Committee met three times in 2004, receiving information on a wide variety of biomass-related topics and achieving a number of important activities. Major Committee activities in 2004 included:

1) Developing recommendations to the Secretaries of Agriculture and Energy on the status of biomass investments.
2) Developing an official position on hydrogen from biomass.
3) Developing a matrix to track the status of joint solicitation R&D projects by roadmap category.
4) Developing a document to track progress in meeting Vision targets.
5) Reviewing several USDA and DOE activities

Recommendations to the Secretaries of Agriculture and Energy
The Committee is required by the Biomass R&D Act of 2000 to submit annual recommendations to the Secretaries of Agriculture and Energy on biomass-related R&D conducted through the Biomass Initiative and within the Departments of Agriculture and Energy. In 2004, the Committee submitted recommendations in the following areas:

1) The Departments' R&D portfolios in relation to the Committee's Vision and Roadmap.
2) Overall recommendations.
3) The 2005 Joint Solicitation technical topic areas.

http://www.bioproducts-bioenergy.gov/

Biomass Board

The Biomass Research and Development Board (the Board), is a sub-organization formed under the Joint Biomass Research and Development Initiative and is co-chaired by the DOE and the USDA. The Board is responsible for coordinating Federal activities for the purpose of promoting the use of biobased industrial products. Membership includes the following agencies:

U.S. Department of Agriculture
Department of Energy
National Science Foundation
Environmental Protection Agency
Department of Interior
Office of Science and Technology Policy
Office of the Federal Environmental Executive

Official functions of the Board include the following:

- Coordinating programs within and among departments and agencies of the Federal Government for the purpose of promoting the use of biobased industrial products by
  - maximizing the benefits deriving from Federal grants and assistance; and
  - bringing coherence to Federal strategic planning.
- Coordinating research and development activities relating to biobased industrial products--
  - between the Department of Agriculture and the Department of Energy; and
  - with other departments and agencies of the Federal Government; and
- Providing recommendations to the points of contact concerning administration of the Act.

http://www.bioproducts-bioenergy.gov/about/biomassBoard.asp

US Global Change Research Program

The Climate Change Science Program (USGCRP) integrates federal research on climate and global change, as sponsored by thirteen federal agencies and overseen by the Office of Science and Technology Policy, the Council on Environmental Quality, the National Economic Council and the Office of Management and Budget.

Membership of the global Change Science Program

- Agency for International Development
- Dept. of Agriculture
- Dept. of Commerce, Natl. Oceanic & Atmospheric Admin.
- Dept. of Defense

- Dept. of Energy
- Dept. of Health and Human Services, National Institutes of Health
- Dept. of State
- Dept. of Transportation
- Dept. of the Interior, US Geological Survey
- Environmental Protection Agency
- National Aeronautics & Space Administration
- National Science Foundation
- Smithsonian Institution

During the past thirteen years the United States, through the U.S. Global Change Research Program (USGCRP), has made the world's largest scientific investment in the areas of climate change and global change research -- a total investment of almost $20 billion. The USGCRP, in collaboration with several other national and international science programs, has documented and characterized several important aspects of the sources, abundances and lifetimes of greenhouse gases; has mounted extensive space-based monitoring systems for global-wide monitoring of climate and ecosystem parameters; has begun to address the complex issues of various aerosol species that may significantly influence climate parameters; has advanced our understanding of the global water and carbon cycles (but with major remaining uncertainties); and has developed several approaches to computer modeling of the global climate.
http://www.usgcrp.gov/usgcrp/agencies/

5 Environmental Regulation, Rules, and Legislation

Impact of Environmental Regulation and Legislation

The attributes of biomass energy can provide significant environmental advantages over conventional fuels. Environmental regulations, rules, and guidelines have historically been one of the drivers in creating markets for biomass fuels and bioenergy. Since biomass fuels can often exceed air pollutant standards, opportunities for biomass are expanding as Federal, state, and regional authorities move to market-based systems to address environmental problems. The use of market incentives creates opportunities for biomass because these systems allow companies that exceed their levels of pollutant control to trade their excess reductions to entities that cannot meet their requirements.

Stationary Sources:

On March 10, 2005, the EPA announced a sweeping new rule (the Clean Air Interstate Rule, "CAIR") that aims to dramatically reduce SO_2,,NO_x, and mercury emissions from power plants in 28 states. The aggressive new program ratchets down allowances dramatically over the next 10 years. Complying with the rule, imposed under the Clean Air Act, will require power plants in 28 states and the District of Columbia to cut sulfur-dioxide emissions by 70 percent over 2003 levels by 2015. They will also have to make a 60 percent cut in nitrogen oxides.

The implications of this new, more aggressive rule, and the tight time frame for compliance could have a significant impact on the bioenergy sector in a number of ways;

- SO_2, NO_x and mercury credits generated by bioenergy facilities will likely see a dramatic increase in value as plants forced to comply with the new tighter standards will be competing to buy SO_2, NO_x and mercury allowances generated by the bioenergy facilities to comply with the new limits faced by fossil fuel fired utilities. (An example of this situation lies in recent activity in the credit trading markets. SO_2 credits set a new high in the fall of 2004 at over $250/ton – Reports in early March of 2005 quoted transactions in the $500-700/ton of SO_2 on the Chicago Climate Exchange electronic trading platform. As the market matures, it could be a significant factor in the cash flow to bioenergy facilities)

- The utilities themselves will likely either invest in renewable energy projects or seek partnerships that have the potential to generate credits ("EPA Clean Air Markets – Reports and Articles," http://www.epa.gov/airmarkets/articles/mclean/) Potential partners might include NRCS EQIP and CSP program participants

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Liquid Fuels:

Biofuels have almost no sulfur, produce less carbon monoxide emissions, and fewer particulates. Current ethanol technologies have a smaller greenhouse gas profile than gasoline and future technologies and efficiency improvements could significantly lower net greenhouse gas emissions. It is important to note that using a low blend of ethanol in gasoline can increase nitrogen oxides

and volatile organic compound emissions, contributors to urban air pollution. Ethanol has experienced substantial growth in use as an oxygenate in gasoline, as required in certain areas of the country under the Clean Air Act Amendments of 1990. Currently, 20 states have banned the use of the alternate oxygenate, Methyl Tertiary Butyl Ether (MTBE) in gasoline, thus leaving ethanol as the primary source of oxygenate for reformulated gasoline.

Greenhouse Gases:

- Greenhouse Gas (GHG) credits also have potential, though the program is still voluntary at this time.
- Coupled with the soon to be announced registry and accounting system for allowances by the Interagency Working Group on Climate Change, the stage is set for the integration of bioenergy generated credits into the financial marketplace with futures markets in SO_2, NO_x and mercury credits providing price transparency and forward pricing that will lead to broader opportunities for financing of bioenergy facilities through the ability to sell allowances years into the future.

The newly rolled out Carbon Management Evaluation Tool (COMET-VR) program for estimating carbon sequestration from tillage and cropping practices could be an ideal link to NRCS efforts in the area of carbon sequestration.

COMET-VR is a web-based estimation tool that is easily usable by individual farmers and ranchers with no training needed. It delivers an estimate of annual soil carbon fluxes along with fuel and fertilizer use, which can be reported to the §1605(b) national voluntary reporting system. The tool was designed to aid producers in making their management decisions. Producers insert their current and alternative farming and grazing practices into COMET-VR, which then estimates changes in fuel use, fertilizer and carbon storage from each alternative.

COMET-VR provides a verifiable soil carbon budget for individual producers, and could provide additional value through the entry of qualifying producer's credits into the national greenhouse gas registry.

<u>Potential Roles for NRCS</u>

A key element in the foundation of a market, is a “value establishing” process for credits—the registry/audit function. A well functioning registry could directly benefit the functioning of NRCS renewable energy and bio-based product efforts by:

- Defining the commodity – NRCS could establish consistent metrics for determining the environmental benefits for biomass feedstocks and technologies.
- Providing a more transparent method of measuring the public benefits of environmentally oriented programs
- Allowing for testing of alternative verification, certification, accounting, aggregation, and auditing systems.
- Facilitating the development of a cash market for credits, creating a value for farmers and ranchers generating the credits, and providing a better basis for cost/benefit analysis of individual programs
- Fostering the development of public, transparent futures markets, potentially leading to regulated (Commodity Futures Trading Commission (CFTC)), widely available pricing system. Initial project categories for eligible offsets since 1990 in the agricultural sector

include: agricultural methane destruction and carbon sequestration in forestry and agricultural soils.

As the credit trading program develops under the Clean Air Act, a system similar in function to COMET-VR, but designed to quantify criteria air pollutant benefits of farmers' actions could be deployed. In that way, farm and ranch generated credits could be available to entities needing to purchase credits to comply with the Clean Air Act regulations.

Chapter 6 Outside Partners

What outside groups could partner with NRCS?

The bio-based products and bioenergy initiative offers significant opportunities to leverage NRCS resources with outside governmental and non-governmental associations and organizations. Groups to be considered based on commonality of function and areas of interest include the following:

The National Association of State Energy Officials (NASEO)
NASEO is made up of chief state level energy officials from across the U.S. The individual state energy agencies provide a variety of information and technical assistance services. Among the areas of focus of NASEO is renewable energy and energy audits. NRCS could benefit from the experience of state agencies in the area of energy audits, from identifying potential qualified auditors capable of conducting farm energy audits to increasing the awareness of the CSP farm energy audit program. NASEO's experience in energy conservation and renewable energy could compliment NRCS efforts in those areas as well.

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National Association of State Departments of Agriculture (NASDA)
NASDA was founded in 1915 as a nonprofit organization made up of Commissioners, Secretaries, and Directors of agriculture in all 50 states and 4 U.S. territories. NASDA members are the primary agricultural spokespersons in their respective states. NASDA could be very helpful as a partner to NRCS in publicizing conservation and energy based programs, providing feedback and potentially leveraging state and local dollars to expand the reach of NRCS efforts.

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President – Nathan Rodgers, New York
Staff - Richard W. Kirchhoff, Executive Vice President and Chief Executive Officer

National Rural Electric Cooperative Association (NRECA)
The National Rural Electric Cooperative Association (NRECA) is the national service organization dedicated to representing the national interests of cooperative electric utilities and the consumers they serve. The NRECA Board of Directors oversees the association's activities and consists of 47 members, one from each state in which there is an electric distribution cooperative.

NRECA consists of more than 900 member cooperatives that serve 37 million people in 47 states. Most of the 865 distribution systems are consumer-owned cooperatives; some are public power districts. NRECA membership includes other organizations formed by these local utilities: generation and transmission cooperatives for power supply, statewide and regional trade and service associations, supply and manufacturing cooperatives, data processing cooperatives and employee credit unions. Associate membership is open to equipment manufacturers and distributors, wholesalers, consultants and other entities that do business with members of the electric cooperative network.

The NRECA offers excellent potential for partnership efforts. The EQIP discussion (page 21 of the description beginning on page 18 of this document) describes a joint NRECA-USDA RUS initiative in Wisconsin where a local rural electric cooperative joined with farmers in a program to purchase methane from livestock manure to generate electricity for the local rural electric cooperative. The NRECA structure also appears to be compatible with the USDA-DOE Joint Biomass Research and Development Initiative that provides grants for methane digesters.

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National Association of Regulatory Utility Commissioners (NARUC)
The National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization founded in 1889. Its members include the governmental agencies that are engaged in the regulation of utilities and carriers in all fifty States, the District of Columbia, Puerto Rico and the Virgin Islands. NARUC's member agencies regulate the activities of telecommunications, energy, and water utilities.

NARUC's mission is to serve the public interest by improving the quality and effectiveness of public utility regulation. Under State law, NARUC's members have the obligation to ensure the establishment and maintenance of utility services as may be required by the public convenience and necessity, and to ensure that such services are provided at rates and conditions that are just, reasonable and nondiscriminatory for all consumers.

As state level regulators, NARUC Commissioners have a major policy impact their respective state's electricity, gas and water markets. NARUC could be a valuable partner in the areas of on-farm generation of electricity and in energy conservation efforts.

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Electric Power Supply Association (EPSA)
EPSA's mission is to advance the interests of its members: competitive generators, power marketers and other suppliers. EPSA advocates domestic and international policies that will result in a fully competitive electric power supply marketplace. EPSA supports the development of organized wholesale power markets operated under the auspices of a regional transmission organization that will benefit consumers and improve reliability. EPSA members are largely independent power suppliers, and as such, have experience in many of the grid interconnection problems faced by those who build wind energy systems, or biomass to electricity systems. The also represent a potential "aggregator" for numerous small generation facilities.

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Eugene Peters, Acting President
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Electric Power Research Institute (EPRI)
The Electric Power Research Institute (EPRI) was established in 1973 as an independent, non-profit center for electricity and environmental research. EPRI's collaborative science and technology portfolio now spans every aspect of power generation, delivery and end-use, drawing upon a world-class network of scientific, engineering and technical talent. EPRI's clients represent over 90 percent of the electricity generated in the US. International client participation represents over 10 percent of EPRI's program investment.

Through the power of collaboration, EPRI is able to leverage the collective resources of its clients to address the industry's toughest and most critical challenges related to generation, delivery and end-use, with a special focus on safe, reliable, cost-effective electricity and environmental stewardship.

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Kurt Yeager, President and CEO

American Public Power Association (APPA)
APPA is a national association comprised of more than 2,000 community-owned electric utilities, serving over 43 million people, or about 14 percent of the nation's electricity consumers. Public power utilities are operated by local governments to provide communities with reliable, responsive, not-for-profit electric service. APPA has potential to be a partner with both CSP and EQIP programs.

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Federal Power Marketing Administrations (PMA's)
The five federal power marketing administrations (PMAs) -- Alaska Power Administration (APA), Bonneville Power Administration (BPA), Southeastern Power Administration (SEPA), Southwestern Power Administration (SWPA), and Western Area Power Administration (WAPA) -- are separate and distinct organizational entities within the Department of Energy. The PMAs' mission is to market power generated at federal multipurpose water projects (about 6% of the nation's total electricity generation) at the lowest possible rates to consumers, consistent with sound business principles. Each PMA has its own specific geographic boundaries, system of projects, statutory responsibilities, operation and maintenance responsibilities, and statutory history. Several PMA's have experience in conducting energy audits, and have been involved in renewable energy projects.

Contact information
Bonneville Power Administration (BPA)
P.O. Box 3621
Portland, Oregon 97208-3621
(503) 230-7334 or toll-free (800) 622-4520.

Tennessee Valley Authority (TVA)
400 W. Summit Hill Dr.
Knoxville, TN 37902-1499
Phone: 865-632-2101

Western Area power Authority (WAPA)
P.O. Box 281213
Lakewood, CO 80228-8213
Phone: 720-962-7000
Fax:720-962-7200

Southwestern Power Administration (SWPA)
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Email: info@swpa.gov

Chicago Climate Exchange
Chicago Climate Futures Exchange (CCFE) is a CFTC designated contract market which offers standardized and cleared futures contracts on emission allowances and other environmental products. Clearing services are provided by The Clearing Corporation, and market surveillance services are provided by the National Futures Association. CCFE is a wholly owned subsidiary of the Chicago Climate Exchange principles.

Contact information

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Chapter 7

The Road Ahead

NRCS – A Future Built on Experience

From its beginning in 1933 as the Soil Erosion Service (located within the Department of the Interior) until the establishment of the Soil Conservation Service, by an act of Congress in 1935 in the Department of Agriculture (USDA), the NRCS has faced the challenge of protecting and enhancing America's natural resources on private land. The ravages of soil erosion on U.S. agriculture led policy makers to realize the critical need to stop the growing damage of soil erosion, and the need to train and educate farmers and ranchers on the principles of soil and water conservation. For over 70 years, NRCS and its predecessor agencies have managed programs and disseminated technical information that has protected and enhanced the nation's agriculture and natural resource base.

The NRCS is in a strong position to play a leadership role in addressing the challenges ahead. With an experienced and technologically competent staff, and an infrastructure experienced in program and technology delivery that reaches the tribal, farmer and rancher managed resource base, adding additional support for renewable energy, energy management and conservation is a natural fit within the current structure.

The opportunity for leadership is highlighted by the just released study conducted jointly by the USDA and DOE on the potential for biomass as a supplier of energy. The report, "***Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply," (***http://feedstockreview.ornl.gov/pdf/billion_ton_vision.pdf.) is the result of a collaborative effort by experts within the two agencies to examine the feasibility of biomass as a significant contributor of petroleum equivalent energy to the U.S. The study concludes that biomass could provide the equivalent of 30 percent of petroleum supplied energy, ***on a sustainable basis***, by the year 2030. As discussed further in the Strategic Plan Framework section, ongoing examination and assessment of the implications of a seven-fold increase in biomass production from current levels on water and soil resources is a responsibility that falls directly under the NRCS role in natural resource stewardship.

Looking ahead, the challenges facing the agriculture and natural resources sector are likely to expand as demand for energy grows, and fossil fuel sources become increasingly more difficult to locate and expensive to recover. Beyond the opportunities identified in this assessment, opportunities exist for broader based efforts and programs to strengthen support and speed the deployment of energy conservation, renewable energy, and bio-based products, especially the identification of environmental services being provided by farmers and ranchers.

Framing a Strategic Plan for Energy Related Programs

NRSC's strategy on energy-related issues centers on four points:

1) Supporting the development and transfer of knowledge-based technologies related to energy conservation that are environmentally sound;
2) Supporting the development and introduction of environmentally sound production technologies related to energy conservation;
3) Integrating energy-related concerns into the NRSC's planning framework; and,

4) Maintaining existing and seeking new communication channels for energy-related information from, across, and within the Federal government and especially USDA.

This strategic framework adheres to the four guiding principles established in the NRCS Strategic Plan Supplement of 2003:

> ***"Service to the agricultural community, partnership with private sector entities to ensure common purposes and cooperation, community action to leverage the actions of the agency and individuals, and technical excellence of our personnel and in the projects that we undertake."***

In addition, the strategy implicitly recognizes that:

1. Economics, particularly historically low energy prices relative to other production expenses, explains much of the current energy use patterns in agriculture (as well through the economy). NRCS activities need to focus on those energy-related efforts that will be maintained in potentially "low" energy price environments as well as the currently "high" price environment. If not, activities taken at this time may prove "unjustified" and unable to withstand sheer market forces in the future.

2. The introduction and adoption of sound technology can alter the economics of alternative energy supplies and has the potential to significantly contribute to the nation's energy supply. Such technology should be sought after and potentially offer the nation feasible domestic-sourced energy options.

3. Better energy management (conservation and on-farm production) provides benefits to society in other ways than simply reducing over-all energy demand (and possibly an alternative sourced energy for the society at large). Other benefits include less dependence on imported sources of energy and potentially more environmentally friendly energy sources.

4. Efforts to capture energy from agriculture through bio-mass and other means can result in trade-offs: some of these trade-offs are positive (less dependence on imports; less greenhouse gas emitted from farms and ranches); some potentially negative (increased removal of vegetative material from fields). Given its' past, NRCS is well positioned to help identify the environmental trade-offs in alternative production practices and on-farm renewable energy technologies as well as provide credibility in the information supplied by producers in future environmental service markets.

<u>Goal 1</u> - Support the development and introduction of knowledge-based technologies that better account for energy management (on-farm energy use and energy conservation possibilities) and for environmental services provided.

Energy conservation is an important priority for technology development in farm and ranch situations. The conservation of natural resources, particularly soil and water, on the nation's working lands has been the primary focus of the NRCS. Recently, other resource concerns such as water and air quality, maintenance of wildlife and native species, have been included to the original conservation emphasis. As one of its most important functions, NRCS can serve a useful function in providing farmers and ranchers with assessment and evaluation tools to help them evaluate their current systems and design more energy efficient systems. Demonstration areas are another important source of information on production techniques and practices that are directed in energy management. Section 1605(b) also requires USDA (NRCS and FS) to cooperate with the DOE to establish a means for farmers and

ranchers to voluntarily account for greenhouse gas (GHG) reductions that may serve as certifiable means to establish future market transactions.

Action Items and Status:

(1) Design and develop tools to facilitate energy audits for farmers to account for direct energy consumption and identify areas for improvement. This can be accomplished using the on-farm energy audit component of CSP for eligible farmers and ranchers.

Guidelines for a certified, on-farm energy audit are being drawn up at the current time for use in the 2005 CSP program. CSP, as noted in the text of this report, provides a financial incentive to eligible participants for an on-farm energy audit. Remaining issues and questions include: the need to establish production practice standards for such audits or auditor certification and possibility of requesting the American Society of Agricultural Engineers to establish such standards. These issues are addressed in another NRCS working paper (Aschmann).

(2) Design and develop tools for farmers and ranchers to access their direct and indirect energy use in specific farm and ranch operations.

Development of a web-based "energy calculator" for use by farmers and ranchers to access the impact on their direct and indirect energy use from changes in their production practices is underway. A draft version of the program has been presented to National Headquarters staff (Aschmann).

(3) Design and develop appropriate means for farmers and ranchers to share information on production techniques and practices that are particularly successful in better energy management and provision of environmental services being provided from production agriculture.

Communicating area-wide farm and ranch level results of applied technology can be an effective tool in providing valuable information to NRCS clientele. NRCS could increase support of farmer-to-farmer nutrient reduction tests similar to the Iowa Soybean Association's innovative project on nutrient management (http://www.iowadnr.com/other/watersummit/files/fnutrients.pdf). NRSC's CR&D program staff could provide an important facilitating role in such outreach and information sharing activities.

A specific, farm-level effort in this area is the development and introduction of NRSC's web-based estimation tool, the Carbon Management Evaluation Tool (COMET-VR). This tool is a good example of kind of information that producers will be able to provide in meeting the future market demands expected in providing environmental services. It is recognized that such environmental markets are dynamic and as such, models will need to be flexible and robust in order to capture changing needs. Another effort that deserves attention is having NRCS lend support for an updated annotated bibliography of renewable energy research suitable for application on farms and ranches. This type of information could be supplied directly by NRCS or supported by NRCS and supplied through other means, i.e. the Extension Service or land-grant universities.

Goal 2 - Support the development and introduction of appropriate farm and ranch-based production technologies that better address energy-related concerns while recognizing their potential to create spill-over effects, i.e. soil degradation, reduced water and air quality, lower wildlife populations, and other impacts on resources.

Current high levels of energy use present a particular pressing concern for NRCS for many reasons. During the past year energy prices have increased significantly. The Department of Energy is

forecasting that gasoline prices this summer will be 20 percent higher than last summer and that oil prices will remain above $50 a barrel throughout 2005 and 2006. Higher energy prices are not only reflected in higher fuel costs they also affect virtually all production costs. As an example of the link of inputs to petroleum costs, fertilizer costs are projected to be 30 percent higher than last year. Because crop production costs are sensitive to energy prices, there is a growing need on the part of farmers and ranchers to improve their management of energy related resources to reduce their costs and improve their "bottom line". In the process, NRCS has a role to identify trade-offs between energy management actions, i.e. reduced use and its impact on the environment.

This last point is illustrated in another way. Financial incentives are being provided to farmers and ranchers to use bio-based fuels and products in many areas by their state governments. Such incentives in the bio-fuel industry are expected to increase supplies and use in the foreseeable future. As noted earlier in this report, the recently released study conducted jointly by the USDA and DOE, ***"Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply,"*** highlights the potential for biomass to supply as much as 30 percent of the nation's petroleum consumption by 2030 *on a sustainable basis*. As the demand for biomass for energy and products grows, the trade-off of greater energy production and the potential to "over harvest" biomass crops and crop residues and its resultant detrimental impact on other resources, such as soil erosion and air quality, needs to be addressed. Such impacts would need to address the potential abandonment of conservation crop rotations as economic incentives to produce a single biomass crop over a wide geographic area increase. Going forward, NRCS has a role to play in assessing the conservation implications of alternative bio-based fuel strategies and educating farmers about the environmental impacts of such management decisions. At the same time, continuing research is needed to determine the level of biomass that can safely be removed from an area without damage to the soil resource, and to establish sustainable cropping systems that optimize biomass production in those areas where biomass energy crops are grown. Because bio-based technologies are rapidly evolving and expanding, research is needed to ensure that their environmental impact is minimized.

Action Items and Status:

(1) Support research and development of new practices and products that foster better energy management, such as precision agriculture and anaerobic digester technologies.

NRCS has played an important, long standing role in supporting research by ARS that is aimed to better address conservation concerns. Identification of production technologies that are appropriate means for reducing energy use by farmers and ranchers will need to be emphasized in the future. Many promising technologies exist, including those mentioned in this report dealing with irrigation water (SDI), precision agriculture, and anaerobic digesters to produce methane. NRCS should continue to encourage ARS and the renewable energy research community to develop technologies and adapt developing technologies for application on farms and ranches.

These technologies and others will need to be assessed not only on their merits with respect to energy efficiency, but their impact on the environment. This implies that energy-related work with ARS and other research institutions also address how their bio-based energy and product crop rotations and management techniques affect the potential for soil depletion, pest infestations, and water quality problems.

Another mechanism at NRCS disposal in this area is the conservation incentive grants (CIG) program. Projects directed towards better energy management can play a part in the identification, development, and eventual successful adoption of energy-efficient farm and ranch production techniques. Such an

emphasis will need to be continually reinforced in the future. Where appropriate, such projects can serve as pilot projects or demonstration projects to test and refine NRSC energy initiatives.

(2) Support the adoption of new practices that foster better energy management by individual farmers and ranchers, such as precision agriculture and anaerobic digester technologies.

Although financial incentives provided to eligible producers by CSP can play a role here, cost-share programs made through EQIP can also play an important role in fostering the adoption of technologies that directly and/indirectly address energy management concerns.

(3) Provide financial incentives to farmers and ranchers that reduce energy costs by emphasizing selected traditional conservation practices, such as irrigation water management (especially SDI), nutrient management, pesticide management, crop residue management, among others.

As discussed in the report, the CSP has provisions for energy enhancements that directly tie incentives to reduced energy use and other enhancements which tied actions that indirectly affect energy use (through better placement of fertilizers, increased use of manure and legumes to supply nutrients to growing crops, etc.). Continued vigilance of CSP will be necessary to ensure that the program is an effective means to reduce energy use in farm operations at minimum cost to NRCS and on their costs of production.

(4) Support research that links environmental consequences with the new practices being explored under (1) above.

As work with ARS and other research institutions commences on the new practices described under (1), a commensurate level of research needs to explore the environmental consequences of such activities were to be widely adopted. For example, serious concern exists as to the safe level of residue harvesting for bio-based energy and product use will have on soil quality and erosion levels. Other interactions within the dynamics of agriculture production abound.

***Goal 3* - Integrate energy-related resource concerns into the NRCS planning framework and make appropriate adjustments in programs (i.e. energy-related conservation practice standards, review of program impact on energy used, etc.) and personnel (i.e. training).**

Conservation planning historically has been primarily directed to soil and water concerns and served as the main foundation of NRSC assistance and program delivery. The agency values revolve around sound conservation planning, and most of the technical tools available to field offices are designed to assist the planning process in these traditional areas and need to specifically include energy-related concerns. For example, the NRCS Field Office Technical Guide was developed to assist Field Office personnel develop technically sound conservation plans for farmers and ranchers. If energy resource conservation is to be considered in the planning process technical, documents to assist in energy resource conservation planning must be available in the Field Office Technical Guide. Practice Standards (FOTGPS) must be developed to address energy conservation, and the Conservation Physical Effects (CPPE) matrix must include the energy resource concerns.

Reflective of the past emphasis of NRCS noted above, energy was not historically considered as a resource of concern in the planning process by field staff. Many field office personnel are not aware of energy resource concerns and how they are related to other natural resources, or why energy conservation is important to the environment. Training is urgently needed so that the energy resource can be appropriately considered during all conservation planning.

Action Items and Status (related to programs and policies):

1) Provide technical support to facilitate the development of an agency energy policy.

2) Specifically address and incorporate energy resource concerns into the NRCS planning framework (e.g., resource concerns, quality criteria, CPPE, conservation system guides and performance results systems).

3) Incorporate energy resource considerations and purposes into existing national practice standards as the standards are updated.

4) Develop National Practice Standards to address energy conservation and environmentally sound on-farm renewable energy development.

5) Explore the integration of energy management strategies with ongoing NRCS environmental outcomes projects, such as the Conservation Effects Assessment Project (CEAP).

6) Develop chapters in the Engineering Field Handbook, technical notes, and other technical documents for use by NRCS personnel and their partners and clients addressing energy conservation, energy production from biomass, and other on-farm renewable energy resource development.

7) Consider alternative fuels and other options to reduce energy use associated with NRCS operations.

One important area under this action item is the review of the agency's vehicle fleet replacement policy. A review is currently underway by OIG and is expected to be released in the near future. A follow-up study by NRCS could investigate the findings and recommendations of this report.
Action Item(s) and Status (related to personnel training and development):

- Develop a computer-based training, or self-paced workbook, on the basics of energy, energy conservation and renewable energy generation through the National Employee Development Center for all NRCS field and state personnel.
- Include an energy module in the NRCS Boot Camp material.
- Deliver energy training to a minimum of 2,000 NRCS employees and Technical Service Providers (TSP's) within five years.

<u>Goal 4</u> - Maintain existing and open new communication channels for energy-related information being transmitted from and across the Federal Government and particularly, within USDA.

(**1) Attempt to better inform other Agencies of NRCS activities.**

With respect to the energy audit provisions of CSP, meetings were recently held with RUS and other possible governmental and non-governmental cooperating entities to identify possible areas where NRCS actions could be leveraged. One area of closer collaboration is the advance notification of which CRP watersheds are being selected in upcoming years to RUS and NAREC. These entities have direct contact with farmers and ranchers (in most cases) and have personnel with some past experience with energy audits. With advance notice, these entities could better inform possible CSP participation with the energy audit provision and better allocate their services and assistance.

Recently, a short write-up of CSP energy enhancement provisions was provided to NAREC for inclusion in individual rural utility newsletters for their membership (Aschmann).

(2) Provide a better information and knowledge base of energy-related activities across the Federal government.

NRCS should take an active role in the BBCC. This group and their meeting could help to build a network within USDA and other federal agencies to coordinate technology development of sustainable renewable energy technologies for farms and ranches.

A promising opportunity for interagency cooperation lies in a proposal for NRCS to work jointly with the USDA Forest Service and the National Council of State Legislatures to develop a "primer" on biomass power and fuels geared towards educating state and local government officials on federal research and financial support for renewable energy and bio-based products. The primer is already in the draft stage (See Appendix) and appears promising in that an emphasis of the report on wood based avenues of bio-based fuels and products: an area that is not traditional emphasized by NRCS, but nonetheless, an important area of concern. This concern may be expanded in the future if carbon sequestration and other environmental concerns are addressed via forest and forest products. Also, this primer could serve as a powerful outreach vehicle to potential partners, including government agencies, as well as the national associations identified as potential partners in Chapter 6 of the report. The key objectives in developing the primer are to:

- Strengthen outreach efforts to state and local governments and national associations;
- Leverage federal agency resources though cooperative efforts with outside partners; and,
- Provide a vehicle for outreach to potential partners, such as national associations of state energy officials, state agricultural officials, state level utility regulators, and similar national trade or industry associations.

The road ahead contains both challenges and opportunities for the NRCS. The challenges include continuing in the leadership role of promoting stewardship of the nation's soil and water resource base at the same time as demand for additional output grows, and economic pressure increases upon farmers and ranchers. The opportunities lie in applying historical experience to assist in addressing new and pressing needs for energy conservation, renewable energy and opportunities to support the development of biobased products. The NRCS is extremely well positioned to provide leadership in the newly evolving areas of resource related energy conservation and renewable energy.

<u>The NRCS, renewable energy and biobased products initiatives</u>

The NRCS should take a more active role in Federal agency and USDA interagency working groups organized to share information and engage in joint efforts on renewable energy and biobased products. The level of responsibility given to the agency through the 2002 Farm Bill, and the opportunities to utilize the NRCS program delivery structure and technical expertise justifies the creation of a focused coordinative effort at the upper leadership level of the agency on energy conservation, renewable energy and biobased products initiatives.

Chapter 8

Appendix

Primer on biomass and fuels for state and local governments -Prospectus

Prospectus:
A Primer on Biomass Power and Fuels for Legislators and Policy Makers
A joint effort of the National Conference of State Legislatures, the USDA Forest Service, [NRCS,] and TSS Consultants

Audiences

The primary audience for this information will be state legislators and their staff. It will be of particular interest to chairs of state legislative agriculture, natural resources and energy committees.

Another audience in need of this basic information includes regulatory and executive bodies at the state level (Public Utility Commissions, Environmental Conservation and Natural Resources Agencies). Key among them are the National Association of Regulatory Utility Commissioners (NARUC), the National Association of State Departments of Agriculture (NASDA), the National Association of State Foresters (NASF), and the National Association of State Energy Officials (NASEO). These organizations, along with several other associations will help their members to explore linkages between biomass utilization and their respective areas of interest.

Products

Four documents will result from this effort. The first will be a detailed document, approximately 50-75 pages in length that will outline the technologies, markets and policies that affect the development of biomass energy and products. The remaining three documents will be brief two to four page summaries of the larger document that focus on technology, market and policy issues associated with the development of biomass energy and products.

Draft outline

Introduction and Policy Context

This section briefly describes major biomass feedstock pathways from forestry, agriculture and recovery of municipal wood waste, and outlines the unique attributes of each fuel type. For example, the introduction will address the need for better understanding of forest biomass management and utilization in general that will include a description of the millions of acres affected by wildfires in the past several years as a result of insect infestations, fire suppression and drought. It will also address the cost of wildfires and the increasing perception that production of biomass power and other products could be better integrated with forestry management. Similar details will be provided for agricultural wastes and municipal wood wastes.

Finally, the introduction will outline why it is important for state policymakers to understand the issues, lay out a description of the current opportunities and public benefits, and give examples of state policy processes currently under way that would benefit from better information about biomass power and other forms of biomass utilization.

Many biomass-related technologies are well developed and fully commercial. Others are only at the beginning of a development cycle, and have yet to find commercial application. Therefore, the primer will focus on short-, mid-, and long-term applications for biomass energy and products. In the short-term, the primer will concentrate primarily on biomass power. In the mid- to long-term, the focus will be on the expansion of a system of biorefineries that will produce multiple products from biomass including transportation fuels (biofuels), and the integration of those products into the mainstream. It will also focus on the development and use of biobased products.

Technology

1. *What's Real and What's Not*: A discussion of current and future power and biofuels technologies with a description of what is at the pilot stage and what is available off-the-shelf. This section will describe and compare which technologies now have the highest utilization and the broader biorefinery/bioproduct approach to biomass management.
2. *Costs*: A general discussion of costs for the sake of comparison, to include a description of "hidden costs", i.e. externalities or system costs. This section will describe how costs have changed in the past two decades and how they compare to other competing technologies. Finally, the section will describe biopower as one of several potential uses of biomass, among a broader suite of potentially economically viable products to be made from biomass.
3. *Emissions*: This section will examine emissions from: 1) dominant off the shelf technologies; 2) biomass power compared with other forms of power generation; and 3) biofuels compared with other fuels.
4. *Small vs. Large Scale*: A discussion of the economies of scale involved in using the major technologies to include mention of the proposed applications and scales of likely to emerge technologies (e.g. biomass gasifier generating units under 1MWe). This section will further examine implications for transportation and distribution systems.
5. *Water Use*: This section will focus especially on power generation since more is known about this than biofuels production.
6. *Biofuels in General*: This section will discuss how biofuels fit into current applications (e.g. biogas co-fired with natural gas or coal, ethanol mixes, biodiesel ratios and implications for technology adaptations, etc.).
7. *Fuel Supply Issues*: How much fuel is produced or could be produced from forest restoration and fuels treatment activities, agricultural wastes, and municipal wood wastes? From other sources? What are estimates of "reserves"? What is realistic?

Markets

1. *Define Markets*: A discussion of the current and anticipated demand, displacement of current markets, and competition with other wood products (i.e. the same chip might be turned into paper or composite panels).
2. *Market Integration*: A discussion of how the forest products and agricultural industries may overcome costs (especially collection, processing and transportation of the feedstocks) by product integration. As an example, explore the development of multiple forest products from one treatment cycle to accomplish forest restoration and fuel reduction.

Policies

1. Renewable Portfolio Standards (RPS): A brief summary to include: 1) what is an RPS; 2) which states have adopted an RPS; and 3) how do they work?
2. System Benefit Charges (SBC): A brief summary to include: 1) what is an SBC; 2) what states have an SBC in place; 3) how does an SBC operate; and 4) what types of projects do funds from an SBC support?
3. Brief description and discussion of the federal "Biobased Products Initiative."
4. Power transmission issues.
5. Power plant siting issues.
6. The broad range of definitions of biomass in state statutes and RPS policies.
7. Tax Incentives and other financial incentives to promote the development of biomass and biofuels technologies.
8. Integration with other state agricultural and energy policies.
9. Green Pricing: Who guarantees and certifies green energy? What are the impacts on market share and green premium pricing?
10. Renewable Energy Credits (RECs): How do RECs work? Specific REC issues for biomass.
11. Competitiveness of Biomass: How does biomass compete with other renewables? Under a state's RPS does biomass or some other renewable get more credit than another? How does the price structure of biomass power compare under deregulated market conditions?
12. Political Sensitivities: Does biomass energy receive credits for emission reduction offsets? How is biomass energy negotiated into the green power markets?
13. Case Studies: This section will include one example each of the integration of forest management byproducts, agricultural wastes, and municipal wood wastes with biopower at a significant scale.

Conclusions

Lessons learned from the past two decades of biomass power and biomass management, including:

- Costs;
- Fuel supply issues;
- Integration between biomass power and other power generation, i.e. the integration of biomass power into energy markets;
- Technology challenges still to be overcome; and
- The top ideas a policymaker should consider when developing policy in support of biomass energy technologies and generation.

Considerations for Development and Production of the Primer

NCSL has some important experience in developing policy guides and primers. They have produced longer syntheses—75-100 pages in length—and shorter briefing documents—such as the geothermal energy primer published in January 2003. They have also produced two-day seminars, or Energy Institutes, for legislators and staff on topics such as energy security and energy and air quality.

The initial stage of development will include an evaluation of critical need and demand. Some states have developed RPS policies that offer few options beyond the promotion of wind and solar resources. Some US regions, such as the northeast, northwest and Midwest, are looking towards heavy reliance on biomass power and biofuels production. Biomass energy and product development is potentially appealing to urban legislators who are facing major landfill capacity limitations and constraints on existing thermal reduction strategies for municipal waste management.

Budget: $75,000

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Budget – Bioenergy and Biobased Products
USDA Office of Budget and Program Analysis

UNITED STATES DEPARTMENT OF AGRICULTURE
Biobased Products/Bioenergy Related Programs

(Dollars in Thousands)

	2001 Actual	2002 Actual	2003 Actual	2004 Actual	2005 Estimate	2006 Budget
Biobased Products and Bioenergy Programs						
Budget Authority						
Bioenergy Incentive Payments	$40,684	$78,744	$147,211	$149,440	$100,000	$60,000
Research	73,731	93,852	111,040	116,961	115,476	105,758
Rural Development Loans and Grants	2,024	2,820	21,840	23,312	26,935	12,144
Support to Encourage Procurement of Biobased Products, Conservation, and Other Programs	7,736	9,218	3,422	3,223	4,394	4,401
Total, Biobased/Bioenergy Programs	**$124,175**	**$184,634**	**$283,513**	**$292,936**	**$246,805**	**$182,303**
Total Program Level	**$155,857**	**$224,634**	**$283,513**	**$315,748**	**$879,674**	**$478,017**
Biobased Products and Bioenergy Programs						
RECAP, by Agency, Budget Authority						
Agricultural Research Service	$48,853	$64,217	$69,500	$71,705	$69,573	$62,507
Cooperative State Research, Education, and Extension Service	12,428	12,185	14,981	18,936	19,102	15,390
Forest Service	12,450	12,450	12,450	12,444	12,450	15,510
Natural Resources Conservation Service	7,059	12,539	14,832	13,876	14,351	12,351
Office of the Chief Economist	612	1,612	2,630	2,634	4,134	4,134
Office of Procurement and Property Management	65	67	69	589	260	267
Rural Development	2,024	2,820	21,840	23,312	26,935	12,144
Subtotal, Biobased/Bioenergy	**83,491**	**105,890**	**136,302**	**143,496**	**146,805**	**122,303**
Commodity Credit Corporation	40,684	78,744	147,211	149,440	100,000	60,000
Total, Biobased/Bioenergy	**$124,175**	**$184,634**	**$283,513**	**$292,936**	**$246,805**	**$182,303**

Bioenergy and Biobased Products – By Agency
USDA Office of Budget and Program Analysis

(Dollars in Thousands)

	2001 Actual	2002 Actual	2003 Actual	2004 Actual	2005 Estimate	2006 Budget
Biobased Products and Bioenergy Programs						
RECAP, by Agency, Budget Authority						
Agricultural Research Service	$48,853	$64,217	$69,500	$71,705	$69,573	$62,507
Cooperative State Research, Education, and Extension Service	12,428	12,185	14,981	18,936	19,102	15,390
Forest Service	12,450	12,450	12,450	12,444	12,450	15,510
Natural Resources Conservation Service	7,059	12,539	14,832	13,876	14,351	12,351
Office of the Chief Economist	612	1,612	2,630	2,634	4,134	4,134
Office of Procurement and Property Management	65	67	69	589	260	267
Rural Development	2,024	2,820	21,840	23,312	26,935	12,144
Subtotal, Biobased/Bioenergy	**83,491**	**105,890**	**136,302**	**143,496**	**146,805**	**122,303**
Commodity Credit Corporation	40,684	78,744	147,211	149,440	100,000	60,000
Total, Biobased/Bioenergy	**$124,175**	**$184,634**	**$283,513**	**$292,936**	**$246,805**	**$182,303**

	(Dollars in Thousands)					
	2001 Actual	2002 Actual	2003 Actual	2004 Actual	2005 Estimate	2006 Budget
Agricultural Research Service						
Biobased Products	$41,480	$46,236	$49,623	$51,294	$49,378	$42,009
Bioenergy	6,867	17,475	19,341	19,820	19,587	19,890
Federal Procurement of Biobased Products	506	506	536	591	608	608
Total ARS	48,853	64,217	69,500	71,705	69,573	62,507
Commodity Credit Corporation						
Mandatory Funds: Bioenergy Incentive Payments	40,684	78,744	147,211	149,440	100,000	60,000
Cooperative State Research, Education, and Extension Service						
Biobased Products						
Formula Programs	4,012	4,047	3,349	3,152	3,192	1,821
National Research Initiative	4,003	2,654	4,985	4,600	4,600	6,600
Special Research Grants-Earmarks	4,217	5,484	3,732	3,607	3,740	0
Bioenergy						
Formula Programs	Incl Above	Incl Above	366	1,263	1,261	777
National Research Initiative	Incl Above	Incl Above	1,010	4,097	4,097	6,097
Special Research Grants-Earmarks	Incl Above	Incl Above	1,539	2,217	2,212	95
Mandatory Funds: Initiative for Future Agriculture and Food Systems	196	0	0	0	0	0
Total, CSREES	12,428	12,185	14,981	18,936	19,102	15,390
Forest Service						
Biobased Products Research	12,000	12,000	12,000	12,000	10,000	13,000
Bioenergy Research	450	450	450	444	2,450	2,510
Total, FS	12,450	12,450	12,450	12,444	12,450	15,510

	(Dollars in Thousands)					
	2001 Actual	2002 Actual	2003 Actual	2004 Actual	2005 Estimate	2006 Budget
Natural Resources Conservation Service						
Conservation Operations	20	0	0	0	0	0
Forestry Incentives Program	6,311	6,811	0	0	0	0
Resource Conservation and Development: Bioenergy Demonstration Projects	728	728	723	0	0	0
Mandatory Funds: Biomass R&D (Sec. 9008, Farm Bill)	0	5,000	13,909	13,525	14,000	12,000
CCC Section 11 Biomass R&D Administrative costs	0	0	200	351	351	351
Total, NRCS	7,059	12,539	14,832	13,876	14,351	12,351
Office of the Chief Economist						
Biobased Products and Bioenergy	612	612	630	634	634	634
Preferred Procurement and Labeling Program for Biobased Products	0	0	0	0	1,500	1,500
Mandatory Funds:						
Federal Procurement of Biobased Products (Sec. 9002, Farm Bill)	0	1,000	1,000	1,000	1,000	1,000
Biodiesel Fuel Education Program (Sec. 9004, Farm Bill)	0	0	1,000	1,000	1,000	1,000
Total, OCE	612	1,612	2,630	2,634	4,134	4,134

	(Dollars in Thousands)					
	2001 Actual	2002 Actual	2003 Actual	2004 Actual	2005 Estimate	2006 Budget
Office of Procurement and Property Management						
Alternative Fuels and Preferred Products	65	67	69	69	73	74
Federal Procurement of Biobased Products (discretionary, in support of Sec. 9002, Farm Bill)	0	0	0	20	187	193
Rural Development/RUS contribution for agreement to develop an affirmative biobased products procurement program	0	0	0	500	0	0
Total, OPPM	65	67	69	589	260	267
Rural Development						
Other Rural Development grants programs	474	0	0	0	0	0
Other Rural Development loan programs	1,550	0	0	0	0	0
Loan Level	(31,682)	(40,000)	(0)	(0)	(0)	(0)
RCAP/DOE: Matching Funds Grant for an Integrated Ethanol Plant, Feedlot and Animal	0	2,820	133	0	0	0
Value-added Grants	0	0	0	500	4,119	2,144
Renewable Energy Programs:						
Renewable Energy Grants	0	0	0	22,812	11,408	5,000
Renewable Energy Loans	0	0	0	0	11,408	5,000
Renewable Energy Loans (Program Level)	(0)	(0)	(0)	(0)	(610,053)	(285,714)
Renewable Energy Grants and Loans	(0)	(0)	(0)	(22,812)	(22,816)	(10,000)
Mandatory Funds: Renewable Energy Grants and Loans (Sec. 9006, Farm Bill)	0	0	21,707	0	0	0
Total, RD	2,024	2,820	21,840	23,312	26,935	12,144
Total, USDA Biobased Products	**$124,175**	**$184,634**	**$283,513**	**$292,936**	**$246,805**	**$182,303**

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Discussion Paper – Ethanol Market Changes: Implications for Ethanol Plant Income Stream Planning

Ethanol Market Conditions – Future Implications

Ethanol Prices
What Influences Them and Determines Ethanol Use?
What Impact Will This Have on the Ethanol Industry?
What are the Policy Implications?

Otto Doering, Purdue University, W. Lafayette, IN
Mark Seetin, Energy Consultant, Washington. D.C.

The Ethanol Marketplace

Ethanol production in 2004 surged to a record 3.4 billion gallons. According to statistics reported by the Renewable Fuels Association (RFA), as of March, 2005, an additional 16 new ethanol facilities and expansion of production in 2 existing facilities will result in a total annual capacity of 4.4 billion gallons.

An indication of the growth of the ethanol market and its potential integration into the larger petroleum marketplace was the recent launch of competing ethanol futures contracts by the Chicago Board of Trade (CBOT and the Chicago Mercantile Exchange (CME). While a successful futures contract in ethanol would add price transparency to the ethanol market, significant barriers exist to the entry of any new futures contract.

First, in the world of futures trading, liquidity is paramount - trading volume quickly moves to the most liquid market, resulting in a single futures contract for a particular commodity. If the timing is right for an ethanol futures contract, one of the exchanges will likely become dominant. Second, for ethanol to exist as an independent contract, it must prove to be superior to any substitute contract, such as the New York Mercantile Exchange (NYMEX) New York Harbor unleaded gasoline futures contract, in price transparency and as a hedging vehicle. An example of this situation lies in the jet fuel market. According to statistics reported by the Energy Information Administration (EIA) of the U.S. Department of Energy (DOE), the jet fuel market is 40% of the size of the heating oil market, yet there is no futures contract for jet fuel in the United States. The NYMEX heating oil futures contract has been widely used by airlines, refiners and jet fuel marketers as a substitute for a jet fuel futures contract. Despite several attempts by futures exchanges, a jet fuel futures contract has not succeeded as a free standing hedging instrument.

Regardless of whether this particular attempt to establish an ethanol futures contract succeeds or not, the growing volume of ethanol being produced and the fact that several exchanges have sought to establish a futures contract for ethanol indicates that ethanol is in the process of being integrated into the larger energy marketplace.

What Market Forces Influence the Ethanol Price?

As an oxygenate

The 1990 Clean Air Act Amendments required that reformulated gasoline (RFG) sold for consumption in areas of the U.S. not meeting Clean Air Act standards, must contain not less than 2% oxygen by weight. The two primary sources of oxygenate are Methyl Tertiary Butyl Ether

(MTBE) and ethanol. 20 states have now banned MTBE in gasoline leaving ethanol as the primary oxygenate in these states.

If one looks at the market and forgets the $0.51 per gallon ethanol subsidy, one critical question is the opportunity cost for ethanol. If one does not purchase ethanol, what would one purchase to accomplish the same function? Is ethanol priced on the basis of replacing an oxygenate additive, like MTBE, or is it a volume replacement for gasoline? Especially when oil prices were in the $20-30 a barrel range, many believed that ethanol would command a price above that of gasoline because of its usefulness as an oxygenate since oxygenates commanded a higher price. In terms of setting an MTBE based market price the key questions would be; what is the price of MTBE, and beyond that, what is the demand for MTBE that might be met by ethanol? If enough ethanol is produced to fill the demand for MTBE and there is still ethanol waiting to be sold that enters the market as a gasoline substitute, this will reduce the price of all ethanol to the gasoline replacement level – irrespective of whether MTBE or ethanol as an oxygenate is more valuable than gasoline. The same holds for ethanol use as an octane enhancer.

As Energy

If ethanol is used as a substitute for gasoline, its usefulness is its ability to do work. The ability to do work is related to its heat content. Ethanol has a high heat value of 83,961 BTUs and gasoline has a high heat value of 125,070 BTUs. Strictly on the basis of heat value, ethanol will do only 67% of the work of gasoline. If the ability to do work determines value, then ethanol would be priced at 67% of the value of gasoline. If gasoline futures for delivery in New York are $1.60 a gallon (reflecting crude prices of $55+ per barrel), then, on an energy content basis, we would expect an ethanol energy replacement price of $1.07 in the same location.

Transportation, location, and logistics

The ability to do work is not the only factor influencing ethanol prices. Transportation and the logistics of handling and blending ethanol also influence its price. Gasoline can be transported by truck, rail, barge and pipeline. For long distances when high volumes are involved, pipeline tends to the preferred and least expensive mode. Ethanol can not be transported through the nation's petroleum pipelines because the ethanol will absorb moisture and dissolve impurities in the pipeline system that gasoline does not. It would be extremely expensive to make the pipeline system absolutely clean and moisture free. Barges may be used to transport ethanol, but waterway limitations, such as the annual winter freeze up in the Upper Midwest, requires an intermodal approach. Because of the limitations in the use of pipeline and, to some degree, waterway transport of ethanol, ethanol transportation to markets outside of the Midwest will rely more heavily on truck and rail transportation. Because of the limitations in shipping ethanol as opposed to gasoline, it is somewhat more expensive to ship ethanol long distances. Where ethanol transportation costs are more expensive than those for gasoline ethanol would have to be priced lower to make up the transportation differential.

When ethanol is blended with gasoline, this is usually done at a local distribution terminal where a rail or truck tank-car load of ethanol is splash-blended with the gasoline. This extra step adds cost to a gasoline/ethanol blend product. The shelf life of this blend may be shorter than that of gasoline, but this may not be a factor because of the seasonal shifts in gasoline blends between winter and summer result in stocks being turned over at least on a seasonal basis. What is important here is that the final product of the gasoline/ethanol blend is a local product that can not be shipped through a pipeline and must be priced responsively to local market conditions.

The fact that most of the ethanol/gasoline blend product is sold in the Midwest is no accident. Most of the ethanol plants are located in the Midwest, so transportation, blending, and retail logistics are

more favorable and these costs are lower. When MTBE was banned in states outside the Midwest, like California and New York, ethanol had an opportunity to fill this oxygenate niche. However, transportation and some logistics costs will be higher for this distant market.

Excess oxygenate price impact

On January 1, 2004, New York and California enacted statewide bans on the use of MTBE in gasoline. If one were to apply the past logic of a higher ethanol value because of its use as an oxygenate, then ethanol would have been selling at a premium, driven by the volume of the California and New York gasoline oxygenate markets. Is this the case? Not necessarily. Again, if ethanol is sold as an oxygenate at a premium price to substitute for expensive MTBE this price will only hold so long as there is not an excess of ethanol over the amount of MTBE replacement necessary. If there is excess ethanol beyond its required need as an oxygenate, then ethanol will be priced as a gasoline substitute. In 2004, ethanol use included a billion gallons as "conventional gasoline" according to the Renewable Fuels Association. This lower priced ethanol will then be shipped by barge or rail tank-cars and will perform the function of an oxygenate at lower cost than the previously expensive MTBE substitute. (Note that when there has been excess MTBE, its price has fallen as well.) Prices for the various components of California gasoline as recently reported by the California Energy Commission tend to support the view that ethanol is not being priced with an "oxygenate premium" (See Figure 1) Note the decline in ethanol price relative to reformulated gasoline components starting in January 2005 coincident with increased ethanol production capacity.

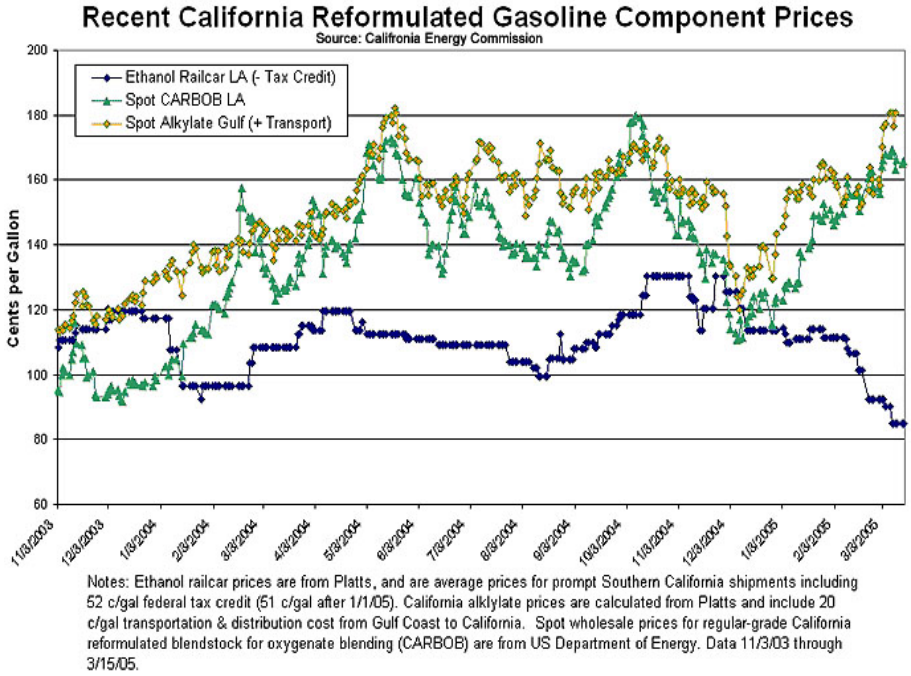

Figure 1. California Energy Commission Report on Gasoline Component Costs – 3/2005

Industry Impact

What does this mean for the ethanol industry? Based on market forces, ethanol may not necessarily receive a premium price as an oxygenate unless its production is limited to the effective oxygenate or MTBE demand. Once ethanol production exceeds oxygenate demand, then ethanol is likely to be priced as a substitute for petroleum, which reflects the energy content differences and transportation and blending costs.

Back to the subsidy

However, we also have a federal subsidy, separate from any state or local tax exemption, of $0.51 per gallon for ethanol production. One issue is how the subsidy is distributed between the ethanol manufacturer, the corn farmer (providing corn, the major input), and others in the distribution chain. That issue aside, if one just adds the $0.51 the blender receives to the example we started with, ethanol at an energy value of $1.07 and gasoline at $1.60, then we come out with an effective ethanol price relative to gasoline of $1.58. Such pricing is consistent with futures prices for gasoline and ethanol in late March 2005 when one considers logistics, delivery points, transportation and other costs for both gasoline and ethanol.

Policy Implications

Spurred by concern over increasing dependence on imported petroleum that was highlighted by oil embargoes in 1973 and 1979, the Federal Government took steps aimed at lessening the country's dependence on imported petroleum.

- A broad array of federal agencies began an extensive research, development and deployment effort to develop renewable energy sources (including ethanol) for electricity generation and transportation fuels
- Financial incentives in the form of tax credits for development and utilization of renewable energy were instituted.
- Federal agencies developed programs to extend technology and provide financial support to the private sector for developing commercial renewable energy facilities.
- Initially, federal and state governments aggressively instituted regulations, gave financial incentives and invested in research to reduce demand for oil and natural gas.

While ethanol has received the largest share of the federal effort on renewable energy in the form of tax incentives, federal research programs have resulted in significant improvements in productivity and efficiency in the production of energy and bio-based industrial products from renewable sources. Though still a relatively small proportion of the transportation fuel sector, the increasing role of ethanol, and growing evidence that it will be priced relative to petroleum based fuels according to its energy content presents policy makers, researchers, and the ethanol industry with serious policy considerations. For ethanol to provide more than a small percentage of transportation fuel demand in the future:

- The ethanol industry must emulate the larger petroleum sector by adopting a "systems approach." Instead of the narrow view that the typical ethanol plant will produce fuel (ethanol) and a co product (Distiller's Dried Grains, "DDG"), there must be carefully planned integration of the full range of new technology being developed and tested by DOE laboratories, such as the work on biorefineries at the National Renewable Energy Laboratory as well as the work at the U.S. Department of Agriculture and the Land Grant Universities. The new technologies include the production of "value added" products and chemicals, and consideration to the addition of combined heat and power (CHP) technology to new and existing ethanol plants, so that each operates to maximum efficiency and effectiveness.

- Ethanol will have to be produced from a wider array of feedstocks with less dependence on natural gas for process heat.

- Federal agencies charged with moving technology to the private sector, and with providing financial and technical assistance in planning and construction should encourage their clients to adopt the systems approach to renewable energy and bioproduct ventures.

- There will have to be full value market recognition of the environmental benefits of biofuels and allied bioproducts.

The increasing production of ethanol beyond the amount required as an oxygenate, coupled with ethanol's lower energy content relative to gasoline, has become a factor in its pricing as a transportation fuel –a substitute for gasoline - not purely as an oxygenate. The move towards pricing ethanol according to its energy content will likely have the effect of putting pressure on existing and planned ethanol production facilities to look for ways to improve efficiency and expand production of value added bio-based products. Public sector policy makers and researchers, and the private sector will need to work together to stress a systems approach, as embodied by the concept of "biorefineries" instead of ethanol plants, and including emerging technology such as combined heat and power (CHP) to this part of the renewable energy sector.

Ethanol production facilities are likely to face lower prices for ethanol than the optimistic forecasts based on expensive oxygenate replacement and convictions of ever increasing petroleum prices. This situation underscores the need to plan for and develop ways to conserve energy used in processing, as well as the need to optimize output of additional value added products to new and existing facilities.

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