Annual Report to Congress on the Biomass Research and Development Initiative for FY 2005

Submitted Jointly by

U.S. Department of Agriculture

&

U.S. Department of Energy

Contents

I. Introduction

A. Purpose

This annual report to Congress is submitted in accordance with section 309 of the Biomass Research and Development Act of 2000[1] (the Biomass Act), 7 U.S.C. 8608 note. For each fiscal year (FY) in which funds are appropriated to carry out this title, the Secretary of Agriculture and the Secretary of Energy shall jointly submit a report to Congress on:

- The status and progress of the Biomass Research and Development Initiative (Initiative), including a report from the Biomass Research and Development Technical Advisory Committee (Committee) on the use of funds appropriated for the Initiative;
- The general status of cooperation and research and development efforts carried out by each agency with respect to biobased industrial products, including a report from the Committee on whether the points of contact are funding proposals under section 307(c)(2)(C); and
- The plans of the Secretary of Energy and the Secretary of Agriculture for addressing concerns raised in this report, including concerns raised by the Committee.

The general purpose of the Initiative is outlined in section 307 of the Biomass Act: "The Secretary of Agriculture and the Secretary of Energy, acting through their respective points of contact and in consultation with the [Biomass Research and Development] Board, shall establish and carry out a Biomass Research and Development Initiative under which competitively awarded grants, contracts, and financial assistance are provided to, or entered into with, eligible entities to carry out research on biobased industrial products." A copy of the Biomass Act is contained in Appendix 1 of this report. Appendix 2 lists members of the Interagency Biomass Research and Development Board (the Board).

FY 2005 was the fourth fiscal year in which funds were made available to the Initiative. The U.S. Department of Energy (DOE) and the U.S. Department of Agriculture (USDA) awarded a combined total of approximately $12.6 million in research funding to 11 biomass projects through their joint solicitation for FY 2005. Adjustments to improve the previous year's solicitation process were identified by the Committee and were implemented in the FY 2005 joint solicitation.

B. Coordination of Federal Biomass R&D Activities

In FY 2005, the Departments continued coordination and collaboration efforts. Acting on behalf of their respective Secretaries, the points of contact for the Departments worked closely together to coordinate their agencies' activities, as well as the activities of the Board and the Committee.

[1] The *Annual Report to Congress on the Biomass Research and Development Initiative for FY 2005* responds to the requirements of the Biomass R&D Act of 2000, 7 U.S.C. 7624 note. In August 2005, section 941 of the Energy Policy Act of 2005 (EPAct) (P.L. 109-58) amended the Biomass Act. Activities performed under the Biomass Act in FY 2006 will respond to requirements as revised by EPAct and will be reported in accordance with the revised Biomass Act in the 2006 annual report to Congress.

The increased coordination between the Departments has resulted in a number of joint projects and activities described in this report.

As identified by the Biomass Act, the principal participants of the Initiative and their respective duties are shown in Exhibit 1.

Exhibit 1: Initiative Participants and Duties

Participant	Description	Duty
Points of Contact	Senior officials from both DOE and USDA	Coordinate the biomass R&D programs within their respective Departments Serve as co-chairs of the Biomass R&D Board
Biomass Research and Development Board (Board)	A council co-chaired by the points of contact	Coordinate biomass R&D programs within and among Departments and agencies of the Federal Government
Biomass Research and Development Technical Advisory Committee (Committee)	A group of individuals from industry, academia, non-profits, and the agricultural and forestry sectors	Make recommendations to the Biomass Research and Development Board and advise the Secretaries of Agriculture and Energy on administration of the Biomass Act
Designated Federal Officer (DFO)	A senior staff person in DOE's Office of the Biomass Program	Facilitates communication between the Board and the Committee

The DOE's Biomass Program provides coordination support for both the Board and the Committee, carries out the directives of the Board, and responds to the recommendations of the Committee.

- Current points of contact are:
  - Alexander A. Karsner, Assistant Secretary, Energy Efficiency and Renewable Energy, DOE
  - Thomas C. Dorr, Under Secretary for Rural Development, USDA.
- The DOE DFO is Neil Rossmeissl.

II. Report from the Secretaries of Agriculture and Energy

Since the enactment of the Biomass Act, the Departments have continued to forge a strong working relationship to fulfill the requirements of the Biomass Act and to improve coordination and integration of Federal biomass R&D activities.

Specific accomplishments during FY 2005 include:

- **Joint Solicitation** – The Departments coordinated a joint solicitation under the Initiative and received more than 670 applications. Following an independent technical peer review and joint programmatic review, 11 projects were awarded funding. The value of the funding awarded is $12.6 million with an additional $6 million in cost-share provided by the private-sector partners.

- **Joint USDA and DOE Portfolio Assessment by the Committee** – Both Departments provided to the Committee their compilation of biomass-related R&D activities and investments in alignment with *Roadmap* R&D categories for an assessment of the joint biomass portfolios. This was the third year in which this information was provided to the Committee.

- **Interagency Meetings** – The Departments continued to hold periodic interagency meetings to identify opportunities for collaboration between respective programs.

- **Joint Solicitation Research and Development Tracking Matrix** – A matrix was developed to track the status of R&D projects funded by the Departments under the joint solicitations. This matrix tracks projects for each of the fiscal years in which funds are made available and includes sponsoring agency, research funding recipient and partners, Committee *Roadmap* category and subcategory, funding levels, and impact information. The Committee will also continue to measure market data relevant to each of the Committee's goals for biopower, biofuels, and biobased products.

- **Feedstock Analysis** – The Departments conducted research and published a joint study: *Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply*.

- ***Vision* Goals Tracking Document** – A document was created to track progress toward the accomplishment of the goals for biopower, biofuels, and bioproducts as outlined in the Committee's *Vision* document. This tracking document will be updated annually.

- **Committee Statement on Ethanol** – The Committee developed a statement in support of recent analyses by the Departments on the net energy benefits of ethanol. It recommended that an independent peer review of these analyses be performed to validate the findings.

- **Workshops** – DOE implemented the 1st International Biorefinery Workshop in Washington, DC, on July 20-21, 2005, in conjunction with the European Commission. The USDA also participated in this workshop. The workshop brought together over 300 participants to

discuss issues related to feedstock development, conversion technologies, financing, and policy needs for establishing biorefineries. Committee members also participated as session chairs.

The achievements in FY 2005 improved coordination between the Departments, as well as with the other agencies that participate on the Board. The joint solicitation process was completed in a coordinated fashion between the Departments with awards made on schedule. Further improvements to streamline the process were identified and are being implemented for the FY 2006 joint solicitation. They include:

- Release of the solicitation three months earlier in the fiscal year
- Acceleration of the review schedule
- Pre-selection and approval of reviewers

III. Status and Progress of the Biomass Initiative

A. Goals and Objectives of the Initiative

Since the establishment of the Initiative in June of 2000, the Departments have been working together to ensure that their biomass R&D programs are carried out in accordance with the Biomass Act. As outlined in section 307 of the Biomass Act, specific purposes of the Initiative are as follows:

1. *To stimulate collaborative activities by a diverse range of experts in all aspects of biomass processing for the purpose of conducting fundamental and innovation-targeted research and technology development;*
2. *To enhance creative and imaginative approaches toward biomass processing that will serve to develop the next generation of advanced technologies making possible low cost and sustainable biobased industrial products;*
3. *To strengthen the intellectual resources of the United States through the training and education of future scientists, engineers, managers, and business leaders in the field of biomass processing; and*
4. *To promote integrated research partnerships among colleges, universities, national laboratories, Federal and State research agencies, and the private sector as the best means of overcoming technical challenges that span multiple research and engineering disciplines and of gaining better leverage from limited Federal research funds.*

B. Biomass Research and Development Technical Advisory Committee

The Committee was established by section 306 of the Biomass Act and is now ending its fifth year of activities. The Committee's efforts since 2001 have helped lay the groundwork for current biomass R&D success. Section IV of this annual report provides the Committee's recommendations to the points of contact on the Initiative and the Departments' response.

Committee activities during FY 2005 included:

- In November 2004, the Committee evaluated the 2004 joint solicitation process, developed recommendations based on its *Vision* and *Roadmap*, developed technical topic areas for the 2005 joint solicitation, and gave recommendations for the 2005 joint solicitation process. The Committee also developed its 2005 Work Plan.

- In March 2005, the Committee reviewed its 2005 Work Plan and project portfolio matrix, in addition to the Departments' Billion-Ton Feedstock Study.

- In July 2005, the Committee received an update on the joint solicitation process, discussed methods to communicate the benefits of biomass to the public, and discussed an update to its *Vision* goals, and established a *Vision* and *Roadmap* subcommittee.

During FY 2005, the Committee consisted of 18 individuals from industry, academia, non-profit organizations, and the agricultural and forestry sectors who are experts in their respective fields.

2005 Members of the Biomass Research and Development Technical Advisory Committee

Name	*Organization*	*Term Ending*
Chair		
Thomas Ewing	Davis & Harman LLP	November 2007
Vice-Chair		
Terry Jaffoni	Clean Transportation Fuels, Inc.	November 2006
Members		
J. Wayne Barrier	Metropolitan Energy Systems, Inc.	November 2005
Thomas Binder	Archer Daniels Midland	November 2005
Robert Boeding	National Corn Growers' Association	November 2005
Jerrel Branson	Biocrude, LLC	November 2006
William Carlson	Carlson Small Power Consultants	November 2005
Ralph P. Cavalieri	Washington State University	November 2006
Carolyn Fritz	Allylix, Inc.	November 2006
Charles Goodman	Southern Company	November 2005
Jack Huttner	Genencor International, Inc.	November 2006
Kim Kristoff	GEMTEK Products	November 2005
David Morris	Institute for Local Self Reliance	November 2005
Gary Pearl	Fats and Proteins Research Foundation, Inc.	November 2005
Delmar R. Raymond	Weyerhaeuser Company	November 2006
Philip L. Shane	Illinois Corn Marketing Board	November 2005

C. FY 2005 Solicitation Results

In FY 2005, the Departments coordinated a joint solicitation under the Initiative and received more than 670 applications. Following an independent technical peer review and joint programmatic review, 11 projects were awarded funding. The value of the funding awarded is $12.6 million with an additional $6 million in cost share from the private-sector partners. A brief public summary of each selected project and its funding amount is provided below.

2005 Joint Solicitation Projects

1. ***Title***: Increasing the Potential for the Utilization of Cellulose from Straw for Biofuel and Bioproduct Production
   Main Proposer: University of Idaho (Moscow, Idaho)
   Partners: Edward J. Souza, University of Idaho, Aberdeen; Shulin Chen, Washington State University.
   Estimated Duration of Project: 36 months
   Federal Funds Requested: $693,285 (79%)
   Cost-Share Funds: $184,277 (21%)
   Total Project Cost: $877,562

This project seeks to demonstrate the feasibility of using biomass from wheat and barley for biofuel production and to promote the development of future barley and wheat cultivars for fuel production. The project will accomplish this by examining the economic feasibility of the use of reduced lignin grain crops for fermentable sugar production and determining the effect the environment has on lignin biosynthesis in straw. It will also determine what level of lignin decrease can be tolerated by wheat without having a negative impact on crop performance. Since the research uses wheat and barley genotypes adapted to the Pacific Northwest, a successful demonstration of the economic feasibility of ethanol from straw would allow for rapid implementation of the technology in rural communities in this area.

2. ***Title***: Development of Low-Lignin Switchgrass for Improved Ethanol Production
Main Proposer: The Samuel Roberts Noble Foundation, Inc. (Ardmore, Oklahoma)
Partner: Oak Ridge National Laboratory.
Estimated Duration of Project: 36 months
Federal Funds Requested: $670,166 (77%)
Cost-Share Funds: $204,415 (23%)
Total Project Cost: $ 874,581

The reduction of lignin in switchgrass by genetic engineering is likely one of the most effective and economic ways of reducing the costs of producing ethanol. This project seeks to produce low-lignin switchgrass by transgenic down-regulation of the key lignin biosynthetic enzymes: cinnamyl alcohol dehydrogenase (cad), and caffeic acid *O*-methyltransferase (COMT). It also seeks to reduce the cross-linking of polysaccharides with lignin in switchgrass through the down-regulation of coumarate 3-hydroxylase (C3H), aldehyde deydrogenase (aldh) and COMTII-like genes in order to modify ferulate and lignin biosynthesis. The transgenic materials that are developed will be tested for their conversion efficiency to ethanol in comparison to untransformed controls. Those transgenic lines identified as increasing the efficiency of ethanol production will then be incorporated into a grass breeding program for the development of elite switchgrass cultivars.

3. ***Title:*** Implementation of a Scale-Up Pilot Plant Demonstration Facility Toward the Commercialization of Florida Biomass Feedstocks for Ethanol Production
Main Proposer: The Tampa Bay Area Ethanol Consortium (Tampa, Florida)
Partners: Bartow Ethanol, LLC; United States EnviroFuels, LLC; UltraForce Technology, LLC; and Common Purpose Institute.
***Estimated Duration of Project*:** 36 months
Federal Funds Requested: $1,920,000 (80%)
Cost-Share Funds: $480,000 (20%)
Total Project Cost: $2,400,000

This project will demonstrate how the production, harvest, transportation, storage, handling and conversion of multiple feedstocks compatible with the climate and soil of Florida can be managed to produce ethanol economically. The project will focus on the development of a flexible-feedstock process that will enable the use of a combination of several feedstocks (citrus pulp and peel waste, sweet sorghum, and nonfood, high-starch sweet potato) to enable stable, year-round ethanol production. This entails designing and constructing a two million

gallon per year flex-feed ethanol plant; integrating high-power ultrasonics as a pretreatment technology in the plant; and validating the technical and economic feasibility of producing, harvesting, storing, handling, and converting multiple feedstocks.

4. ***Title***: Biopower Demonstration and Educational Outreach
Main Proposer: University of Montana, College of Technology (Missoula, Montana)
Partners: Community Power Corporation; Plum Creek Timber Company; Tricon Timber Company; the Confederated Salish and Kootenai Tribes; Sustainable Systems, LLC; University of Montana College of Forestry and Conservation; Montana State Forester's Office; Montana Department of Environmental Quality; USDA Forest Products Laboratory; National Renewable Energy Laboratory; Montana Community Development Corporation; and the Missoula County School District.
Estimated Duration of Project: 36 months
Federal Funds Requested: $990,500 (70%)
Cost-Share Funds: $443,500 (30%)
Total Project Cost: $1,434,000

   The goal of this project is to create positive awareness of the environmental and economic benefits of bioenergy in the minds of thousands of new stakeholders. The University of Montana College of Technology and its partners will advance the awareness of bioenergy as a biobased product by researching and applying bioenergy technology in ways that will expand its knowledge and understanding, identifying important stakeholder groups that are key to expanded use of bioenergy, and packaging and distributing information about bioenergy and other biobased products to stakeholders in a way that is memorable and actionable. They will institute an education and research program, develop a biomass technical curriculum and design a series of high visibility outreach initiatives. A highly visible mobile educational laboratory will be outfitted with a wood chipper and dryer powered by biomass and several applications that can show audiences how biomass can be used to create bioenergy.

5. ***Title***: Conversion of Biodiesel Derived Glycidol, Glycerol Carbonate and C-3 Oxygenates by Catalytic and Biocatalytic Pathways
Main Proposer: North Carolina State University, Department of Chemical and Biomolecular Engineering (Raleigh, North Carolina)
Partners: North Carolina Solar Center; Chambers Process Engineering, PA; and Carolina Soy Products.
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,606,265 (80%)
Cost-Share Funds: $411,795 (20%)
Total Project Cost: $2,018,060

   Conversion of glycerol, a byproduct of biodiesel production, to other, more chemically reactive and therefore, useful three-carbon (C3) compounds is the focus of this project. Several approaches are being evaluated, including novel chemistries utilizing solid catalysts, the use of supercritical carbon dioxide as a reactant, the evolution of enzymes with improved catalytic activities, and the creation of genetically engineered bacteria that express new

metabolic pathways to generate valuable C3-oxygenates. This multi-pronged effort is expected to generate several new technologies in the laboratory with sufficient promise to justify small pilot-scale evaluation.

6. ***Title***: Environmental Enhancement through Corn Stover Utilization
Main Proposer: Iowa State University (Ames, Iowa)
Partners: Eprida, Inc.; National Renewable Energy Laboratory (NREL); Oak Ridge National Laboratory (ORNL); USDA North Central Soil Conservation Research Laboratory; Cargill Incorporated; and Demonstratives.
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,853,996 (79%)
Cost-Share Funds: $500,349 (21%)
Total Project Cost: $2,354,345

This project proposes a new system for maintaining soil fertility that employs corn stover or corn fiber for production of nitrogen-rich, biologically active char that both enriches the soil and sequesters carbon from the atmosphere. In this system, corn stover or corn hulls are collected and pre-processed locally to yield fine, porous char and energy rich bio-oil. The bio-oil, which can be thought of as densified biomass, is transported by tanker truck to a central facility for steam reforming to hydrogen followed by some part of it being converted to anhydrous ammonia (the process yields excess hydrogen for other applications). Using existing infrastructure of the agricultural fertilizer industry, anhydrous ammonia is transported back to the distributed preprocessing facilities where it is reacted with carbon dioxide, water, and char, which are byproducts from pyrolysis of biomass, to yield ammonia bicarbonate precipitated within the pores of the char. The nitrogen-rich char is injected into the soil where it serves three purposes: nitrogen fertilizer, biologically active soil amendment, and a means for sequestering carbon from the atmosphere.

7. ***Title***: Carbon Fiber from Biomass Lignins
Main Proposer: Oak Ridge National Laboratory (Oak Ridge, Tennessee)
Partners: MeadWestvaco; Lignol Innovations Corp.; the Tennessee Forest Products Center.
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,083,770 (71%)
Cost-Share Funds: $450,000 (29%)
Total Project Cost: $1,533,770

This project proposes to evaluate the use of biomass lignins, such as ethanol organosolv lignins produced from wood, woody biomass, annual crop materials, and grasses, as carbon fiber feedstocks. It is expected that the techniques used in the evaluation of carbon fiber feedstocks from Kraft lignins can be modified to permit the evaluation of melting and spinning behavior; presence and removal of contaminants that interfere with fiber production; fiber mechanical properties; carbon fiber production from lignin-based materials; and fabrication of small composites from experimental carbon fibers. The project will evaluate: 1) technologies needed to produce biomass-derived lignins that can be readily converted to industrial-grade carbon fibers, 2) the production and properties of carbon fibers from biomass lignins, 3) activation of lignin-based carbon fibers, and 4) integration of lignin

recovery into production schemes for other biobased products, including ethanol. If the ability to produce carbon fiber from biomass lignins can be demonstrated, lignin may become the most valuable product of a biorefinery. Sales of biomass-derived carbon fiber could spur biorefinery deployment and, at the same time, improve energy efficiency, the environment, sustainability, and rural development.

8. ***Title***: Environmental and Economic Performance of an Integrated, Digester-Cogeneration-Value-Added Process
Main Proposer: Clarkson University (Potsdam, New York)
Partners: North Harbor Dairy, LLC; Environomics; New York State Energy Research and Development Authority (NYSERDA), New York State.
Estimated Duration of Project: 36 months
Federal Funds Requested: $805,938 (46%)
Cost-Share Funds: $960,315 (54%)
Total Project Cost: $1,766,253

The overall goal of this project is to provide the data and understanding necessary to overcome questions of reliability and to prove the economic and environmental value of anaerobic digestion (AD) systems in order to increase their implementation. Tasks being undertaken in the project include: design and install a digester, energy recovery and value-added product system (e.g., micro-cheese); develop a mathematical model to optimize the digester/cogeneration/value-added system; quantify the environmental impact through a detailed life cycle environmental analysis; and survey farmers to identify their perceptions of AD systems, barriers they face, and economic and education instruments they feel are required to overcome these barriers. The project will generate quantifiable evidence of the technical, environmental, economic, and social efficacy of this integrated system. The model developed in this project will be invaluable for the regulatory community to identify incentive structures needed to promote this technology, for the designer to evaluate design and operational parameters, and for the farmer to optimize his/her system to adjust for seasonal variations in temperature, changes in manure composition, or other farm management practices.

9. ***Title***: Biomass Gasification: A Comprehensive Demonstration of a Community-Scale Biomass Energy System
Main Proposer: University of Minnesota, Morris (Morris, Minnesota)
Partners: West Central Research and Outreach Center; North Central Soil Conservation Research Laboratory; Chippewa Valley Ethanol Company; Ottertail Power Company; HGA, Inc.; and Architects Engineers Planners.
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,896,493 (45%)
Cost-Share Funds: $2,345,597 (55%)
Total Project Cost: $4,242,090

This project will address the obstacles to establishing community-scale biomass systems and develop tools to enable further deployment of biomass gasification systems. Guidelines will be created to promote parallel development of sustainable biomass cropping systems. Six

different streams of biomass feedstocks will be demonstrated: corn stover, corn earlage, wheat straw, soybean residue, native grasses, and hybrid poplar. Information obtained from test burns will be used to develop the Biomass Toolbox, including Standard Operating Procedures, Best Management Practices, Templates for Contracts and Pricing Structures, and Environmental Permitting Templates. Capstone classes for professionals and World Wide Web monitoring of the biomass system highlight the outreach efforts.

10. ***Title*****:** Bioenergy: Optimum Incentives and Sustainability of Non-Industrial Private Forests in the U.S. South
Main Proposer: University of Florida (Gainesville, Florida)
Partners: Virginia Polytechnic Institute and State University, University of Arkansas.
Estimated Duration of Project: 36 months
Federal Funds Requested: $656,525 (76%)
Cost-Share Funds: $164,494 (24%)
Total Project Cost: $821,019

The goal of this project is to determine the optimum mix of policy instruments that can bridge current management and sustainable forest management of non-industrial private forests (NIPF) with wood energy as a product in the U.S. South. To accomplish this goal, an in-depth assessment of the effect of policy initiatives on forest biomass supply, bioenergy production, employment, profitability, and environmental quality will be conducted. The assessment will include a study of NIPF landowners to gauge their willingness to enter into sustained biomass production for bioenergy through land use and forest management decisions; a study of the values households place on wood biomass and bioenergy production; a study of the effects of biomass-related policy instruments on NIPF landowner decisions; a region-wide economic analysis of employment, income, household welfare, and environmental effects of biomass-related policy instruments; and a status paper that combines the knowledge gained in the other parts of the assessment. The assessment will serve as the basis for exploring strategies to promote NIPF sustainability and increase bioenergy usage ten-fold by 2020 in the U.S. South. Theoretically consistent methodologies, including contingent valuation, dynamic optimization, and computable general equilibrium, will be applied to achieve the proposed tasks. The span of the data collection will cover most eventualities for biomass production, including coastal plain, piedmont, mountain, and bottomlands site types, as well as pine, hardwood, and mixed cover types.

11. ***Title*****:** Incentives for Biomass Commercialization: Pioneering Markets for Biomass Using Renewable Energy Certificates, Emission Reduction Credits and Incentive Programs for Ammonia, PM10 and PM2.5 Reductions
Main Proposer: Environmental Resources Trust (Washington, DC)
Partners: Inland Empire Utilities Agency; ENVIRON International Corporation; Spurgin & Associates; Eastern Research Group, Inc.; The Milk Producers Council; South Coast Air Quality Management District; and CH2M HILL.
Estimated Duration of Project: 24 months
Federal Funds Requested: $449,993 (70%)
Cost-Share Funds: $191,078 (30%)
Total Project Cost: $641,071

The goal of this project is to spur the commercialization of biopower and bioproducts from animal feed operations throughout the country by capturing the economic value of their multiple environmental benefits, including biopower generation, verified emission reductions, emission reduction credits, and renewable energy certificates. This project will demonstrate a model to generate revenue from environmental benefits, including the potential to create valuable PM10 emission reduction credits based on achieved ammonia reductions. Project deliverables will include protocols, tools and training materials designed to promote diffusion of advanced biomass technology throughout the United States. It will also develop online or web-enabled tools for quantification, monitoring, reporting and verification.

IV. Report of the Biomass Research and Development Technical Advisory Committee & Departmental Response

Section 306 of the Biomass Act charges the Committee with advising the points of contact with respect to the Initiative. Further, it charges the Committee with evaluating whether, and making recommendations to the Board to ensure that, "the funds authorized for the Initiative are distributed and used in a manner that is consistent with the goals of the Initiative;" and "the points of contact are funding proposals under this title that are selected on the basis of merit, as determined by an independent panel of scientific and technical peers."

During Committee meetings held over the course of the year, the Departments provided the Committee with updates on the status of the Initiative's joint solicitation process. Following the announcement of the FY 2005 joint solicitation awards, the Committee was provided with a written overview of the joint solicitation process, as well as a summary of the awards made and distribution of funds. Those results are provided in Section III-C of this annual report.

The following are summarized comments and recommendations made by the Committee for 2005, related to the joint solicitation process and the awards made. The Committee recommendations to the Secretaries of Agriculture and Energy for 2005 are categorized into the following areas:

A. High-Priority Recommendations to the Secretaries of Agriculture and Energy
B. Recommended Changes to the Fiscal Year 2005 Joint Solicitation Process
C. Recommendations to the Secretaries of Agriculture and Energy on the Departments' R&D portfolios in Relation to the Committee's *Vision* and *Roadmap*
D. Overall Recommendations to the Secretaries of Agriculture and Energy in 2005

The responses of the Departments have been added in *italics* after each recommendation. No changes have been made to the actual content of the Committee's recommendations by adopting this report structure.

In addition to the Committee's recommendations, a minority report was disseminated to all Committee members. This report was neither discussed nor voted on by the Committee; however, it is included in Appendix 3 of this annual report.

A. High-Priority Recommendations to the Secretaries of Agriculture and Energy

1. Increase funding to encourage the achievement of *Vision* and *Roadmap* goals as outlined in future revised versions of the documents. The agencies are asked to detail consequences of under-funded research.

   The reduction in funding for the joint solicitations were caused by a mandatory funding decrease in section 9008 of Title IX of the Food Security and Rural Investment Act and a reduction in discretionary DOE Biomass Program funds due to congressionally directed projects. Funding for the Biomass Research and Development Initiative under the Departments' joint solicitation has decreased annually since its establishment by the Biomass

Act. It is noted that funding for this initiative comes from two Appropriations Committees and that the Biomass Act is an authorization of funding for USDA only. Any DOE funding comes from discretionary funds out of Energy and Water Development Appropriations. The Committee requests that Congress note that these congressionally-directed funds are inhibiting the potential of the Initiative's joint solicitation, which aims to achieve the bioenergy goals set in the Committee's *Vision* and *Roadmap* documents.

Response: *DOE is making efforts to better communicate to Congress the technical strategy of the Biomass Program, and the benefits that strategy could have on energy security, if funding for congressionally-directed activities were used in alignment with Biomass Program R&D strategies.*

2. Expedite the approval process for future Committee membership packages. The Committee has lost the benefit of having the 2004 members' participation.

   The delays in the DOE membership approval process withheld membership from a significant portion of the Committee during 2005. The members recommend expedited approval in the future, as uncertainty in this area has a serious and irreparable negative impact on the Committee's focus and efficacy.

   Response: *The Departments regret the delays in the 2004 nomination process. The DFO has made a concerted effort to expedite the Committee membership package for 2005. Specifically, the DFO has already submitted nominations for new membership. This timeframe is ahead of the 2004 schedule, promising to achieve a faster, more streamlined nomination process.*

3. Channel R&D to address issues or new opportunities for increasing the market utility of biofuels.

   In order to ensure a smooth transition from petroleum-based fuels to biofuels, more research needs to be funded that is focused on practical applications in the marketplace, such as the use of existing infrastructure for the distribution and storage of biofuels, the use of biodiesel in cold climates, and ethanol permeation.

   Response: *The DOE Biomass Program in FY 2007 is requesting additional funding to better address the new opportunities for the utility of biofuels. The effort hopes to achieve increased funding for biomass to fuels conversion technologies and deployment of these technologies in the private sector. Through the Clean Cities Program, DOE intends to award $1.5 million for E-85 refueling infrastructure in FY 2006 to encourage the adoption of biofuels into the marketplace. USDA has ongoing biofuels conversion and marketing research and support programs.*

4. Have a subcommittee interact with the congressional appropriations committee with the goal of having funding realigned with the *Vision* and *Roadmap* goals.

The revised *Vision* and *Roadmap* documents will be used as a valuable tool to evaluate R&D effectiveness in the future. The Committee is organizing subcommittees in the areas of policy and analysis, and will focus its message outwards to policymakers, fully highlighting any discrepancies with peer-approved guidelines in the *Vision* and *Roadmap* documents.

Response: *The Departments encourage the Committee to pursue further development of its policy and analysis subcommittees.*

B. Recommended Changes to the Fiscal Year 2005 Joint Solicitation Process

1. Reduce minimum award amount to $150,000 for individual projects, allowing a greater number of awards in a wider range of topics. Where appropriate, projects should be incrementally funded thereafter.

   Project performance should be evaluated at regular intervals over the course of each project, and the results should be used to help determine decisions on continued funding. The Committee would like the Secretaries to examine current funding practices, and where possible, move toward a higher number of awards, with funds distributed over the course of the project.

   Response: *The Departments do evaluate the progress of technical research throughout the year in the form of quarterly reports, stage gate reviews, peer reviews, and other mechanisms. The Departments will review the Committee's recommendation to reduce the minimum award amount.*

2. Announce the joint solicitation results earlier.

   Delay in announcing the official joint solicitation awards can make information leaks possible and frustrate awardees with funding uncertainties. The Departments are urged to facilitate efficiency in the award approval process. Board affirmation meetings held prior to the official announcement should be scheduled farther in advance to avoid these delays.

   Response*: Each year the Departments have made progress in accelerating the release of the joint solicitation and technical review of results. The Departments will make every effort to expedite public release of awards once decisions have been finalized; however, the Departments will continue to ensure that no awardees are announced until official selections have been completed.*

3. Increase compensation for reviewers from industry and academia that are involved in the joint solicitation technical merit review.

   The Committee is concerned that reviewers primarily consist of Federal employees (USDA and DOE).

   Response*: The FY 2005 joint solicitation preproposal review was held in February 2006. It involved reviewers from industry, academia, and government. In the scientific community,*

voluntary peer review by technical experts who are not compensated is a common practice. The Department does not plan to compensate reviewers beyond their travel reimbursement.

C. Recommendations to the Secretaries of Agriculture and Energy on the Departments' R&D Portfolios in Relation to the Committee's *Vision* and *Roadmap*

1. Require bidders to demonstrate commercial viability of the proposed technology as part of their funding request.

   While the current joint solicitation process requires complete life cycle documentation in submitted proposals, the Committee encourages the establishment of evaluation metrics for each funded project along each step of its duration. The Committee's joint solicitation project matrix, resulting from a previous recommendation, aligns current R&D investments with *Roadmap* objectives. Assessing the likelihood of proposal success will be easier with an early explanation of each project's practical timeline to commercialization.

   Response: *The Departments will review this recommendation when planning for future solicitations. All DOE Biomass Program projects, including those funded through the joint solicitation, are reviewed annually via the stage gate process. The stage gate process reviews projects at five different steps in the project life cycle, from preliminary investigation to commercial launch. USDA has awarded a contract to the University of Nebraska for the FY 2002, 2003 and 2004 awards to perform peer reviews of the funded projects. The results of these peer reviews will be used to determine any necessary changes that might be needed for future solicitations.*

2. Fund further research on the co-products of biofuel production.

   In order to improve the economics of biofuels manufacturing and enhance value, co-product research is necessary. In grain-based biofuel production, these co-products include high-protein distiller's dry grains (DDG) and petroleum-replacing biochemicals.

   Response: *The main focus of DOE research for 2005 has been the biorefinery concept in which a facility produces both biofuels and high-value co-products. In addition, bioproducts are one of the major platforms of the DOE biomass research portfolio, and co-product research and commercialization is important to the USDA.*

3. Fund further research on incentive programs and other methods to stimulate biobased products growth.

   The Committee believes that a huge market opportunity exists for biobased products, separate from biofuels, but that funding and incentives to support this potential market are lacking. The Committee finds that the definition of biobased products included in the Federal Government's procurement program is too narrow and advocates further incentives to spur the market for biobased products, including the co-products of biofuels production.

Response: *The Federal Biobased Product Preference Procurement Program has an important impact on the demand for biobased products in the United States. The Departments will review the new policy recommendations from the Committee.*

4. Recognize and communicate to other Federal agencies the importance of basic sciences for the success of biomass research.

   Upon review of the Departments' R&D portfolios, the Committee recognizes the need for basic science R&D. This basic science is needed in order to tackle some major technical barriers related to biomass fuels, power, and products. These needs should be communicated not only to the Departments, but to other Federal agencies, such as the Department of the Interior, the Environmental Protection Agency, the Office of Science and Technology Policy, the National Science Foundation, the Office of the Environmental Executive, and the Department of Transportation. The Committee recommends that these Federal agencies coordinate basic science activities aimed at addressing our need for biomass fuels, power, and products.

   Response: *The DOE Biomass Program, the DOE Office of Science, and USDA will define the requirements for collaboration on biomass research.*

5. Continue funding for the thermochemical R&D platform.

   Support for this area has fluctuated since the Committee's inception, and members strongly advocate its continued work, incorporating full use of all available biomass resources in future energy production.

   Response: *Funding for the thermochemical platform for FY 2005 was more than $18 million. The DOE Biomass Program requested $15 million for the thermochemical platform in FY 2006. However, in FY 2006 $10.5 million is available for this platform and includes approximately $6 million for congressionally-directed projects. Funding for thermochemical research has decreased from the request, due to the need to accommodate funding for congressionally-directed activities not related to the thermochemical platform.*

D. Overall Recommendations to the Secretaries of Agriculture and Energy in 2005

1. Facilitate a renewed emphasis on public education and awareness, and help to educate policy makers, their staff, and the public, including increased focus on education within universities.

   The Committee feels that there is a need for a paradigm shift at the high school and university levels on how organic chemistry and related engineering disciplines are taught to rely on petroleum-based feedstocks for various chemicals. The Committee commends prior hybrid science programs at select universities, which have pulled separate departments and disciplines together to encourage research and student opportunities in the bioenergy field. The Committee advises an increase in public education in the Northeast and California, where public awareness of the increased use of biofuels is low. A better informed public will help shape future policy. Policy can also focus on creating more support for biomass-related

disciplines throughout the educational system. This could be done via more university grants to support graduate students in these research disciplines or a change in curriculum to include biomass as a feedstock in chemical manufacturing, which will increase focus on the technical challenges and potential research areas for Ph.D. or graduate research. These changes could assist in communicating a thorough commitment to biomass technology that will influence future policy.

Departmental Response: *The Departments have plans to better communicate to the public the costs and benefits of biomass technologies, via websites, conference exhibits, and other activities. The Departments also conduct competitively solicited research at universities, which in turn exposes graduate students to the field. Additionally, DOE's EERE office supports a crosscutting Technology Advancement and Outreach activity that disseminates information about energy efficiency and renewable energy technologies and products, including biomass.*

2. Increase the number of university faculty directly involved in federally funded biomass research.

   Federal grants from the National Science Foundation, the National Institutes of Health, and other agencies do not target biomass work specifically. Moreover, Federal agencies that fund biomass research do not adequately communicate with one another. Opportunities for biomass research have a very low award rate. Consequently, current students lack learning opportunities in the biomass field. These factors combine to hinder fulfillment of the actual personnel needs of the biomass industry. The Committee recommends providing funding for top-down education of academia about the technological opportunities available in biomass, endorses the enhanced biomass professional community this will create, and advocates cooperation with industry to publicize education in biomass technology.

   Response: *The Departments cannot directly influence university decisions to increase staff. The Departments will continue to develop research strategies to advance biomass technologies as they support national goals.*

3. Simplify the statutory language in section 9002 of the Farm Security and Rural Investment Act of 2002 (Farm Bill). Specifically, the Committee requests a broader, more inclusive (all bio-organic matter) definition of biobased products, concurrent with that of the *Vision* statement, be allowed.

   The Committee elucidated this position in a memorandum during 2005. Drafted by Committee member David Morris of the Institute for Local Self-Reliance, the memorandum was affirmed and sent to Secretary Bodman on behalf of the Committee.

   USDA rulemaking defines products according to the level of biobased content, with a mature markets definition that excludes natural fibers, among other materials, from their Federal Biobased Product Preference Procurement Program. The Committee does not intend to alter the definition of bioproducts given in its *Vision* statement to exclude natural materials and fibers. Instead, the *Vision* definition focuses on tracking of petroleum-replacing biobased

products for goal-setting, and will include natural material data in reporting when available. This definition is recommended for standard use when it is final.

Response: *USDA has considered the Committee recommendations regarding broadening the definition of biobased products to allow a wider definition of products for biobased designation under the Federal Biobased Products Preferred Procurement Program. USDA has also reviewed section 9002 of the Farm Security and Rural Investment Act (FSRIA) of 2002, and the conference report language on the Act in which Congress emphasized its intent that the focus of the Preferred Procurement Program be on new products and new markets.*

In light of the clear intent of the Congress regarding section 9002 of FSRIA, USDA has decided to maintain the focus of the Preferred Procurement Program on new products and new markets. To broaden the definition of bioproducts in the way requested by the Committee would effectively invalidate the Preferred Procurement Program as a tool to support development of new products and new markets, since Federal agencies would then be able to choose to procure mature biobased products in mature markets, instead of the new products and new markets that Congress clearly intended to emphasize.

USDA does, however, appreciate the Committee's desire to give recognition to mature biobased products in mature markets. Therefore, it will propose in forthcoming regulation implementing the voluntary labeling program provided for in section 9002 to make available the use of the "U.S.D.A. Certified Biobased Product" label and logo to all biobased products meeting labeling program qualifications, without regard to whether the product is a mature or new product or if the generic grouping of products under which it would fall has been designated for preferred procurement. This action will substantially broaden the application of the voluntary labeling program to mature products in mature markets, as well as to new products in new markets.

Appendix 1: Biomass Research and Development Act of 2000

H.R.2559

Agricultural Risk Protection Act of 2000 [Enrolled Bill (Sent to President)]

TITLE III--BIOMASS RESEARCH AND DEVELOPMENT ACT OF 2000

SEC. 302. FINDINGS.

Congress finds that--

1. conversion of biomass into biobased industrial products offers outstanding potential for benefit to the national interest through--
    A. improved strategic security and balance of payments;
    B. healthier rural economies;
    C. improved environmental quality;
    D. near-zero net greenhouse gas emissions;
    E. technology export; and
    F. sustainable resource supply;
2. the key technical challenges to be overcome in order for biobased industrial products to be cost-competitive are finding new technology and reducing the cost of technology for converting biomass into desired Biobased industrial products;
3. biobased fuels, such as ethanol, have the clear potential to be sustainable, low cost, and high performance fuels that are compatible with both current and future transportation systems and provide near-zero net greenhouse gas emissions;
4. biobased chemicals have the clear potential for environmentally benign product life cycles;
5. biobased power can--
    A. provide environmental benefits;
    B. promote rural economic development; and
    C. diversify energy resource options;
6. many biomass feedstocks suitable for industrial processing show the clear potential for sustainable production, in some cases resulting in improved soil fertility and carbon sequestration;
7. (A) grain processing mills are biorefineries that produce a diversity of useful food, chemical, feed, and fuel products; and
   (B) technologies that result in further diversification of the range of value-added biobased industrial products can meet a key need for the grain processing industry;
8. (A) cellulosic feedstocks are attractive because of their low cost and widespread availability; and
   (B) research resulting in cost-effective technology to overcome the recalcitrance of cellulosic biomass would allow biorefineries to produce fuels and bulk chemicals on a very large scale, with a commensurately large realization of the benefit described in paragraph (1);

9. research into the fundamentals to understand important mechanisms of biomass conversion can be expected to accelerate the application and advancement of biomass processing technology by--
    A. increasing the confidence and speed with which new technologies can be scaled up; and
    B. giving rise to processing innovations based on new knowledge;
10. the added utility of biobased industrial products developed through improvements in processing technology would encourage the design of feedstocks that would meet future needs more effectively;
11. the creation of value-added biobased industrial products would create new jobs in construction, manufacturing, and distribution, as well as new higher-valued exports of products and technology;
12. (A) because of the relatively short-term time horizon characteristic of private sector investments, and because many benefits of biomass processing are in the national interest, it is appropriate for the Federal Government to provide pre-commercial investment in fundamental research and research-driven innovation in the biomass processing area; and
    (B) such an investment would provide a valuable complement to ongoing and past governmental support in the biomass processing area; and
13. several prominent studies, including studies by the President's Committee of Advisors on Science and Technology and the National Research Council--
    A. support the potential for large research-driven advances in technologies for production of Biobased industrial products as well as associated benefits; and
    B. document the need for a focused, integrated, and innovation-driven research effort to provide the appropriate progress in a timely manner.

SEC. 303. DEFINITIONS.

In this title:

1. ADVISORY COMMITTEE- The term `Advisory Committee' means the Biomass Research and Development Technical Advisory Committee established by section 306.
2. BIOBASED INDUSTRIAL PRODUCT- The term `biobased industrial product' means fuels, chemicals, building materials, or electric power or heat produced from biomass.
3. BIOMASS- The term `biomass' means any organic matter that is available on a renewable or recurring basis, including agricultural crops and trees, wood and wood wastes and residues, plants (including aquatic plants), grasses, residues, fibers, and animal wastes, municipal wastes, and other waste materials.
4. BOARD- The term `Board' means the Biomass Research and Development Board established by section 305.
5. INITIATIVE- The term `Initiative' means the Biomass Research and Development Initiative established under section 307.

6. INSTITUTION OF HIGHER EDUCATION- The term `institution of higher education' has the meaning given the term in section 102(a) of the Higher Education Act of 1965 (20 U.S.C. 1002(a)).
7. NATIONAL LABORATORY- The term `national laboratory' has the meaning given the term `laboratory' in section 12(d) of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3710a(d)).
8. POINT OF CONTACT- The term `point of contact' means a point of contact designated under section 304(d).
9. PROCESSING- The term `processing' means the derivation of biobased industrial products from biomass, including--
    A. feedstock production;
    B. harvest and handling;
    C. pretreatment or thermochemical processing;
    D. fermentation;
    E. catalytic processing;
    F. product recovery; and
    G. coproduct production.
10. RESEARCH AND DEVELOPMENT- The term `research and development' means research, development, and demonstration.

SEC. 304. COOPERATION AND COORDINATION IN BIOMASS RESEARCH AND DEVELOPMENT.

A. IN GENERAL- The Secretary of Agriculture and the Secretary of Energy shall cooperate with respect to, and coordinate, policies and procedures that promote research and development leading to the production of Biobased industrial products.
B. PURPOSES- The purposes of the cooperation and coordination shall be--
    1. to understand the key mechanisms underlying the recalcitrance of biomass for conversion into Biobased industrial products;
    2. to develop new and cost-effective technologies that would result in large-scale commercial production of low cost and sustainable biobased industrial products;
    3. to ensure that biobased industrial products are developed in a manner that enhances their economic, energy security, and environmental benefits; and
    4. to promote the development and use of agricultural and energy crops for conversion into biobased industrial products.
C. AREAS- In carrying out this title, the Secretary of Agriculture and the Secretary of Energy, in consultation with heads of appropriate departments and agencies, shall promote research and development--
    1. to advance the availability and widespread use of energy efficient, economically competitive, and environmentally sound biobased industrial products in a manner that is consistent with the goals of the United States relating to sustainable and secure supplies of food, chemicals, and fuel;
    2. to ensure full consideration of Federal land and land management programs as potential feedstock resources for biobased industrial products; and
    3. to assess the environmental, economic, and social impact of production of biobased industrial products from biomass on a large scale.

D. POINTS OF CONTACT-
    1. IN GENERAL- To coordinate research and development programs and activities relating to Biobased industrial products that are carried out by their respective Departments--
        A. the Secretary of Agriculture shall designate, as the point of contact for the Department of Agriculture, an officer of the Department of Agriculture appointed by the President to a position in the Department before the date of the designation, by and with the advice and consent of the Senate; and
        B. the Secretary of Energy shall designate, as the point of contact for the Department of Energy, an officer of the Department of Energy appointed by the President to a position in the Department before the date of the designation, by and with the advice and consent of the Senate.
    2. DUTIES- The points of contact shall jointly--
        A. assist in arranging interlaboratory and site-specific supplemental agreements for research and development projects relating to biobased industrial products;
        B. serve as cochairpersons of the Board;
        C. administer the Initiative; and
        D. respond in writing to each recommendation of the Advisory Committee made under section 306(c).

SEC. 305. BIOMASS RESEARCH AND DEVELOPMENT BOARD.

A. ESTABLISHMENT- There is established the Biomass Research and Development Board, which shall supersede the Interagency Council on Biobased Products and Bioenergy established by Executive Order No. 13134, to coordinate programs within and among departments and agencies of the Federal Government for the purpose of promoting the use of biobased industrial products by--
    1. maximizing the benefits deriving from Federal grants and assistance; and
    2. bringing coherence to Federal strategic planning.
B. MEMBERSHIP- The Board shall consist of--
    1. the point of contact of the Department of Energy designated under section 304(d)(1)(B), who shall serve as cochairperson of the Board;
    2. the point of contact of the Department of Agriculture designated under section 304(d)(1)(A), who shall serve as cochairperson of the Board;
    3. a senior officer of each of the Department of the Interior, the Environmental Protection Agency, the National Science Foundation, and the Office of Science and Technology Policy, each of whom shall--
        A. be appointed by the head of the respective agency; and
        B. have a rank that is equivalent to the rank of the points of contact; and
    4. at the option of the Secretary of Agriculture and the Secretary of Energy, other members appointed by the Secretaries (after consultation with the members described in paragraphs (1) through (3)).
C. DUTIES- The Board shall--
    1. coordinate research and development activities relating to biobased industrial products--

A. between the Department of Agriculture and the Department of Energy; and
B. with other departments and agencies of the Federal Government; and

2. provide recommendations to the points of contact concerning administration of this title.

D. FUNDING- Each agency represented on the Board is encouraged to provide funds for any purpose under this title.
E. MEETINGS- The Board shall meet at least quarterly to enable the Board to carry out the duties of the Board under subsection (c).

SEC. 306. BIOMASS RESEARCH AND DEVELOPMENT TECHNICAL ADVISORY COMMITTEE.

A. ESTABLISHMENT- There is established the Biomass Research and Development Technical Advisory Committee, which shall supersede the Advisory Committee on Biobased Products and Bioenergy established by Executive Order No. 13134--
    1. to advise the Secretary of Energy, the Secretary of Agriculture, and the points of contact concerning--
        A. the technical focus and direction of requests for proposals issued under the Initiative; and
        B. procedures for reviewing and evaluating the proposals;
    2. to facilitate consultations and partnerships among Federal and State agencies, agricultural producers, industry, consumers, the research community, and other interested groups to carry out program activities relating to the Initiative; and
    3. to evaluate and perform strategic planning on program activities relating to the Initiative.
B. MEMBERSHIP-
    1. IN GENERAL- The Advisory Committee shall consist of--
        A. an individual affiliated with the biobased industrial products industry;
        B. an individual affiliated with an institution of higher education who has expertise in biobased industrial products;
        C. two prominent engineers or scientists from government or academia who have expertise in Biobased industrial products;
        D. an individual affiliated with a commodity trade association;
        E. an individual affiliated with an environmental or conservation organization;
        F. an individual associated with State government who has expertise in biobased industrial products;
        G. an individual with expertise in energy analysis;
        H. an individual with expertise in the economics of biobased industrial products;
        I. an individual with expertise in agricultural economics; and
        J. at the option of the points of contact, other members.
    2. APPOINTMENT- The members of the Advisory Committee shall be appointed by the points of contact.

C. DUTIES- The Advisory Committee shall--
    1. advise the points of contact with respect to the Initiative; and
    2. evaluate whether, and make recommendations in writing to the Board to ensure that--
        A. funds authorized for the Initiative are distributed and used in a manner that is consistent with the goals of the Initiative;
        B. the points of contact are funding proposals under this title that are selected on the basis of merit, as determined by an independent panel of scientific and technical peers; and
        C. activities under this title are carried out in accordance with this title.

D. COORDINATION- To avoid duplication of effort, the Advisory Committee shall coordinate its activities with those of other Federal advisory committees working in related areas.

E. MEETINGS- The Advisory Committee shall meet at least quarterly to enable the Advisory Committee to carry out the duties of the Advisory Committee under subsection (c).

F. TERMS- Members of the Advisory Committee shall be appointed for a term of 3 years, except that--
    1. one-third of the members initially appointed shall be appointed for a term of 1 year; and
    2. one-third of the members initially appointed shall be appointed for a term of 2 years.

SEC. 307. BIOMASS RESEARCH AND DEVELOPMENT INITIATIVE.

A. IN GENERAL- The Secretary of Agriculture and the Secretary of Energy, acting through their respective points of contact and in consultation with the Board, shall establish and carry out a Biomass Research and Development Initiative under which competitively awarded grants, contracts, and financial assistance are provided to, or entered into with, eligible entities to carry out research on biobased industrial products.

B. PURPOSES- The purposes of grants, contracts, and assistance under this section shall be-
    1. to stimulate collaborative activities by a diverse range of experts in all aspects of biomass processing for the purpose of conducting fundamental and innovation-targeted research and technology development;
    2. to enhance creative and imaginative approaches toward biomass processing that will serve to develop the next generation of advanced technologies making possible low cost and sustainable biobased industrial products;
    3. to strengthen the intellectual resources of the United States through the training and education of future scientists, engineers, managers, and business leaders in the field of biomass processing; and
    4. to promote integrated research partnerships among colleges, universities, national laboratories, Federal and State research agencies, and the private sector as the best means of overcoming technical challenges that span multiple research and engineering disciplines and of gaining better leverage from limited Federal research funds.

C. ELIGIBLE ENTITIES-

1. IN GENERAL- To be eligible for a grant, contract, or assistance under this section, an applicant shall be--
    A. an institution of higher education;
    B. a national laboratory;
    C. a Federal research agency;
    D. a State research agency;
    E. a private sector entity;
    F. a nonprofit organization; or
    G. a consortium of two or more entities described in subparagraphs (A) through (F).
2. ADMINISTRATION- After consultation with the Board, the points of contact shall--
    A. publish annually one or more joint requests for proposals for grants, contracts, and assistance under this section;
    B. establish a priority in grants, contracts, and assistance under this section for research that--
        i. demonstrates potential for significant advances in biomass processing;
        ii. demonstrates potential to substantially further scale-sensitive national objectives such as--
            I. sustainable resource supply;
            II. reduced greenhouse gas emissions;
            III. healthier rural economies; and
            IV. improved strategic security and trade balances; and
        iii. would improve knowledge of important biomass processing systems that demonstrate potential for commercial applications;
    C. require that grants, contracts, and assistance under this section be awarded competitively, on the basis of merit, after the establishment of procedures that provide for scientific peer review by an independent panel of scientific and technical peers; and
    D. give preference to applications that--
        i. involve a consortia of experts from multiple institutions; and
        ii. encourage the integration of disciplines and application of the best technical resources.

D. USES OF GRANTS, CONTRACTS, AND ASSISTANCE- A grant, contract, or assistance under this section may be used to conduct--
1. research on process technology for overcoming the recalcitrance of biomass, including research on key mechanisms, advanced technologies, and demonstration test beds for--
    A. feedstock pretreatment and hydrolysis of cellulose and hemicellulose, including new technologies for--
        i. enhanced sugar yields;
        ii. lower overall chemical use;
        iii. less costly materials; and
        iv. cost reduction;

B. development of novel organisms and other approaches to substantially lower the cost of cellulase enzymes and enzymatic hydrolysis, including dedicated cellulase production and consolidated bioprocessing strategies; and
C. approaches other than enzymatic hydrolysis for overcoming the recalcitrance of cellulosic biomass;

2. research on technologies for diversifying the range of products that can be efficiently and cost-competitively produced from biomass, including research on--
    A. metabolic engineering of biological systems (including the safe use of genetically modified crops) to produce novel products, especially commodity products, or to increase product selectivity and tolerance, with a research priority for the development of biobased industrial products that can compete in performance and cost with fossil-based products;
    B. catalytic processing to convert intermediates of biomass processing into products of interest;
    C. separation technologies for cost-effective product recovery and purification;
    D. approaches other than metabolic engineering and catalytic conversion of intermediates of biomass processing;
    E. advanced biomass gasification technologies, including coproduction of power and heat as an integrated component of biomass processing, with the possibility of generating excess electricity for sale; and
    F. related research in advanced turbine and stationary fuel cell technology for production of electricity from biomass; and
3. research aimed at ensuring the environmental performance and economic viability of biobased industrial products and their raw material input of biomass when considered as an integrated system, including research on--
    A. the analysis of, and strategies to enhance, the environmental performance and sustainability of Biobased industrial products, including research on--
        i. accurate measurement and analysis of greenhouse gas emissions, carbon sequestration, and carbon cycling in relation to the life cycle of biobased industrial products and feedstocks with respect to other alternatives;
        ii. evaluation of current and future biomass resource availability;
        iii. development and analysis of land management practices and alternative biomass cropping systems that ensure the environmental performance and sustainability of biomass production and harvesting;
        iv. the land, air, water, and biodiversity impacts of large-scale biomass production, processing, and use of biobased industrial products relative to other alternatives; and
        v. biomass gasification and combustion to produce electricity;
    B. the analysis of, and strategies to enhance, the economic viability of biobased industrial products, including research on--
        i. the cost of the required process technology;

ii. the impact of coproducts, including food, animal feed, and fiber, on biobased industrial product price and large-scale economic viability; and
iii. interactions between an emergent biomass refining industry and the petrochemical refining infrastructure; and

C. the field and laboratory research related to feedstock production with the interrelated goals of enhancing the sustainability, increasing productivity, and decreasing the cost of biomass processing, including research on--
i. altering biomass to make biomass easier and less expensive to process;
ii. existing and new agricultural and energy crops that provide a sustainable resource for conversion to biobased industrial products while simultaneously serving as a source for coproducts such as food, animal feed, and fiber;
iii. improved technologies for harvest, collection, transport, storage, and handling of crop and residue feedstocks; and
iv. development of economically viable cropping systems that improve the conservation and restoration of marginal land; or

4. any research and development in technologies or processes determined by the Secretary of Agriculture and the Secretary of Energy, acting through their respective points of contact and in consultation with the Board, to be consistent with the purposes described in subsection (b) and the priority described in subsection (c)(2)(B).

E. TECHNOLOGY AND INFORMATION TRANSFER TO AGRICULTURAL USERS-
1. IN GENERAL- The Administrator of the Cooperative State Research, Education, and Extension Service and the Chief of the Natural Resources Conservation Service shall ensure that applicable research results and technologies from the Initiative are adapted, made available, and disseminated through their respective services, as appropriate.
2. REPORT- Not later than 5 years after the date of the enactment of this Act, the Administrator of the Cooperative State Research, Education, and Extension Service and the Chief of the Natural Resources Conservation Service shall submit to the committees of Congress with jurisdiction over the Initiative a report on the activities conducted by the services under this subsection.

SEC. 308. ADMINISTRATIVE SUPPORT AND FUNDS.

A. IN GENERAL- To the extent administrative support and funds are not provided by other agencies under subsection (b), the Secretary of Energy and the Secretary of Agriculture may provide such administrative support and funds of the Department of Energy and the Department of Agriculture to the Board and the Advisory Committee as are necessary to enable the Board and the Advisory Committee to carry out their duties under this title.
B. OTHER AGENCIES- The heads of the agencies referred to in section 305(b)(3), and the other members appointed under section 305(b)(4), may, and are encouraged to, provide administrative support and funds of their respective agencies to the Board and the Advisory Committee.

C. LIMITATION- Not more than 4 percent of the amount appropriated for each fiscal year under section 307(f) may be used to pay the administrative costs of carrying out this title.

SEC. 309. REPORTS.

A. INITIAL REPORT- Not later than 180 days after the date of the enactment of this Act , the Secretary of Energy and the Secretary of Agriculture shall jointly submit to Congress a report that--
    1. identifies the points of contact, the members of the Board, and the members of the Advisory Committee;
    2. describes the status of current biobased industrial product research and development efforts in both the Federal Government and private sector;
    3. includes a section prepared by the Board that establishes a set of criteria to assess the potential of Biobased industrial products, which shall include for both biomass production and transformation into biobased industrial products--
        A. an energy accounting;
        B. an environmental impact assessment; and
        C. an economic assessment; and
    4. describes the research and development goals of the Initiative, including how funds will be allocated in order to accomplish those goals.
B. ANNUAL REPORTS- For each fiscal year for which funds are made available to carry out this title, the Secretary of Energy and the Secretary of Agriculture shall jointly submit to Congress a detailed report on--
    1. the status and progress of the Initiative, including a report from the Advisory Committee on whether funds appropriated for the Initiative have been distributed and used in a manner that--
        A. is consistent with the purposes described in section 307(b);
        B. uses the set of criteria established under subsection (a)(3); and
        C. takes into account any recommendations that have been made by the Advisory Committee;
    2. the general status of cooperation and research and development efforts carried out at each agency with respect to biobased industrial products, including a report from the Advisory Committee on whether the points of contact are funding proposals that are selected under section 307(c)(2)(C); and
    3. the plans of the Secretary of Energy and the Secretary of Agriculture for addressing concerns raised in the report, including concerns raised by the Advisory Committee.

SEC. 310. FUNDING.

A. FUNDING.- Of funds of the Commodity Credit Corporation, the Secretary shall make available to carry out this title-
    1. $5,000,000 for fiscal year 2002; and
    2. $14,000,000 for each of fiscal years 2003 through 2007; to remain available until expended.

B. AUTHORIZATION OF APPROPRIATIONS.-In addition to amounts transferred under subsection (a), there are authorized to be appropriated to carry out this title $49,000,000 for each of fiscal years 2002 through 2007.

SEC. 311. TERMINATION OF AUTHORITY.

The authority provided under this title shall terminate on September 30, 2007.

Appendix 2: Interagency Biomass Research and Development Board

Interagency Biomass Research and Development Board

The Board, which was established by section 305 of the Biomass Act, is co-chaired by the points of contact from the U.S. Department of Agriculture and the U.S. Department of Energy. Board members are senior officers from the Department of the Interior (DOI), the Environmental Protection Agency (EPA), National Science Foundation (NSF), Office of the Federal Environmental Executive (OFEE), and the Office of Science and Technology Policy (OSTP).

FY 2005 Members of the Biomass Research and Development Board

Co-Chairs

- Douglas Faulkner, Acting Assistant Secretary, Energy Efficiency and Renewable Energy, United States Department of Energy
- Thomas C. Dorr, Under Secretary for Rural Development, United States Department of Agriculture

Members

- Adam Sharp, Agricultural Counselor to the Administrator, EPA (EPA is in the process of identifying a new representative to be on the Board)
- Bruce Hamilton, Director, Bioengineering and Environmental Systems Division, NSF
- Rebecca Watson, Assistant Secretary, Land and Minerals Management, DOI
- Dr. Sharon Hays, Chief of Staff, White House Office of Science Technology and Policy (OSTP)
- Dana Arnold, Chief of Staff, White House Office of the Federal Environmental Executive (OFEE)

Appendix 3: Biomass Research and Development Technical Advisory Committee Minority Report

The minority report was disseminated to all Committee members, but was neither discussed nor voted on by the Biomass Research and Development Technical Advisory Committee.

Biomass Research and Development Technical Advisory Committee

Minority Report

Submitted by
Committee Member David Morris
March 7, 2006

This Minority Report takes issue with several recommendations submitted by the Biomass Research and Development Technical Advisory Committee (hereafter called Committee) to the Secretaries of Agriculture and Energy and, through them, to the U.S. Congress.

The Minority's recommendations are presented at the end of each section.

1. Should Increased Biomass R&D Funding Be Channeled Through DOE?

The Majority recommends as a "High-priority":

> *"Increase funding to encourage achievement of Vision and Roadmap goals.... The agencies are asked to detail consequences of under-funded research."*

Among its obligations, the Committee is charged by Congress to evaluate the federal biomass R&D program. Recommending increased funding is appropriate if the Committee had performed such an evaluation. It has not. This is due in part to a lack of initiative on the part of the Committee itself, and in part to the Agriculture and Energy Departments' policies that deny the Committee access to any information not already available to the general public.

Without access to internal evaluations or progress reports, a Committee evaluation would have to rely on available external evaluations and its members' personal knowledge. Sufficient negative assessments of DOE's biomass work exist that, without undertaking its own evaluation, the Committee is not justified in recommending increased funding to DOE as the best way to achieve expanded use of biofuels and bioproducts.

•In 2001, DOE's own Inspector General criticized the Department's handling of its only two cellulosic ethanol commercialization projects.[2]

•In 2003, the same Office criticized the Department's management of its most important biomass gasification commercialization project.[3]

•The Office of Management and Budget's 2005 Biomass and Biorefinery Systems Assessment contains a number of critical assessments in a question and answer format.[4]

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[2] Financial Assistance for Biomass-to-Ethanol Projects. Department of Energy. Office of Inspector General. Office of Audit Services DOE/IG-0513. July 2001.

[3] McNeil Biomass Project. Department of Energy. Office of Inspector General. Office of Audit Services. DOE/IG-0630. December 2003.

[4] www.whitehouse.gov/expectmore/detail.10003400.2005

Q. *"(I)s the program design effectively targeted so that resources will address the program's purpose directly and will reach intended beneficiaries?"*
A. "NO."

Q. "(D)oes the program assess and compare the potential benefits of efforts within the program and…to other efforts in other programs that have similar goals?"
A. "NO."

Q. "Are funds (federal and partners') obligated in a timely manner and spent for the intended purpose?"
A. "NO."

Q. "Has the program demonstrated adequate progress in achieving its long-term performance goals?"
A. "SMALL EXTENT."

Q. "Does the program(including program partners) achieve its annual performance goals?"
A. "SMALL EXTENT."

The first generation of significantly sized cellulosic biofuel(diesel or ethanol) plants planned or under construction is occurring almost entirely outside the United States(e.g. Canada, Spain, Brazil, Sweden), with little or no U.S. R&D funding. Near term facilities proposed in the United States (e.g. Changing World Technologies, BCI, Pearson Technologies) have been funded largely by earmarks, a practice condemned by the Majority report, not as a result of DOE solicitations.

Four years after USDA's and DOE's first joint solicitation, to our knowledge, only one technological improvement funded through that effort has been commercialized. That contract was negotiated with a small business. However, the vast majority of DOE contract funding is awarded to large corporations. No DOE study has examined the effectiveness of its practice of preferring large corporations as its primary R&D and commercialization vehicle, at least none has been made public.

One could argue that increased funding almost always increases impact. That may be true, but it raises another issue the Majority report does not address. Should increased funding be channeled through the DOE? Or could biofuels and bioproducts be commercialized more effectively by other federal agencies, a new project-oriented agency, a consortium of non-profits, or a consortium of private companies?

Minority Report Recommendation #1: Congress should direct an independent entity to evaluate the effectiveness of DOE and USDA programs in commercializing biofuels and bioproducts. Part of that evaluation should examine what the state of the technology and markets would have been if there had been no DOE biomass program. Another part of the evaluation

should examine the effectiveness of federal agencies biomass R&D efforts compared with other public and quasi-public (e.g. soybean checkoff R&D) efforts.

2. Is DOE's research pertinent to and useful to policy makers?

DOE, as the nation's sole energy agency, has the obligation not only to direct R&D but also to educate the general public about energy issues and to provide relevant and timely information to those trying to design effective national, state and local energy policies.

Recent DOE actions raise questions about how DOE views its educational role, especially with respect to policy making.

In early 2004, the Energy Department suddenly doubled its previous estimate of the cost of making ethanol from cellulose (to $2.75 from $1.40 a gallon). No documentation was offered to explain the dramatic change.

In May 2004, David Garman, then Acting Undersecretary of Energy, testified before the Senate Agriculture Committee. During his testimony he was asked to explain the Department's revision. After a several month delay, DOE offered its explanation. That explanation is posted in a question and answer format on the Policy Questions section of DOE's Energy Efficiency and Renewable Energy web site.

> Q. "You mention that the current cost for ethanol from biomass is twice the cost of ethanol made from corn grain. This cost is much higher than previous estimates published by DOE, and it implies that it is not ready for commercialization."[5]

DOE answers its own question by noting that the previous estimate was based on the lowest cost feedstock(wood waste at $25 per ton) and the lowest cost technology(acid hydrolysis). The new estimate was based on a much higher feedstock cost (corn stover at $53 per ton), and a much more expensive production technology (enzymatic).

This does explain the discrepancy. But it should have led the Majority report to note the disconnect between DOE research and policymaking.

Congress and the President want to achieve the most rapid commercialisation of ethanol (and other biofuels) from cellulose. However, they also want to develop a policy that achieves that goal at the lowest possible public cost. If Congress is going to offer incentives, for example, it needs a knowledgeable estimate regarding the level of incentive required, and that in turn requires it to be made aware of the actual cost of ethanol from the first cellulose to ethanol facilities. Estimates of the potential cost of second and third generation plants are not pertinent to the elaboration of policies designed to have a short-term impact.

In this regard, it is remarkable that DOE is unwilling to make public its estimates of the cost of cellulosic ethanol from the first commercial plants. Indeed, on its web site, DOE maintains, "It

[5] Policy Questions. Energy Efficiency and Renewable Energy. Department of Energy. http://www1.eere.energy.gov/biomass/policy_questions.html

is not appropriate for the National Bioenergy Center or DOE to speculate on the cost of acid processes that are the subject of current commercial and financial negotiations. Suffice it to say that, given the much greater state of development for these acid technologies, we would expect their costs to be lower."

At this time, DOE is willing to offer policy makers and the nation estimates of the long-term costs of cellulosic ethanol but not the short costs of cellulosic ethanol.

Minority Recommendation #2. The Department of Energy should immediately make public its estimates of the costs of making cellulosic ethanol from the lowest cost feedstock and the lowest cost production technology. The report should include a complete and well-documented breakdown of the cost components. The report should be available to Congress in time for use in developing policy initiatives in 2006.

3. Are USDA and DOE adequately fulfilling their obligations as lead agencies in expanding the use of bioproducts?

In its November 2003 report the full Committee sent this recommendation to the Secretaries of Agriculture and Energy.

> "The Biomass Technical R&D Advisory Committee formally recommends that the Secretaries of Agriculture and Energy immediately establish an aggressive purchasing program for biobased products. The Secretaries should establish a departmental-wide goal in which biobased products, defined as products that contain over 90 percent plant or animal matter by weight, account for a minimum of 30 percent of all purchases in each product category for which biobased products are available, exhibit equal or superior performance characteristics and have a total product cost--including the cost of disposal and handling--no more than 10 percent higher than their conventional counterparts. This goal should be achieved by January of 2006.
>
> By January of 2004, the Secretaries of Agriculture and Energy shall report back to the Committee on progress achieved to date and the procurement strategy that has been put in place to achieve the two-year goal.
>
> Separately, the Secretaries should recommend to other parts of the federal government and to state and local government that they should have a similar program. A report to the Advisory Committee shall be made by June 2004 as to progress with expanding biomass purchasing beyond USDA and DOE."

The Committee felt that, as the lead agencies in implementing the Congressionally-directed biomass initiative, the Energy and Agricultural Departments should become models of bioproduct and biofuels procurement. The Committee recommended the Departments not await the completion of the formal rulemaking for bioproducts procurement since that would take several years. The Departments should immediately and aggressively increase their purchase of bioproducts and develop a mechanism for monitoring compliance with that directive.

In the 2.5 years since the submission of the recommendation by the full Committee, neither DOE nor USDA has submitted to the Committee a report that demonstrates its embrace of that recommendation. There has been no report on the departments' level of procurement, any new directives regarding bioproducts procurement, nor any advances that have occurred in bioproducts procurement in other agencies.

Minority Recommendation #3. Congress should direct USDA and DOE to comply with the recommendation submitted to the departments regarding bioproducts procurement by the Committee in November 2003.

4. Must the Farm Bill provisions be changed to allow USDA to treat natural fibers the same as biobased fibers in its bioproducts procurement regulations?

In 2005, the USDA issued draft regulations to implement the Congressional directive to expand bioproducts procurement by federal agencies. The draft regulations formally distinguished between natural fibers and biobased fibers. In other words, for the first time there would be a formal federal preference for a synthetic fiber derived from plants over a natural fiber derived from plants. This Committee found this contrary to the spirit of the legislation and, if finalized, was concerned it could generate a backlash from parts of the agricultural community (e.g. cotton, wool, and other natural fibers) to the bioproducts procurement effort.

In November the Committee sent a letter to that effect to the Secretaries of Agriculture and Energy. To date there has been no response.

The Majority report repeats the views contained in its November 2005 letter, that there should be no preference of synthetic fibers made from plants over natural fibers. But its recommendation implies that the ball is in the Congressional court, that only by changing the legislative language can the outcome of the rulemaking be changed.

> "The Committee recommends Congress simplify the statutory language in section 9001 of the 2002 Farm Bill. Specifically, the Committee requests a broader, more inclusive (all bio-organic matter) definition of biobased products, concurrent with that of its Vision statement."

The Majority report suggests that Congress has directed the USDA to distinguish between natural and biobased fibers. To the Minority's reading, the existing law does not contain such a directive, either explicit or implicit.

> "***SEC. 9001. Defines a biobased product as a product "****determined by the Secretary to be a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials."*

Minority Recommendation #4. The USDA's decision in its draft regulations to distinguish between natural fibers and biobased fibers is not directed by Congress. Its final rulemaking should make no such distinction.