Annual Report to Congress on the Biomass Research and Development Initiative for FY 2004

Submitted Jointly by

The U.S. Department of Agriculture
&
The U.S. Department of Energy

July 2005

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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 (the Biomass Act), 7 U.S.C. 7624 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 must jointly submit a report to Congress that details the status of activities carried out under the Biomass Research and Development Initiative (Initiative). The Initiative is the multi-agency effort to coordinate and accelerate all Federal biobased products and bioenergy research and development (R&D). Its general purpose 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 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."

FY 2004 was the third fiscal year in which funds were made available to the Initiative by Congress through section 9008 of the Farm Security and Rural Investment Act of 2002 (Farm Bill) (P.L. 107-171). The Farm Bill amended section 310 of the Biomass Act to extend the termination date to September 30, 2007, provided $5 million of Commodity Credit Corporation funds for FY 2002, and provided $14 million annually for FY 2003-07 to the U.S. Department of Agriculture (USDA) for the purpose of carrying out activities under the legislation. The U.S. Department of Energy (DOE) and USDA awarded a combined total of approximately $25.5 million in research funding to 22 biomass projects in their joint solicitation for FY 2004. Twenty-one of those projects were selected in the FY 2004 joint solicitation and one was selected during the FY 2003 solicitation, but partially funded with FY 2004 funding. This is an increase from the FY 2003 joint solicitation, in which DOE and USDA successfully collaborated to award $23 million in research. Adjustments to improve the previous year's solicitation process were identified by the Biomass R&D Technical Advisory Committee (Committee) and were implemented in the FY 2004 joint solicitation with marked improvement.

This annual report on the Initiative details activities that USDA and DOE (the Departments) conducted during FY 2004. The activities highlighted in this report include activities that are not directly funded through the Biomass Act, but contribute to the advancement of biomass research and development. Specifically, this report does the following:

- Describes the current general status and progress of the Initiative;
- Describes the current general status of cooperation and research and development efforts carried out by the Departments;
- Details the Biomass R&D Technical Advisory Committee's assessment of biomass-related research performed by the Departments as it relates to the Committee's *Roadmap*; and
- Provides Committee advice and recommendations related to the joint solicitation process and projects funded under the Initiative.

B. Coordination of Federal Integration

Coordination and collaboration between the Departments have steadily increased and remain strong. Acting on behalf of their respective Secretaries, the points of contact for the Department have been working closely together to coordinate their agencies' activities, as well as the activities of the Biomass Research and Development Board (Board) and the Committee. To date, the increased coordination

between the Departments has resulted in a number of joint projects and activities contained within this document.

The principle participants of the Initiative as identified in the Biomass R&D Act and their respective duties are shown in Exhibit 1.

Exhibit 1
Initiative Participants and Duties

Participant	Description	Duty
Points of Contact	A senior official from both DOE and USDA	Coordinate the biomass research and development programs within their respective Departments
Biomass Research and Development Board	A Cabinet level council co-chaired by the points of contact	Coordinate biomass research and development programs within and among Departments and agencies of the Federal Government
Biomass Research and Development Technical Advisory Committee	A group of individuals from industry, academia, non-profits, and the agricultural and forestry sectors	Communicate through the Biomass Research and Development Board to advise the Secretaries of Energy and Agriculture on administration of the Biomass R&D Act

The DOE's Office of the 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. A DOE senior official serves as the Designated Federal Officer (DFO) for the Committee.

- The points of contact serve as co-chairs of the Board. Current points of contact for DOE and USDA are David K. Garman, Under Secretary for Energy, Science and Environment; and Mark Rey, Under Secretary, Natural Resources and Environment, USDA, respectively.
- The Board works with the Federal agencies to coordinate the integration of biomass R&D programs.
- The DOE's DFO, Neil Rossmeissl, facilitates communication between the Board and the Committee.

II. A REPORT FROM THE SECRETARIES OF AGRICULTURE AND ENERGY

Since the enactment of the Biomass Act, USDA and DOE 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 research and development activities.

Several specific accomplishments made during FY 2004 include:

- **Joint Solicitation** – USDA and DOE successfully coordinated a joint solicitation under the Initiative awarding 22 projects. The total Federal funds collectively requested by all eligible proposals exceeded $108 million. The FY 2004 joint solicitation stated that $26 million in funds would be made available. Approximately $25.5 million was awarded.

- **Joint USDA and DOE Portfolio Assessment by the Committee** - A compilation of biomass-related research and development activities and investments being performed by both USDA and DOE in alignment with *Roadmap* categories was provided to the Committee for an assessment of the joint biomass portfolios of USDA and DOE. This was the second year in which this was provided to the Committee.

- **Interagency Meetings** – Periodic interagency meetings between USDA and DOE staff continued to be held to identify opportunities for collaboration between our respective programs.

- **Joint Solicitation Research and Development Tracking Matrix** – A matrix was developed to track the status of R&D projects funded under the DOE and USDA 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. This matrix is provided to the Committee at each meeting.

- ***Vision* Goals Tracking Document** – A document was created to track progress towards 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.

- **Hydrogen Statement** – An official stance was developed by the Committee in response to questions about the level of importance of hydrogen R&D with respect to other biomass R&D, such as ethanol, thermo-chemical conversion and sugar platforms.

The achievements of FY 2004 improved coordination between USDA and DOE, as well as the other agencies of 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 2005 joint solicitation.

III. STATUS AND PROGRESS OF THE BIOMASS INITIATIVE

A. Goals and Objectives

Since the establishment of the Initiative in June of 2000, USDA and DOE 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 R&D Act, specific purposes are:

- "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;
- 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;
- 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
- 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."

To further guide the Biomass Initiative in its funding of projects and in providing direction for achieving the goals of the Biomass Act, the Committee, through their *Vision for Bioenergy and Biobased Products in the United States*, has established the industrial targets shown in Exhibit 2 which help to guide R&D priorities.

Exhibit 2
Vision Goals

Goal Area	2001 (baseline)	2010	2020	2030
BioPower - Biomass share of electricity & heat demand in utilities and industry[1]	3 percent (2.7 quads)	4 percent (3.3 quads)	5 percent (4.0 quads)	5 percent (5.0 quads)
BioFuels - Biomass share of demand for transportation fuels[2]	0.5 percent (0.15 quads)	4 percent (1.3 quads)	10 percent (4.0 quads)	20 percent (9.5 quads)
BioProducts - Share of target chemicals that are biobased	5 percent	12 percent	18 percent	25 percent

These industry targets will be influenced by many factors, including legislation (e.g., ethanol mandate, tax credits for production of electricity from biopower), regulation (e.g., requirements for the purchase of bio-based products), and progress resulting from privately-funded and government-funded R&D. The Initiative seeks to advance R&D to help achieve the goals identified in the Biomass Act, and to make technological advances that may help industry achieve the targets shown above.

[1] Power generated from biomass will supply the given percentage of total industrial and electric generator energy demand for the given year.
[2] Transportation fuels from biomass will account for the given percentages of total U.S. transportation fuel consumption in the given years.

B. Measuring Progress

To measure technical progress in achieving industry targets (as set by the Committee), the Committee will continue to track the research funded under the joint solicitations. This tracking includes monitoring the technical success of each project, evaluating the contributions of each project in meeting the *Vision* and *Roadmap* goals, and determining the contribution of each project as it relates to the goals of the Initiative. The Committee will also continue to measure market data related to each of the Committee's goals in biopower, biofuels, and biobased products. Moreover, the Departments are measuring the technical progress of R&D performed under the Initiative through the same R&D monitoring and evaluation methods used for their overall R&D portfolio.

C. 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 USDA and DOE. 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).

The Board received recommendations from the Committee on the overall investment of Federal funds in biomass-related research, the importance of Federal procurement of biobased products, and advice on the joint solicitation performed under the Initiative.

The Board met on June 25, 2004, to determine whether or not to affirm the procurement process and projects selected under the FY 2004 USDA/DOE Joint Biomass Solicitation. The vote to affirm the procurement process and projects selected by USDA and DOE was unanimous.

Members of the Biomass Research and Development Board

Co-Chairs
Mark Rey, Under Secretary, Natural Resources and Environment, USDA
David K. Garman, Under Secretary for Energy, Science, and Environment, DOE

Members
Bruce Hamilton, Director, Bioengineering and Environmental Systems Division, NSF
Adam Sharp, Counselor to the Administrator, EPA
Jim Tate, Science Advisor, DOI
Kathie Olsen, Associate Director for Science, OSTP
Ed Pinero, Director, OFEE

D. Biomass Research and Development Technical Advisory Committee

The Committee was established by section 306 of the Biomass Act and is now ending its fourth year of activities. During FY 2004, the Committee consisted of 30 individuals from industry, academia, non-profit organizations, and the agricultural and forestry sectors that are experts in their respective fields.

In 2001, the Committee prepared recommendations to the Secretaries of Agriculture and Energy for research and development and other activities necessary for advancing goals and challenges for biofuels, biobased products, and biopower.

In June 2002, the Secretaries of Agriculture and Energy requested that the Committee develop *Vision* and *Roadmap* documents to guide future biomass research and development activities. The documents would serve as a resource for the Departments in planning their biomass research and development portfolios. The Committee worked over the course of several months to develop these documents. The *Vision for Bioenergy and Biobased Products in the United States* was released in October 2002 and set far-reaching goals for the role of biomass in future energy and product markets. The corresponding *Roadmap for Biomass Technologies* was released in January 2003.

In 2003, the Committee used the *Vision* and *Roadmap* as a baseline to develop recommendations for Federal agencies on biomass research and development. DOE and USDA assembled information on their biomass research portfolios and investment and organized the portfolio information along Committee *Roadmap* categories. The material was presented to the Committee in February of 2003 and was evaluated by the Committee over a period of seven months (February through August) through a series of meetings and conference calls. The Committee developed its assessment of the portfolio and developed recommendations.

In 2004, the Committee received a detailed report on USDA and DOE's past joint solicitation projects. The Committee received an overview of the history of biomass R&D in several key areas including cellulosic conversion, ethanol and sugar platform, and gasification and cofiring. The Committee also discussed the role of hydrogen from biomass and developed its position in a formal statement. The Committee received a detailed report and presentation on a portfolio review of USDA and DOE agency-wide biomass R&D and outreach activities. The Committee then 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.

2004 Members of the Biomass Research and Development Technical Advisory Committee

Name	***Organization***	***Term Ending***
Chair		
Thomas Ewing	Davis & Harman LLP	November 2004
Vice-chair		
Terry Jaffoni	Cargill-Dow, Inc.	November 2006
Members		
Wayne Barrier	Metropolitan Energy Systems	November 2005
Roger Beachy	Donald Danforth Plant Science Center	November 2004
Tom Binder	Archer Daniels Midland	November 2005
Robert Boeding	National Corn Growers Association	November 2005
Jerrel Branson	BEST BioFuels, LLC	November 2006
Dale Bryk	Natural Resources Defense Council	November 2004
William Carlson	Wheelabrator Environmental Systems	November 2005
Ralph P. Cavalieri	Washington State University	November 2006
Joseph Chapman	North Dakota State University	November 2005
Robert Dorsch	Dupont	November 2004
Roger B. Fragua	Council of Energy Resource Tribes	November 2006
Carolyn Fritz	Dow Chemical Company	November 2006

Charles Goodman	Southern Company	November 2005
Brian Griffin	Southern States Energy Board	November 2004
Pat Gruber	Natureworks LLC	November 2004
William Guyker	Life Fellow – IEEE	November 2004
John S. Hickman	Deere & Company	November 2004
William Horan	Horan Brothers Agricultural Enterprises	November 2004
Jack Huttner	Genencor International, Inc.	November 2006
Kim Kristoff	Biobased Manufacturers Association	November 2005
David Morris	Institute for Local Self Reliance	November 2005
William Nicholson	Potlatch Corporation	November 2004
Gary Pearl	Fats and Proteins Research Foundation	November 2005
Delmar R. Raymond	Weyerhaeuser Company	November 2006
William Richards	Richards Farms, Inc.	November 2004
Philip Shane	Illinois Corn Marketing Board	November 2005
Larry Walker	Cornell University	November 2004
John Wootten	Peabody Energy	November 2004

E. FY 2004 Initiative Activities

The funds authorized for the Initiative from USDA through section 9008 of the 2002 Farm Bill and from DOE through the Energy and Water Development Appropriation Bill were used in accordance with the priorities, criteria, and procedures outlined in the Biomass Act. Over 400 pre-applications, divided into eight unique technical topic areas or categories, were submitted in response to this year's solicitation. Thirty-one reviewers from USDA and 31 from DOE participated in the pre-application review process. As a result of the pre-application review, 93 applicants were invited to submit full applications, representing a collective request of more than 108 million Federal dollars.

The solicitation announcement outlined specific program policy details that the Departments would use for making grant awards, as shown in Exhibit 3. The solicitation pointed applicants to additional information on the Biomass Act and its revisions, as well as a web link for the *Roadmap for Biomass Technologies in the United States* prepared by the Committee, to use as an added resource for developing proposals.

After pre-proposals were received, a technical merit review process was used to evaluate and score each pre-proposal. Each technical reviewer evaluated the pre-proposal assigned to his or her group and a consensus-building process was used to develop technical scores for all applications within each category based on criteria presented in a jointly developed Evaluation and Selection Plan. The Technical Merit Review Chair formally transmitted these results to the Selection Official from each Department. Each Department appointed a program policy review committee to make further recommendations based on each Department's programmatic priorities as outlined in the solicitation.

Exhibit 3
Pre-application Evaluation Criteria

The following technical evaluation criteria will be used to evaluate pre-applications:

Criterion 1:	**Technical Relevance and Merit**	**Weight: 30 percent**
Criterion 2:	**Technical Approach/Work Plan**	**Weight: 25 percent**
Criterion 3:	**Energy Efficiency/Displacement, Rural Economic Development, environmental Benefits**	**Weight: 20 percent**
Criterion 4:	**Technical, Management, and Facility Capabilities**	**Weight: 25 percent**

DOE TECHNICAL TOPIC AREAS

1. **Thermochemical Conversion – SynGas Cleanup & Conditioning and Pyrolytic Bio-Oils – Handling and Blending Characteristics**
2. **Thermochemical Conversion and Conditioning – Fundamental Breakthrough Research**
3. **Biomass – Petroleum Refinery Evaluations**
4. **Thermochemical Conversion – Kraft Black Liquor Gasification**

USDA TECHNICAL TOPIC AREAS

5. **Feedstock Development and Production**
6. **Biobased Products – Environmental and Economic Performance**
7. **Biomass Focused Forest Management Training**
8. **Incentives**

Program Policy Factors: DOE

- **Balance of the overall portfolio of DOE investments in biomass research and development.**
- **Level of cost sharing above the minimum requirement.**

Program Policy Factors: USDA

- **Emphasizing near term implementation and application to commercially viable biomass production, management, handling, processing, and manufacturing.**
- **Involving consortia that include Tribal entities.**
- **Addressing methods for biomass production, harvesting, handling, and utilization that are environmentally beneficial and cost effective.**
- **Exhibiting mobility and adaptability of economically viable and relatively small-scale biomass utilization technology.**
- **Improving rural-based processing and manufacturing of biobased products and power production from biomass, including those that demonstrate the potential to stimulate revenue streams and economic improvement in rural areas.**
- **Developing, diversifying, and expanding renewable biomass products systems, leading to improved self-sufficiency for rural constituencies, including farmers, ranchers, rural communities and institutions, tribes, local governments, and businesses.**

F. Solicitation Results

Following the pre-application review process, 22 projects were selected for funding. The following provides a brief public summary of each of the selected projects and the funding amounts.

DOE Projects

1. ***Title***: Trace Metal Scavenging from Biomass Syngas with Novel High Temperature Sorbents
Main Proposer: Southern Research Institute
Partners: University of Alabama Birmingham, Southern Company, including the Power Systems Development Facility staff, and the Gas Technology Institute
Estimated Duration of Project: 36 months (3 years)
Federal Funds Requested: $769,376 (80 percent)
Cost-Share Funds: $193,506 (20 percent)
Total Project Cost: $962,882

The objective of this project is to develop technology, based on inexpensive high temperature sorbents and novel applications, to condition hot syngas, while preventing the escape of trace metals through the barrier filter. Rather, the trace metals will be reactively captured and ultimately sequestered in a benign form. Application of this technology to full scale gasifiers will allow integrated gasification combined cycle systems to operate with relatively high particulate control device (PCD) temperatures, in order to obtain high cycle efficiency, without fear of damaging the gas turbine blades with metals that have escaped the PCD. In addition, the high temperature sorbents developed in this work will eliminate toxic metals (e.g., Pb, Cd, As, Se, and Ni).

2. ***Title***: Biomass Gas Cleanup Using a Therminator
Main Proposer: Research Triangle Institute
Partners: Cratech, Clemson University and Süd-Chemie
Estimated Duration of Project: 36 months (3 years)
Federal Funds Requested: $2,000,000 (80 percent)
Cost-Share Funds: $500,000 (20 percent)
Total Project Cost: $2,500,000

This project will develop and demonstrate a novel fluidized-bed reactor system (therminator) to remove tar, ammonia and sulfur from raw biomass syngas from a pressurized fluidized-bed biomass gasifier. Since this system can accept particle-laden syngas, the particle filter can be installed downstream of the therminator block. The key to the development of the therminator is the development of an attrition resistant and active tri-functional catalyst to remove tar, ammonia and sulfur. The project will consist of development and scale-up of the triple function catalyst; design, construction and commissioning of a skid-mounted bench-scale therminator; transport and installation of the therminator at Cratech's pressurized fluidized-bed biomass gasification pilot plant; and slip-stream demonstration of the therminator over three 100-h tests using actual biomass gasification syngas. An engineering evaluation and commercial assessment of the therminator technology will also be carried out. The work will be carried out over 36 months.

3. ***Title***: Catalytic Hydrothermal Gasification for Eastman Kingsport Chemical Production Plant
Main Proposer: Antares Group Inc.
Partners: Eastman Chemical, Pacific Northwest National Laboratory, and Galleon Engineering.
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,142,925 (78 percent)
Cost-Share Funds: $318,653 (22 percent)
Total Project Cost: $1,461,578

The project targets the incorporation of wet waste streams into chemical production processes. It includes an engineering evaluation of the process and process modeling, an economic evaluation and comparison to potential alternatives, and process development unit testing.

Low-Temperature Catalytic Hydrothermal Gasification offers an attractive solution for the gasification of biomass slurries and sludges. The process is a unique thermocatalytic gasification concept, which converts wet organic residues to medium-Btu gas (methane and carbon dioxide). Specifically, the gasification system is expected to operate with streams containing as little as 5-20 percent by weight dry solids (95 to 80 percent moisture). Conventional gasification systems are generally inoperable with feedstocks containing more than about 50-60 percent weight moisture, and generally uneconomical at moisture contents exceeding 30 percent by weight.

4. ***Title***: Engineering New Catalysts for In-Process Elimination of Tars
Main Proposer: Gas Technology Institute
Partners: None
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,995,932 (80 percent)
Cost-Share Funds: $504,042 (20 percent)
Total Project Cost: $2,499,974

The proposed target aims at developing a new methodology for the economical production of commercial quantities of tar-cracking catalysts. These catalysts should meet existing performance criteria and may make use of otherwise unused waste materials.

The approach permits the incorporation of catalytically active materials (e.g., NiO) within an inert, refractory material (e.g., olivine) which is then formed and processed (if necessary) to enhance the availability of catalytic material on all exposed surfaces. The exact methods by which commercial quantities of such mixtures are economically produced and formed into granular or monolithic catalysts are proprietary intellectual property of the Gas Technology Institute and due to patent considerations cannot be publicly disclosed at present. However, when these mixtures are prepared and made into finely divided granules or into self-supporting monoliths, the resulting materials should be indistinguishable (in catalytic function) from catalysts prepared by conventional techniques. Indeed, another potentially fruitful area of investigation in the proposed work involves engineering waste materials of little (or negative) value into catalytically active materials by processing industrial wastes that contain potential catalysts into attrition resistant refractory catalyst substrates and tar-cracking catalysts.

5. ***Title***: Theremochemical Conversion of Corn Stover
Main Proposer: Bioengineering Resources, Inc.
Partners: Chippewa Valley Ethanol, Katzen International, Burns and McDonnell
Estimated Duration of Project: 3 years
Federal Funds Requested: $1,989,365 (80 percent)
Cost-Share Funds: $500,000 (20 percent)
Total Project Cost: $2,498,365

The purpose of this project is to develop and demonstrate at pilot scale an optimal gasification/fermentation process to utilize corn stover. A major emphasis will be placed on the integration of a stover ethanol facility with a conventional grain alcohol plant in the corn belt. The corn plant can utilize waste heat from the stover plant. Other synergies include the use of common ethanol storage and loadout facilities, utilities, waste treatment, maintenance shops, laboratories, roads, fire protection, offices, etc. The economy of these commonalities will be quantified to define an optimal corn/stover plant that can serve as a model for the industry. The specific tasks in this project include the definition of the best feedstock conditions and gasifier temperatures, as well as enriched oxygen concentration, to maximize gasifier efficiency and throughput; fermentation of the stover syngas to gather data for design scale up, emissions measurement for permitting and by product utilization; and the preparation of a detailed design and energy balance for projection of the economics of the combined stover/corn plants.

6. ***Title***: Advancement of High Temperature Black Liquor Gasification Technology
Main Proposer: Weyerhaeuser Company
Partners: Chemrec AB; The Institute of Paper Science & Technology at Georgia Tech; Simulent, Inc.; and Pacific Simulation, Ltd
Estimated Duration of Project: 36 months (3 years)
Federal Funds Requested: $1,078,080 (48 percent)
Cost-Share Funds: $1,188,905 (52 percent)
Total Project Cost: $2,266,985

Weyerhaeuser will work collaboratively with other researcher's to utilize the New Bern facility to:

- Validate the tools (models) and fundamental knowledge generated in other funded and proposed projects.

- Utilize the "commercial" operation of the facility to evaluate solutions to long-term process issues (e.g., scaling and other process integration issues work by implementing and demonstrating solutions at New Bern)

The atmospheric unit operated by Weyerhaeuser in New Bern, North Carolina, represents an unusual opportunity to rapidly advance this technology. By partnering with the technologies developer, Chemrec, the issues that need resolution to achieve the efficiency, throughput, reliability and pulp mill integration necessary for the technology to be considered commercially viable can be dealt with relatively quickly and at reasonable cost. The Weyerhaeuser Company, realizing that the technology is not likely to gain commercial success without rapidly addressing these important issues proposes to make their New Bern unit available as a "test bed" to advance the technology to commercial reality. This proposal

identifies the scale up and commercialization issues that the New Bern unit is capable of addressing and lays out a plan, working with others, to achieve the needed results.

7. ***Title***: Cost-Benefit Analysis of Gasification for Fuels/Chemicals Production at Kraft Pulp Mills
Main Proposer: Princeton University
Partners: None
Estimated Duration of Project: 28 months
Federal Funds Requested: $552,620 (74 percent)
Cost-Share Funds: $197,775 (26 percent)
Total Project Cost: $750,395

The project will analyze the cost and benefits of producing fuels and chemicals through gasification at pulp mills. It will complement an earlier study that looked at heat and power production.

The assembled project team has recently completed a major independently-reviewed study and national impacts of market penetration of black-liquor gasification combined cycle for heat and power generation. They are not aware of any such detailed studies that have been undertaken to assess black liquor or biomass-derived fuels and chemicals at pulp mill-based biorefineries in the U.S. The study is intended to help fill this gap. It will inform technology decision makers in the pulp and paper industry and the fuels and electricity industries on the potential value of gasification investments at pulp mills. It will also help inform DOE regarding prospective national costs and benefits of such biorefineries and highlight R&D needs. The output of the project will include detailed heat/mass balances for case-study mill biorefineries, capital and operating cost estimates, project financials and a national impacts assessment quantifying the energy, environmental and economic development benefits.

8. ***Title***: Investigation of Pressurized Entrained Flow Kraft Black Liquor Gasification in an Industrially Relevant Environment
Main Proposer: University of Utah
Partners: The University of Wisconsin Madison; Brigham Young University; Simulent, Inc.; the USDA Dairy Forage Research Center; the USDA Corn Insect and Crop Genetics Research Unit; World Resources Institute; John Deere; and Genencor International
Estimated Duration of Project: 3 Years
Federal Funds Requested: $779,069 (80 percent)
Cost-Share Funds: $194,767 (20 percent)
Total Project Cost: $973,836

The University of Utah, Brigham Young University and Simulent, Inc., will address several of the research needs that have been identified as critical for successful commercialization of entrained-flow kraft black liquor gasification, and to provide new and relevant data on liquor conversion by gasification. The approach involves combining operation of a special semi-pilot scale pressurized, entrained-flow research gasifier with fundamental lab-scale experiments conducted under controlled conditions. The project comprises five technical tasks. Droplet formation and burner performance will be evaluated through a combination of experimental droplet imaging studies and computational modeling of droplet formation. Physical characteristics of black liquor will be studied throughout the entire range of conversion, from droplet to smelt bead. Chemical transformations of the liquor and development of the syngas will be studied in detail. Transport and radiative properties of the

smelt product will be measured, and properties of the syngas resulting from partial oxidation of liquor in a pressurized gasifier will be characterized.

9. ***Title***: New Sustainable Chemistry for Adhesives, Elastomers and Foams
Main Proposer: Rohm and Haas Company
Partners: Virginia Polytechnic Institute and State University (Professor Timothy E. Long), Eastman Chemicals (Dale E. O'Dell), the USDA Eastern Regional Research Center (Dr. Thomas A. Foglia) and DOE/USDA
Estimated Duration of Project: 2 years
Federal Funds Requested: $2,000,000 (68 percent)
Cost-Share Funds: $935,953 (32 percent)
Total Project Cost: $2,935,953

The Rohm and Haas Company will partner with Virginia Polytechnic Institute and State University, Eastman Chemicals, the USDA Eastern Regional Research Center and DOE/USDA to develop novel biobased chemistry. The team will pursue a biorefinery approach to produce novel soy-sugar polymers. The program will develop products which can replace petrochemical-based polyurethane adhesives, elastomers and foams. The team will use acetoacetates of mono- or disaccharides and other biobased materials, such as castor oil, glycerol, isosorbide and crop oil derivatives, at levels of 20-50 percent and acrylate modified crop oils at levels from 20-60 percent to produce biobased adhesives. Research on adhesives will then be extended to foams and elastomers. Polyurethane foams and elastomers are closely related technologically to polyurethane adhesives in that all three applications require an excellent balance of elastomeric character and high tensile strength and, not surprisingly, share common raw materials.

USDA Projects

A. Following the review process, 10 projects were selected for full funding. Two projects were selected for negotiation for partial funding, and one project that was partially funded in FY 2003 was approved for completion of its funding. The following provides a brief public summary of each of the selected projects and the funding amounts.

1. ***Title***: Integrated Size Reduction and Separation to Pre-Fractionate Biomass
Main Proposer: University of Tennessee
Partners: Oak Ridge National Laboratory, and First American Scientific Co.
Estimated Duration of Project: 36 months
Federal Funds Requested: $717,399 (70 percent)
Cost-Share Funds: $307,180 (30 percent)
Total Project Cost: $1,024,579

A systematic approach with the university/government research infrastructure and an equipment manufacturer is expected to rapidly lead to a commercialized system and useful understanding for other biomass processing efforts. Innovative size reduction of biomass reduces energy use, increases ease of bulk handling, increases density, reduces transportation costs, and facilitates efficient separation. This project's aim is to develop a new size reduction system. Improved physical separation of biomass concentrates higher value components, returns unused plant components to the soil, decreases bulk for wet separation processes, decreases drying energy and improves transportation and the use of a voluminous, chemically diverse feedstock. Integration of size reduction and separation is accomplished

through concurrent tasks timed to identify connective functions and biomass properties. High opportunity feedstocks like switchgrass, corn stover, forest residues, and straw from rice or flax will be prioritized.

2. ***Title***: Biomass Opportunity for Imperial, Nebraska Region: What is the Value?
Main Proposer: Imperial Young Farmers & Ranch
Partners: None
***Estimated Duration of Project*:** 36 months
Federal Funds Requested: $2,000,000 (64 percent)
Cost-Share Funds: $1,113,280 (36 percent)
Total Project Cost: $3,123,280

This project's objective is to define the value of sustainable removal of the "excess" feedstock to the farmers and potential processors across the supply chain using innovative methods for corn grain and stover collection, wet storage of stover, and rail transport from collection sites to supply a large biorefinery. In the next 10 years, biorefineries are expected to be processing biomass—initially crop residues like straw and stover—for the production of fuels and chemicals. Potential processors have made great strides in improving the conversion process, but there remains a large amount of uncertainty in the feedstock supply, its cost, reliability and environmental impact of removal. Benefits for changing existing farming practices must be demonstrated to the farmer and the potential farmer with stable pricing and a suitable life cycle analysis. The findings can be quickly implemented in the short-term, and are readily adapted to straw and energy crops as markets for feedstocks develop.

3. ***Title:*** Integrated Feedstock Supply Systems for Corn Stover Biomass
Main Proposer: Iowa State University
Partners: The University of Wisconsin Madison, the USDA Dairy Forage Research Center, the USDA Corn Insect and Crop Genetics Research Unit, and the World Resources Institute, with industry partners John Deere and Genencor International
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,999,724 (73 percent)
Cost-Share Funds: $738,439 (27 percent)
Total Project Cost: $2,738,163

This project will address critical needs for corn stover feedstock development through an integrated multidisciplinary approach. Overall objectives are to: 1) develop innovative harvesting and storage technologies to move corn stover from the farm to the factory gate; 2) identify genetic varieties of corn with specific properties attractive for biomass industries; and 3) evaluate and optimize these systems for efficiency, and economic and environmental sustainability. System integration goals of the project include maximizing the economic viability of processing corn biomass to fuel and chemicals, while increasing overall biomass productivity, efficiency of nutrient and energy use, soil and environmental quality, and rural economic development.

4. ***Title*:** A New Ethanol Recovery Technology for Small-Scale Rural Production of Ethanol from Biomass
Main Proposer: Membrane Technology and Research, Inc.
Partners: U.S. Environmental Protection Agency, Integrated Separation Solutions, Kraft Foods, PFM Corporation, and a large wine producer
Estimated Duration of Project: 24 months

Federal Funds Requested: $1,032,045 (63 percent)
Cost-Share Funds: $600,000 (37 percent)
Total Project Cost: $1,632,045

This project focuses on the development and demonstration of BioSep, a novel membrane-based ethanol recovery technology that allows economical distributed production of ethanol from biomass available throughout rural America. In contrast, current ethanol production technology requires a large centralized processing facility because the ethanol recovery step is economically viable only at large capacities. The technical approach to be followed in the project integrates a pervaporation process that uses ethano-selective membranes with a novel condensation technique to produce a concentrated solution of ethanol. Dehydration of this solution yields fuel-grade ethanol. The proposed technology will reduce the cost of small-scale, localized ethanol production in rural communities. This will benefit the rural agricultural economy, generating jobs in farming, ethanol production, and distribution. Ethanol that is produced locally, can be used locally, potentially eliminating the need for an expensive distribution infrastructure. The process has been proven in bench-scale research, but a field demonstration is essential to prove its viability.

5. ***Title*****:** Development of a Wood Preservative System from Wood BioOil Fractions
Main Proposer: Mississippi State University, Forest Products Department
Partners: Mississippi State University: Chemistry and Chemical Engineering; National Renewable Energy Laboratory; Chemical Specialties, Inc.; and Renewable Oil Intemational
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,409,011 (80 percent)
Cost-Share Funds: $353,000 (20 percent)
Total Project Cost: $1,762,011

There is a need to develop a cost-effective environmentally benign organic wood preservative system for residential applications to minimize environmental concerns. Research indicates that BioOils may have a potential role in the development of new environmentally benign wood preservative formulations. This concept is particularly attractive because BioOil can be derived from low-value wood feedstocks, such as pine plantation thinnings, chips, bark or sawdust. This project will develop a novel, technologically advanced approach to developing a wood preservative system with fuel as a by-product. Both the BioOil preservative and fuel will diversify the range of products that can be produced from plentiful timber resources.

6. ***Title*****:** Fuel Cell Systems Operating on 100 Percent Bio-Liquid Fuels
Main Proposer: Technology Management, Inc.
Partners: None
Estimated Duration of Project: 27 months
Federal Funds Requested: $965,161 (80 percent)
Cost-Share Funds: $241,290 (20 percent)
Total Project Cost: $1,206,451

A significant fraction of fuels consumed in the U.S. is from foreign sources, creating a major strategic and economic vulnerability. Shifting our energy dependence away from imported petroleum sources toward alternative, renewable, domestic agricultural sources could reduce this dependency. Coupling biofuels with fuel cells for stationary distributed electric power generation will further enhance economic and environmental benefits. Under this proposal, Technology Management, Inc., will build and operate a modular proof-of-concept solid oxide fuel cell (SOFC) power generation system capable of generating up to 1kW of biopower from

biomass or biofuels. Compared to conventional, engine-based power generation technologies, the proposed fuel cell systems are extremely clean, quiet, and practical at smaller module sizes with the potential to provide a new revenue stream/co-product for bio-fuels, such as vegetable oil and ethanol. This program leverages the current national priority and investment in fuel cell commercialization, and provides economic and social benefits for rural enterprises and communities by demonstrating a demand component for renewable biofuels, and modular, distributed SOFC power generation systems.

7. ***Title*****:** Hayfork Biomass Utilization and Value Added Model for Rural Development
Main Proposer: Watershed Research and Training Center
Partners: None
Estimated Duration of Project*:* 36 months
Federal Funds Requested: $503,400 (77 percent)
Cost-Share Funds: $152,000 (23 percent)
Total Project Cost*:* $655,400

This project supports the design and early implementation phases of an innovative biomass utilization facility to be located in Hayfork, California. It will include development of stewardship contracts for public lands fuels reduction; a log sort yard; a small log processor, a post and pole operation; a value-added incubator and industrial park; and wood-fired electrical generation plant. The basic approach is to add value in three distinct areas: 1) process currently sub-merchantable material into lumber and poles to increase their value from fuel to forest product; 2) add value to the electricity generated by the biomass plant by offering seasonally adjusted capacity; and 3) add value to the downstream heat and steam from the power plant by selling heat and steam to greenhouses and manufacturers co-located at the facility site. Currently no single part of this value-added system can stand alone on its own economic merit. Only by combining uses and value-added can the economics work. This model, once it is developed, financed, and built, will provide the infrastructure for forest health and fuels reduction work on public lands. This model is relatively small scale and can be used in many public land communities.

8. ***Title*****:** Technology Transfer and Education Programs for the Southern U.S.
Main Proposer: USDA Forest Service Southern Research Station
Partners: None
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,000,000 (73 percent) (The original request was for $1,240,008 on SF 424, but was $1,075,001 on SF424A,)
Cost-Share Funds: $368,704 (27 percent)
Total Project Cost: $1,368,705

The goal of this biomass training program is to encourage the use of woody biomass for bioenergy production in communities at the wildland-urban interface in the thirteen southern States and Puerto Rico. The overall objectives of this project are to: 1) increase awareness and knowledge about using woody biomass for energy production; 2) enable community leaders, potential woody fuel users, biomass suppliers, and forest managers to discuss the possibilities in their region; and 3) provide tools and resources as communities begin to plan for new opportunities. The expected result is increased likelihood that more woody biomass will be used to generate power in southern communities.

9. ***Title*****:** Sustainable Forestry for Bioenergy and Biobased Products

Main Proposer: Southern Forest Research Partnership, Inc.
Partners: USDA Forest Service, Southern Research Station, the University of Florida, the Southern Region Cooperative Extension Service, and the Southern States Biobased Alliance of the Southern States Energy Board.
Estimated Duration of Project: 36 months
Federal Funds Requested: $1,000,000 (77 percent) (The original request was for $1,801,453)
Cost-Share Funds: $541,448 (23 percent)
Total Project Cost: $1,541,448

The southern United States provides 60 percent of the Nation's timber supply and by association a very high percentage of the Nation's wood waste. The potential availability of bioenergy and biobased products in the South is very substantial. This project will rapidly develop knowledge enhancing products to inform and train rural community leaders and practitioners involved in growing, harvesting, transporting, and processing biomass and biobased products. Once the curricula, training events, and programs are designed, a targeted marketing, outreach, and program delivery will be made available to southern forest managers, including historically underserved communities.

10. Title: Development of Existing Biomass Resources through Education of Key Supply Bottlenecks
Main Proposer: University of Minnesota
Partners: Minnesota Logger Education Program; the Fond du Lac Tribal and Community College; the Minnesota Department of Natural Resources; WesMin USDA NRCS RC&D; the University of Minnesota College of Agricultural, Food and Environmental Sciences; College of Natural Resources; Center for Integration of Natural Resources and Agricultural Management; and Extension Service.
Estimated Duration of Project: 36 months
Federal Funds Requested: $397,711 (77 percent)
Cost-Share Funds: $116,386 (23 percent)
Total Project Cost: $514,097

Supplying biomass to wood burning plants in Minnesota is a potential market for loggers; however, the supply of wood fiber that is suited to pulp mills, reconstituted products or saw timber is limited and nearly fully utilized by existing mills. Development of a market for pre-commercial thinnings and brush-land harvest would reduce the costs of these valuable management techniques and allow land managers additional opportunities. In order to establish this technology, a supply chain and base of buyers is essential. This project addresses education that targets key bottlenecks in the supply chain and provides resource-based information to key existing, or potential, buyers.

11. Title: Small-scale, Biomass Fired Gas Turbine Plants Suitable for Distributed and Mobile Power Generation
Main Proposer: Electric Power Research Institute
Partners: None
Estimated Duration of Project: 10 months
Federal Funds Requested: $241,933 (75 percent)
Cost-Share Funds: $80,645 (25 percent)
Total Project Cost: $322,578

This project will evaluate the economic benefits of using forestry residues, including those arising from the Healthy Forests Initiative, for generating power in small-scale, indirectly fired, gas-turbine power plants. Two nominal plants would be evaluated, 2 MW and 15 MW. The goal of this project is to complete a financial analysis of the proposed indirect-fired cycle and determine the circumstances under which the two plants can operate economically. The economic benefits of implementing this project will encourage increased usage of biomass resources within the U.S. resulting in substantial improvements in the security of energy supply, environmental quality by reducing fossil fuel use and carbon dioxide emissions, and economic growth in rural regions.

12. ***Title*****:** Development of Workable Incentive Systems for Biobased Products, Biofuels and Biopower
Main Proposer: North Carolina State University
Partners: New Uses Council, Manufacturers Association, Environmental and Energy Study Institute
Estimated Duration of Project**:** 36 months
Federal Funds Requested**:** $450,000 (80 percent)
Cost-Share Funds**:** $115,333 (20 percent)
Total Project Cost**:** $565,333

This project will develop a series of proposals for incentive systems designed to promote developing markets for biorefineries – entities which take organic feedstocks to produce biomass energy, biofuels, and/or biobased products. Local governments and rural communities can participate directly by creating "biomass enterprise zones" with local economic development goals in mind. The approach will be to examine models of local, State and national incentives for energy, agriculture, and economic development; determine factors that influence their interaction and effectiveness; identify barriers and gaps and make recommendations to overcome them; then to use this information to create incentive system models to promote biorefinery development; and finally to demonstrate the application of the models through a series of geographically and technologically diverse case studies.

13. ***Title*****:** Design and Demonstration of a Commercial Prototype for Onsite Production of High Purity Hydrogen from Farm Animal Wastes
Main Proposer: New Energy Solutions, Inc.
Partners: REB Research & Consulting; Panamerican Enterprises, Inc.; Cornell University; and AA Dairy
Estimated Duration of Project**:** 24 months
Federal Funds Requested**:** $1,456,931 (77 percent) (This project was selected through the FY 2003 joint solicitation. The original request from last year was $1,661,534 with $204,603 funded in FY 2003. The remainder will be funded with FY 2004 joint solicitation funds.)
Cost-Share Funds**:** $437,031 (23 percent) (The original request from last year was $548,919 with $111,888 funded in FY 2003. The remainder will be funded with FY 2004 joint solicitation funds.)
Total Project Cost**:** $1,893,962 (The original request from last year was $2,210,453 with $316,491 funded in FY 2003. The remainder will be funded with FY 2004 joint solicitation funds.)

New Energy Solutions, Inc., (NESI) has integrated REB Research and Consulting's patented hydrogen selective tubes into the design of a compact plant for converting animal wastes into high purity hydrogen. The overall plant design includes an anaerobic digester to provide anaerobic digester gas to generate pure hydrogen. The project objective is to demonstrate the

operational, environmental, and economic features and benefits of an innovative plant designed for utilizing animal wastes to produce ultra high purity hydrogen for a variety of uses that include fuel for fuel cells, transportation, and industrial processes. NESI will conduct a three-phase program, the results of which will include verification of the design parameters and performance database for the plant; design and construction of a Beta demonstration plant; and demonstration of the operational, environmental, and economic features of this plant at an existing anaerobic digester site on a dairy farm in New York State.

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

The Biomass Act charges the Committee with advising the Secretary of Energy, the Secretary of Agriculture, and the points of contact concerning the "technical focus and direction of requests for proposals issued under the Initiative and procedures for reviewing and evaluating the proposals." In addition, it assigns the Committee the duty of evaluating awards made, making recommendations to the Board to ensure that "funds authorized for the Initiative are distributed and used in a manner that is consistent with the goals of the Initiative," and that 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." The Initiative is described in section 307 of the Biomass Act.

As required by section 309 of the Biomass Act, the Committee is submitting this report to assess whether or not funds appropriated for the Initiative are being used in a manner that is consistent with the Biomass Act.

During Committee meetings held over the course of the year, DOE provided the Committee with updates on the status of the joint solicitation process. Following the announcement of the FY 2004 joint solicitation awards, the Committee was provided with a written overview of the joint solicitation process and a summary of the awards made.

The following are summary comments made by the Committee on the joint solicitation process and the awards made. Comments are organized into four areas:

A. Recommendations on the FY 2004 Joint Solicitation Process
B. Recommendations to the Secretaries on Energy and Agriculture on the Departments R&D Portfolios in Relation to the Committee's Vision and Roadmap
C. Overall Recommendations to the Secretaries of Energy and Agriculture in 2004
D. Recommendations on the 2005 Joint Solicitation Technical Topic Areas

Although this is the Committee's report, Departmental responses have been added in italics after each recommendation made by the Committee in each of the four areas listed above. No changes have been made to the actual content of the Committee's report by adopting this report structure.

A. Recommended Changes to the FY 2004 Joint Solicitation Process

1. The request for proposal (RFP) process should be changed to allow more time for response, easier access to the RFP, and to be more focused in its proposal criteria description.

   Departmental Response: *To address the Committee's concern regarding the short turn-around time for the 2004 joint solicitation, the Departments extended the length of time for bidders to prepare pre-applications by three weeks. The following table shows the FY 2004 joint solicitation schedule versus the FY 2005 schedule:*

	Issue Date	Pre-Application Due	Full Application Due
2004 Solicitation	12/23/03	1/30/04	3/26/04
2005 Solicitation	12/17/04	2/15/05	4/15/05

To address the Committee's concern regarding easier access to the RFP, the FY 2005 joint solicitation RFP was posted to fedgrants.gov. Additionally, announcements of the RFP were posted to the Biomass Initiative website, the DOE's Office of the Biomass Program website, and in a USDA news release.

2. Proposals should be required to identify the relevance to the *Vision* and *Roadmap*, to address cost, energy, and environmental impacts, and to address by-products generated from the project.

Departmental Response: *The 2005 joint solicitation RFP includes an appendix that relates technical topic areas to Roadmap goals.*

The 2005 joint solicitation review criterion requires proposals to address: improvements in energy efficiency and economics of the biomass technology, oil displacement, rural economic development, and environmental benefits. Specifically the RFP calls for:

- *Estimated benefits in comparison to existing technology or system (e.g., crude oil displacement or energy efficiency gains in product production).*
- *Comparison of the cost to produce the targeted product(s), fuel(s), and power, versus existing best commercial technology.*
- *Anticipated energy and/or economic benefits, including those related to enterprise and community self-sufficiency, rural economic development, job creation, and reduction in imports.*
- *Potential for the proposed work to provide sufficient benefits in terms of cost reduction, risk reduction, or performance improvement to justify the cost of the system being investigated.*
- *Potential for near-term implementation of the proposed system or technology.*
- *Incorporation of activities and technologies that are protective of the environment.*
- *Extent to which public safety, environmental concerns, and land sustainability issues in rural areas are addressed.*

3. More proposal reviewers should be selected from industry, academia, and pools of retired experts and should be paid for their services.

Departmental Response: *The Departments will take this recommendation into consideration during the FY 2005 joint solicitation review process and as they select experts to perform the technical merit review. The Departments will continue to strive for a slate of reviewers that brings both strong technical expertise and balance across the range of biomass technologies that will be evaluated in the proposal process.*

4. Continue to approve proposals on the merit of the project, but strive to include a variety of project sizes.

Departmental Response: *The Departments will take this recommendation into consideration as it selects proposals. The Departments, however, will place emphasis primarily on proposals that demonstrate strong technical merit and respond to each Department's strategic objectives.*

5. Projects in progress should be reviewed regularly and required to provide clear decision points before they are continued or provided with additional funding.

Departmental Response: *The 2005 joint solicitation review criteria require proposals to address performance measures and milestones for evaluating progress with regard to key subtasks and/or deliverables. Additionally, USDA and DOE will conduct regular reviews of all R&D projects. For example, in March of 2005, USDA and DOE will hold a joint Stage-Gate review of feedstock related R&D projects that will include a review of past joint solicitation projects. Moreover, each recipient is required to submit quarterly reports on technical progress so that DOE and USDA project managers can track the progress of each project awarded on a regular basis.*

6. USDA and DOE should announce publicly the joint solicitation awardees in a timely fashion and explain why each was chosen.

Departmental Response: *Each year, the Departments publicly announce the results of the joint solicitation as soon as awards are finalized. These announcements provide a brief public description of each award and its relation to the Committee's Roadmap. The Departments will attempt to provide a fuller description of the contribution that each award has towards program objectives. The detailed results of the technical merit evaluations, however, are not for public release in order to protect the intellectual property rights of awardees.*

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

1. USDA and DOE should track progress towards, and funding spent, on *Roadmap* goals. USDA in particular, given its program focus, should track these variables across all agencies.

Departmental Response: *The Departments provided information on the Federal investment and technical progress towards Roadmap categories through the Biomass R&D Portfolio Analysis and Narrative provided in 2003 and 2004. These reports collected funding data by project or department focus with respect to Roadmap category. The Departments began working with members of the Committee, as well as Department staff, in the first quarter of FY 2005 to begin developing a standard format for collecting and reporting this information on a regular basis. The intent is to illustrate direct linkages and progress towards Roadmap objectives.*

2. USDA and DOE should seek more funding for achievement of *Roadmap* and *Vision* goals and for biobased resources.

Departmental Response: *In its annual budget request, each Department evaluates the Committee's Roadmap and submits funding requests that align with both the Roadmap and the Department's programmatic objectives. In the case of DOE, funds allocated toward achieving Roadmap objectives are severely impacted due to Congressionally directed appropriations.*

3. USDA and DOE should conduct a major benchmarking study that describes the current state of the following areas: biomass technologies, biomass in the marketplace, and the environmental impacts associated with biomass projects.

Departmental Response: *The Departments will consider conducting a benchmarking study. Such a study, however, would be a major effort that would divert funding away from other R&D efforts. DOE has conducted such studies in limited areas. For example, in 2004, DOE and the Pacific Northwest National Laboratory conducted the Top Ten Products Study that identified twelve chemicals that can be made from sugars that are most likely to successfully enter the marketplace. Additionally, in coordination with the National Renewable Energy Laboratory, DOE is conducting an integrated biorefinery analysis..*

C. Overall Recommendations to the Secretaries of Energy and Agriculture in 2004

1. Laws, regulations, and policies dealing with biomass should define biomass as all biomass and biomass derivatives.

Departmental Response: *For purposes of the Biomass Initiative, the Departments use the Biomass Act for direction on the definition of biomass. In addition the USDA's Guidelines for Designating Biobased Products for Federal Procurement (effective February 10, 2005) defined biobased products as "A product determined by USDA 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." The Departments will consider this recommendation by the Committee, which will be included in the annual report to Congress.*

2**.** The Committee recommends the following approach for setting funding priorities regarding biomass to hydrogen:

- Accelerate the development and market penetration of ethanol-powered hybrid electric vehicles and ethanol powered plug-in hybrid vehicles to capture immediate environmental and energy security benefits.
- Significantly increase funding for cellulosic R&D programs.
- Continue to evaluate other alternative fuels strategies, including hydrogen, with particular emphasis on biomass to hydrogen in recognition of its unique carbon sequestration capabilities.

Departmental Response:

- *The Department conducts extensive research and development activities, cost-shared with industry, in support of advanced transportation technologies, including hybrid electric vehicles, under the DOE FreedcomCar and Vehicle Technologies Program. Furthermore, the President's National Energy Policy includes proposals to provide incentives for hybrid electric vehicles and to encourage the expanded use of ethanol as a motor fuel. As part of our continuing efforts to promote the use of renewable fuels, DOE's Office of the Biomass Program recently held a meeting with industry representatives to identify the non-technical barriers to greater use of biomass technologies and potential solutions to those barriers.*

- *Cellulosic R&D is an important component of both USDA and DOE RD&D programs. DOE has made important strides in this area that were presented to the Committee in March 2004. Part of the struggle in funding more cellulosic R&D involves competing R&D demands and Congressionally directed funding.*
- *Under the President's Hydrogen Fuel Initiative, the Department has established an aggressive multi-year plan for hydrogen research, development, and demonstration. The DOE Hydrogen, Fuel Cells, and Infrastructure Technologies Program works to overcome the technical barriers to use of hydrogen and fuel cells for transportation, distributed stationary power, and portable power applications. The program is investigating the full range of potential sources for hydrogen production, including biomass.*

The Departments will continue to take this recommendation into consideration.

3. Biomass efforts should be tied to the Healthy Forests Initiative when appropriate.

Departmental Response: *DOE has developed a Forest Biorefinery Plan that will assist in achieving the Healthy Forests Initiative goal of reducing forest fires through debris removal and forest thinning that would be used as feedstocks for the biorefinery. USDA was consulted during development of the plan to assist with the determination of the amount of forest derived feedstock available and in identifying the R&D needs of a forest based biorefinery.*

4. The Departments should provide the Committee with an annual, quantitative progress report on the Federal Biobased Products Procurement Program. The report should be specific in providing a detailed outline of program development required and progress made, as well as an assessment of the amount of biobased products being purchased by the Federal Government by agency and by product category. This is the *second year* such a report has been requested. The biobased products industry is willing to assist the Federal Government in educating its procurement officers on biobased products.

Departmental Response: *At the March 11, 2004, Committee meeting, USDA provided the Committee with an update on the status of its Federal Procurement of Biobased Products plan. A brief status update was given at the March 17, 2005, Committee meeting, and a full update will be given at the summer 2005 Committee meeting once the rule is finalized.*

5. The Departments need to provide the Committee with the appropriate information to fulfill its obligations under the Biomass Act.

Departmental Response: *The Committee's responsibilities under the Biomass Act are:*

- *To advise the Secretaries and points of contact on the technical focus and direction of RFPs issued under the Initiative.*
- *To advise the Secretaries and points of contact on procedures for reviewing and evaluating the proposals.*
- *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 related to the Initiative.*

- *To evaluate and perform strategic planning on program activities relating to the Initiative.*

Each year, the Departments have developed a Work Plan to address these responsibilities. Information is provided within the resources of Department staff. Examples of information provided in FY 2004 include:

- *USDA provided a status report on the Federal Procurement of Biobased Products ruling. As of March 2004, the ruling was not yet finalized, but a voluntary program was in place. This information assists the Committee with its task of facilitating Federal and State partnerships with agricultural producers and industry.*
- *DOE staff provided the Committee with information on past DOE R&D on biomass technologies, including cellulosic ethanol, gasification, and cofiring. These presentations assist the Committee with its task of evaluating and performing strategic planning on program activities by providing them with background on R&D that has already been conducted.*
- *USDA and DOE staff provided the Committee with a matrix of current and past joint solicitation R&D projects by Roadmap category, allowing the Committee to better advise the Secretaries and points of contact on the solicitation process and awards.*
- *USDA and DOE staff generated a report to track the current progress towards achievement of Vision goals. This documents allows the Committee to identify areas that require more attention in meeting Vision goals, thus enabling them to provide more useful recommendations on the technical focus and direction of joint solicitation RFPs.*
- *The Committee was presented with information on hydrogen from biomass by a variety of experts, including those from industry, government, and the non-profit sector, with a range of opinions on the topic. This information assisted the Committee in the development of its position on biomass to hydrogen, which it used to make suggestions on the direction of program funding in this area.*
- *The Committee reviewed the results of the 2004 joint solicitation in order to make recommendations on the technical focus and direction of RFPs and on the procedures for reviewing and evaluating proposals.*
- *USDA presented to the Committee a report on the Energy Balance for Corn Ethanol. This assisted the Committee with making recommendations on program planning as it relates to corn ethanol.*
- *USDA and DOE provided the Committee with presentations on overall program direction and R&D portfolio analysis, assisting the Committee in suggesting technical topic areas that need more attention in joint solicitation RFPs, and in making strategic program planning recommendations.*

6. The approval of the Secretaries' annual report to Congress should be expedited and congressional actions resulting from the report should be communicated to the Committee.

Departmental Response: *The Departments recognize that the final approval of the FY 2003 annual report was unusually long and will make every effort to expedite the FY 2004 report.*

D. Committee Recommendations on the 2005 Joint Solicitation Technical Topic Areas

1. R&D for bioproducts such as adhesives, lubricants, coatings, etc.

2. Broaden liquid biofuel research

3. Production of bioproducts and biofuels from hemicellulose streams, such as those extracted from raw materials at pulp and paper mills, without loss of quality in the final product

4. Cellulosic R&D, including large volume waste materials

5. Biopower generation through small-scale utility generating facilities

Departmental Response: *The Departments took the Committee's recommendations into consideration when developing technical topic areas for the FY 2005 joint solicitation. One of the technical topic areas in the FY 2005 joint solicitation was Biobased Products Development, which includes the specific products mentioned in the Committee's recommendation. The Departments did not want to limit the types of biobased products to those listed in the Committee's recommendation in order to support a wide-range of proposals and R&D topics. The Departments also did not want to limit the joint solicitation technical topic areas too narrowly so as to exclude certain research proposals that may have been received otherwise. While some of the technical topic areas suggested by the Committee were not specifically included in the FY 2005 joint solicitation RFP, many of them fall into the broader areas that were included.*