Summary:

Biomass Research & Development Technical Advisory Committee Meeting

September 29, 2004

December 20, 2004

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Meeting Summary

A. Purpose

On September 29, 2004, a Biomass Research and Development Technical Advisory Committee (Committee) meeting was held at the Hilton Crystal City Hotel in Arlington, Virginia. The Committee was established by the Biomass R&D Act of 2000 (Biomass Act). The Committee's mandates under the Biomass Act include advising the Secretary of Energy and the Secretary of Agriculture, facilitating consultations and partnerships, and evaluating and performing strategic planning. This meeting was the third Committee meeting held during the 2004 calendar year. The Committee members came to the meeting to hear presentations on US Department of Agriculture (USDA) and Department of Energy (DOE) strategic direction and on the results of the subcommittee established during the previous meeting to analyze the biomass R&D portfolios of USDA and DOE. The Committee also met to review the draft recommendations on the 2004 joint solicitation process, the 2005 joint solicitation technical topic areas, and the overall 2004 recommendations to the Secretaries of Energy and Agriculture that were developed at the July 13 – 14, 2004 meeting, and to finalize those recommendations. Finally, the Committee began developing topics for the 2005 Committee Work Plan.

B. Welcome and Overview of the Agenda

The meeting was chaired by Thomas Ewing, Committee Chair, and Terry Jaffoni, Vice Chair. Mr. Ewing opened the meeting and reviewed the topics on the agenda.

William Guyker raised the issue of high oil prices and why biomass fuels are not being used as an alternative on a more widespread basis.

Kim Kristoff, Robert Dorsch, and Terry Jaffoni responded that oil prices have not yet reached the levels or had the economic impact as occurred in the 1970's. William Carlson explained that the 1970's oil crisis was a result of political problems, whereas now it is an issue of limited resources, and should therefore be dealt with.

Tom Ewing, John Wootten, and William Guyker discussed the increasing oil and coal demands of India and China. Mr. Wootten cited a West Virginia University report on global coal demands.

Larry Walker stated that the response to the oil issue needs to be multidimensional and should include environmental sustainability, rural development, and other issues as well.

Robert Dorsch said that obtaining the input of petroleum companies would be useful. William Nicholson responded that the forest industry has done this, and was told that the petroleum industry has no interest in having a source of ethanol. Larry Walker and Mr. Dorsch replied that they know of petroleum companies that are partnering with ethanol producers. Terry Jaffoni said that petroleum companies are interested in biomass-based fuels, as well as hydrogen, because they know that oil supplies will decline and prices

will reach a level so high that the traditional petroleum industry will not be sustainable without alternative resources and fuels. David Morris said that whether or not petroleum companies enter into ethanol production will depend on markets in California. There is interest in California to construct ethanol plants in order to reduce or eliminate Midwest imports. If California markets expand, petroleum companies will likely invest in ethanol production.

Chairman Ewing suggested considering this issue in the Committee's recommendations.

C. Update on Action Items from Last Meeting and Other Committee Business

Don Richardson, Designated Federal Officer, welcomed all to the meeting. Mr. Richardson discussed the Committee's quorum requirement. DOE Advisory Committee guidelines state that one more than one half of a Committee's members have to be present. In the case of this Committee, 16 members must be present. Because only 14 Committee members were present at this meeting, the meeting must be considered a subcommittee meeting. Any results of a subcommittee meeting must first be circulated throughout the entire Committee for approval before they may go to the Departments.

Don Richardson informed the Committee that its Charter will expire on November 21, 2004 and is therefore in the process of being renewed. Mr. Richardson described the Charter, stating that all of its contents come from the Biomass R&D Act of 2000 and that it is required to be updated every two years. If the Charter is not renewed, the Committee is not permitted to meet. The Charter is contained in *Attachment A*.

Don Richardson discussed the appointment of new members to the Committee. There are 13 members whose terms expire on November 21, 2004. David Morris asked if there was a bylaw to ask those members who have not attended meetings to leave the Committee. Mr. Richardson replied that he has recognized this issue and is addressing it. Mr. Richardson also expressed the importance of finalizing the Committee's 2004 recommendations before the departing members' expiration date.

D. Presentation on DOE Strategic Direction

Don Richardson of the DOE's Biomass Program introduced Cindy Riley of the National Renewable Energy Laboratory (NREL) as the new program systems integrator. As systems integrator, Ms. Riley will support the planning and execution of complex R&D projects and to ensure the coordination of those projects.

Don Richardson gave a presentation on the Biomass Program's strategic direction that included a discussion of the program's mission and goals, the legislative and political drivers of the program, and a summary of some of the R&D being conducted through the program. The presentation can be found in *Attachment B*.

David Morris asked what EWD refers to. Mr. Richardson responded that it is Energy and Water Development Appropriations Sub-Committee. This subcommittee is responsible for appropriating some of the Biomass Program's annual funding.

Carolyn Fritz asked how much of the program's $61 million budget went to the 2004 joint solicitation. Mr. Richardson responded that $14 million went to the solicitation, but that some of that money is from FY 2005 funds because the awards were granted at the end of the fiscal year.

Ralph Cavalieri asked whether or not earmarks suggest that Congress is unhappy with how the program is choosing to spend its budget. Mr. Richardson replied that sometimes that is the case, but the large number of Biomass Program earmarks has to do with wide interest across Congress in the issue.

William Guyker asked, if the DOE submits its own budget request, why Department of Interior funds affect the Biomass Program budget. Mr. Richardson replied that Interior funds refer to funds appropriated by the Interior Appropriations Subcommittee that are directed to a number of programs within DOE, not funding from the Department of Interior.

Terry Jaffoni asked if the results of the 2002 and 2003 joint solicitation projects have been published. Mr. Richardson replied that several of the 2003 projects are four year projects that are not yet complete, and that intellectual property rights affect the ability to publish results, but that he would work on trying to get non-intellectual property information released. Cindy Riley responded that reports on the projects are available as part of the statement of work, but that CRADA information on projects is protected for five years. Once the five years are up, information is often requested through the Freedom of Information Act.

Larry Walker asked about the two DOE solicitations currently active. Mr. Richardson responded that the Biomass Program recently released a university and a products solicitation. Information about these solicitations can be found at the following sites: http://www.eere.energy.gov/biomass/news_detail.html/news_id=8148 and http://www.eere.energy.gov/biomass/news_detail.html/news_id=8173, respectively.

Carolyn Fritz asked whether or not getting ethanol into the market was part of the demonstration project initiative. Cindy Riley, Melissa Klembara of BCS, and Mr. Richardson responded that Larry Russo of the Biomass Program held a deployment meeting to work on the issue. William Nicholson asked for the results of that meeting. Mr. Richardson replied that he would work with Mr. Russo to get the information to the Committee.

Ralph Cavalieri asked whether or not DOE recognizes work by land grant universities. Mr. Richardson responded that Jim Fisher of DOE serves on a board of directors that works with land grant universities. Cindy Riley replied that NREL recently gave a briefing to a group of land grant representatives.

David Morris asked if the future direction of the Biomass Program involves work with USDA. Mr. Richardson said that DOE does not work closely with USDA as far as strategic direction is concerned, but that the two agencies are working together on the forest initiative aspect of the biorefinery work. Mr. Richardson also discussed the interagency R&D Board that contains members from DOE, USDA, and several other agencies.

E. Presentation on USDA Strategic Direction

Glenn Carpenter of USDA gave a presentation on USDA's strategic direction that described the differences between USDA and DOE's focus and organization, described the various agencies within USDA that conduct biomass-related work, and listed potential topic areas for the USDA portion of the 2005 joint solicitation. The presentation may be viewed in *Attachment C*.

William Guyker asked what USDA's definition of feedstock included. Mr. Carpenter replied that USDA works with all types of feedstocks, including corn stover, switchgrass, and black willow, in 160 different applications.

Terry Jaffoni said that in the areas of biobased products and environmental and economic performance, a full life-cycle analysis is needed, but that she did not see any money going to this area of research in the last solicitation. John Hickman responded that life-cycle analysis was a large topic in earlier solicitations and that this research may show up in the individual platforms rather than in its own topic area. Cindy Riley replied that life-cycle analysis and environmental assessment were part of the scoring criteria in the biorefinery solicitation.

Ralph Cavalieri asked if the funding amounts presented referred to the only the joint solicitation, or to other areas as well. Mr. Carpenter said that the funding amounts pertained only to the joint solicitation.

William Carlson asked how USDA selected projects if their biomass work is so unfocused. Bryce Stokes of USDA replied that biomass work is pulled together very well within the USDA agencies and that there are interactions between all of the agencies. Mr. Carpenter explained that the focus of each agency varies, and that biomass work within each is therefore difficult to compare.

David Morris asked about a lack of USDA data in two areas: 1) cost assessment of all digesters, and 2) rate of soil erosion associated with cornfields. Mr. Carpenter replied that he is unaware of any numbers on digesters, but cited a national symposium on digester technology that took place last year. The symposium proceedings may contain such data. He also said that he is sure that soil erosion data is available and that he would look into the issue.

Terry Jaffoni explained that the Committee struggles to understand how USDA funds are being spent. An analysis of the increases and decreases in funding in specific areas over

time, and a rationale on what is being done within each of the different agencies would help the Committee. Ralph Cavalieri added that the Committee needs a more comprehensive understanding of what USDA does so that it can identify the gaps in its work, and asked if such a review of gaps exists. Mr. Carpenter replied that is does not, but that the joint solicitation helps USDA to do this. Larry Walker said that he understands that USDA's activities are diffused, but that the Committee needs to see how its recommendations have been implemented.

The Committee took a 15-minute break.

F. Presentation on Subcommittee Review of USDA and DOE Portfolios

Mike Manella of BCS, Incorporated gave a presentation on the work of the subcommittee established at the July 2004 Committee meeting to conduct an analysis of USDA and DOE biomass portfolios. The presentation included a description of the subcommittee's task, the Departments' response to the Committee's request for information, and a summary of the portfolio analysis. The presentation is included in *Attachment D.* The complete portfolio analysis is included in *Attachment E*.

Ralph Cavalieri asked if USDA had earmarks. Mr. Manella replied that the analysis did not classify earmarked funds for USDA. Glenn Carpenter said that he does not think they exist in biomass categories. He explained that CSREES could not break down its figures any further because not all of its funds have been accounted for yet.

David Morris raised the issue of the scope of the Committee. He explained that a previous chairman said that it was limited to the joint solicitation, as stated in the Biomass R&D Act of 2000, but asked if this should be extended. Don Richardson agreed that the scope of the Committee should be the entire biomass program, not just the joint solicitation.

Larry Walker pointed out that not all of the funds reported in the USDA analysis involve R&D. Terry Jaffoni replied that the Committee has discussed whether or not policy and incentives belong in the scope of the Committee and have agreed that they do. Jim Goff of USDA said that part of the difficulty arises because USDA is not an R&D based agency.

Carolyn Fritz, who chaired the subcommittee, explained that when the subcommittee met to develop a method by which to conduct this analysis, they agreed that a method of reporting that is useful to the Committee but manageable to the Departments and that could be updated regularly is needed. Ms. Fritz suggested that the Committee agree on a format to use for such analysis.

Ralph Cavalieri asked if the numbers used in the analysis were direct federal expenditures, to which Mr. Manella replied that they were. Mr. Cavalieri said that, depending on who conducts the R&D, different amounts of information will come from the investments, and that this is a problem not accounted for in the analysis. Larry

Walker disagreed, stating that addressing such an issue would complicate the analysis too much. He said that the Committee has oversight on Federal R&D, and should not be concerned with other funds. Mr. Cavalieri responded that the Committee could make false recommendations if it does not understand where Federal funds are being directed. William Nicholson replied that he disagrees with both Mr. Cavalieri and Mr. Walker, and stated that the Committee is not narrowly focused on R&D only, but also on policy, procurement, incentives, etc, and that what needs to be addressed is which of these areas have received no funding.

John Wootten said that he thought the R&D by Roadmap Category matrix was the most helpful document. He said that the document could be improved by adding a column for the dollar amount spent in each area. Kim Kristoff agreed that such a document would be helpful, but warned that the Committee should not be weighed down by these details. He said that the focus of the Committee should be to determine the direction of the R&D funding, results, and contribution to goals.

Carolyn Fritz asked that the Committee recognize everyone who provided input to and conducted the portfolio analysis. Chairman Ewing acknowledged those involved.

G. Review of Committee Comments during July 2004 Meeting on Recommendations on the 2004 Joint Solicitation

Vice-chair Terry Jaffoni opened discussion on the recommendations on the 2004 joint solicitation process.

Chairman Ewing asked if the Committee would like to begin the recommendations by vocalizing frustration about the Committee's scope and the need for more information from the agencies.

Terry Jaffoni said that she would like to put forward two questions: 1) what is the format that the Committee would like to see agency information updated in regularly? and 2) what is the oversight of the Committee? Ms. Jaffoni believes that the Committee focus is broader than the joint solicitation, but would like to know what the Committee thinks. Larry Walker responded that he would like to know the portion of program funds for which the Committee has responsible. Tom Binder said that he would like the Committee to comment on the balance of the agencies' overall portfolios, but that it would help if portfolio information was divided into R&D projects versus education and incentives. David Morris replied that it should be made clear that the Committee does not have control over anything, but has charge and visibility. Robert Dorsch replied that the Committee does have some influence over the joint solicitation process.

Vice-chair Jaffoni refocused the discussion to the 2004 joint solicitation recommendations. The draft recommendations that were developed at the July 13 – 14, 2004 Committee meeting were projected on the screen for review. The Committee reviewed each recommendation. The final set of recommendations on the 2004 joint

solicitation process that will go forward for review by the entire Committee is included in *Attachment F*.

The Committee broke for lunch.

H. Review of Committee's Comments during July 2004 Meeting on Recommendations for 2005 Joint Solicitation Technical Topic Areas

Chairman Ewing and Vice-chair Jaffoni announced that the 2004 joint solicitation recommendations would be condensed and sent to the Committee for review, and that they would like to move on to a discussion on the 2005 joint solicitation technical topic areas. The draft recommendations on the 2005 joint solicitation technical topic areas that were drafted at the July 13 – 14, 2004 were placed on the screen for review. The Committee discussed each recommendation. The final list of recommendations on the 2005 joint solicitation technical topic areas that will go to the entire Committee for review is included in *Attachment G.*

Once the list of recommendations on the 2005 joint solicitation technical topic areas was completed, the Committee decided that each member should vote for his or her top five topics. A longer list of recommendations would not be useful to the Agencies because the solicitation is not large enough to include all of the topics. Chairman Ewing directed the staff to consider this when sending the recommendations out for review.

Several Committee members expressed concern that the Committee's work and recommendations were not as productive this year as in previous years. Vice-chair Jaffoni asked the Committee if anyone had any suggestions on how to improve the recommendation process for next year. David Morris suggested that it would be more effective for the Committee to prioritize a few major goals each year, allow each member to voice an opinion on them, then move on to other topics. John Hickman pointed out that the Committee's job is getting harder as they have more projects and material to review each year. John Wootten said that he believes the process will get easier as the Committee gains a better understanding of the Agencies' programs. Larry Walker said that he prefers the current method of developing recommendations because everyone has a say and a vote.

The Committee broke for 15 minutes.

I. Review of Committee's Comments during the July 2004 Meeting on Overall Recommendations to the Secretaries of Energy and Agriculture

Vice-chair Terry Jaffoni opened discussion on the overall recommendations to the Secretaries. The draft recommendations developed at the July 13 – 14, 2004 were placed on the screen for review. The Committee reviewed and adjusted each recommendation. The final list of 2004 Recommendations to the Secretaries of Energy and Agriculture that will go forward to the entire Committee for review is included in *Attachment H*.

J. Discussion on Topics to Include in the 2005 Committee Work Plan

Vice-chair Terry Jaffoni asked the Committee to brainstorm topic areas that they would like to include in the Committee's 2005 Work Plan. Several members suggested topic areas as staff captured them on the screen. The full list of suggested topic areas is included in *Attachment I.*

K. Adjournment

Chairman Ewing asked for any public comment. None was made.

Chairman Ewing discussed the date for the next meeting. It was decided that the next meeting will not take place until the new Committee members are appointed. A tentative date of March 2005 was set, but Chairman Ewing and Don Richardson will be in contact to select a date.

The meeting was adjourned.

ADDENDUM A

Biomass Research and Development Technical Advisory Committee Meeting
September 29, 2004

ATTENDEES

Committee Members Present

Tom Ewing, Chair
Terry Jaffoni, Vice-chair
Tom Binder
William Carlson
Ralph Cavalieri
Robert Dorsch
Carolyn Fritz
William Guyker
John Hickman
Kim Kristoff
David Morris
Bill Nicholson
Larry Walker
John Wootten

Committee Members Not Present

Wayne Barrier
Roger Beachy
Robert Boeding
Jerrel Branson
Dale Bryk
Joseph Chapman
Roger Fragua
Charles Goodman
Brian Griffin
Pat Gruber
William Horan
Jack Huttner
Gary Pearl
Delmar Raymond
William Richards
Philip Shane

Federal Employees Present

Mike Kossey – USDA
Glen Carpenter – USDA
Carol Kramer-LeBlanc – USDA
Jim Goff – USDA
Bryce Stokes – USDA
Chavonda Jacobs-Young - USDA
Paul Grabowski – DOE
Cindy Riley – NREL

Total Public Attendees – 9

Total Attendees – 32

Designated Federal Officer – Don Richardson

ADDENDUM B

Public Meeting of the
Biomass Research and Development Technical Advisory Committee
September 29, 2004
Crystal City Hilton Hotel, Decatur Room
Arlington, VA

Previous decisions or actions related to this agenda:

At the July 13 – 14, 2004 meeting, the Committee heard presentations for and against funding for the hydrogen initiative. As a result, the Committee developed a position on hydrogen that is now posted at www.bioproducts-bioenergy.gov. The Committee also received a presentation on the process and results of the 2004 joint solicitation, drafted recommendations on the process, awards, and R&D being done through the solicitation, and began developing recommendations on evaluation criteria and technical topic areas for the 2005 solicitation. Finally, the Committee identified additional topics to include in their 2004 Recommendations to the Secretaries of Agriculture and Energy. The Committee requested that a review of the USDA and DOE project portfolios in relation to the Roadmap be presented at the September meeting so that they can make more informed recommendations. In so doing, the Chairman requested that the agencies provide information on their R&D portfolios and that a subcommittee, lead by Carolyn Fritz, meet to review the information provided by the agencies.

Prior to today's meeting, the Committee should have received the following documents:

- Subcommittee USDA and DOE Portfolio Analysis
- Updated version of the matrix mapping projects awarded under the joint solicitation to the Committee's *Roadmap*
- Tracking of *Vision* Goals document
- 2003 Recommendations to the Secretaries report
- Results of the 2004 joint solicitation
- Copies of the draft recommendations developed at the July meeting
- Summary of the OBP MYTP
- Copy of the Biomass R&D Act

Description of subjects of this meeting:

The agenda for this meeting will include a discussion on the Committee's 2004 recommendations to the Secretaries of Agriculture and Energy. The recommendations will focus on the results of the 2004 joint solicitation, the process and topics for the 2005 joint solicitation, and overall recommendations on the progress of the USDA and DOE in meeting the goals defined in the *Vision* and *Roadmap* documents. The Committee will also begin developing a 2005 Work Plan. Specifically the Committee will:

- Hear presentations on USDA and DOE program direction.
- Hear from the Subcommittee on its review of the USDA and DOE project portfolios.
- Review the recommendations on the 2004 and 2005 joint solicitations and overall recommendations from the last meeting.
- Discuss, refine, and finalize recommendations for the 2004 Recommendations to the Secretaries of Agriculture and Energy.
- Discuss topics to cover in the 2005 Work Plan and begin developing the Work Plan.

Agenda

September 29th - Biomass R&D Technical Advisory Committee Meeting

8:00 – 8:30 Continental Breakfast

8:30 – 8:45 Welcome and Overview of Agenda – *Thomas Ewing, Committee Chair*

8:45 – 9:15 Update on Action Items from Last Meeting and Other Committee Business -*Don Richardson, Designated Federal Officer*

- Committee Business
- Charter
- Updated R&D Matrix

9:15 – 9:55 Presentation on USDA and DOE program direction – *Don Richardson, DOE and Glenn Carpenter, USDA*

9:55 – 10:10 Break

10:10 – 10:40 Presentation on Subcommittee review of USDA and DOE portfolios- *Carolyn Fritz, Subcommittee Chair and Michael Manella, BCS, Incorporated*

10:40 – 11:10 Open Discussion

11:10 – 11:20 Review of Committee comments during July 2004 meeting on Recommendations to the Secretaries – *Terri Jaffoni, Committee Vice Chair*

- Joint Solicitation process
- Awards made under the joint solicitation
- Recommended topics for 2005 joint solicitation
- Additional recommendations to the Secretaries of Energy and Agriculture

11:20 – 12:00 Round Robin on Committee Recommendations - *Terry Jaffoni, Committee Vice Chair*

- 2004 joint solicitation process and awards
- 2005 joint solicitation
- USDA/DOE R&D Portfolio

12:00 – 1:00 Lunch

1:00 – 2:00 Continue Round Robin and/or Open Discussion as needed - *Terry Jaffoni, Committee Vice Chair*

2:00 – 2:15 Break

2:15 - 3:00 Finalize Committee Recommendations – *Tom Ewing, Committee Chair*

3:00 – 4:30 Discussion of topics to cover in the 2005 Work Plan – *Terry Jaffoni, Committee Vice Chair*

4:30 – 4:45 Public Comment

4:45 – 5:00 Discussion of topics for next meeting – *Tom Ewing, Committee Chairman*
- Meeting with Biomass R&D Board/Next Meeting
- Additional topics

5:00 Adjourn

U.S. Department of Energy, Office of the Biomass Program

Current and Future Scope

Don Richardson
Office of the Biomass Program
September 29, 2004

Mission of OBP

"The mission of OBP is to partner with U.S. industry to foster research and development on advanced technologies that will transform our abundant biomass resources into clean, affordable, and domestically-produced biofuels, biopower and high-value products. The result will be improved economic development, expanded energy supply options, and increased energy security"

Strategic Direction

George W. Bush Administration Direction

Return to a focus on energy as a national security issue

Energy Title in Farm Bill

The Hydrogen Initiative

→ David Garman
Asst Secretary
Energy Efficiency
Renewable Energy

Biomass R&D Act of 2000
- Technical Advisory Committee
- Biomass R&D Board
- Joint USDA/DOE Biomass R&D Solicitations

Consolidation of DOE biomass activities under one program

Importance of H_2

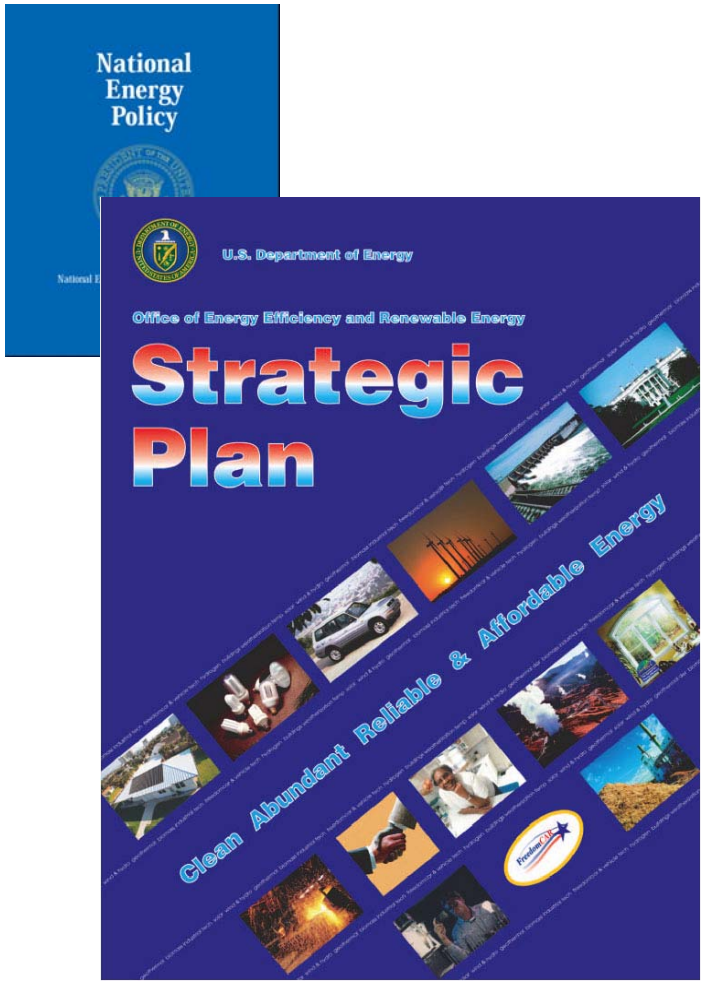
Significant impacts of "Earmarks"

Emphasis on oil displacement and the creation of the bioindustry

Legislative Drivers

- ***Biomass Research & Development Act of 2000***
  - Created the Biomass R&D Initiative, a multi-agency effort to accelerate all Federal biobased products and bioenergy R&D.
  - The Initiative is guided by:
    - The Biomass Board
    - The Technical Advisory Committee
- ***Title IX, Farm Bill 2002***
  - Section 9002 - Federal Procurement of Biobased Products
  - Section 9006 - Renewable Energy Systems & Energy Efficiency Improvements
  - Section 9008 - Biomass Research and Development
  - Section 9010 - Continuation of Bioenergy Program
- ***Title II, Healthy Forest Restoration Act of 2003***

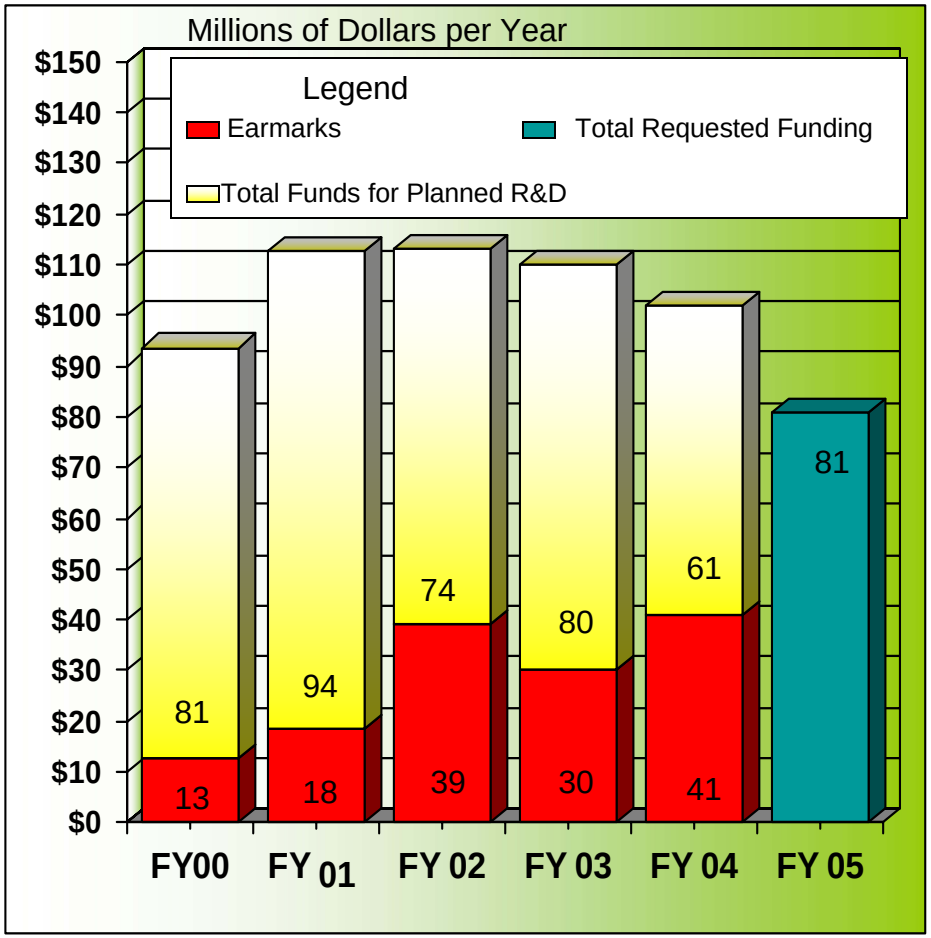
Strategic Direction



EERE Portfolio Priorities

- Dramatically reduce or even end dependence on foreign oil
- Reduce burden of energy prices on the disadvantaged
- Increase the viability and deployment of renewable energy technologies
- Increase the reliability and efficiency of electricity generation, delivery and use
- Increase the efficiency of buildings and appliances
- Increase the efficiency/reduce the energy intensity of industry
- Create the new domestic bioindustry
- Lead by example through Government's own actions

Earmarks and Total Funding

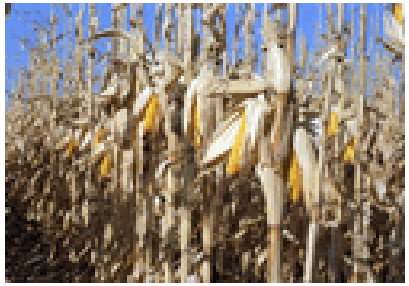


- Three-fold increase in earmarks since 2000
- EWD Earmarks have grown from 18% to over 47% of total funding.
- Real decline in the available funds used in support planned R&D

U.S. Department of Energy
Energy Efficiency and Renewable Energy

Integrated Biorefinery – Options vs. Funding

Office of the Biomass Program



Feedstock production, collection, handling & preparation

Hydrolysis
Acids, enzymes
Gasification
High heat, low oxygen
Digestion
Bacteria
Pyrolysis
Catalysis, heat, pressure
Extraction
Mechanical, chemical
Separation
Mechanical, chemical

Sugars and Lignin
Synthesis Gas
Bio-gas
Bio-Oil
Carbon-Rich Chains
Plant Products

USES

Fuels:
- Ethanol
- Renewable Diesel
- Hydrogen

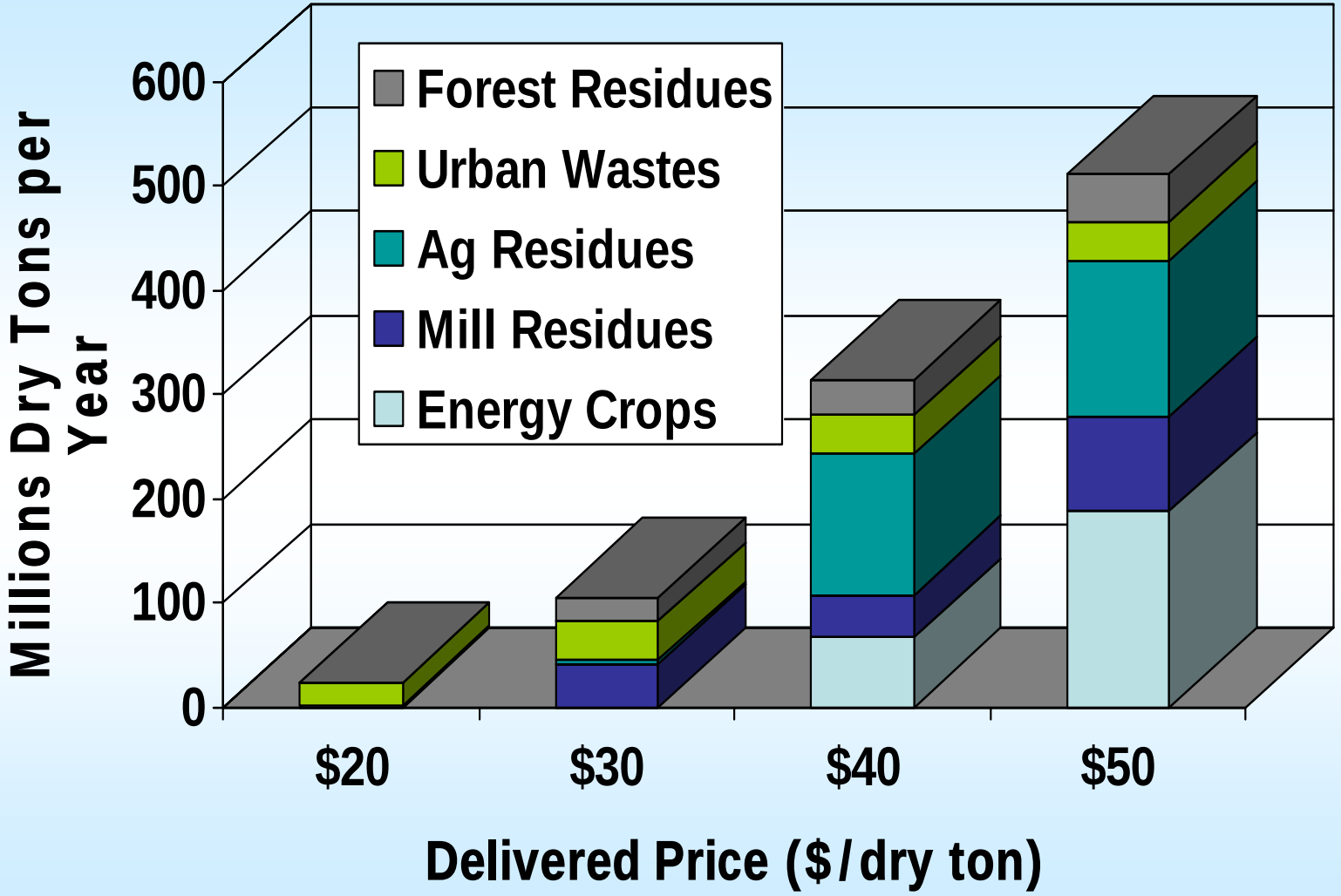
Power:
- Electricity
- Heat

Chemicals
- Plastics
- Solvents
- Chemical Intermediates
- Phenolics
- Adhesives
- Furfural
- Fatty acids
- Acetic Acid
- Carbon black
- Paints
- Dyes, Pigments, and Ink
- Detergents
- Etc.

Food and Feed

Feedstock Supply

Potential Midterm Non-crop based U.S. Biomass Supply



Program Goals

DOE's Strategic Goal
To protect our national and economic security by promoting a diverse supply of reliable, affordable and environmentally sound energy

EERE Strategic Goals
1. Dramatically reduce or even end dependence on foreign oil
2. Create the new, domestic bioindustry

Biomass Program Goals

Feedstock Goal

To develop sustainable technologies capable of supplying lignocellulosic biomass to biorefineries producing fuels, chemicals, heat and power

Sugar Platform Goal

To develop the capability for using lignocellulosic biomass to produce inexpensive sugar streams that can be utilized for the production of fuels, chemicals and materials

Thermochemical Platform Goal

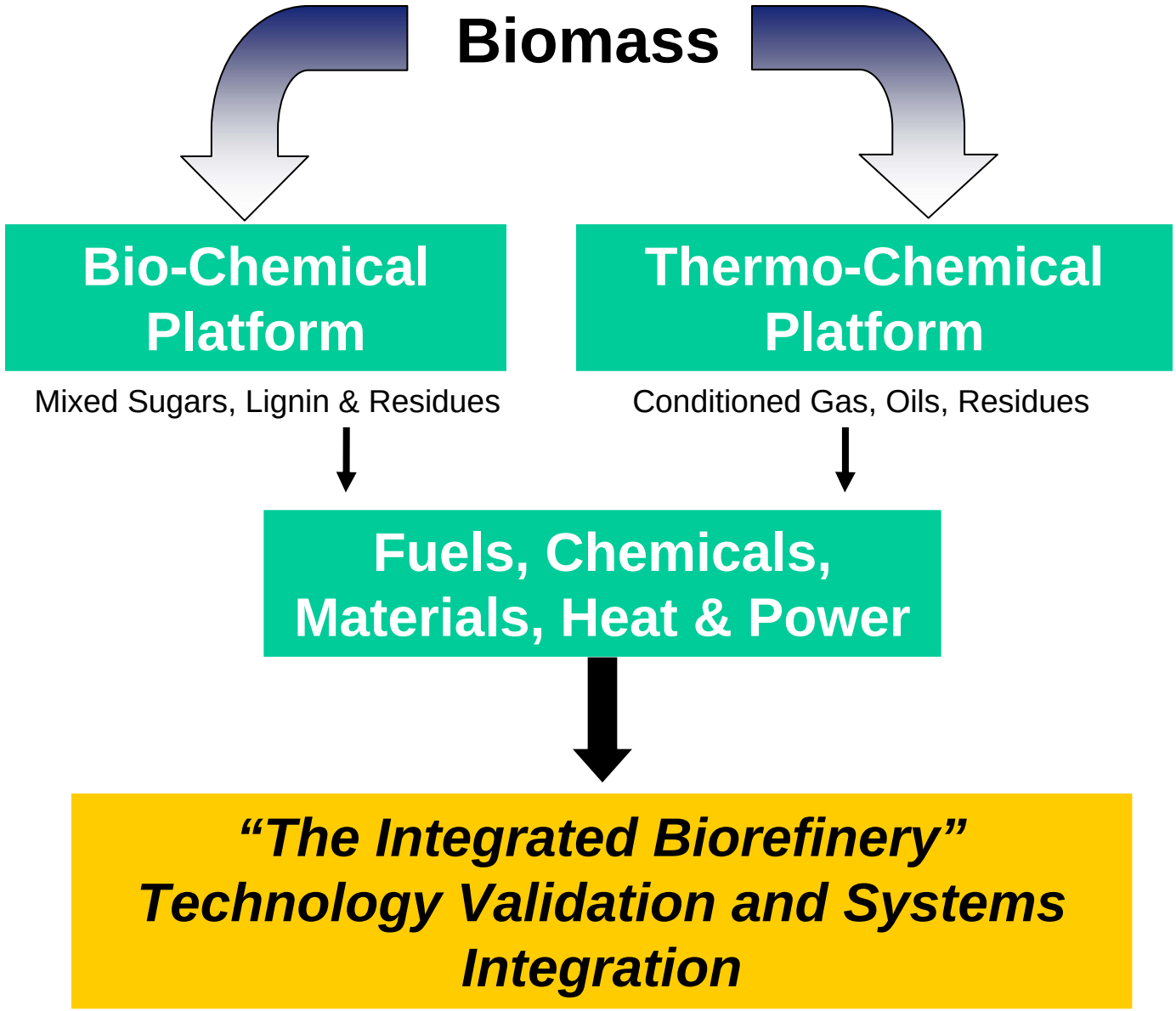
To develop the capability of thermochemically converting biomass into simple building blocks for the production of fuels, power, hydrogen, chemicals and materials.

Products Goal

To develop the capability to produce fuels, power, chemicals and/or materials utilizing intermediates from thermochemical and sugar platforms.

Integrated Biorefinery Goal

To support the establishment of integrated biorefineries through partnerships with industry and academia


Biomass
Bio-Chemical Platform
Thermo-Chemical Platform
Mixed Sugars, Lignin & Residues
Conditioned Gas, Oils, Residues
Fuels, Chemicals, Materials, Heat & Power
"The Integrated Biorefinery" Technology Validation and Systems Integration

Program Targets

Develop biorefinery-related technologies to the point that they are cost and performance competitive and are used by the nation's transportation, energy, chemical, and power industries to meet their market objectives

2005: Demonstrate an integrated process for fuels production from biomass

2007: Complete technology development necessary to enable start-up demonstration of a biorefinery producing fuels, chemicals, and power

2010: Help U.S. industry to establish the first large-scale biorefinery based on agricultural residues

Intermediate Targets

- **Syngas** - from $6.14/GJ (2003 base case cost estimate) to $5.01/GJ by 2010.
- **Sugar Feedstocks** - from $0.14/lb (2003 base case cost estimate) to $0.10/lb by 2012.
- Industrial viability of three commodity scale products by 2010.
- $35 per dry ton for biomass feedstock 2010.

Integrated Biorefinery

Integrated Biorefinery Goals

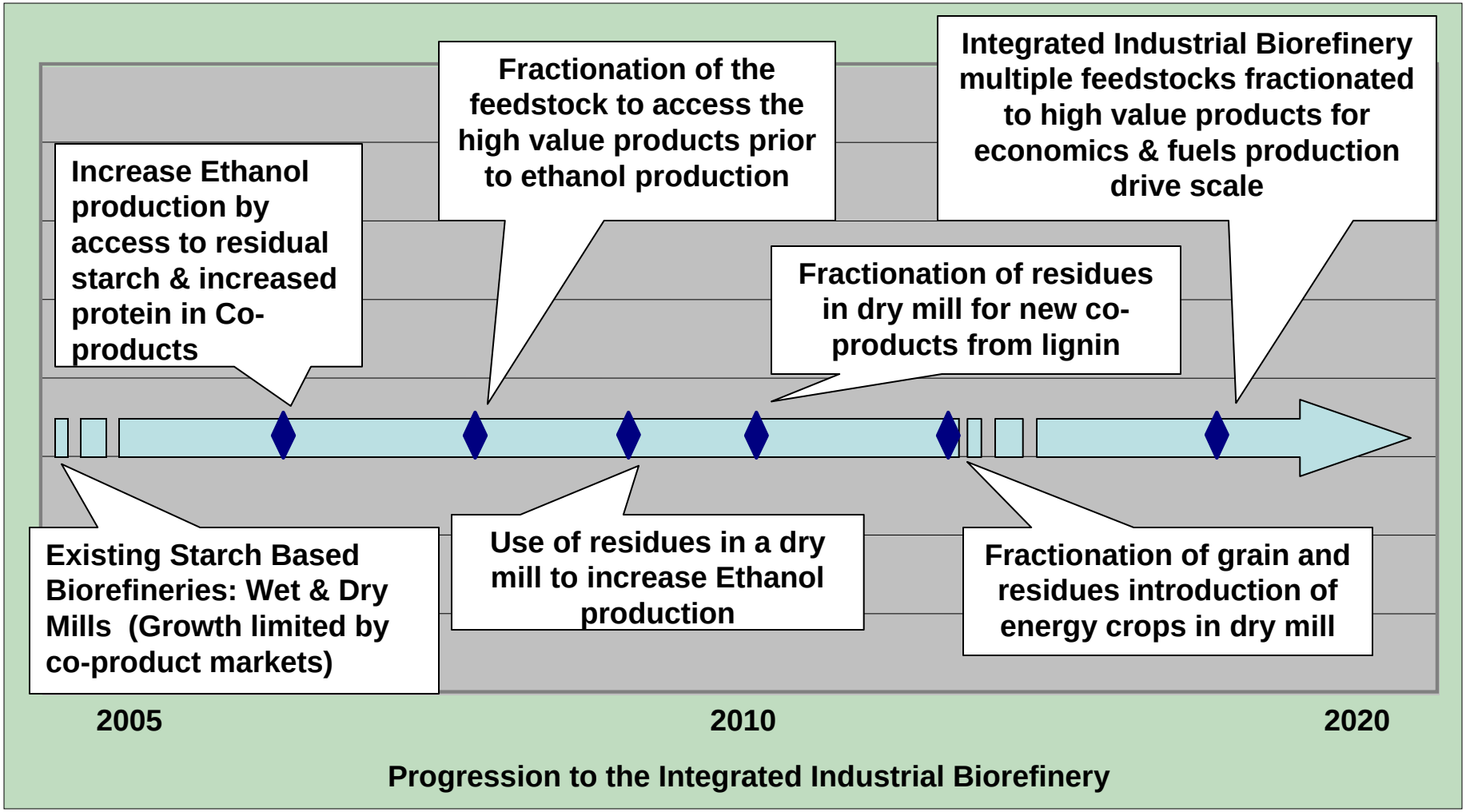
To support the establishment of integrated biorefineries through partnerships with industry and academia.

- Ultimate deployment strategy of the Program.
- Most technical barriers are aimed at reducing costs and are addressed through the Program's four other R&D areas.
- However, barriers exist that are specific to the goal of successful demonstration and deployment:
  - Challenge of end-to-end, feed-to-product, process integration
  - Risk of pioneer technology
  - Attracting investors/industry partnerships

Technical Topics

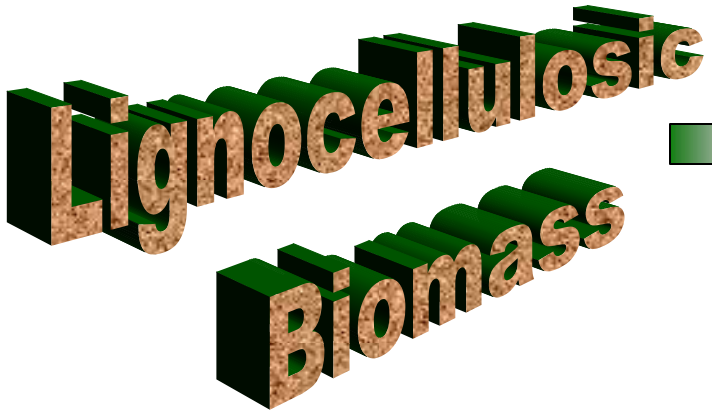
- Biomass R&D Initiative's USDA/DOE Joint Solicitations
  - FY02, DOE awarded 6 major sugar biorefinery development projects
  - FY03, DOE awarded 4 projects, mostly on new value-added products from biorefineries.
  - FY04, DOE awarded 9 projects, mostly focused on thermochemical platform (gasification) technologies.
- Current Industrial Linkages
  - Corn-Ethanol Industry
- Future Industrial Linkages
  - Transform Pulp and Paper Mills to "Forest" Biorefinery
  - Transform a Petroleum Refinery to a Biorefinery.

Biorefinery Development



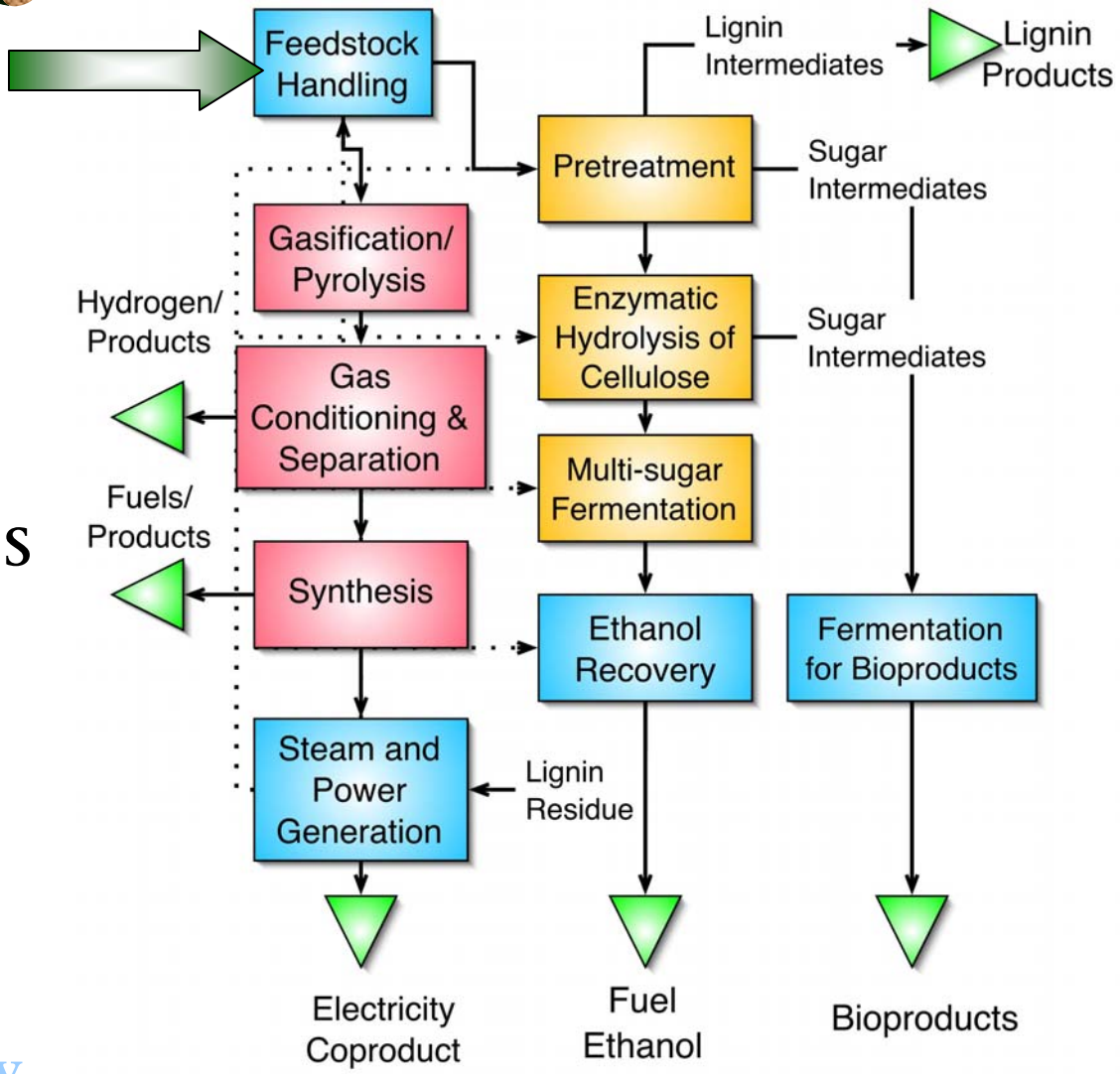
Progression to the Integrated Industrial Biorefinery

Cellulosic Biorefinery Vision



An integrated biorefinery makes use of:

- Thermochemical conversion technology
- Biochemical conversion technology
- Existing technology



USDA

- R&D FOCUS AND AGENCY DIRECTION
  - Differences between USDA and DOE
  - All of the USDA agencies are doing different things which are not primarily focused on Biomass
  - USDA biomass projects may also be concerned with agricultural production issues and efficiencies, agricultural product marketing, and sustainability and environmental effects

USDA

- USDA is not project oriented therefore project description is not available in the Portfolio Analysis or supplemental material
- Because USDA has such a varied presence in Biomass there are many, many projects in areas related to biomass that are not related to energy

USDA

- AGENCY BREAKDOWN
  - Agricultural Research Service (ARS)
  - Cooperative State Research Education and Extension Service (CSREES)
  - Farm Service Agency

USDA

- AGENCY BREAKDOWN
  - Forest Service
  - Office of the Chief Economist
  - Rural Development
  - Natural Resources Conservation Service

NATURAL RESOURCES CONSERVATION SERVICE

- USDA Biomass Initiative Joint Solicitation
  - Goals/Objectives
    - NRCS is not a research agency
    - Contrary to traditional
- Western National Technology Development Center---Biomass Technology Special Team

USDA

- Program direction
- FY2004
  - Feedstock Development and Production
  - Biobased Products – Environmental and Economic Performance
  - Biomass Focused Forest Management Training
  - Incentives

USDA

- Possible Technical topics for FY2005:
  - Feedstock Development
  - Biobased products
  - Forest training
  - Biomass education
  - Other topics as per committee direction

LEGISLATION

- On September 8, 2004 the Senate Agriculture Appropriations Subcommittee held their mark-up for the FY05 budget. It appears a number of preliminary cuts have been made to critical energy title programs authorized by the 2002 farm bill.

Section 9002: Federal Procurement of Biobased Products:

	Administration	House	Senate
FY 05	$2 million	$2.969 million	$2 million

Section 9004: Biodiesel Fuel Education Program:

	Administration	House	Senate
FY05	$1 million	$1 million	zeroed

*mandatory funding of $1 million/yr. provided in the 2002 farm bill.

LEGISLATION

Section 9006: Renewable Energy and Energy Efficiency Rural Development Program:

	Administration	House	Senate
FY05	$10.77 million	$23 million	$20 million

*mandatory funding of $23 million/yr

Section 9008 Biomass Research and Development Act:

	Administration	House	Senate
FY05	$14 million	$14 million	No information

Section 9010 CCC Bioenergy Program:

	Administration	House	Senate
FY05	$100 million	$100 million	$100 million

*mandatory funding of $150 million/yr.

LEGISLATION

Section 6401: Value-Added Agricultural Product Market Development Grants (VAPG):

	Administration	House	Senate
FY05	$15 million	$15.5 million	$15 million

*mandatory funding of $40 million/yr.

- The Subcommittee has embargoed release of their official funding levels until full Committee markup, which is unlikely to occur until the week of September 20th. This allows an opportunity for amendments to be offered to restore full funding to these important energy title programs. EESI will be sending out updates as developments warrant.

USDA

- Oversight of Projects
  - FY 2003 NRCS/CSREES
  - FY2004
    - NREL-----three projects
    - USDA-FS----seven projects
    - USDA-NRCS----State personnel

USDA

- FY 2003 Projects
  - Local Energy
  - New Energy Solutions
  - T. R. Miles
- Imperial Young Farmers and Ranchers

USDA/DOE PORTFOLIO ANAYLSIS

Developed by:

United States Department of Agriculture

United States Department Of Energy

Biomass R&D Technical Advisory Sub-Committee

BCS Inc.

USDA/DOE PORTFOLIO ANAYLSIS

- Committee Request:
  - Overview of DOE and USDA portfolios in relation to the *Roadmap* to facilitate Committee review of '04 joint solicitation results and recommendations on '05 topics
- DOE and USDA Response:
  - Analyzed DOE FY04 AOP and FY05 Spend Plan to allocate DOE funding along Roadmap categories
  - USDA budget office distributed template to 7 USDA agencies to analyze agency funding along Roadmap categories

USDA/DOE PORTFOLIO ANAYLSIS

Sub-Committee questions on analysis:

- Request for more information on “Other” category in Processing and Conversion - Table 2 (USDA)
  - Other is money from CSREES, RD, and ARS
- Request for more information on “Incentives” in Public Policy Measures - Table 4 (USDA)
  - This is for the Farm Service Agency biomass utilization incentives program
- How much are the earmarks for DOE?
  - On Total table 5 earmarks are represented
- Where is the Biomass Initiative Joint Solicitation money?
  - Joint solicitation funds are shown in parenthesis.

FEEDSTOCKS – ROADMAP CATEGORY

FEEDSTOCKS

TABLE 1

Roadmap Subcategory	FY03				FY04				FY05 (estimated)				Total FY03-05	
	DOE	USDA	Total	%	DOE	USDA	Total	%	DOE	USDA	Total	%	DOE-USDA	%
A. Biotechnology and Plant Physiology	**$2,902,173**	**$2,078,000**	**$4,980,173**	**32**	**$7,483,000**	**$6,004,600**	**$13,487,600**	**39**	**$3,511,000**	**$7,604,600**	**$11,115,639**	**38**	**$29,583,412**	**44**
1. Fundamental Structure of Lignocellulosic Materials					$5,865,000	$1,703,000	$7,568,000		$645,000	$1,703,000	$2,348,000			
2. Cost-effective Pre-delivery Treatment Processes					$1,618,000	$4,101,600	$5,719,600		$2,866,000	$4,101,600	$6,967,600			
3. Other					$0	$200,000	$200,000		$0	$1,800,000 *($1,600,000)*	$1,800,000			
B. Agronomic Practices	**$0**	**$4,596,000**	**$4,596,000**	**30**	**$0**	**$4,969,400**	**$4,969,400**	**15**	**$0**	**$5,272,200**	**$5,272,200**	**18**	**$14,837,600**	**12**
1. Soil Sustainability					$0	$417,700	$417,700		$0	$761,300	$761,300			
2. Other					$0	$4,551,700	$4,551,700		$0	$4,510,900 *($800,000)*	$4,510,900			
C. Feedstock Handling	**$4,314,407**	**$1,689,000**	**$6,003,407**	**39**	**$3,021,000**	**$12,523,243**	**$15,544,243**	**46**	**$3,131,000**	**$9,406,200**	**$12,537,200**	**43**	**$34,084,850**	**44**
1. Feedstock Density					$0	($717,319)	$717,319		$0	$0	$0			
2. Sensors					$0	*($3,999,724)*	$3,999,724		$0	$0	$0			
3. Best Practices for Harvesting Storage					$2,040,000	$1,007,100	$3,047,100		$3,131,000	$1,007,100	$4,138,100			
4. Other					$981,000	$6,799,100	$7,780,100		$0	$8,399,100 *($1,600,000)*	$8,399,100			
Total	**$7,216,580**	**$8,363,000**	**$15,579,580**	**100**	**$10,504,000**	**$23,497,243**	**$34,001,243**	**100**	**$6,642,000**	**$22,283,000**	**$28,925,000**	**100**	**$78,505,823**	**100**

Note: Italicized amounts are from Biomass Joint Solicitation

FEEDSTOCKS – ROADMAP CATEGORY

Figure 1: FEEDSTOCKS – BY DEPARTMENT

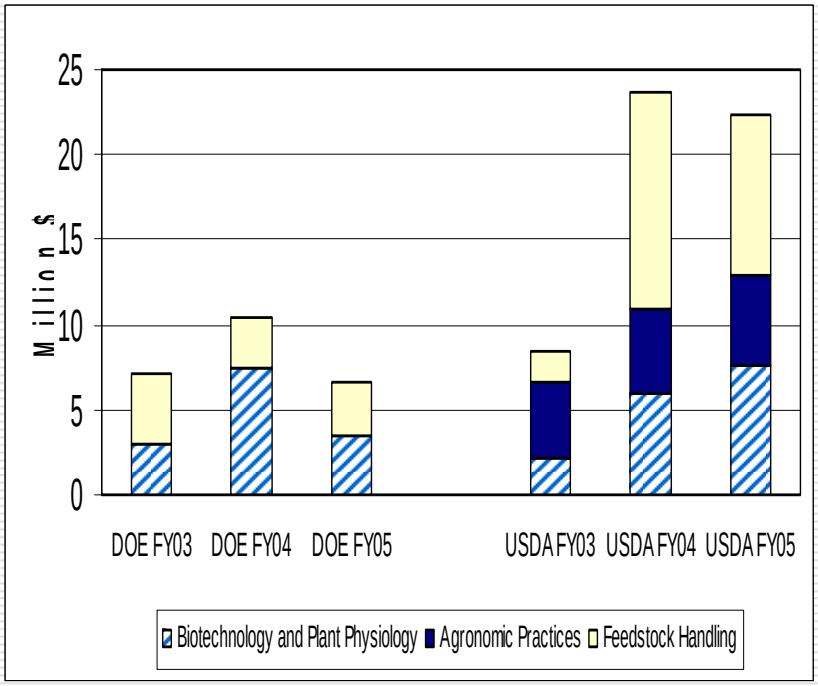


FIG 1

Figure 2: FEEDSTOCKS COMBINED DOE/USDA FUNDING

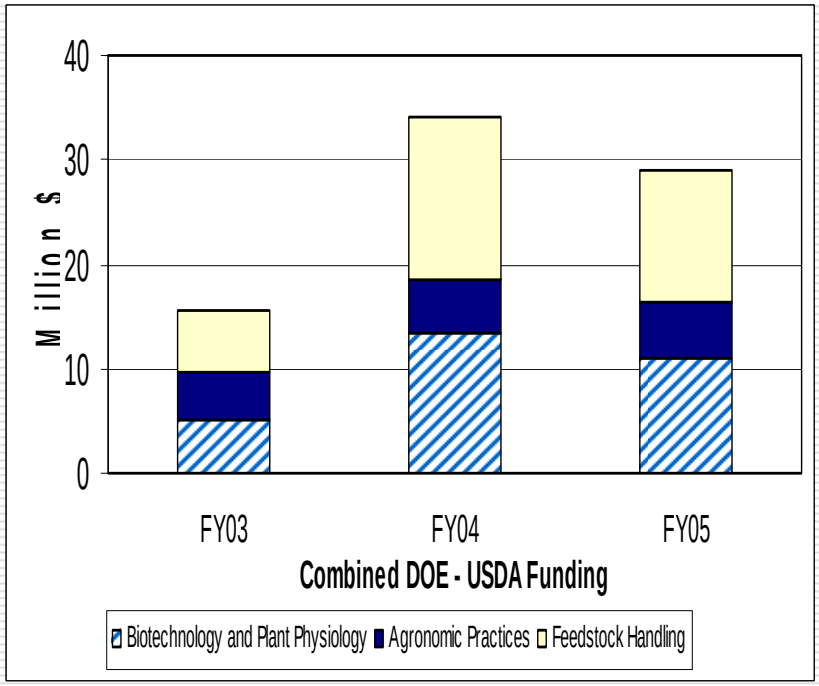


FIG 2

PROCESSING AND CONVERSION ROADMAP CATEGORY

PROCESSING AND CONVERSION

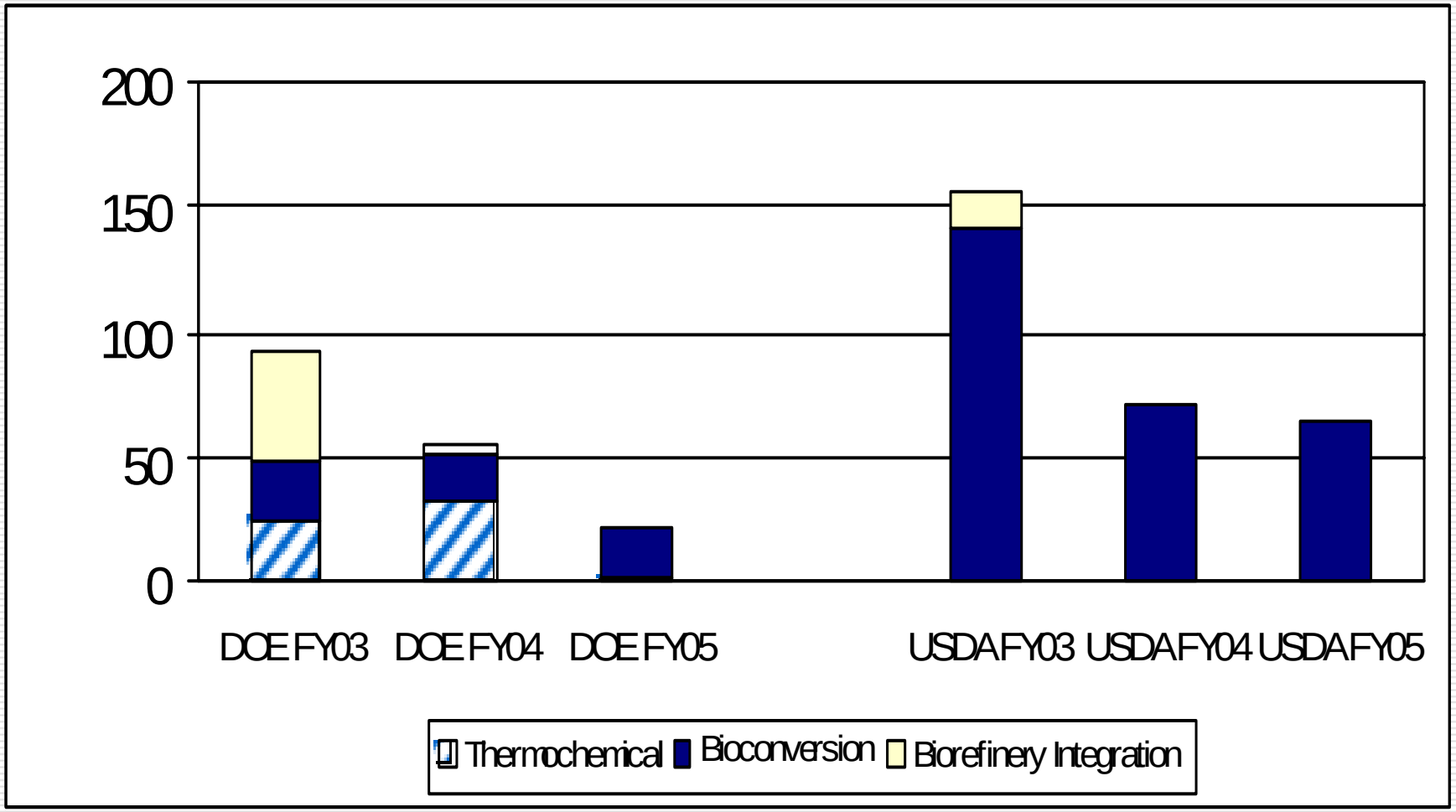
TABLE 2

Roadmap Subcategory	FY03				FY04				FY05 (estimated)				Total FY03-05	
	DOE	USDA	Total	%	DOE	USDA	Total	%	DOE	USDA	Total	%	DOE-USDA	%
A. Thermo-chem Conv. Pathways	**$24,863,500**	**$200,000**	**$25,063,500**	**11**	**$31,618,000**	**$200,000**	**$31,818,011**	**35**	**$2,967,000**	**$200,000**	**$3,167,000**	**4**	**$60,048,511**	**13**
1. Co-firing					$2,500,000	$0	$2,500,000		$0	$0	$0			
2. Direct Combustion					$0	$0	$0		$0	$0	$0			
3. Biomass Gasification					$11,243,000 *($7,758,000)*	$0	$11,243,000		$2,600,000	$0	$2,600,000			
4. Anaero. Ferm						$200,000	$200,000		$0	$200,000	$200,000			
5. Mod. Sys.					$17,875,000	$0	$17,875,000		$0	$0	$0			
6. Other					$0	$0	$0		$367,000	$0	$367,000			
B. Bio-conver.	**$20,464,101** *(3,320,000)*	**$141,521,800**	**$161,985,901**	**62**	**$20,865,000**	**$71,441,462**	**$92,306,462**	**64**	**$17,950,000**	**$63,013,000**	**$80,963,000**	**96**	**$335,255,363**	**69**
1. Phy & Chem Treatment					$8,235,000	$1,432,000	$9,667,000		$1,400,000	$695,700	$2,095,700			
2. Biomass Frac&Sep.Tech					$0	$730,600	$730,600		$3,762,000	$626,000	$4,388,000			
3. Util of Res. Sol. & Liquids					$0	$1,884,700	$1,884,700		$0	$1,884,700	$1,884,700			
4. Chem/Enz Conv. Proc.					$1,930,000	$10,333,362 *($1,894,000)*	$12,263,362		$2,052,000	$8,439,400	$10,491,400			
5. Catalytic and Chem. Conv.					$8,289,000 *($1,996,000)*	$5,168,700	$13,457,700		$1,200,000	$5,168,700	$6,368,700			
6. Inhibitory Sub. in Sugar					$0	$0	$0		$0	$0	$0			
7. Separ. & Purification					$0	$1,819,700	$1,819,700		$0	$1,819,700	$1,819,700			
8. Biomass Ferm.&Hydro					$0	$2,824,900	$2,824,900		$8,133,000	$2,429,800	$10,562,800			
9. Syngas Ferm.					$2,411,000	$0	$2,411,000		$1,403,000	$0	$1,403,000			
10. Other		$77,214,800			$0	$47,247,500	$47,247,500		$0	$41,949,000 *($3,000,000)*	$41,949,000			
C. Bioref. Int	**$45,011,650** *(2,000,000)*	**$13,909,000** *(13,909,000)*	**$58,920,650**	**27**	***$2,000,000***	**$0**	**$2,000,000**	**1**	**$0**	**$0**	**$0**	**0**	**$60,920,650**	**14**
Total	**$90,339,251**	**$155,630,800**	**$245,970,051**	**100**	**$54,483,000**	**$71,641,462**	**$126,124,462**	**100**	**$20,917,000**	**$63,213,000**	**$84,130,000**	**100**	**$456,224,524**	**100**

Italicized amounts are from Biomass Joint Solicitation. B.10 Other: Underlined amounts are from Cooperative State Research Education and Extension Services (CSREES), Rural Development (RD), and Agricultural Research Service (ARS)

PROCESSING AND CONVERSION ROADMAP CATEGORY

Figure 3: PROCESSING AND CONVERSION BY DEPARTMENT



PROCESSING AND CONVERSION ROADMAP CATEGORY

Figure 4: PROCESSING AND CONVERSION COMBINED

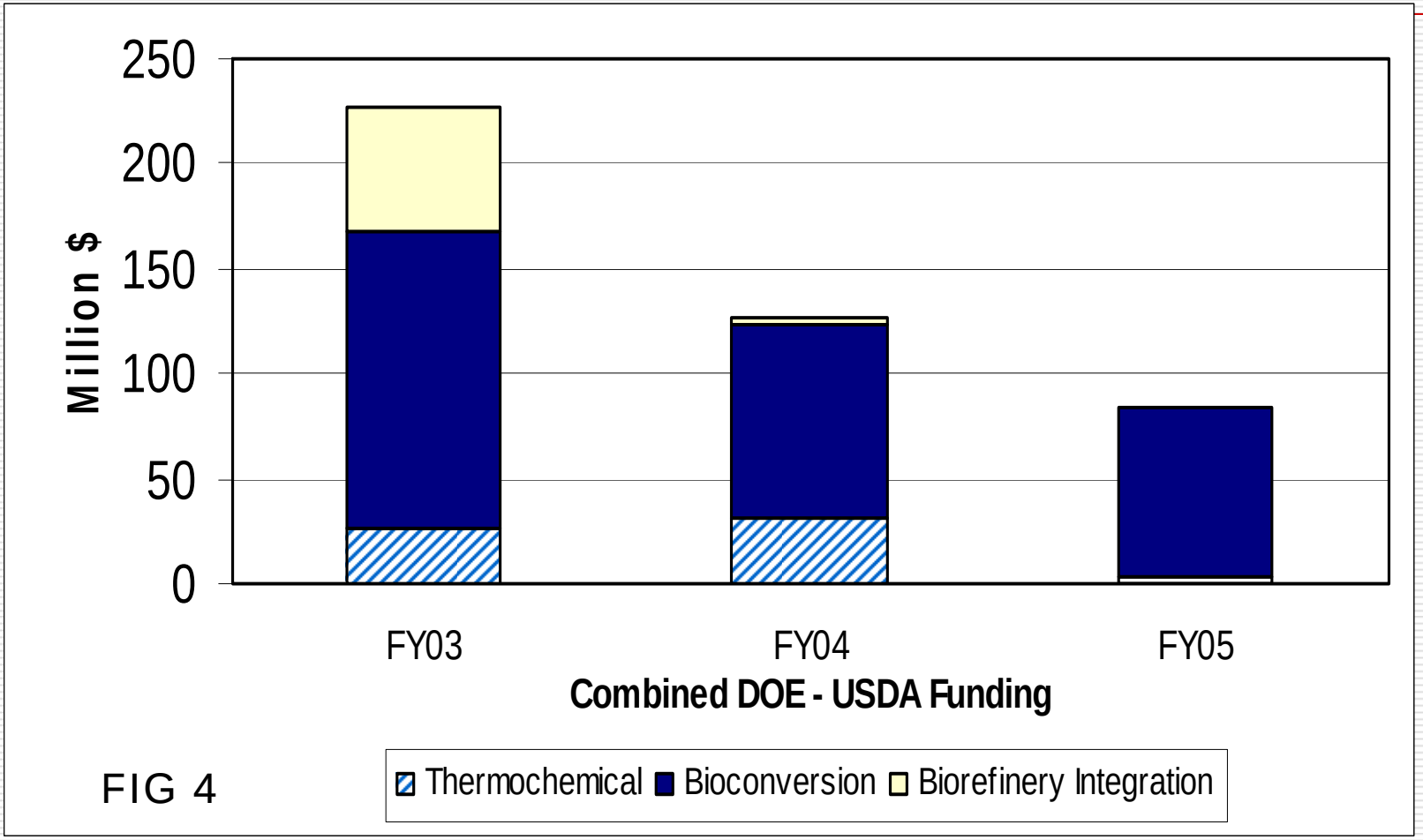


FIG 4

PRODUCT USES AND DISTRIBUTION ROADMAP CATEGORY

TABLE 3

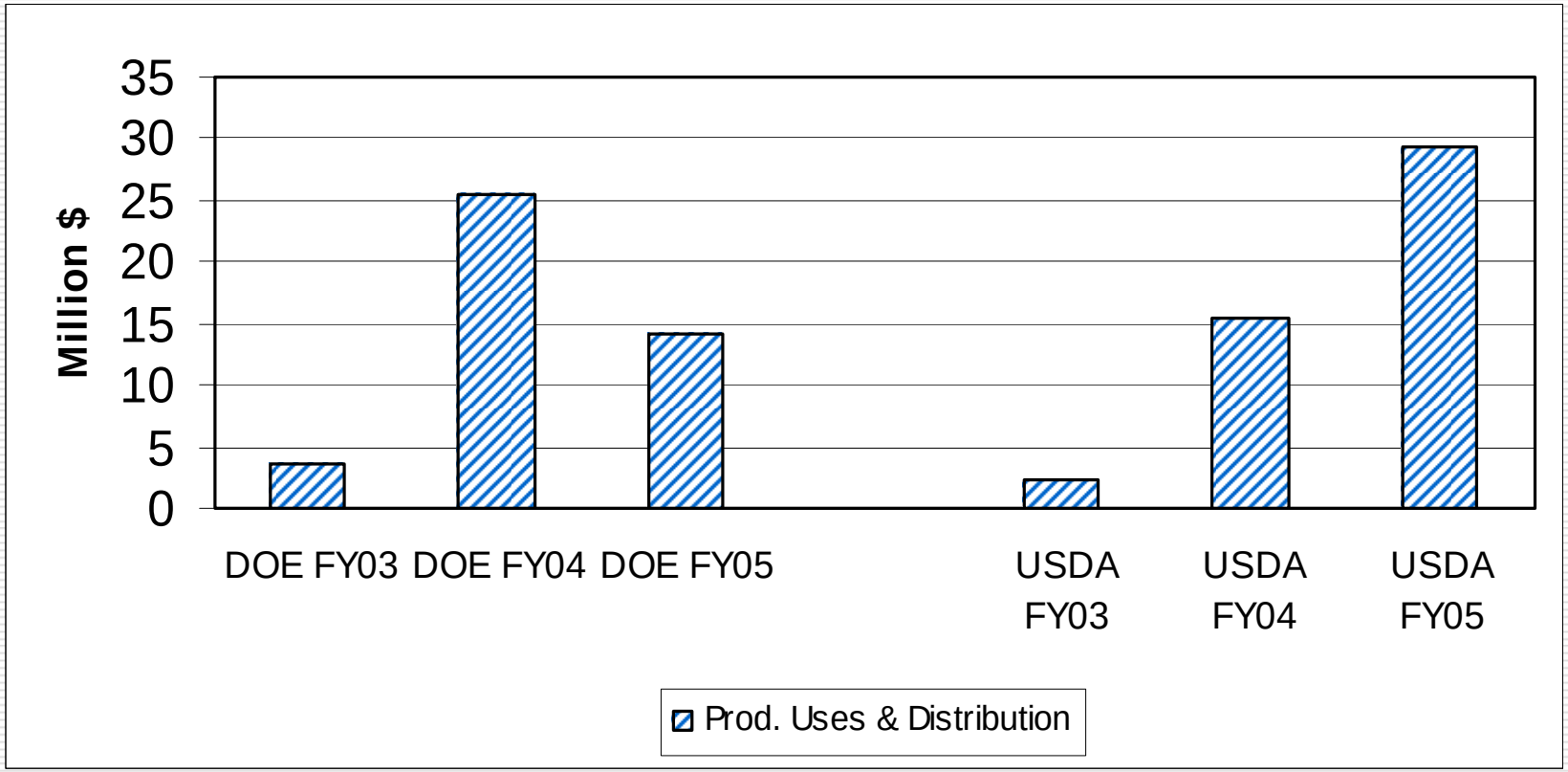
FUNDING IN PRODUCT USES AND DISTRIBUTION

Roadmap Subcategory	FY03				FY04				FY05 (estimated)				Total FY03-05
	DOE	USDA	Total	%	DOE	USDA	Total	%	DOE	USDA	Total	%	DOE-USDA
A. End-Products & Distribution Systems	**$3,587,000**	**$2,228,000**	**$5,815,000**	**100**	**$25,360,000**	**$15,365,417**	**$40,725,417**	**100**	**$14,218,000**	**$15,187,200**	**$29,405,200**	**100**	**$75,945,617**
1. Biofuels Utilization Research					$740,000	$1,268,200 ($503,000)	$2,008,200		$1,656,000	$1,281,800 ($517,000)	$2,937,800		
2. Properties of Biofuels					$5,255,000	$1,729,961 ($965,000)	$6,984,961		$0	$1,751,800 ($987,000)	$1,751,800		
3. Ethanol Distribution in Pipelines					$0	$0	$0		$0	$0	$0		
4. Biorefinery Pilot Plant Demonstration Projects					$19,365,000	($2,441,056)	$21,806,056		$11,089,000	($2,496,000)	$13,585,000		
5. Gasification					$0	$0	$0		$0	$0	$0		
6. Hydrogen					$0	$0	$0		$0	$0	$0		
7. Standards for Biobased Products					$0	$0	$0		$0	$100,000	$100,000		
8. Other					$0	$9,926,200	$9,926,200		$1,473,000	$9,557,600	$11,030,600		
Total	**$3,587,000**	**$2,228,000**	**$5,815,000**	**100**	**$25,360,000**	**$15,365,417**	**$40,725,417**	**100**	**$14,218,000**	**$15,187,200**	**$29,405,200**		**$75,945,617**

Note: Italicized amounts are from Biomass Joint Solicitation.

PRODUCT USES AND DISTRIBUTION ROADMAP CATEGORY

Figure 5: PRODUCT USES AND DISTRIBUTION BY DEPARTMENT



PRODUCT USES AND DISTRIBUTION ROADMAP CATEGORY

Figure 6: PRODUCT USES AND DISTRIBUTION COMBINED

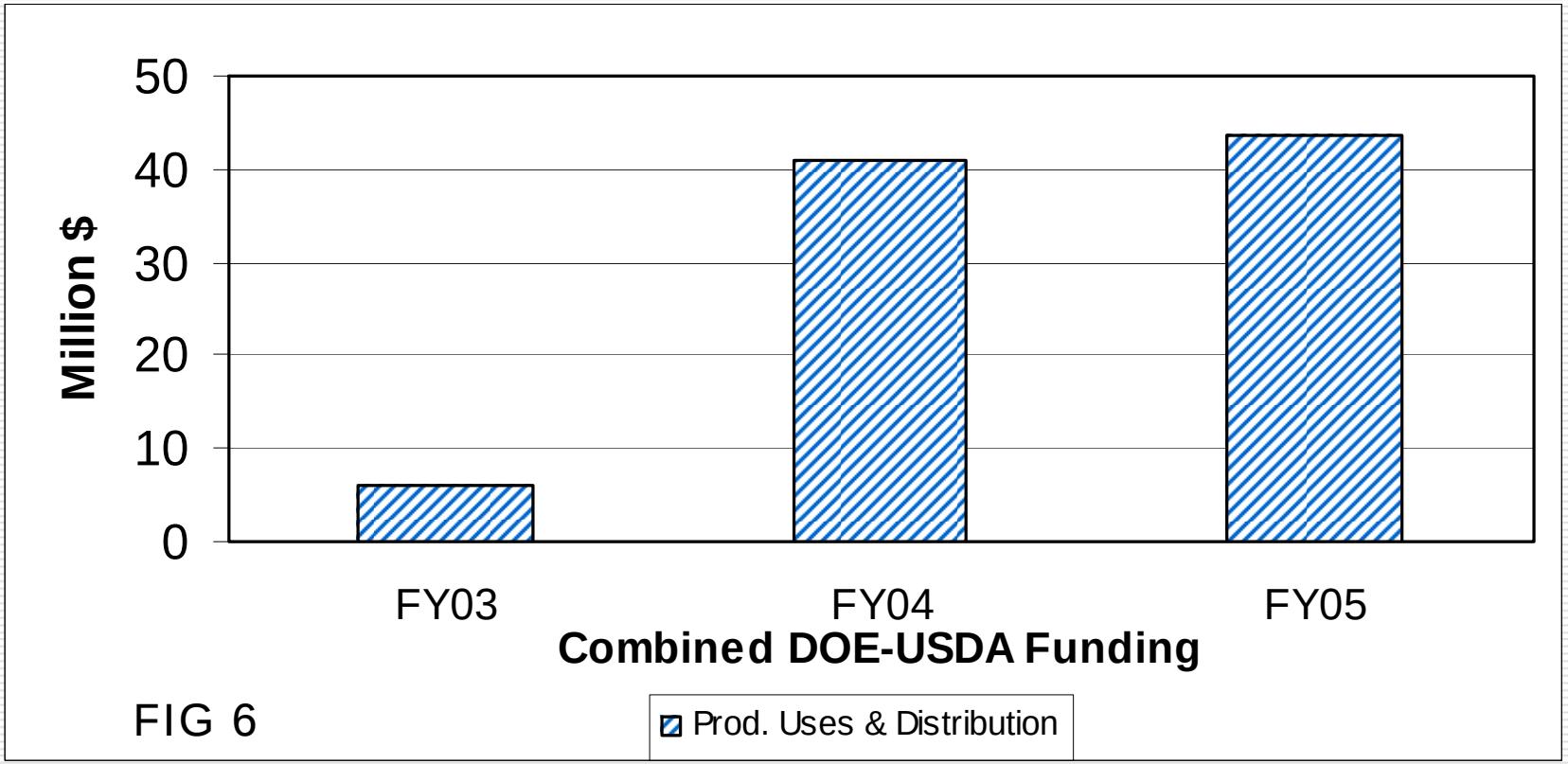


FIG 6

PUBLIC POLICY TO SUPPORT BIOMASS DEVELOPMENT ROADMAP CATEGORY

PUBLIC POLICY MEASURES TO SUPPORT BIOMASS DEVELOPMENT **TABLE 4**

Roadmap Subcategory	FY03				FY04				FY05 (estimated)				Total FY03-05	
	DOE	USDA	Total	%	DOE	USDA	Total	%	DOE	USDA	Total	%		%
A. Economic Analysis	$4,514,691	$250,000	$4,764,691	15	$6,363,000	$700,000 *($450, 000)*	$7,063,000	4	$4,300,000	$687,000 ($437,000)	$4,987,000	4	$16,814,691	4
B. Life Cycle Assessment	$0	$0	$0	0	$445,000	$0	$445,000	1	$200,000	$0	$200,000	0	$645,000	0
C. Procurement and Markets	$100,000	$250,000	$350,000	3.1	$0	$250,000	$250,000	0	$0	$250,000	$250,000	0	$850,000	0
D. Regulatory Measures	$0	$1,000,000	$1,000,000	0	$0	$1,169,000	$1,169,000	0	$500,000	$2,969,000	$3,469,000	3	$5,638,000	1.2
E. Incentives	$0	$147,211,000	$147,211,000	68	$0	$150,000,000	$150,000,000	91	$0	$100,000,000	$100,000,000	84	$397,211,000	90
F. Biomass Resource Supply	$0	$0	$0	0	$0	($241,933)	$241,933	0	$0	$7,889,000 ($1,363,00)	$7,889,000	7	$8,130,933	2
G. Education and Outreach	$3,865,000	$1,000,000	$4,865,000	14	$1,556,000	($3,397,711)	$4,953,711	3	$0	$2,200,000 ($1,200,000)	$2,200,000	2	$12,018,711	3
H. R&D Investment	$0	$0	$0	0	$2,223,000	$0	$2,223,000	1	$0	$0	$0	0	$2,223,000	
Total	$8,479,691	$149,711,000	$158,190,691	100	$10,587,000	$155,758,644	$166,345,644	100	$5,000,000	$113,995,000	$118,995,000	100	$443,531,335	100

Italicized amounts are from Biomass Joint Solicitation $$$. E. Incentives: underlined amounts are for the Farm Service Agency biomass utilization incentives program.

PUBLIC POLICY ROADMAP CATEGORY - DOE

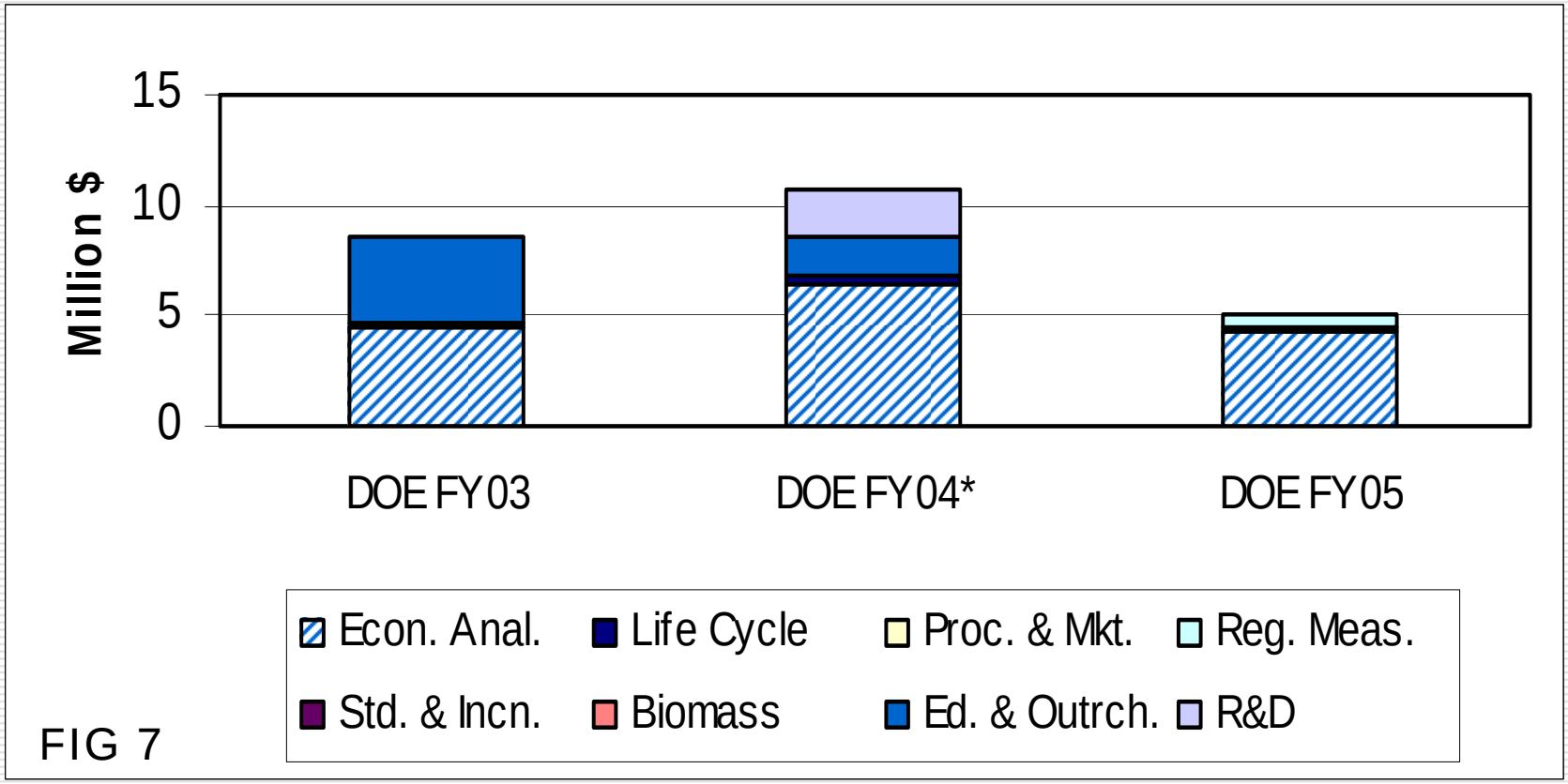


FIG 7

PUBLIC POLICY ROADMAP CATEGORY - USDA

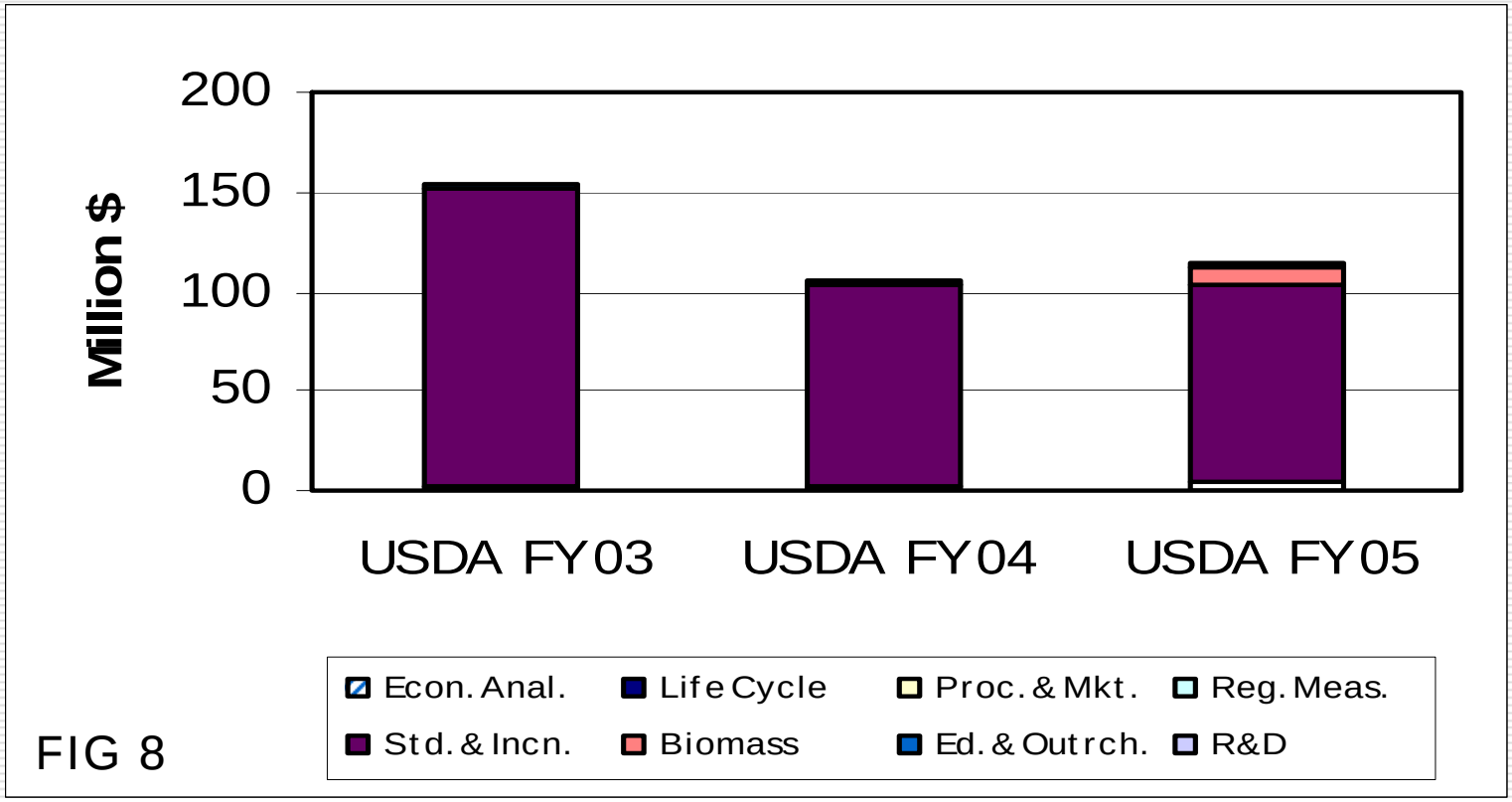


FIG 8

PUBLIC POLICY ROADMAP CATEGORY – COMBINED FUNDING

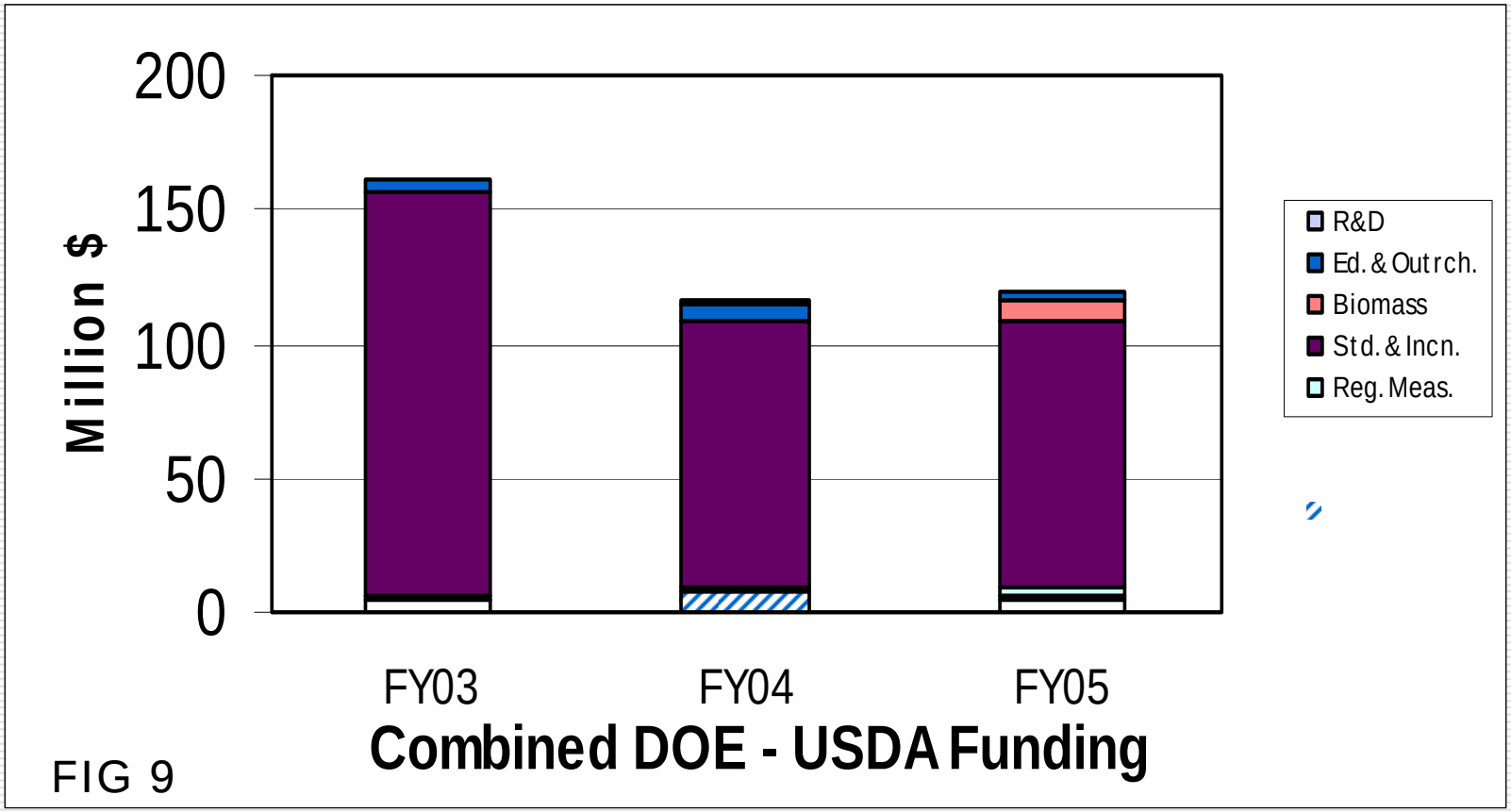


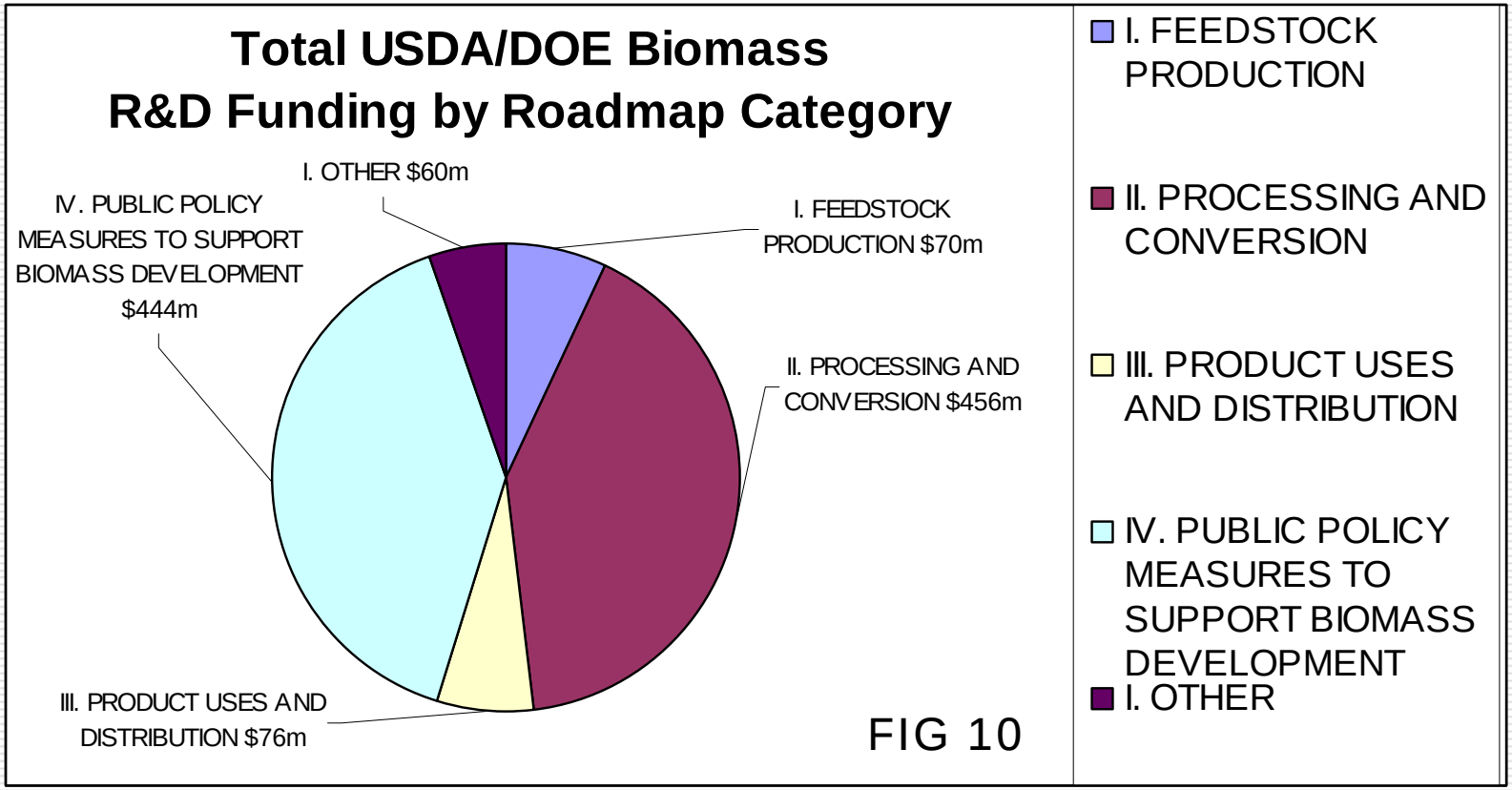
FIG 9

Total Funding by Roadmap Category
USDA / DOE FY03-05

TABLE 5

ROADMAP CATEGORY	DOE				USDA					
	Final FY03 Budget (K$)	Final FY04 Budget (K$)	Final FY05 est. Budget (K$)	DOE FY03-05 Budget (K$)	Final FY03 Budget (K$)	Final FY04 Budget (K$)	Final FY05 est. Budget (K$)	USDA FY03-05 Budget (K$)	TOTAL Budget (K$)	%
I. FEEDSTOCK PRODUCTION	$7,216	$10,504	$6,642	$24,362	$8,363	$23,498	$22,283	$54,144	**$78,506**	7
II. PROCESSING AND CONVERSION	$90,340	$54,483	$20,917	$165,740	$155,631	$71,643	$63,214	$290,488	**$456,228**	41
III. PRODUCT USES AND DISTRIBUTION	$3,587	$25,630	$14,218	$43,435	$2,228	$15,365	$15,187	$32,780	**$76,215**	7
IV. PUBLIC POLICY MEASURES TO SUPPORT BIOMASS DEVELOPMENT	$8,479	$10,587	$5,000	$24,066	$149,711	$155,759	$113,995	$419,465	**$443,531**	40
V. Other	$20,638	$0	$34,500	$55,138	$2,288	$1,000	$1,100	$4,388	**$59,526**	5
TOTAL	**$130,260**	**$101,204**	**$81,277**	**$312,741**	**$318,221**	**$267,265**	**$215,779**	**$801,265**	**$1,114,006**	**100**
Joint Solicitaion	$7,197	$12,307		$19,504	$16,606	$14,050	$14,000	$44,656		
Earmarks	$29,500	$41,810		$71,310	$0	$0	$0	$0		

Figure 10: TOTAL USDA/DOE BIOMASS R&D FUNDING BY ROADMAP CATEGORY



Roadmap Categories

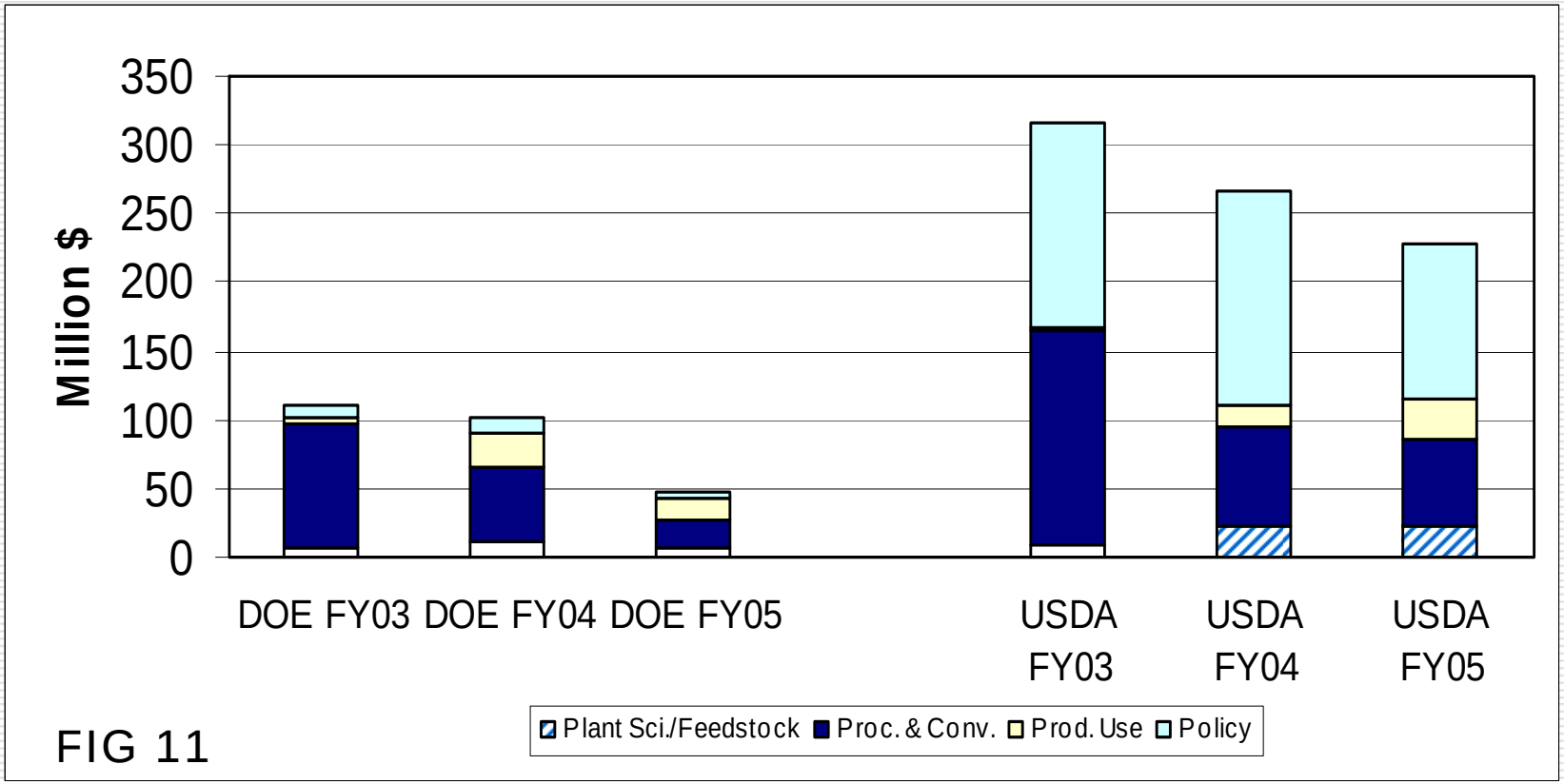


FIG 11

Roadmap Categories – Combined Funding

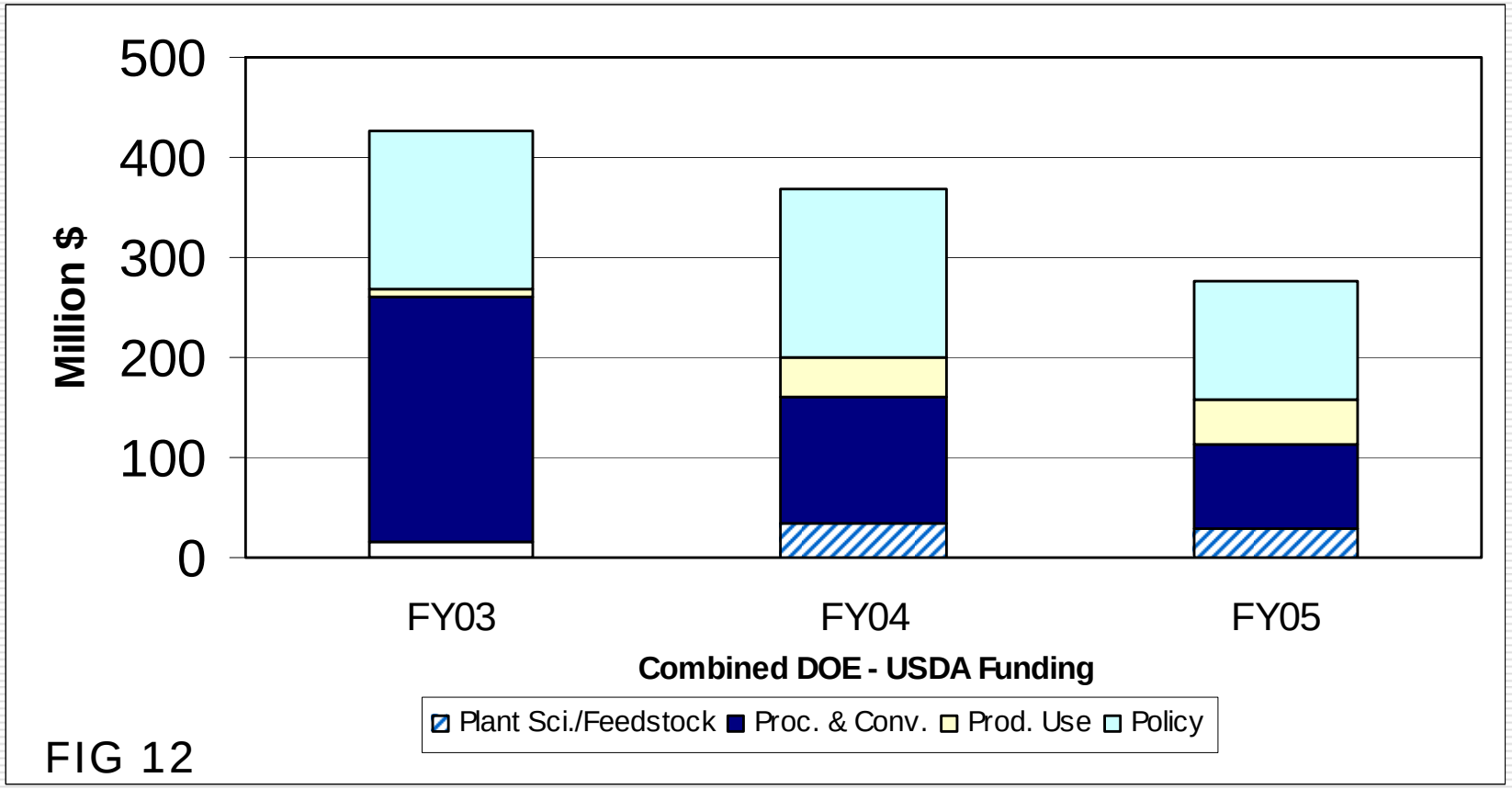


FIG 12

USDA/DOE PORTFOLIO ANAYLSIS

- What are the technical topics if any for the FY05 Joint Solicitation projects
  - USDA – Included in FY05
    - 1- Biobased Products (Healthy Forest Init.)
    - 2- Forest Training (Healthy Forest Init.)
  - DOE – Not included in FY05

USDA/DOE PORTFOLIO ANAYLSIS

Future Updates:

- Consistent format to update the committee :
  - USDA and DOE portfolio information
  - Status of R&D projects funded under joint solicitation
  - Status of progress on achieving vision goals

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- Discussion ...