

**Summary:**

**Biomass Research & Development  
Technical Advisory Committee  
Meeting  
March 17, 2005**

**May 9, 2005**

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Attachment A: Draft 2005 Committee Work Plan

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Attachment E: Presentation on 2005 Joint Solicitation Status

Attachment F: Presentation on Quarterly USDA/DOE Portfolio Evaluation Document

Attachment G: USDA/DOE Portfolio Evaluation Document Template

Attachment H: Presentation on DOE FY 2006 Budget and Program Impacts

Attachment I: Presentation on USDA FY 2006 Budget and Program Impacts

## **Meeting Summary**

### **A. Purpose**

On March 17, 2005, a Biomass Research and Development Technical Advisory Committee (Committee) meeting was held at the Radisson Hotel Old Town Alexandria in Alexandria, VA. 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 first Committee meeting held during the 2005 calendar year. The Committee members came to the meeting to hear presentations on the US Department of Agriculture (USDA) and Department of Energy (DOE) Billion Ton Feedstocks Study, the status of the FY 2002 joint solicitation projects, the status of the FY 2005 joint solicitation, and on the FY 2005 budget and its impacts to USDA and DOE programs. The Committee also reviewed and modified its 2005 work plan and the quarterly portfolio evaluation document.

### **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.

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

Don Richardson, Designated Federal Officer, welcomed all to the meeting. Mr. Richardson gave a status update on the FY 2003 and FY 2004 Annual Reports to Congress. The FY 2003 report was approved and sent to Congress in March 2005. The FY 2004 report is currently being reviewed by USDA and DOE. Mr. Richardson also announced that the Committee's Charter had been reestablished. No major changes were made to the charter.

Don Richardson provided the Committee with information on the USDA Agricultural Air Quality Task Force (AAQTF). This information was in response to the Committee's request at the September 2004 meeting for the identification of other Federal Advisory Committees of interest, particularly in the area of climate change as it relates to biomass. Staff will attempt to have a member of the AAQTF speak to the Committee at a future meeting.

Don Richardson informed the Committee of the upcoming International Biorefinery Workshop. The workshop will be held in Washington, DC on July 20-21, 2005.

Don Richardson informed the Committee that DOE will manage the upcoming FY 2006 joint solicitation. DOE would like to release the solicitation earlier than in past years, potentially as early as the summer of 2005. It was discussed that, should this be the case, staff will need to get the Committee's recommendations on the FY 2006 joint solicitation process and technical topic areas prior to the end of the year as is usually done.

Merlin Bartz of USDA gave a brief update on the status of USDA's final rule on the Federal procurement of biobased products and on the designation of biobased products. Mr. Bartz explained that the rule has not yet been finalized, and that he therefore is not permitted to give extensive detail on it at this time. The Committee will receive a full update on the rule once it is finalized. Several Committee members expressed frustration over the time it has taken to get the rule finalized. William Horan explained that he understands the need to test and designate specific products as biobased, but that civilians have been buying biobased products for years and the government should be doing the same. Kim Kristoff believes the problem is the lack of direction at the federal level regarding the training of federal purchasing agents who do not believe that there is a need to purchase biobased products. Mr. Bartz replied that USDA has been tasked with creating a rule that covers the entire federal government, not just one agency, so the job is more difficult. Bob Boeding asked if turning to Congress for acceleration of rule would be helpful. Chairman Ewing replied that everyone should feel free to contact Congress, and that the problem is that USDA has not gotten the job done. Mr. Kristoff asked if there was a specific problem holding up the rule. Mr. Bartz responded that he is not in a position to provide that information.

Don Richardson announced that those members whose terms expired in November 2004 have been granted six month membership extensions that begin in March 2005.

Don Richardson announced that the Committee will have two new points of contact as a result of reorganization of management at DOE and USDA. The new points of contact have not yet been identified.

#### **D. Review and Discussion of 2005 Work Plan**

Don Richardson referred the Committee to the draft 2005 Work Plan contained in their reference materials. The draft work plan contains future meeting topics such as USDA's biobased products procurement rule, an update from the DOE national laboratories on R&D work, and the reevaluation of *Vision* goals, amongst others. He asked the Committee to review the document, and then give comments or suggested changes as soon as possible.

William Nicholson asked if a change in *Vision* targets implied a change in the *Vision* document. Mr. Richardson replied that if the language in the *Vision* directly supports the specific targets given, yes.

Larry Walker advised the Committee that the *Vision* targets are referenced in other, non-related documents, and that the Committee should consider whether or not they still want to stand by those targets.

Philip Shane asked for an update on the tracking of the targets. Mr. Richardson replied that the tracking document will be updated and will be provided to the Committee prior to the next meeting at which the targets are to be discussed.

Bob Boeding suggested the Committee prioritize the items on the work plan. Mr. Boeding's two priorities were the USDA update on the federal procurement of biobased products ruling and the development of recommendations on the FY 2006 joint solicitation process and technical topic areas. David Morris responded that the Committee has submitted a formal request to USDA on the biobased products rule, so it therefore does not need to be a meeting topic, but USDA just needs to provide the information.

Mr. Walker pointed out that if Committee recommendations on the FY 2006 joint solicitation are to be a priority, the meeting needs to be held prior to June or July. The Committee agreed.

#### **E. Presentation on USDA/DOE Billion Ton Feedstock Study**

Bryce Stokes of USDA and Lynn Wright and Bob Perlack of the Oak Ridge National Laboratory (ORNL) gave a presentation on the USDA/DOE *Billion-Ton Feedstock Supply for a Bioenergy and Bioproducts Industry* study. The Billion-Ton study analyzes the amount of biomass feedstock that would be required to reduce the U.S.'s petroleum consumption by 30 percent, and determined that the U.S. is capable of producing enough biomass feedstock (one billion dry tons annually) to do so.

David Morris asked what made this study different from similar studies conducted. He asked whether or not the numbers were different from other studies, and if so, what those differences were. Mr. Stokes replied that more categories of biomass were analyzed (fuel thinnings for example) and that future projections in wood use were used. Ms. Wright explained that the baseline was done with an unpublished, updated analysis; that all types of biomass were examined whereas most studies only focus on specific feedstocks; and that multiple scenarios were used.

Del Raymond asked if the forest portion of the study just looked at available dry tons. Mr. Stokes answered that it did. Mr. Raymond replied that the study should recognize that more is available.

William Nicholson asked if potential changes in land use were taken into account. Mr. Stokes replied that the issue was not considered in the forest portion, but that agriculture portion did address potential land use changes. Mr. Nicholson asked if the study utilized existing policies, to which Mr. Stokes responded that it did.

William Horan asked if resistance from the environmental community, regarding issues such as road building for access to forest-based biomass and habitat destruction, would prevent the material accounted for in the study from actually being recovered. Mr. Stokes responded that the data in the study is a conservative estimate to account for issues such as the one raised. It was taken into consideration that no new roads would be built. When conducting this study, the authors tried not to take policy limitations into account, only technical limitations. It has been discussed that a second phase of the study would address policy issues. Fred Deneke from the US Forest Service replied that the

study excludes all road-less wild lands, and that support is beginning to build for habitat thinning due to the threat of fire.

Mr. Horan asked if any energy balance studies were being conducted in relation to this study. Mr. Stokes responded that energy balance studies had been conducted in three areas: solid wood products, short rotation woody crops, and energy inputs for the removal of biomass.

Mr. Raymond asked if genetic improvements were taken into account. Mr. Stokes responded that they were discussed, but were not a major factor in the analysis.

Chairman Ewing asked for clarification regarding whether or not the study covers the amount of feedstock currently available or the amount of feedstock currently being used. Mr. Stokes explained that the study analyzes both.

Vice Chair Jaffoni asked for a description of how the biomass is being used (referring to the figure stating that one-fifth of total biomass available is currently being used). Mr. Perlack responded that ethanol accounts for about half, and that power generation and biobased products make up the remainder.

Larry Walker asked if sustainability is addressed in the study. Ms. Wright replied that projections of the amount of biomass expected to be available in the future were consulted. Mr. Walker expressed concern over the 2040-2050 timeframe in which to reach the potential yields claimed in the study.

Ms. Wright discussed the issues of population growth and technology changes in other countries and their consideration in the study with the Committee.

#### **F. Presentation on 2002 Joint Solicitation Projects Update**

Prior to the presentation, Merlin Bartz with USDA informed the Committee that Bryce Stokes is the new chair of the USDA Biobased Products and Bioenergy Coordination Council (BBCC). Mr. Bartz also handed out a USDA Secretary memo on the biobased products procurement rule.

Kevin Craig, with the DOE Golden Office, and Mr. Bartz gave a presentation on the status of the FY 2002 joint solicitation projects. Mr. Craig presented on the six DOE biorefinery projects. Mr. Bartz invited two members of the Iowa Corn Promotion Board to give an update on the two USDA projects.

David Morris noted that some of the FY 2002 joint solicitation project completion dates have passed and asked whether or not final reports on the projects are available. Mr. Craig responded that all of the DOE projects are still in progress. Mr. Bartz responded that he believes that the two USDA project awardees have asked for non-monetary extensions. Mr. Morris asked if any information from the FY 2002 projects is available. Mr. Craig replied that program monthly and quarterly reports may provide some

information, but that the best source will be the November 2005 DOE Office of the Biomass Program Review. Mr. Morris noted that some of the FY 2003 USDA projects are also nearing completion and asked if the Committee could receive a final report on those projects.

Robert Dorsch clarified a point regarding the DOE DuPont biorefinery project. The Integrated Corn Biorefinery project and the Tate and Lyle joint venture are two separate activities. William Horan asked whether or not more plants would result from the project. Mr. Dorsch replied that DuPont hopes so, as the market for corn-based fabrics is expanding.

#### **G. Information Update on 2525 Vision**

William Horan introduced the *2525 Vision*, explaining that the goal is to achieve a 25 percent renewable energy supply by the year 2025. Mr. Horan introduced Ernie Shea, a member of the project steering committee for the Ag Energy Work Group, who developed the *2525 Vision*. More information about the *2525 Vision* may be found at [www.agenergy.info](http://www.agenergy.info).

David Morris said that the initiative is worthwhile because it involves farmers and addresses both biomass and wind energy. Mr. Morris suggested that the Committee develop a renewable energy standard, instead of an ethanol or biodiesel mandate, that supports farmer-ownership of the process. Mr. Shay responded that the 2525 group has had some discussions on policy standards, but has not released a public action plan so as to not get ahead of the farmers. The group does, however, recognize that farmers are interested because it directly affects them.

Chairman Ewing, Mr. Shea, and Larry Walker discussed the various groups involved in the 2525 initiative. Most participants are agricultural producers, with land grant representatives also participating. The group plans to involve private industry, non-profits, and federal and state governments in the next stage to develop an implementation plan.

The Committee broke for lunch.

#### **H. Closed Session**

The Committee met for a closed session.

#### **I. Update on 2005 Joint Solicitation Status**

Glenn Carpenter, with USDA, gave the status on the FY 2005 joint solicitation. Mr. Carpenter explained what the Departments hope to achieve with the solicitation; described the technical topic areas included in the Request For Proposal (RFP); explained the proposal evaluation criteria; and informed the Committee of how many pre-

applications were received, how many would be asked to submit full applications, and presented the timeline for full application review and announcement of awardees.

Larry Walker asked whether or not the Committee's *Roadmap* was addressed during pre-application selection. Mr. Carpenter replied that the *Roadmap* was referenced in the RFP and consulted throughout the solicitation process.

William Carlson, Mr. Carpenter, and Merlin Bartz discussed the USDA programmatic factors that were applied to the solicitation.

William Nicholson suggested showing the basis for the claims made in the RFP.

Kim Kristoff asked whether or not the awards granted have to meet the amounts actually requested. Mr. Carpenter said that it depends on the project and how much the Departments decide to award. Don Richardson replied that the technical reviewers do not see the budget numbers, so they do not influence the amount spent on each project. Mr. Nicholson said he did not see this as a problem as long as the reviewers have information about projects funded and amounts granted in the past. David Morris disagreed, stating that the reviewers should be provided with budget information.

Mr. Nicholson, William Horan, and Mr. Walker discussed the number of proposals received. Mr. Walker believed that the large number of proposals received may not be a negative issue. Mr. Nicholson suggested that making technical topic areas more focused may help reduce the number of proposals received. Mr. Horan stated that the number of proposals submitted will probably not be reduced simply by focusing the RFP more narrowly.

#### **J. Presentation on Quarterly USDA/DOE Portfolio Evaluation Document**

Michael Manella, with BCS, Incorporated, gave a presentation on the revised template for the USDA/DOE portfolio evaluation document. The document organizes USDA and DOE biomass projects by *Roadmap* category, DOE work breakdown structure number, and USDA agency. It identifies Departmental efforts to overcome R&D challenges identified in the *Roadmap*, and illustrates Departmental progress in meeting *Roadmap* objectives.

Vice Chair Jaffoni complimented Mr. Manella and the subcommittee who generated the document.

William Nicholson suggested that it may be useful to categorize the projects in the template as research projects, development projects, and demonstration projects. Del Raymond suggested that the stage gate process could be applied.

Vice Chair Jaffoni asked whether or not it would be possible to attach appending documents to provide more detail than what is included in the template. Mr. Manella replied that it could be done. Vice Chair Jaffoni replied that the document is most useful

as it is; it provides high level information with supplemental information to back it up. Too much more information would weigh the purpose of the document down.

The Committee accepted the document as it is with no adjustments.

#### **K. Presentation on FY 2006 Budget and Program Impacts**

John Ferrell of DOE and Merlin Bartz of USDA gave presentations on FY 2006 budgets and the effects they have on the programs. Specifically, the DOE presentation covered FY 2006 budget requests, key activities in each budget area, and compared FY 2006 requests to FY 2005 actual appropriations. The USDA presentation showed estimated biomass-related funding based on the President's FY 2006 budget in each USDA agency that conducts biomass work.

#### **L. Discussion of Topics for Next Meeting**

Chairman Ewing asked for input on the topics listed in the work plan for the next meeting.

William Nicholson discussed the agenda item on reevaluating the *Vision* targets. He acknowledged that the document detailing the nation's progress in meeting the targets needs to be updated, but said that it would be helpful to have a detailed transparent analysis with supporting data rather than just updated numbers.

William Carlson suggested analyzing the relationship between the R&D priorities and the Billion Ton study. Larry Walker replied that the Billion Ton study shows positive potential, and that the question that needs to be asked is whether or not the current R&D is working towards achievement of that potential.

Mr. Nicholson, Kim Kristoff, Merlin Bartz, Philip Shane, and Terry Jaffoni discussed the barriers to the use of liquid biomass fuels. Mr. Kristoff pointed out that, even in ethanol states, ethanol is being sold to petroleum companies as an additive, not as a fuel. Ms. Jaffoni pointed out that New York has made the switch to ethanol additives due to the MTBE ban, but that New Jersey and Pennsylvania are still using MTBE.

#### **M. Public Comment**

There was no public comment.

#### **N. Adjournment**

Chairman Ewing thanked the Committee for being present and adjourned the meeting.

**ADDENDUM A**

**Biomass Research and Development Technical Advisory Committee Meeting  
March 17, 2 005**

**ATTENDEES**

**Committee Members Present**

Tom Ewing, Chair  
Terry Jaffoni, Vice-chair  
Roger Beachy  
Tom Binder  
Robert Boeding  
Jerrel Branson  
William Carlson  
Robert Dorsch  
William Horan

Kim Kristoff  
David Morris  
Bill Nicholson  
Gary Pearl  
Delmar Raymond  
Philip Shane  
Larry Walker

**Committee Members Not Present**

Wayne Barrier  
Ralph Cavalieri  
Joseph Chapman  
Roger Fragua  
Carolyn Fritz  
Charles Goodman

Pat Gruber  
William Guyker  
John Hickman  
Jack Huttner  
William Richards  
John Wootten

**Federal Employees Present**

Merlin Bartz - USDA  
Mike Kossey – USDA  
Glen Carpenter – USDA  
Bryce Stokes – USDA  
Fred Deneke – USDA  
Sharon Ashurst – USDA  
Paula Geiger – USDA  
Don Erbach – USDA

Will Woodfield – USDA  
Melissa Klembara - DOE  
John Ferrell - DOE  
Lynn Wright - ORNL  
Kevin Craig – DOE GFO  
John Stewart - DOI  
Bob Perlack - ORNL  
Doug Kaempf - DOE

Total Public Attendees – 15

Total Attendees – 44

Designated Federal Officer – Don Richardson

## **ADDENDUM B**

Public Meeting of the  
Biomass R&D Technical Advisory Committee  
March 17, 2005  
Radisson Hotel Old Town Alexandria  
901 North Fairfax Street  
Alexandria, VA 22314  
703-683-6000

### **Previous decisions or actions related to this agenda:**

At the September 29, 2004 meeting, the Committee heard presentations on USDA and DOE program direction and portfolio analysis. As a result, the Committee requested that the agencies begin providing quarterly updates on project portfolios. The Committee also finalized its 2004 Recommendations to the Secretaries of Agriculture and Energy on the Joint Solicitation process, the agencies' portfolios as they relate to the *Vision and Roadmap*, and the 2005 Joint Solicitation technical topic areas. Finally, the Committee brainstormed topics for inclusion in the 2005 Work Plan.

### **The Committee will receive the following documents at today's meeting:**

- 2005 Committee Work Plan
- USDA/DOE Billion Ton Feedstock Paper
- Proposed Quarterly USDA and DOE Portfolio Evaluation Document
- 2002 Joint Solicitation Projects Updated Matrix and Selected Fact Sheets

### **Description of subjects for this meeting:**

The agenda for today's meeting will address the Committee's request for the following items:

- An updateable document highlighting the USDA and DOE project portfolios
- An update on FY 2002 Joint Solicitation projects
- Information on program budgets

Specifically the Committee will:

- Review and modify (if needed) the 2005 Committee Work Plan
- Receive a briefing on new membership requirements (*closed session*)
- Hear a presentation on the USDA/DOE Billion Ton Feedstocks Study
- Hear a presentation on the development of the Quarterly Portfolio Evaluation document
- Hear a presentation on the status of the FY 2002 Joint Solicitation projects
- Receive an update on the status of the FY 2005 Joint Solicitation
- Hear a presentation on the FY 2005 Presidential Budget and Impacts on the Programs

## Agenda

- 8:00 – 8:30 Continental Breakfast
- 8:30 – 8:45 Welcome and Overview of the 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*
- Status of 2003 Annual Report
  - Status of 2004 Recommendations
  - Updated Charter Status
  - Identification of other Federal Advisory Committees of interest
  - First International Biorefinery Workshop
  - Status of FY 2006 Joint Solicitation
  - Update on Federal Procurement of Biobased Products presentation
- 9:15 – 9:30 Review and Discussion of 2005 Work Plan – *Don Richardson, Designated Federal Officer*
- 9:30 – 10:30 Presentation on USDA/DOE Billion Ton Feedstock Study – *Bryce Stokes, USDA and Bob Perlack and Lynn Wright, Oak Ridge National Laboratory* and Discussion – *Tom Ewing, Committee Chair*
- 10:30 – 10:45 Break
- 10:45 – 11:45 Presentation on 2002 Joint Solicitation Projects Update – *Kevin Craig, DOE and Merlin Bartz, USDA* and Discussion – *Tom Ewing, Committee Chair*
- 11:45 – 12:00 Information update on 2525 – *Bill Horan, Horan Brothers Agriculture/Biomass R&D Technical Advisory Committee*
- 12:00 – 1:00 Lunch
- 1:00 – 2:10 Discussion of New SGE Rules, Requirements, and Procedures – *Don Richardson, Designated Federal Officer* – **Closed Session**
- 2:10 – 2:40 Update on 2005 Joint Solicitation Status – *Glenn Carpenter, USDA*

- 2:40 – 3:00 Presentation on Quarterly USDA/DOE Portfolio Evaluation document – *Mike Manella, BCS, Incorporated* and Discussion – *Terry Jaffoni, Committee Co-Chair*
- 3:00 – 3:15 Break
- 3:15 – 4:30 Presentation on FY 2006 Budget and Program Impacts – *John Ferrell, DOE and Merlin Bartz, USDA* and Discussion – *Tom Ewing, Committee Chair*
- 4:30 – 4:45 Discussion of Topics for Next Meeting – *Tom Ewing, Committee Chair*
- Update on OBP’s Deployment Efforts
  - Update on USDA’s Federal Procurement of Biobased Products
  - Presentations from DOE National Laboratories
  - Revision of *Vision* goals
  - Reminder to come prepared to develop recommendations on FY 2006 Joint Solicitation process
  - Other topics
  - Timing conflicts in June/July for scheduling of next meeting
- 4:45 Adjourn

## **2005 WORK PLAN**

### **BIOMASS R&D TECHNICAL ADVISORY COMMITTEE**

#### **BACKGROUND**

The Biomass Technical Advisory Committee, in its advisory capacity, is chartered to provide the following to the Secretaries of Agriculture and Energy and their points-of-contact (the Under Secretary for Natural Resources and Environment, U.S. Department of Agriculture and the Assistant Secretary for Energy Efficiency and Renewable Energy, Department of Energy):

- Advice on the technical focus and direction of requests for proposals issued under the Biomass Research and Development Initiative (Initiative), and
- Advice on the procedures for reviewing and evaluating the proposals.

The Committee shall also:

- Facilitate consultations and partnerships among Federal and State agencies, agricultural producers, industry, consumers, the research community, and other interested groups to carry out program activities relating to the Initiative, and
- Evaluate and perform strategic planning on program activities relating to the Initiative.

Additionally, the Committee shall have the following duties:

- Advise the points-of-contact with respect to the Initiative;
- Make recommendations in writing to the Biomass Research and Development 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;
  - The points-of-contact are funding proposals under this title that are selected on the basis of merit, as determined by an independent panel of scientific and technical peers; and
  - Activities under the Initiative are carried out in accordance with the Biomass Research and Development Act of 2000.
- For each fiscal year for which funds are made available to carry out the Initiative, provide a report to the Secretaries of Energy and Agriculture on whether funds appropriated for the Initiative have been distributed and used in a manner that
  - Is consistent with the purposes described in section 307(b) of the Act,
  - Uses the criteria established under subsection (a)(3), and
  - Takes into account any recommendations that have been made by the Advisory Committee.

To date, the Committee's activities have resulted in six major accomplishments:

- A preliminary set of recommendations, submitted to the Secretaries of Energy and Agriculture in December of 2001, on the potential of biomass research and development.

- The *Vision for Bioenergy & Biobased Products in the United States*, outlining the far-reaching goals that the Committee would like to see achieved by the biomass industry.
- The *Roadmap for Bioenergy & Biobased Products in the United States*, outlining research and development pathways in plant sciences, feedstock production, processing and conversion, and other areas necessary to achieve the goals set forth in the *Vision*.
- A set of recommendations, submitted to the Secretaries of Energy and Agriculture in December of 2002.
- A set of recommendations, submitted to the Secretaries of Energy and Agriculture in December of 2003.
- A set of recommendations, to be submitted to the Secretaries of Energy and Agriculture by December of 2004.

## 2005 ACTIVITIES

In 2005, the Committee plans to complete the following:

- Review results of the FY 2005 Joint Solicitation and make recommendations for FY 2006 joint solicitation.
- Track the progress of R&D funded under the joint solicitation in achieving the Committee's *Vision* goals.
- Identify other Federal Advisory Committees relevant to biomass (e.g. climate change) and cooperate activities.
- Meet with the R&D Board
- Receive Information on the following topics: biomass as related to climate change, residue removal versus soil sustainability, and the cost-effectiveness of collection and transportation of biomass.

## COMMITTEE MEETING SCHEDULE

In 2005, the full Committee will meet at least quarterly, as required by law.

<b>Tentative Date</b>	<b>Purpose</b>
March 17, 2005 1 Day Meeting	Update on Membership Rules  Review 2005 Committee Work Plan  Receive presentation on Quarterly Portfolio Evaluation Document  Receive update on progress of 2002 Joint Solicitation projects and status of 2005 Joint Solicitation  Receive update on USDA Federal Procurement of Biobased Products efforts

	<p>Receive presentation on USDA/DOE Billion Ton Feedstock Paper</p> <p>Receive a presentation on the President's Budget Request and Impact on the Programs</p>
<p>TBD June/July 2005 2 Day Meeting</p>	<p>Day 1: Introduction for New Committee Members and SGE briefings for all members</p> <p>Potentially meet with the USDA's Agricultural Air Quality Task Force</p> <p>Day 2: Receive a presentation on DOE's Deployment Efforts</p> <p>Receive a presentation on USDA's Final Rule on the Federal Procurement of Biobased Products</p> <p>Receive a presentation from the DOE National Laboratories</p> <p>Review and change (if needed) Vision targets</p>
<p>November 2005 2 Day Meeting</p>	<p>Receive review of topics covered and materials received in 2005</p> <p>Review Results of 2005 Joint Solicitation and updated <i>Vision</i> goals tracking document</p> <p>Begin developing Recommendations to Secretaries on Joint Solicitation</p> <p>Finalize Recommendations to Secretaries</p> <p>Joint meeting with R&amp;D Board</p> <p>Develop 2006 Work Plan</p>

### **2005 DELIVERABLES**

- Matrix tracking the progress of USDA and DOE biomass R&D portfolios.
- Revised *Vision* goals.
- Recommendations to the Biomass R&D Board (required per section 309(b) of the Biomass R&D Act of 2000).



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



U.S. Department of Agriculture

*biomass program*

**Biomass as a Feedstock for a  
Bioenergy and Bioproducts Industry:  
The Technical Feasibility of a Billion-Ton Annual Supply**

**DOE/USDA Biomass Feedstock Gate Review Meeting  
March 14, 2005**

**Oak Ridge National Laboratory  
USDA Agricultural Research Service  
USDA Forest Service**



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

U.S. Department of Agriculture

# What Was the Purpose of the Study?

*biomass program*

- To determine whether the land resources of the U.S. are technically capable of producing a sustainable supply of biomass sufficient to displace 30% of the country's present petroleum consumption – approximately equivalent to one billion dry tons.
- Goal was set by a joint advisory committee to the DOE and USDA as a vision for making a major contribution to U.S. energy needs by 2030
  - 5% of the nation's power
  - 20% of the nation's transportation fuels
  - 25% of the nation's chemicals & materials from biobased products.

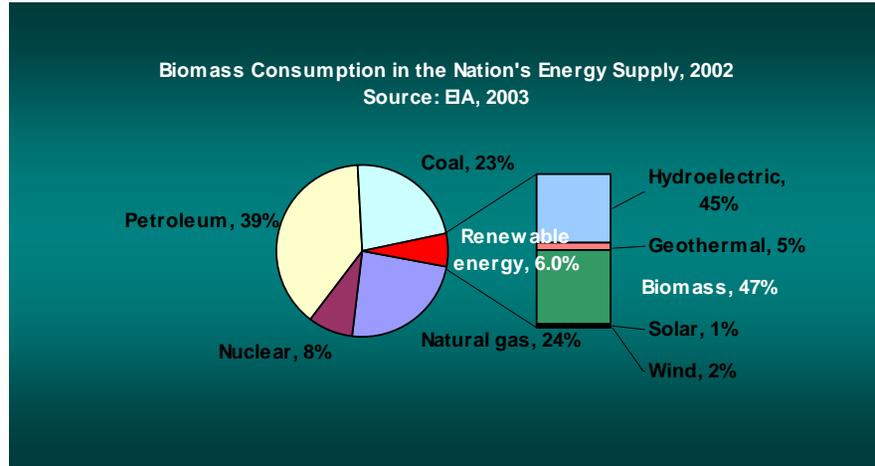


# What Is Current Biomass Consumption?

*biomass program*

## Biomass accounts for approximately:

- 13% of renewably generated electricity
- nearly all (97%) of industrial renewable energy use
- nearly all renewable energy use in residential and commercial sectors (84% and 90%, respectively)
- somewhat more than 2.5% of transportation fuel use



Biomass Resource	Million dry tons/yr
• Forest products industry	
- Wood residues	44
- Pulping liquors	52
• Urban wood & process wastes	35
• Fuelwood (residential/commercial)	24
• Electric utilities	10
• Grains to biofuels	18
• Bioproducts	6
Total	190



# The Biomass Feedstock Resource Base

## *biomass program*

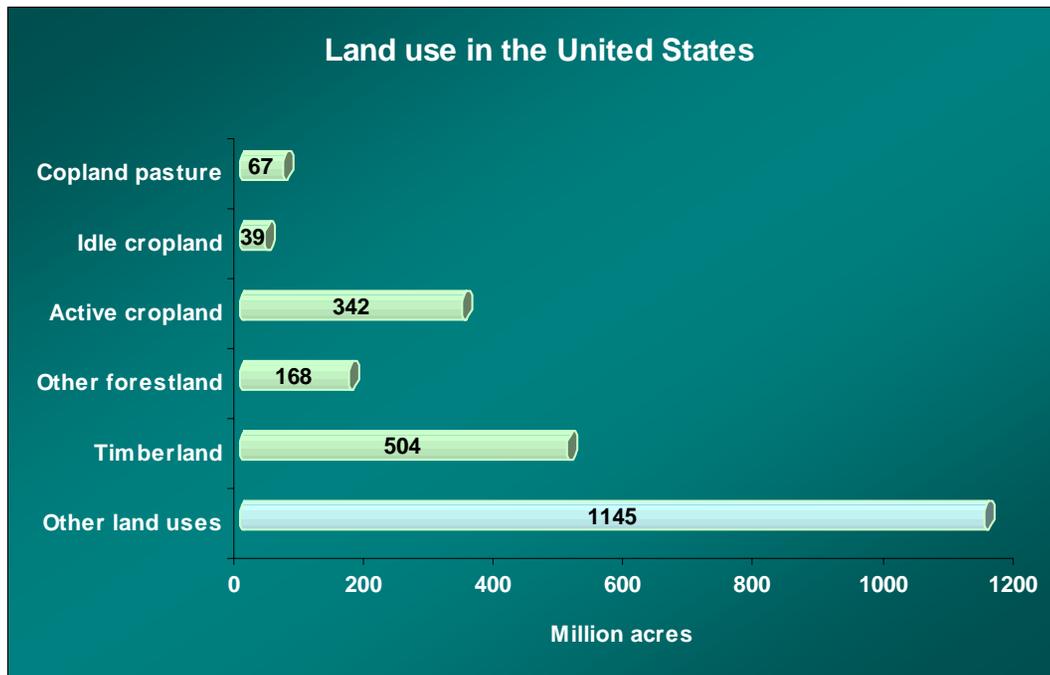
- **About one-half of the land in the contiguous U.S.**
- Forestland resources -- 504 million acres of timberland, 91 million acres of other forestland
- Agricultural resources -- 342 million acres cropland, 39 million acres idle cropland, 68 million acres cropland pasture

## Forest resources

- Logging residues
- Forest thinnings (fuel treatments)
- Fuelwood
- Primary wood processing mill wastes
- Secondary wood processing mill wastes
- Pulping liquors (black liquor)
- Urban wood wastes

## Agricultural resources

- Crop residues
- Grains to biofuels
- Perennial grasses
- Perennial woody crops
- Animal manures
- Food/feed processing wastes
- MSW and landfill gases





# What analysis approach was taken?

## *biomass program*

- Forest resource estimates based on analysis of existing resources, uses, and trends in the demand for forest products
  - Managed less intensively than croplands or not suited for intensive management
  - Expected to provide multiple-use benefits (e.g., wildlife habitat, recreation, and ecological and environmental services)
- Agricultural resource estimates based on scenarios extrapolated from current food/feed trends and R&D
  - Active cropland managed intensively on year-to-year basis
  - Includes perennial crops (grasses and woody crops)



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

USDA  
U.S. Department of Agriculture

# Forest resource analysis

*biomass program*

## **Forest resource analysis utilizes USDA/Forest Service databases and expert opinion**

- Forest Inventory and Analysis database
- Timber Product Output database
- Energy Information Administration
- Fuel Treatment Evaluator (an assessment tool used to identify and evaluate forest stands with accumulated biomass – Healthy Forest Restoration Act)
- Resources Planning Act analyses (periodic timber assessment with projections to 2050)
- Forest Products Laboratory data



# Forest Resources Analysis

*biomass program*

## Residues from commercial logging activities, silvicultural operations & clearing of Timberlands ~ 41 million dry tons/year potential





*biomass program*

## Residues from logging, silvicultural operations & clearing of timberlands

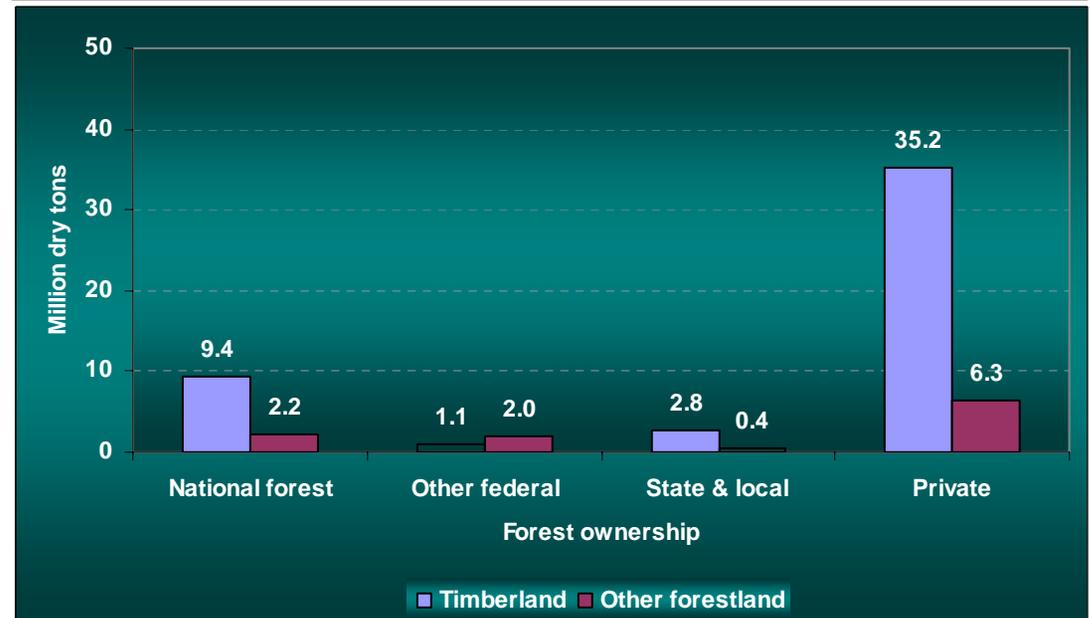
- 70 million dry tons of logging and other removal residues are generated annually
- Collected concurrently with logging/cutting operations
- 50% to 65% of biomass is recoverable (public vs private lands)
- All recovered material (~ 41 million dry tons/year) for biomass uses
- Estimated to increase to ~ 64 million dry tons/year (mid-20<sup>th</sup> century)



# Forest Resources Analysis

*biomass program*

**Residues from fuel treatment operations on timberlands and other forestlands ~ 60 million dry tons/year potential**





*biomass program*

## Residues generated from fuel treatment operations on timberland and other forestland

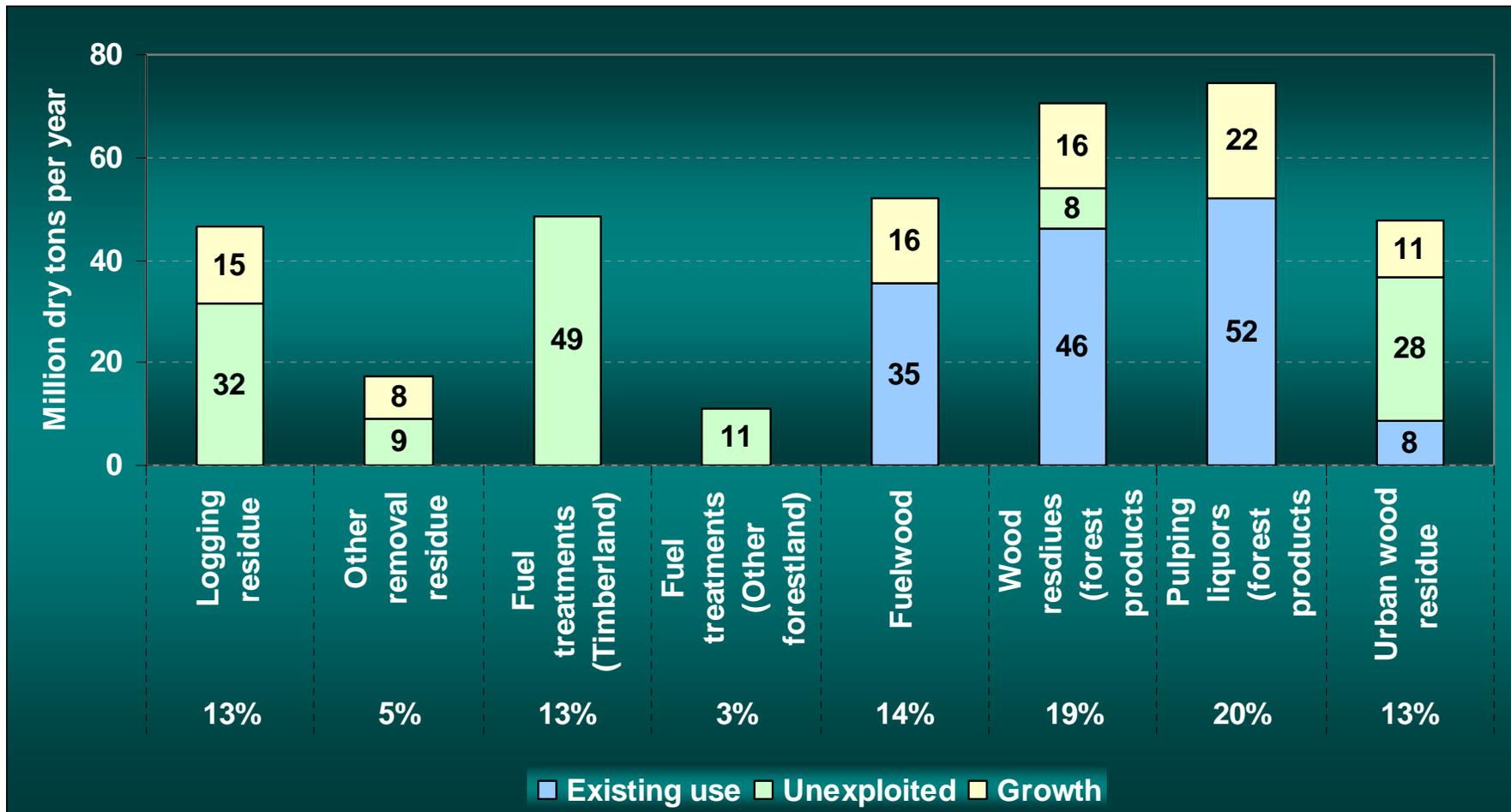
- Timberlands
  - Fuel Treatment Evaluator used to identify biomass requiring removal
  - Recovery of 85% of the identified biomass
  - Accessibility – 60% for public lands and 80% for private lands
  - Biomass fraction – 30% (70% conventional forest products)
  - Collection cycle – 30 years
- Other forestlands
  - Forest Inventory Analysis database used to identify biomass (50% removal)
  - Recovery of 85% of the identified biomass
  - Accessibility – 60% for public lands and 80% for private lands
  - Biomass fraction – 90%
  - Collection cycle – 30 years



# Forest Resource Analysis

*biomass program*

## The sustainable forest resource potential is nearly 370 million dry tons annually





*biomass program*

## Fuelwood

- Wood harvested directly from forestlands Used now by residential and commercial sectors for space heating (24 million dry tons)
- Used by electric power sector (10 million dry tons)
- Additional amounts from projected demand growth



*biomass program*

## Forest products industry processing residues

- Wood residues
  - Primary mill residues (bark and coarse & fine residues): 92 million dry tons generated – 43% used for on-site energy, 41% used for fiber, 14% other products (e.g., mulch), and 2% unused
  - Secondary wood residues (shavings, sawdust, cut-offs, etc.): 16 million dry tons generated, 6 million dry tons available
- Pulping liquors
  - Pulp and paper mills (black liquor): 52 million dry tons equivalent
- Future industry growth contributes more resources



*biomass program*

## Urban Wood Residues

- Wood (finished wood products) & yard/tree trimmings from MSW ~ 8 million dry ton potential
  - Landfill survey data, composition sampling, population driven
  - Material destined for MSW landfills
- Construction, remodeling and demolition waste ~ 20 million dry ton potential
  - Affected by economic activity (e.g., housing starts)
  - Material destined for C&D landfills
  - Contamination/commingling with non-wood products is problematic
- Additional amounts from projected demand growth



*biomass program*

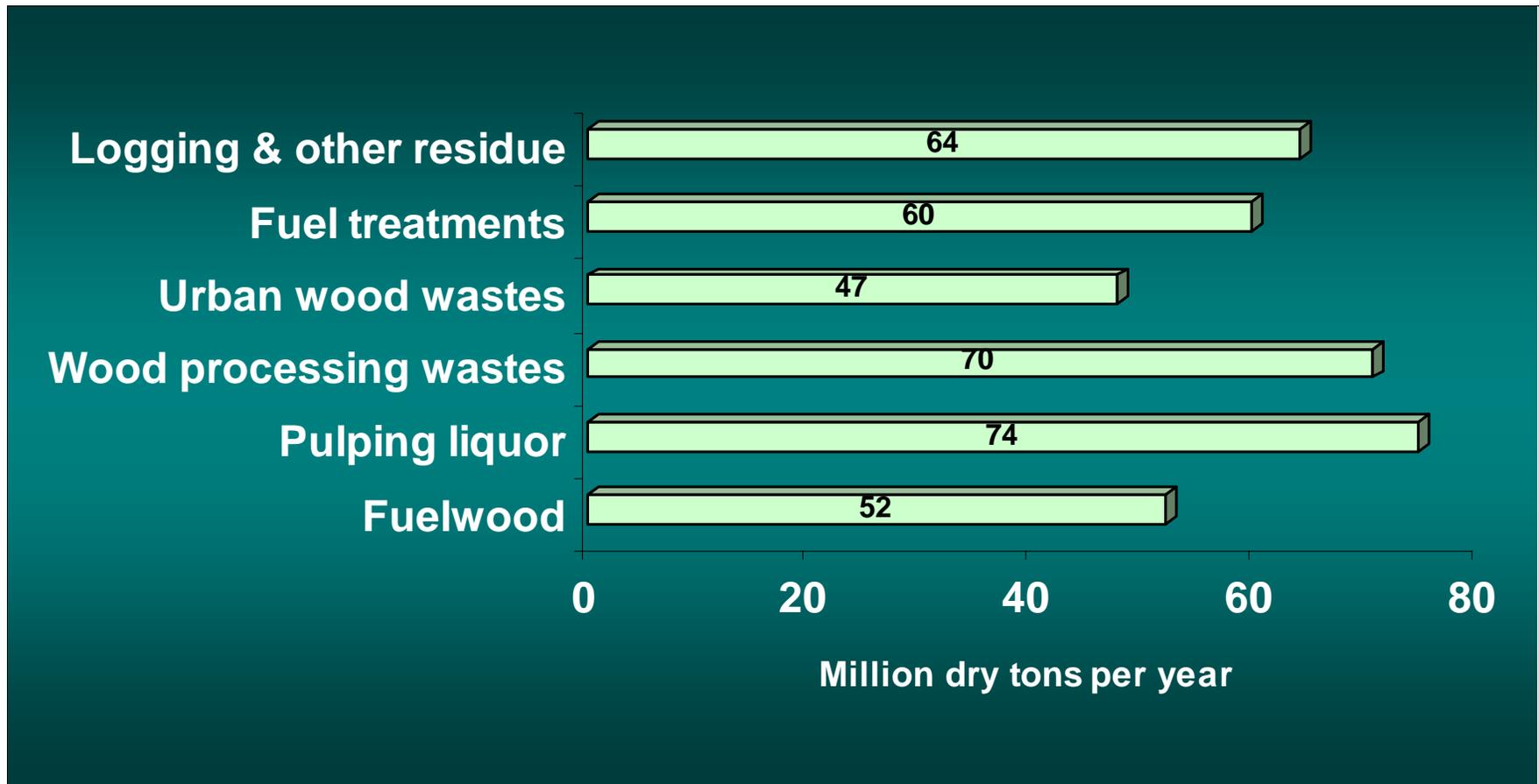
## Forest growth and demand

- Future supply and demand prospects (RPA assessment)
- Projected increase in logging and other removal residue – increased residue recovery, more efficient logging operations
- Increase in the demand for wood and paper products (mill residue and black liquor)
- Increased use of finished wood products and increased recycling
- Increased demand for fuelwood
- Total forest growth and demand ~ 89 million dry tons



*biomass program*

## The sustainable forest resource potential ~ 370 million dry tons per year





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USDA  
U.S. Department of Agriculture

# Agricultural Resource Scenarios

*biomass program*

## **Agricultural resource scenarios utilize USDA information, research, and expert opinion.**

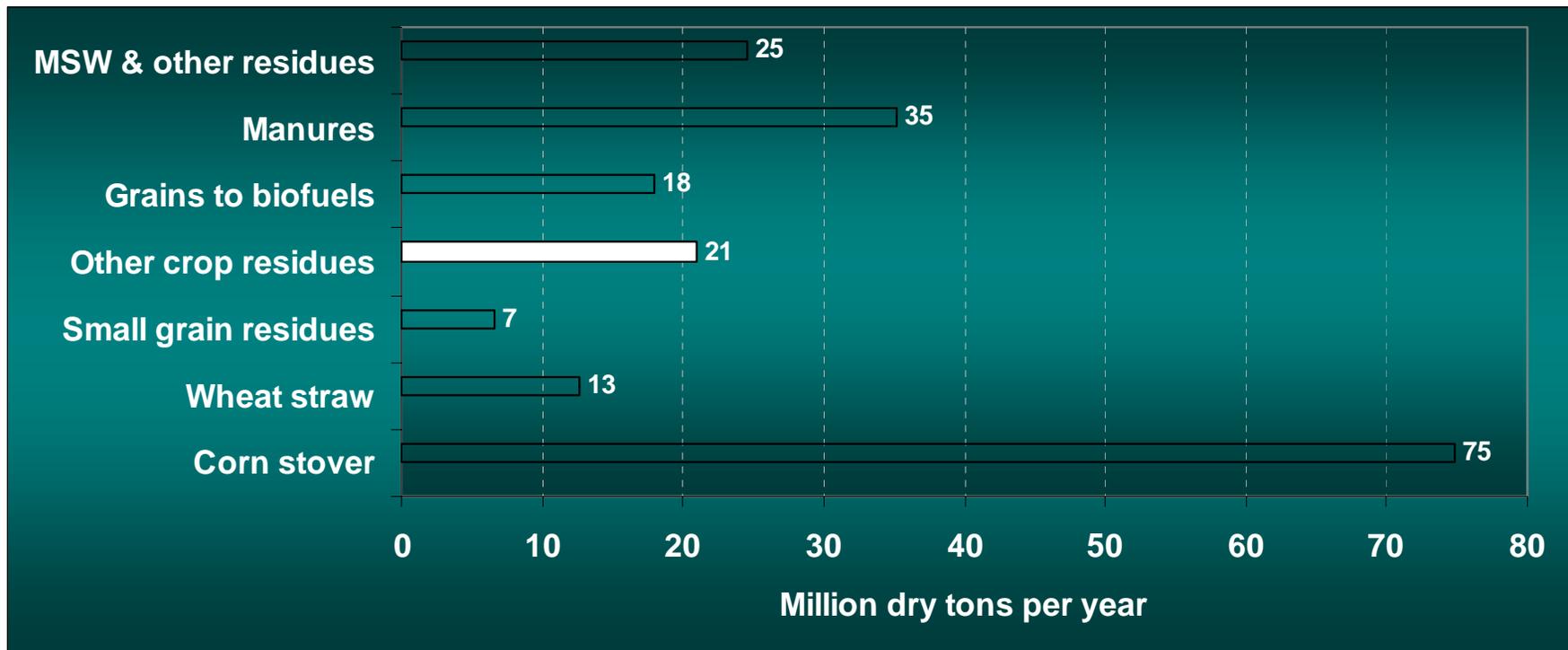
- USDA-NASS: Agricultural Statistics 2003 (2001 crop data)
- USDA-OCE: Baseline Projections to 2012 & 2013
- USDA-ARS: National Agronomy Manual
- USDA-ARS: R&D on forage soybeans yield and residue
- USDA-NRCS: Soil Conservation Index version 25
- USDA-ERS: Confined animal and manure data
- Corn & wheat residue analyses: R. Graham, R. Nelson, M. Walsh, J. Sheehan, (papers and personal communication)
- Corn planting density effects research: Univ. of Nebraska and Pioneer Hi-Bred
- DOE: Roadmap for Agricultural Biomass Feedstock Supply
- FAO and UN population and crop yield projections
- Numerous papers on yield potential and crop residue management



*biomass program*

## Current availability of biomass from agricultural lands is based on data and analysis

- Total current availability of biomass is ~ 193 million dry tons/year
- Slightly more than one-fifth is currently used
- Corn stover is largest source of agriculture-derived biomass





*biomass program*

## Current availability of biomass from agricultural lands – estimation approach

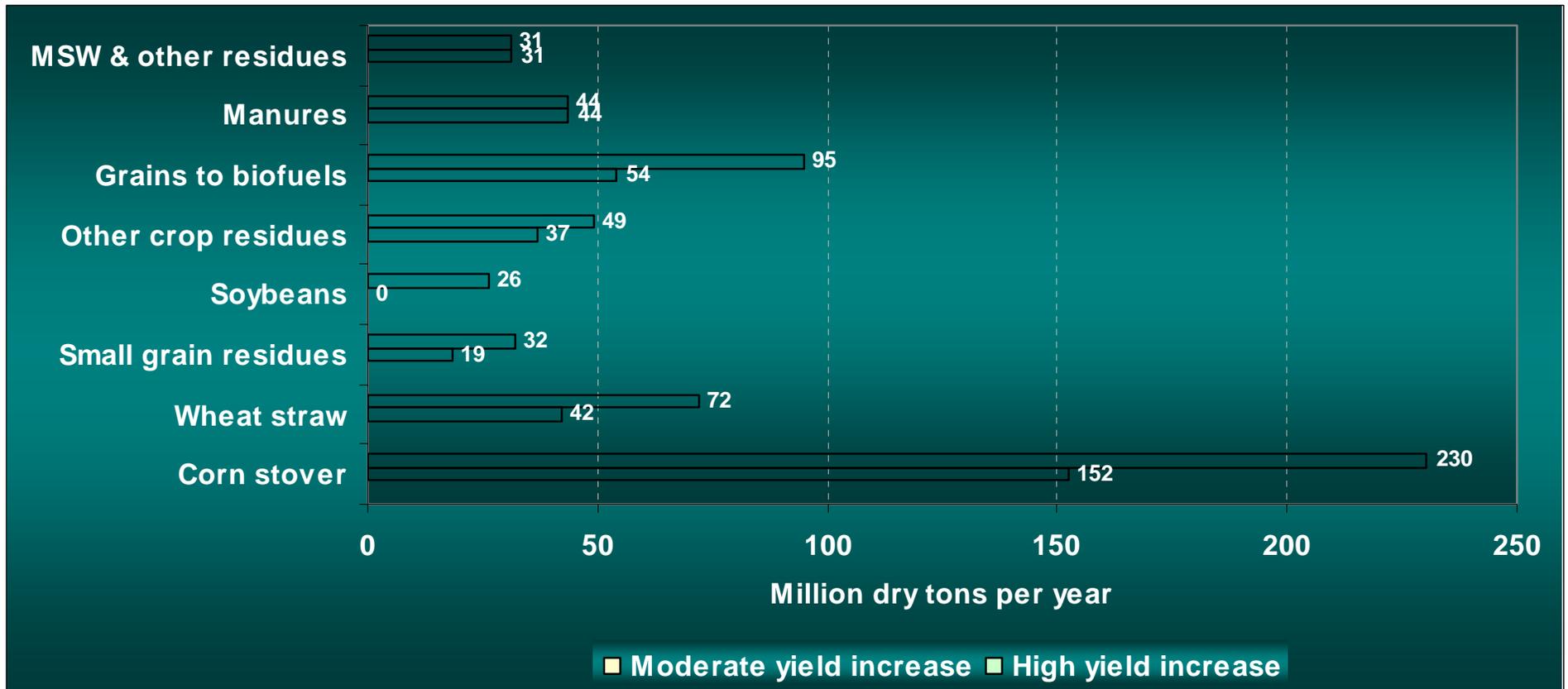
- Relied heavily on recent corn and wheat residue estimates using county level analysis methods
- Established single average residue maintenance requirement factor for each crop
- Considered as many individual crops as possible – accounted for all cropland use
- Selected an average residue to grain/seed number for each crop & moisture content at harvest
- Converted all grain and residue estimates to dry weights
- Included all possible sources of biomass including grains to ethanol, manure, and MSW



# Agricultural Resource Scenarios

*biomass program*

## Availability of biomass under increased crop yields and technology changes only





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# Agricultural Resource Scenarios

*biomass program*

## Availability of biomass under increased crop yields and technology changes only

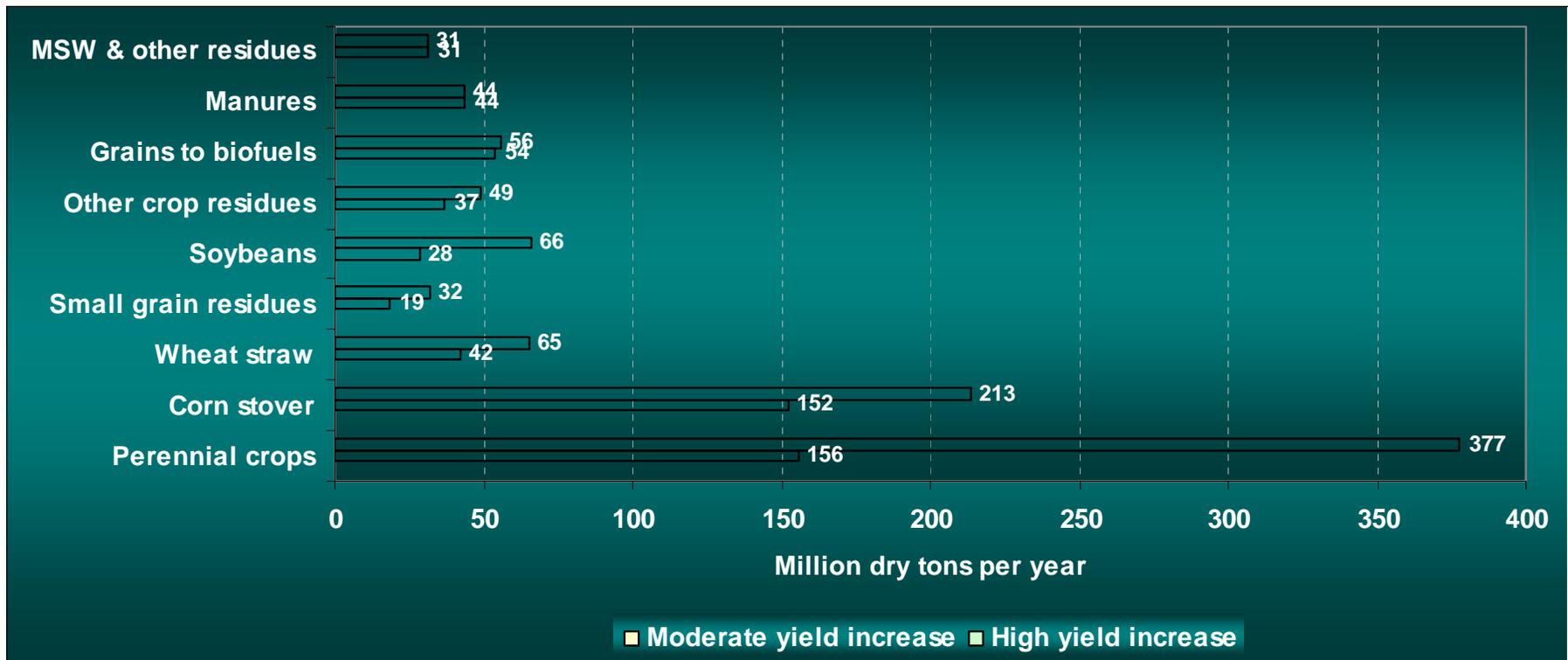
- Total availability is about 379 or 579 million dry tons/year in the moderate and high yield and technology change scenarios
- Yield increases of either 25 or 50% for corn and small other grains and either 15 or 30% for other crops
- Changes in tillage practices (170 or 340 million acres no-till) and improved residue collection technology and equipment (either 60 or 75% collection efficiency)



# Agricultural Resource Scenarios

*biomass program*

## Availability of biomass under increased crop yields, technology changes, and perennial crops with land use change





*biomass program*

## **Availability of biomass under increased crop yields, technology changes, and inclusion of perennial crops with land use change**

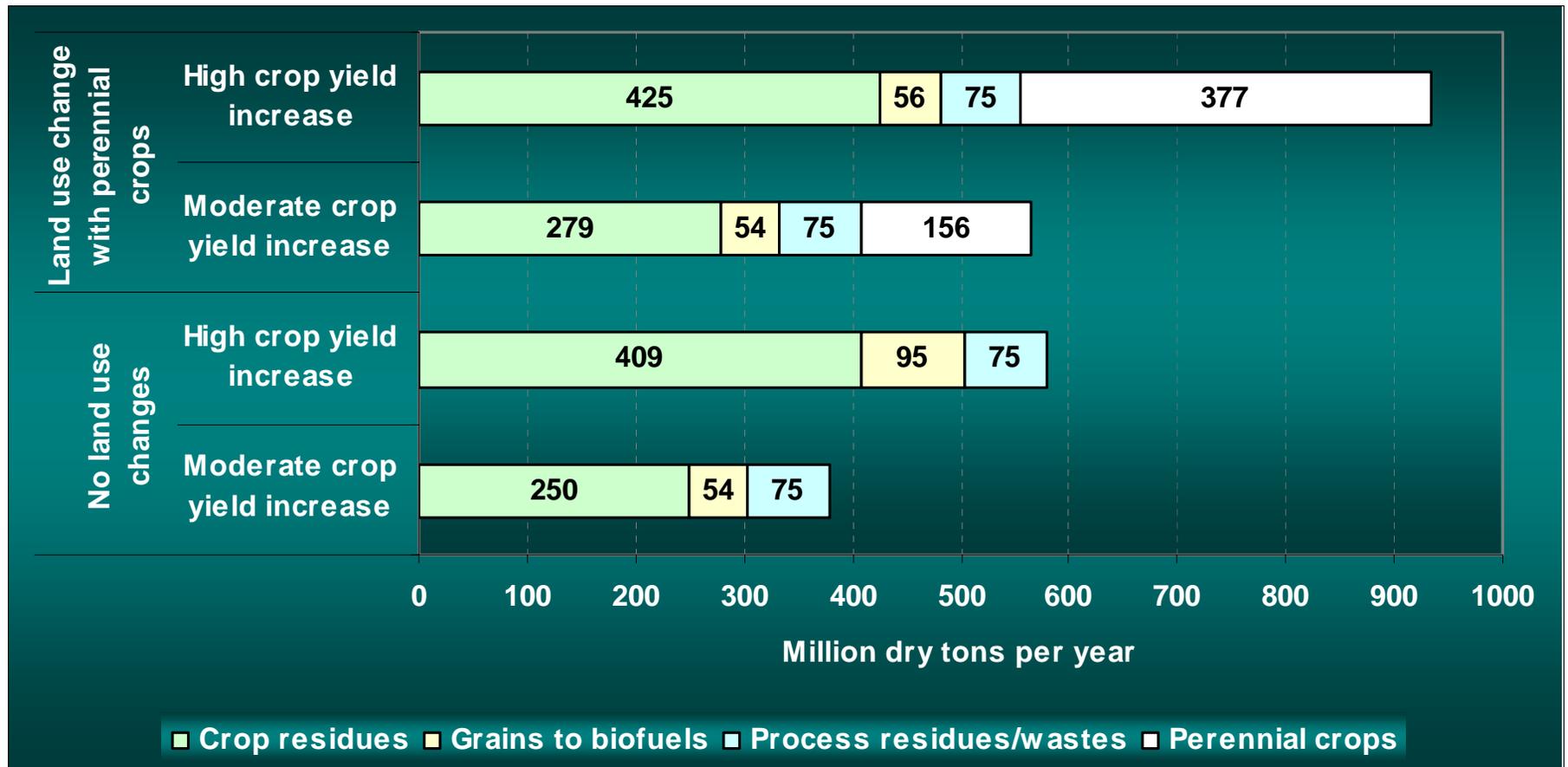
- Total availability is about 563 or 933 million dry tons/year in the moderate and high land use change scenarios
- Yield increases of either 25 or 50% for corn and other small grains and either 15 or 30% for other crops
- Changes in tillage practices (170 or 340 million acres no-till), soybean residue to seed ratios (1.5:1 or 2:1), and residue collection technology and equipment assumptions (either 60 or 75% collection efficiency)
- The allocation of a combination of active cropland, idle cropland, and cropland pasture to perennial crop plantings (grasses or woody crops) is required



# Agricultural Resource Summary

*biomass program*

## Sustainable agricultural resource potential exceeds 930 million dry tons

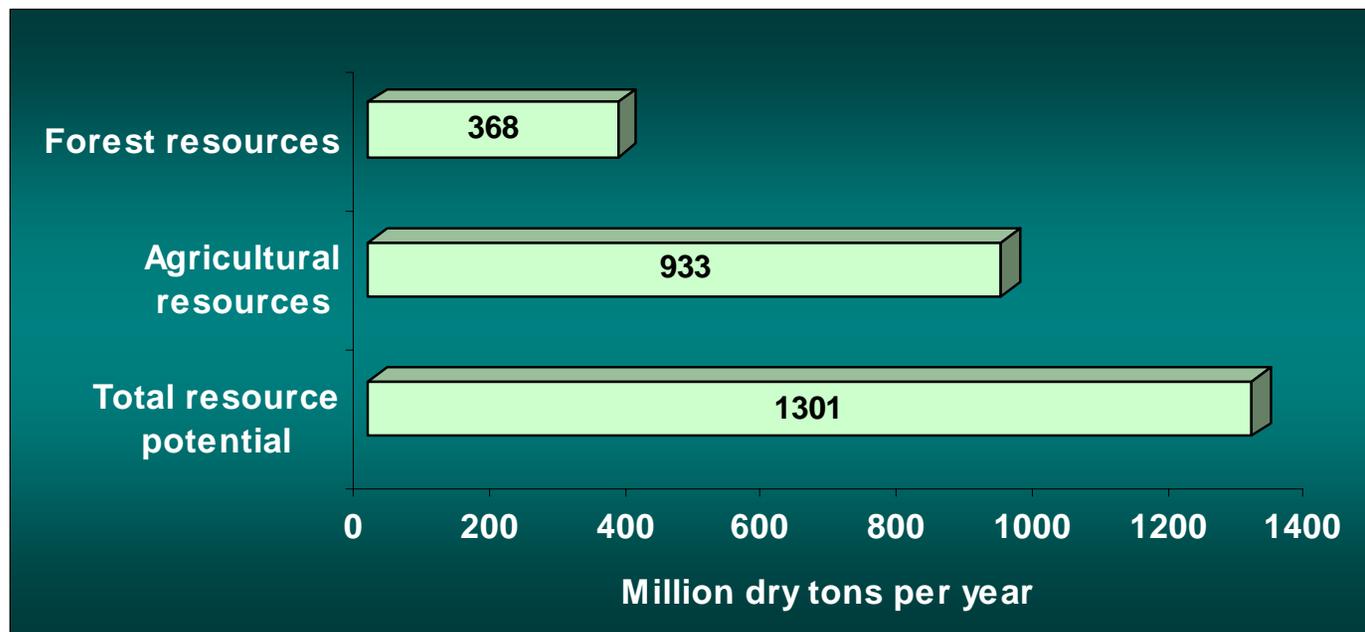




*biomass program*

## Are there sufficient resources to meet 30% of the country's petroleum requirements?

- Land resources can technically supply more than 1.3 billion dry tons annually & still meet food, feed, and export demands
- Will require R&D, policy change, stakeholder involvement
- Required changes are not unreasonable given current trends





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Energy Efficiency and Renewable Energy

U.S. Department of Agriculture

# Food, Feed, Export & Industry Supplies Under Scenarios: Corn Example

*biomass program*

Major crop	USDA Baseline		Technology changes without land use change, no perennial crops		Technology changes with land use change to accommodate perennial crops	
	2001	2013	Moderate	High	Moderate	High
Corn						
Harvested acres (millions)	68.8	73.8	68.8	68.8	68.8	63.8
Yield (bushels/acre)	138.2	158.5	172.8	207.3	172.8	207.3
Production (thousand bushels)	9,506,840	11,695,000	11,886,582	14,263,898	11,886,582	13,225,740
Total grain supply (000's bushels)	11,416,000	12,949,000				
Use (000's bushels)						
Food, Seed, Res. (000's bushels)	1,340,000	1,480,000	1,480,000	1,820,400	1,480,000	1,820,400
Animal Feed (000's bushels)	5,874,000	6,025,000	6,025,000	6,627,500	6,025,000	6,627,500
Export (000's bushels)	1,889,000	2,875,000	2,875,000	3,162,500	2,875,000	3,162,500
Industry/fuel (000's bushels)	714,000	1,360,000	1,506,582	2,653,498	1,506,582	1,615,340
Stocks (000's bushels)	1,599,000	1,209,000				
Total grain Use (000's bushels)	11,416,000	12,949,000	11,886,582	14,263,898	11,886,582	13,225,740



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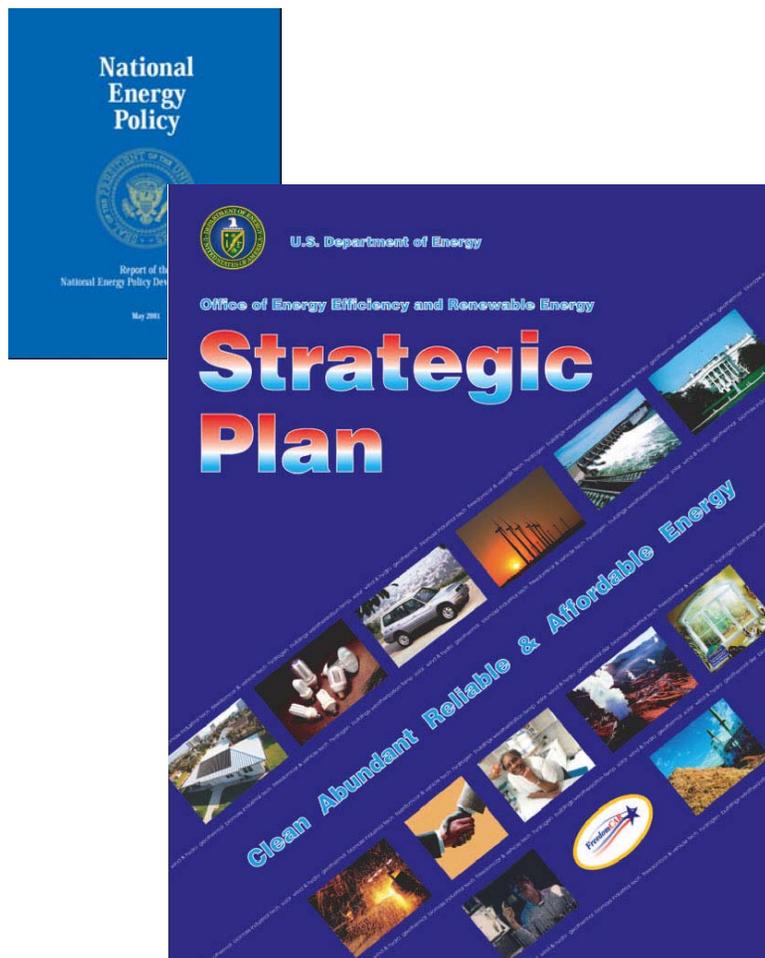
# Solicitation Award Projects Update

Kevin Craig

Office of Biomass Program

U.S. Department of Energy/Golden Field Office

March 17, 2005

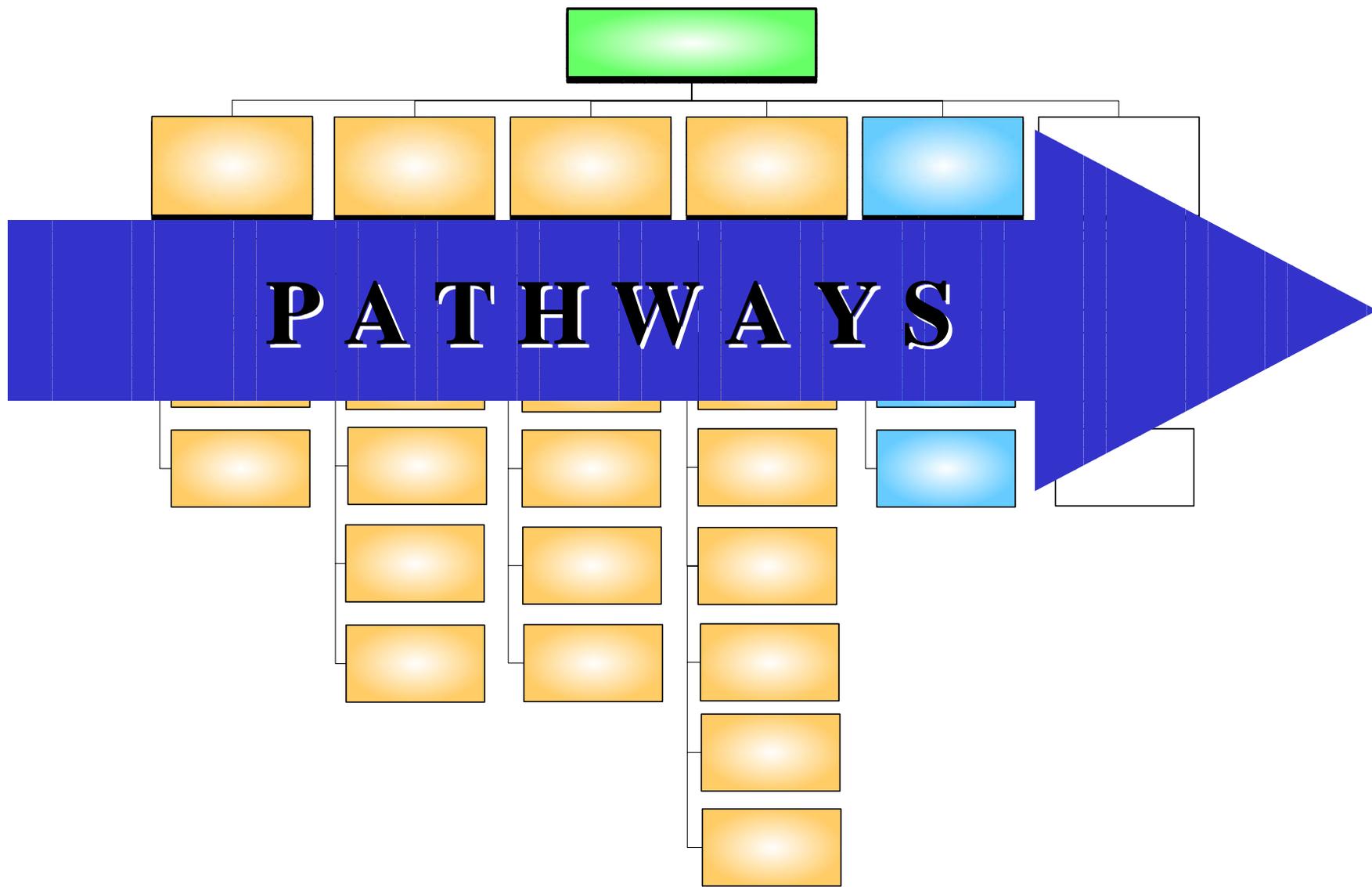


## EERE Portfolio Priorities

- **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



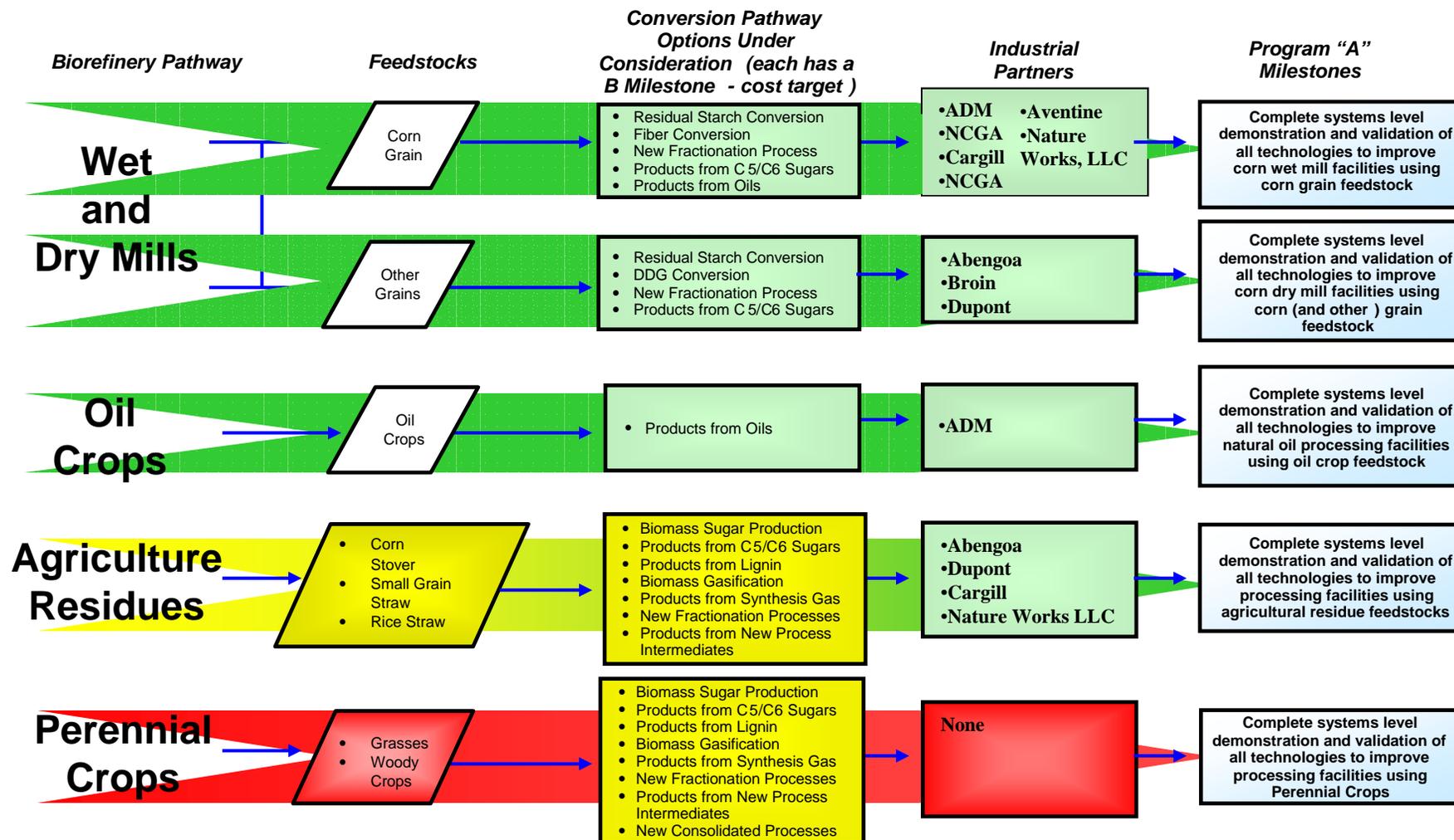
# Pathways to Biorefineries



1.0  
Feedstock

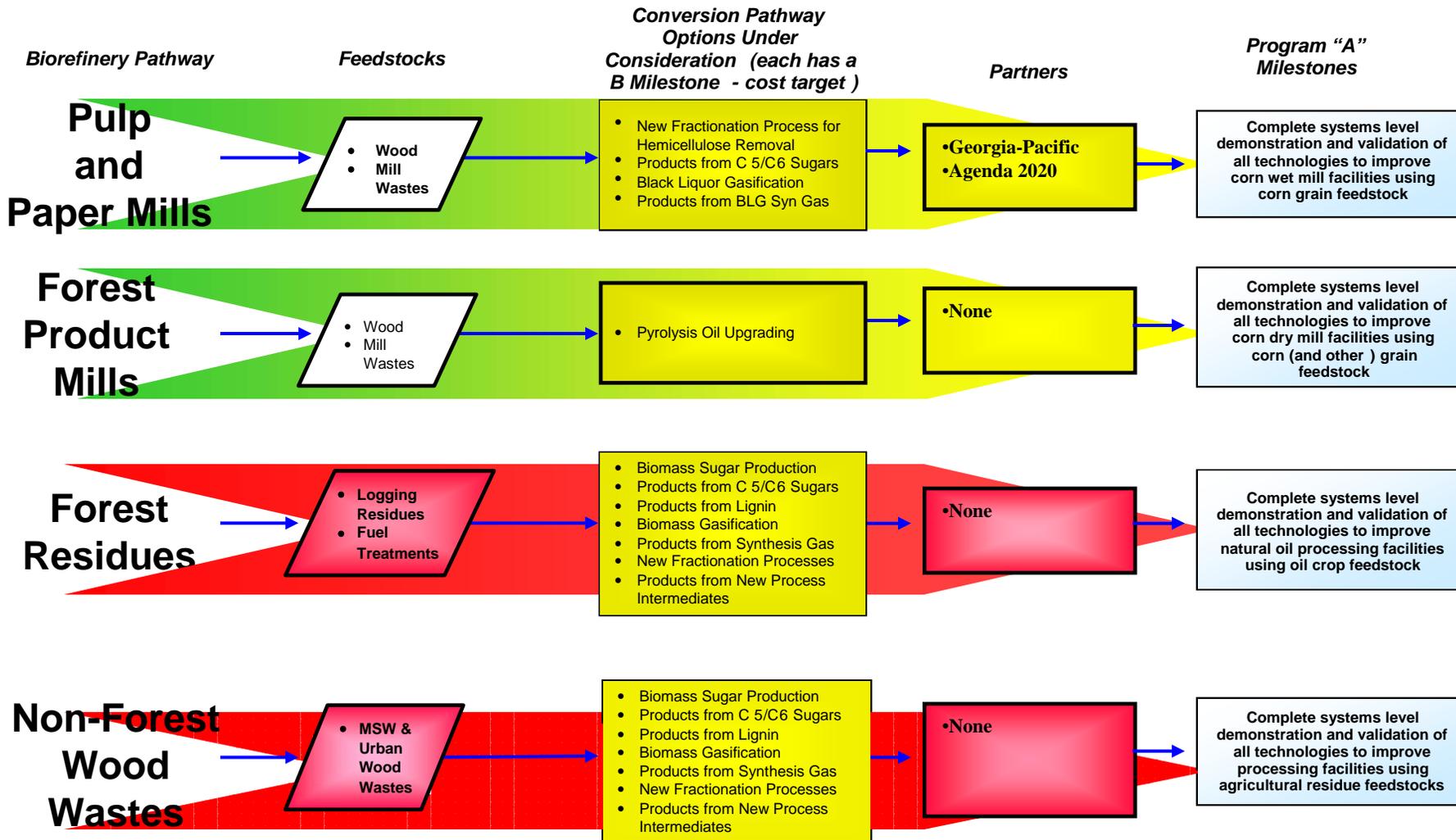


# Agricultural Sector Biorefinery Pathways





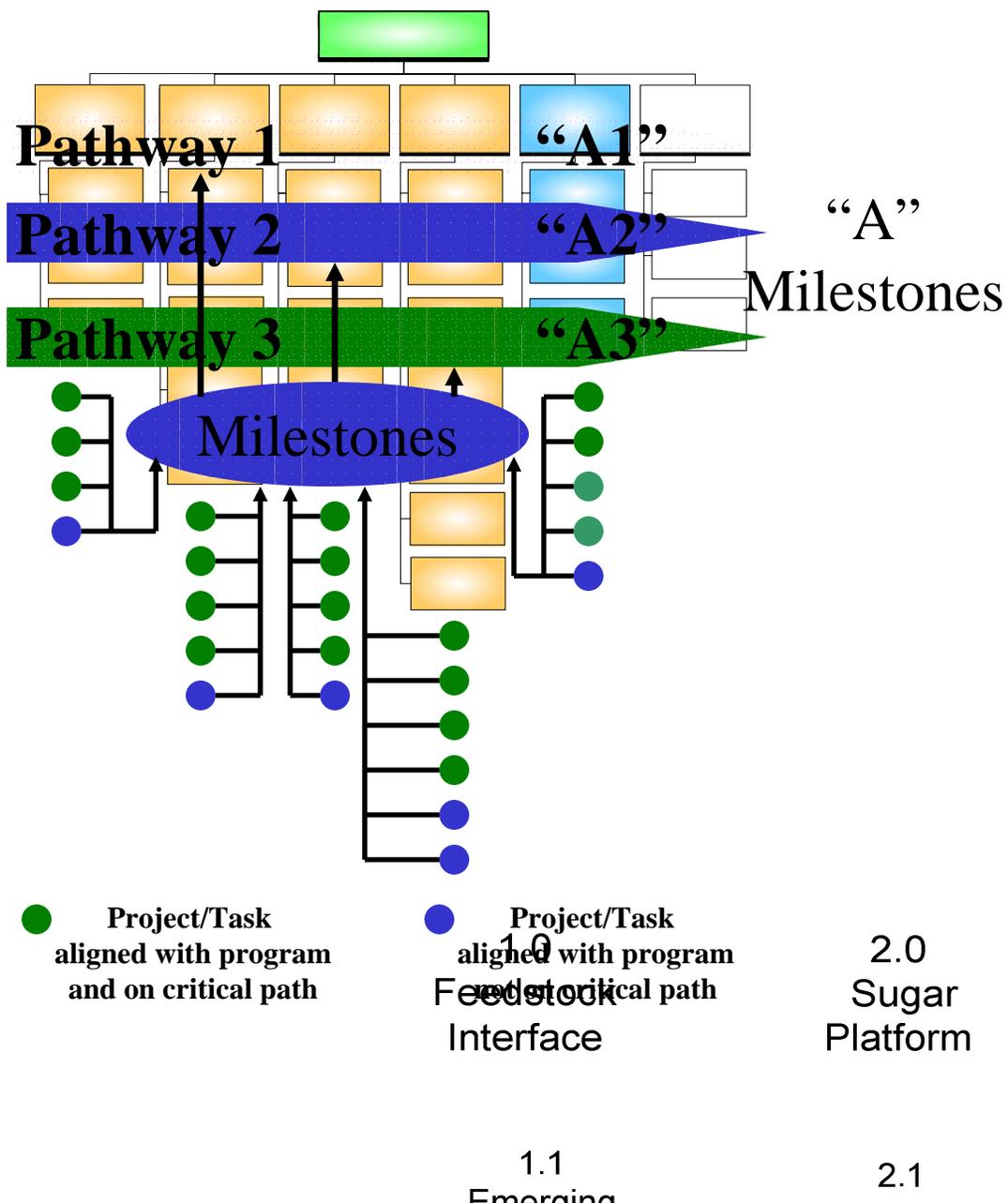
# Forest Sector Biorefinery Pathways



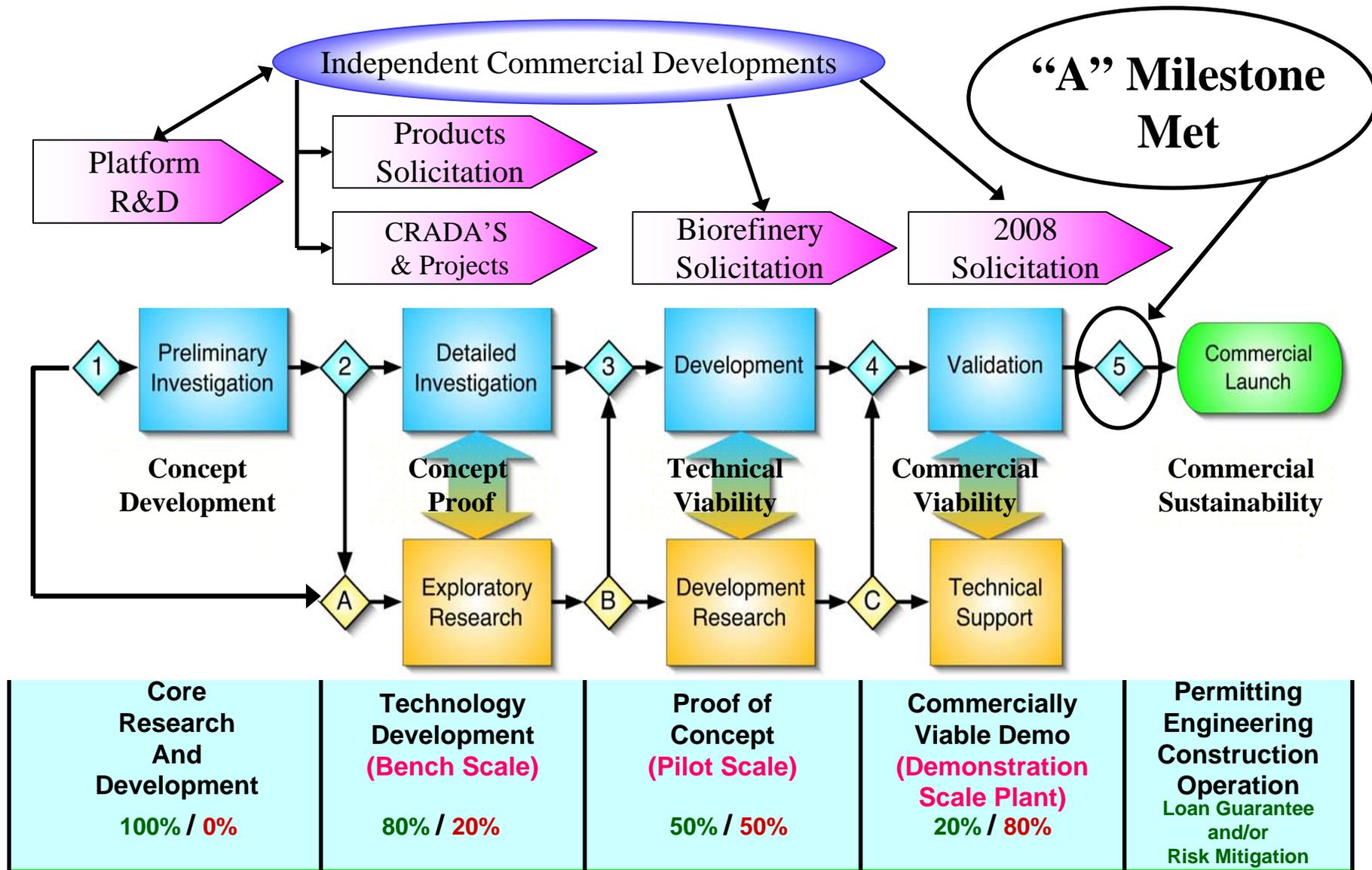


# Pathways

## 2005 and Beyond



- Integrates Pathways and subsequent “A” Milestones across WBS
- Allows project milestones and cost targets to apply directly to pathways
- Allows resources to be focused on technology development critical to a pathway without sacrificing the long term Biomass Program
- Enables dynamic response to changes in resource loading





## FY2002

- Broin – 2<sup>nd</sup> Generation Corn Biorefinery
- Cargill/Codexis – New Biorefinery Intermediate
- NatureWorks LLC – Making the Industrial Biorefinery Happen
- DuPont – Industrial Corn Biorefinery
- Abengoa – Advanced Biorefining of Distillers Grain and Corn Stover Blends
- NCGA – Separation of Corn Fiber and Conversion to Fuels and Chemicals
- Nature Works LLC/MAT - Collection, Commercial Processing and Utilization of Corn Stover



## FY2003

- Trustees of Dartmouth College - Integration of Leading Biomass Pretreatment Technologies with Enzymatic Digestion and Hydrolyzate Fermentation Thermotolerant Biocatalyst for Biomass Conversion to Products
- University of Florida (Gainesville, FL) - Engineering Thermotolerant Biocatalyst for Biomass Conversion to Products
- Pure Vision Technology, Inc. (Ft. Lupton, CO) - Demonstration of the PureVision Biorefinery
- Cargill, Inc. (Minneapolis, MN) - Platform Chemicals from an Oilseed Biorefinery



## FY2004

- Southern Research Institute - Trace Metal Scavenging from Biomass Syngas with Novel High-Temperature Sorbents
- Research Triangle Institute - Biomass Gas Cleanup Using a Therminator
- ANTARES Group Inc - Catalytic Hydrothermal Gasification for Eastman Kingsport Chemical Production Plant
- Gas Technology Institute - Engineering New Catalysts for In-Process Elimination of Tars
- Bioengineering Resources, Inc. - Thermochemical Conversion of Corn Stover
- Weyerhaeuser Company - Advancement of High Temperature Black Liquor Gasification Technology
- Princeton University - Cost-Benefit Analysis of Gasification for Fuels/Chemicals Production at Kraft Pulp Mills
- University of Utah - Investigation of Pressurized Entrained Flow Draft Black Liquor Gasification in an Industrially Relevant Environment
- Rohm and Haas Co. - New Sustainable Chemistry for Adhesives, Elastomers and Foams



## Broin

*“A Second Generation Dry Mill Biorefinery”*

- Improve economics of existing dry mills by adding additional co-products and increasing ethanol yields

### **Technologies:**

- Fractionation
- Pretreatment
- Hydrolysis
- Fermentation

### **Pathway:**

- Corn Dry Mill



## Broin

- Funding
  - Requested funding: \$5.5M
  - DOE Obligated to date: \$3.3M
- Recent Accomplishments/Status
  - Use of corn bran in bench scale fermentation to demonstrate increased ethanol production.
  - Completed the retrofit of the fractionation facility.
  - Received permitting to install the pilot scale fermentation facility.
  - Some delays are expected due to final permitting delays.



## Cargill

### *“New Biorefinery Platform Intermediate Project”*

- Develop a new bio-based platform technology to produce a portfolio of products based on 3-HP (3-hydroxypropionic acid) produced by the fermentation of carbohydrates

#### **Technologies:**

- Strain development
- Fermentation
- Catalysis

#### **Pathway:**

- Corn Wet Mill



## Cargill

- Funding
  - Requested: \$6M
  - DOE Obligated to date: \$2M
- Recent Accomplishments/Status
  - A suitable strain was selected.
  - A reactor configuration, catalyst and operating conditions have been identified.
  - Development of the enzyme assay, and the demonstration of enzyme production was successfully completed.
  - Improvement of the key enzyme in the 3-HP pathway continues.



## Nature Works, LLC

*“Making the Industrial Biorefinery Happen”*

- Develop and validate process technology for use with sustainable agricultural systems to economically produce sugars and chemicals such as lactic acid and ethanol.

### **Technologies:**

- Strain development
- Fermentation
- Pretreatment
- Hydrolysis

### **Pathway:**

- Corn Wet Mill
- Ag Residue



## Nature Works, LLC

- Funding
  - Requested: \$26M
  - DOE Obligated to date: \$9.4M
- Recent accomplishments/status
  - Economic feasibility modeling has been done and initial PFD's developed.
  - Improved strains have been developed.
  - Strain baseline was assessed and advanced experimental tools developed on schedule, resulting in superior strains compared to current literature studies.
  - Iogen constructed the fermentation system ahead of schedule and fermentation has begun.
  - The development of the 2nd Generation strain was completed in the first Quarter of FY05.



## DuPont Biorefinery Project

*“Integrated Corn Based Biorefinery Project”*

- Develop the Integrated Corn Based Biorefinery for the parallel production of Fuel Ethanol and PDO (1,3 propanediol).

### Technologies:

- Strain development
- Fermentation
- Pretreatment
- Hydrolysis

### Pathway:

- Corn Dry Mill
- Ag Residue





## DuPont Biorefinery Project

- Funding
  - Requested: \$18.1M
  - DOE obligated to date: \$10M
- Recent Accomplishments/Status
  - Presented economics on the ICBR showing that the production of PDO in an integrated biorefinery had significantly higher ROI's than the biological production in a non-integrated facility and than from the petroleum route.
  - In 2004, DuPont and Tate & Lyle formed a JV to produce PDO biologically from wet mill derived glucose.
  - "Benchmark ASPEN model has been completed for both production of a value added chemical from corn grain and ethanol from corn stover
  - Completed the subcloning of endoglucanases and characterized (both temperature and pH profiles) 70% of the subclones.
  - CRADA with NREL took longer to negotiate than expected, leading to delays for this part of the work.





## Abengoa Bioenergy LLC

### *“Advanced Biorefining of Distiller’s Grain and Corn Stover Blends”*

- Develop a novel biomass derived process technology that utilizes advanced biorefined Distiller’s Grains and Corn Stover blends to achieve higher ethanol yields in a dry mill.

#### **Technologies:**

- Strain development
- Fermentation
- Pretreatment
- Hydrolysis

#### **Pathway:**

- Corn Dry Mill
- Ag Residue





## Abengoa Bioenergy LLC

- Recent accomplishments and Status
  - Dry mill portion of Pilot plant trouble shooting and base line runs started.
  - Over a dozen milestones and deliverables were completed in 1st Quarter FY05.
  - Benchscale pretreatment and fermentation processing demonstrated a reduction in residual starch and a concomitant increase in the overall yield of ethanol.





## ADM/NCGA

*“Separation of Corn Fiber and Conversion to Fuels and Chemicals”*

- Economically derive high value chemicals and oils from corn fiber.

### **Technologies:**

- Hydrolysis
- Separations
- Catalysis

### **Pathway:**

- Corn Wet Mill



## ADM/NCGA

- Funding
  - Requested: \$2.4M
  - DOE Obligated to date: \$1.1M
- Recent Accomplishments and Status
  - Decision made to continue to pilot scale testing.
  - Spurred secondary project leading to potential major breakthrough in Biodiesel production.



## Nature Works LLC/MAT

### *“Collection, Commercial Processing and Utilization of Corn Stover”*

- Develop and test new harvesting and transportation technologies for corn stover, evaluate wet storage, engineer a fermentation system.

#### **Technologies:**

- Harvesting
- Storage
- Hydrolysis
- Fermentation

#### **Accomplishments:**

- Report issued regarding issues around the development of a biobased supply chain
- Storage bunker was designed built and loaded with stover.

#### **Pathway:**

- Ag residue



## Dartmouth College

*“Integration of Leading Biomass Pretreatment Technologies with Enzymatic Digestion and Hydrolyzate Fermentation Thermotolerant Biocatalyst for Biomass Conversion to Products”*

- This project will develop integrated pretreatment, fermentation, and enzymatic hydrolysis data for leading biomass pretreatment technologies on a common basis, develop models to predict the performance of each unit operation, relate performance to key features of biomass and catalysts, and disseminate results.

### **Technologies:**

- Pretreatment
- Hydrolysis
- Fermentation

**Requested/Obligated:** \$1.8M/\$0.4M

**Accomplishments:** CAFI team presented results to date at the 2004 AIChE meeting. NREL met two of their milestones relative to providing poplar hydrolyzates and solids at both bench and pilot scale conditions established in the past. Testing continues utilizing Genecor enzymes.



## University of Florida

*“Engineering Thermotolerant Biocatalyst for Biomass Conversion to Products”*

- The primary objective of this project is to construct novel thermotolerant biocatalysts that function optimally under environmental conditions that are also optimal for the activity of fungal cellulases.

**Requested/Obligated:** \$1.4M/\$0.6M

### **Accomplishments:**

- Three isolates have been selected for detailed fermentation studies.
- U. of Florida has cloned the gene encoding D-lactate dehydrogenase.



## Pure Vision Technology, Inc.

*“Demonstration of the PureVision Biorefinery”*

- This project will address Phase I of a two-phase project with the overall objective of developing the PureVision technology to pilot scale and demonstration. Phase I is process development and includes optimizing test parameters, testing various separation technologies, producing a design for the pilot-scale unit, and determining the overall economic feasibility of the process..

**Requested/Obligated:** \$2/\$0M

### **Accomplishments:**

- Under negotiation



## Cargill Inc.

### *“Platform Chemicals from an Oilseed Biorefinery”*

- Develop a novel platform of industrial chemicals based on applications of biocatalysis and chemistry that will serve as the foundations for an oilseed biorefinery or an integrated carbohydrate/oilseed biorefinery.

**Requested/Obligated:** \$1.8/\$0.9M

### **Accomplishments:**

- Proceeding apace



## FY2004

- Southern Research Institute - Trace Metal Scavenging from Biomass Syngas with Novel High-Temperature Sorbents
- Research Triangle Institute - Biomass Gas Cleanup Using a Terminator
- ANTARES Group Inc - Catalytic Hydrothermal Gasification for Eastman Kingsport Chemical Production Plant
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- Princeton University - Cost-Benefit Analysis of Gasification for Fuels/Chemicals Production at Kraft Pulp Mills
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- Rohm and Haas Co. - New Sustainable Chemistry for Adhesives, Elastomers and Foams



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# FY 2005 Biomass R&D Solicitation

Glenn Carpenter  
USDA NRCS

# 2005 Solicitation

- Built on last year's successes
- Priorities slightly more focused
- 4 topic areas rather than 8
- Less money for awards

# December 17, 2004

- The U.S. Department of Agriculture (USDA) and the U.S. Department of Energy (DOE) jointly announce the availability of fiscal year 2005 (FY05) funds.
- Solicit applications for financial assistance addressing research, development, and demonstration of biomass based products, bioenergy, biofuels, biopower, and related processes.

# December 17, 2004

- This funding opportunity intended
  - to promote greater innovation and development related to biomass
  - to support Federal policy calling for greater use of biomass-based products, feedstock production, and processing and conversion

# Solicitation

- Is more focused and defined than in previous years in order to assist USDA and DOE in developing a more balanced portfolio.
- This year's focus is on development and demonstration projects that lead to greater commercialization.
- This solicitation is limited to four Technical Topic Areas.

# Technical Topic Areas

- **Topic-1:** Feedstock Development and Production
- **Topic-2:** Biobased Products Development and Environmental and Economic Performance
- **Topic-3:** Integrated Resource Management and Biomass Use
- **Topic-4:** Incentive Analysis and Commercialization

# Evaluation—three step process

- Technical merit review, of preapplications.
- Technical merit review of full applications.
- Program policy factor review of full applications.

# Technical Merit Review

- *Technical Relevance and Merit—30%*
- *Technical Approach/Work Plan—25%*
- *Energy Efficiency/Displacement, Rural Economic Development, Environmental Benefits—25%*
- *Technical, Management, and Facility Capabilities—20%*

# Criterion 1: Technical Relevance and Merit

## Weight: 30 percent

- The technical merit of the application will be evaluated based on the extent to which the project will address research, development, and demonstration activities for biomass. Specific considerations for this criterion are:
  - Clarity and relevance of the project objectives.
  - Novelty, innovation, uniqueness, and originality of the project objectives.
  - Technical merit of the proposed research, development, or demonstration.
  - Extent to which the proposed work will demonstrate the current state of knowledge and/or technology.
  - Extent to which the proposed work will complement or advance the current knowledge or technology for the stated objectives.

## Criterion 2: Technical Approach/Work Plan Weight: 25 percent

- The technical approach will be based on the clarity and technical strength of the approach including the plan for each task and subtask, milestones and deliverables. Considerations for this criterion are:
  - Technical feasibility of the proposed work.
  - Adequacy and completeness of the proposed tasks.
  - Clarity and completeness of the description of each activity necessary to complete the project.
  - Likelihood of achieving project objectives through realistic milestones and logical task structure.
  - Reasonableness of the schedule.
  - Performance measures and milestones for evaluating progress with regard to key subtasks and/or deliverables.
  - Identification and appropriateness of key decision points for mitigating potential problems.
  - Process for monitoring and evaluating the project's progress and performance.

# Criterion 3: Energy Efficiency/Displacement, Rural Economic Development, Environmental Benefits Weight: 25 percent

- The overall projected benefits will be in terms of: improvements in energy efficiency and economics of the biomass technology, oil displacement, rural economic development, and environmental benefits. Specific considerations are:
  - 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.

## Criterion 4: Technical, Management, and Facility Capabilities Weight: 20 percent

- Technical and management qualifications of all participating organizations and key personnel will be evaluated with respect to their ability to carry out the proposed effort. The adequacy and appropriateness of the facilities planned for this work will also be considered. Considerations are:
  - Credentials, capabilities, experience (technical and managerial), performance record, and availability of the applicant and participants to comprehensively address all aspects of the proposed project.
  - Soundness of the project management concept with respect to proposed tasks and organizational structure to achieve project objectives.
  - Type, quality, availability, and appropriateness of facilities, equipment, and materials utilized to carry out the proposed work.
  - Level of participation by project participants as evidenced by letter(s) of commitment.
  - Extent of beneficial collaboration across industry and academia.
  - Current or recent government contracts, grants, cooperative agreements, or other work by the applicant and/or participants in this or related fields.

# Technical Topic Areas

- **Topic-1:** Feedstock Development and Production
- **Topic-2:** Biobased Products Development and Environmental and Economic Performance
- **Topic-3:** Integrated Resource Management and Biomass Use
- **Topic-4:** Incentive Analysis and Commercialization

## TECHNICAL TOPIC AREA:

### (1) Feedstock Development and Production

Proposals are being invited for research, development, and demonstration projects on:

- Agricultural products and by-products, forest residues and suitable crops as biomass feedstocks having significant commercial potential for production of bioenergy, biofuels, and biobased products. Efforts should focus on overcoming economic barriers and using appropriate agronomic and silvicultural methods that ensure sustainable feedstock production from agricultural products, by-products and forest residues.
- Agricultural and silvicultural production/management systems, and equipment designs/evaluations to produce, harvest, and transport biomass; and for research that develops tools which land managers and community developers can use in evaluating the technical and economic viability of biomass production and use in systems of both small and large scales of operation. An example of projects in this area might include life cycle analyses.

## TAC ROADMAP:

### Feedstock Production

- Biotechnology and Plant Physiology
- Agronomic Practices
- Feedstock Handling

### Public Policy Measures to Support Biomass Development

- Economic Analysis
- Life Cycle Analysis
- Procurement and Markets
- Regulatory Measures
- Incentives
- Biomass Resource Supply
- Education and Outreach
- R&D Investment

## TECHNICAL TOPIC AREA:

### (2) Biobased Products Development and Environmental and Economic Performance

New and value-added products are needed to provide incentives for the use of biomass. Greater analytical, technical, and economic understanding is needed of the environmental performance and sustainability of biobased products, including those leading to healthy rural economic development.

Proposals are sought on:

- Development, production, and use of biobased products, including developments and demonstrations of the effects on greenhouse gasses and carbon sequestration, land management practices, and natural resource impacts, including product performance standards.
- Impacts of co-products, including food, animal feed, wood, and fiber, on the price and large-scale economic viability of biobased products, particularly where new revenue streams are created that can enhance rural economic development and improve the quality of life in rural America.

## TAC ROADMAP:

### Product Uses and Distribution

- End products and distribution systems

### Public Policy Measures to Support Biomass Development

- Economic Analysis
- Life Cycle Analysis
- Procurement and Markets
- Regulatory Measures
- Incentives
- Biomass Resource Supply
- Education and Outreach
- R&D Investment

## TECHNICAL TOPIC AREA:

### (3) Integrated Resource Management and Biomass Use

Title II of the Healthy Forest Restoration Act of 2003 added emphasis to the Biomass Research and Development Act of 2000 on resource management that would overcome production barriers and use of biomass. To address these concerns, proposals are solicited that involve the integration of silviculture, harvesting, product processing and economics into forest management decisions to help communities and businesses create economic opportunity through sustainable management of the nations forest resources.

Agricultural systems under sustainable management can produce biomass to provide economic opportunities. There is a need to integrate agronomic practices and production systems into management systems.

Tools and technologies are needed to improve decisions in agricultural and silvicultural management for integrated production and use of biomass for economic opportunity while ensuring sustainability and meeting other management objectives.

## TAC ROADMAP:

Public Policy Measures to Support Biomass Development

- Economic Analysis
- Life Cycle Analysis
- Procurement and Markets
- Regulatory Measures
- Incentives
- Biomass Resource Supply
- Education and Outreach
- R&D Investment

## TECHNICAL TOPIC AREA:

### **(4) Incentive Analysis and Commercialization**

Proposals are invited for projects designed to overcome barriers to biomass use and induce greater commercialization and adoption of biobased production and products systems.

Analysis and analytical tools are needed to identify and develop strategies and mechanisms for internalizing the benefits and costs of biobased products and fuels with significant environmental features and benefits. These strategies can include a wide range of options such as subsidies, tax and regulatory considerations, community based goals, logos and labeling leading to pricing differentials, and mechanisms. This could include creating markets for externalities, such as trading or credit systems for carbon dioxide or sulfur from power plant emissions.

## TAC ROADMAP:

Public Policy Measures to Support Biomass Development

- Economic Analysis
- Life Cycle Analysis
- Procurement and Markets
- Regulatory Measures
- Incentives
- Biomass Resource Supply
- Education and Outreach
- R&D Investment

During the program policy factor review, each application is evaluated against the following criteria:

- 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.

During the program policy factor review, each application is evaluated against the following criteria:

- 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.

## 2005 Solicitation

- Preapplications closed February 15
- 670 preapplications
- Will ask for about 50 full proposals
- Will be able to fund about 12 to 15 full proposals—  
roughly 2 percent of preapplications

# Of the 670 preapplications in each of the Technical Topic Areas

- **Topic-1:** Feedstock Development and Production –150 preapplications
- **Topic-2:** Biobased Products Development and Environmental and Economic Performance—350 preapplications
- **Topic-3:** Integrated Resource Management and Biomass Use—100 preapplications
- **Topic-4:** Incentive Analysis and Commercialization–100 preapplications

# Projects

- Manure
- Landfill
- Forest
- Alternative feedstocks
- Aquaculture

## 2005 Timeline

- December 17, 2004—announcement
- February 15, 2005—preapplications close
- May 2, 2005—full applications close
- June 15, 2005—decision by undersecretaries
- July 15, 2005 general announcement

# FY 2006 Initiative

- Budget?
  - USDA?
  - DOE?
- Priorities?
- Focus?

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Technical Advisory  
Committee's  
*Roadmap* Report

March 17, 2005

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**A Report of ongoing R&D activities at USDA  
and DOE as they relate to the *Roadmap***

Michael Manella  
BCS, Incorporated

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# Background

- During the past two years information has been provided on DOE and USDA R&D portfolios by *Roadmap* category
    - Past reports did not address specific *Roadmap* objectives and did not specifically address accomplishments towards achieving the *Roadmap*
  - Due to the different organizational structures of the two Departments, different levels of information was reported
  - The Technical Advisory Committee requested a standard and consistent format to report ongoing R&D activities at USDA and DOE as they relate to the *Roadmap*
  - The proposed template is an effort to resolve those issues
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# How to use this Document

- This document can be supplemented by existing program documents: Joint Solicitation Matrix and USDA biomass funding summary, annual reports, technical plans, etc.
  - This document will contain all biomass-related R&D, including earmarks and joint solicitation funds
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# Important Aspects of this Document

- Organized by *Roadmap* objective
  - DOE Work Breakdown Structure and USDA Agency
  - Identifies Departmental efforts to overcome R&D challenges identified in the *Roadmap*
  - Illustrates Departmental progress towards achieving *Roadmap* objectives
-

# Organized by *Roadmap* Objective

Roadmap Main Category Sub-Category & Focus	<b>I. Feedstock Production</b>					
	<b><i>A. Biotechnology and Plant Physiology</i></b>					
	<b>Objective One - Improve the technical understanding of plant biochemistry and enzymes and develop the ability to engineer enzymes within desired crops</b>					
U.S. Department of Energy - By OBP Work Breakdown Structure Area	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
Feedstock Interface	List of the major technical goals of this WBS area as they relate to Roadmap objectives	Challenges that the R&D is trying to overcome	Major technical accomplishments and successes of this WBS area as it relates to this roadmap objective	Important participants i.e., National Labs, Universities, and private companies.	FY03	\$\$\$\$
					FY04	\$\$\$\$
					FY05	\$\$\$\$

# DOE Work Breakdown Structure

Roadmap Main Category Sub-Category & Focus	I. Feedstock Production					
	A. <i>Biotechnology and Plant Physiology</i>					
	Objective One - Improve the technical understanding of plant biochemistry and enzymes and develop the ability to engineer enzymes within desired crops					
<b>U.S. Department of Energy - By OBP Work Breakdown Structure Area</b>	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
<b>Feedstock Interface</b>	List of the major technical goals of this WBS area as they relate to Roadmap objectives	Challenges that the R&D is trying to overcome	Major technical accomplishments and successes of this WBS area as it relates to this roadmap objective	Important participants i.e., National Labs, Universities, and private companies.	FY03	\$\$\$
					FY04	\$\$\$
					FY05	\$\$\$
<b>Sugar Platform</b>					FY03	
					FY04	
					FY05	

# USDA Agency

Roadmap Main Category Sub-Category & Focus	I. Feedstock Production					
	A. <i>Biotechnology and Plant Physiology</i>					
	Objective One - Improve the technical understanding of plant biochemistry and enzymes and develop the ability to engineer enzymes within desired crops					
<b>U.S. Department of Agriculture - By Agency</b>	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
<b>Agricultural Research Service (ARS)</b>	List of the major technical goals of this WBS area as they relate to Roadmap objectives	Challenges that the R&D is trying to overcome	Major technical accomplishments and successes of this WBS area as it relates to this roadmap objective	Important participants i.e., National Labs, Universities, and private companies.	FY03	\$\$\$
					FY04	\$\$\$
					FY05	\$\$\$
<b>Cooperative State Education and Extension Research Service (CSREES)</b>					FY03	
					FY04	
					FY05	

# Agency efforts to overcome R&D Challenges Towards the *Roadmap*

Roadmap Main Category Sub-Category & Focus	I. Feedstock Production					
	A. <i>Biotechnology and Plant Physiology</i>					
	Objective One - Improve the technical understanding of plant biochemistry and enzymes and develop the ability to engineer enzymes within desired crops					
U.S. Department of Energy - By OBP Work Breakdown Structure Area	Technical Goals	<b>R&amp;D Challenges</b>	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
Feedstock Interface	List of the major technical goals of this WBS area as they relate to Roadmap objectives	<b>Challenges that the R&amp;D is trying to overcome</b>	Major technical accomplishments and successes of this WBS area as it relates to this roadmap objective	Important participants i.e., National Labs, Universities, and private companies.	FY03	\$\$\$
					FY04	\$\$\$
					FY05	\$\$\$

# Progress Towards Achieving *Roadmap Objectives*

Roadmap Main Category Sub-Category & Focus	I. Feedstock Production					
	A. <i>Biotechnology and Plant Physiology</i>					
	Objective One - Improve the technical understanding of plant biochemistry and enzymes and develop the ability to engineer enzymes within desired crops					
U.S. Department of Energy - By OBP Work Breakdown Structure Area	Technical Goals	R&D Challenges	<b>Accomplishments towards achieving Roadmap Objectives</b>	Major R&D Performers	Federal Funds	
Feedstock Interface	List of the major technical goals of this WBS area as they relate to Roadmap objectives	Challenges that the R&D is trying to overcome	<b>Major technical accomplishments and successes of this WBS area as it relates to this roadmap objective</b>	Important participants i.e., National Labs, Universities, and private companies.	FY03	\$\$\$\$
					FY04	\$\$\$\$
					FY05	\$\$\$\$

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# Important Aspects of this Document

- A new reporting category representing R&D challenges was added
  - A new reporting category representing progress towards the Roadmap was added
  - Constraints inherent in the different structures of the Departments led to organizing the document into DOE's Work Breakdown Structure (WBS) and USDA's Agencies (e.g. ARS, FS, CREES)
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# Important Aspects of this Document

- USDA and DOE have made a concerted effort to report information requested by the TAC
  - This document attempts to simplify the information provided by the Departments into a consistent and recognizable format for the Committee
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# Moving Forward

- Approval by the Technical Advisory Committee, USDA and DOE



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The End

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Roadmap Main Category Sub-Category & Focus	IV. Public Policy Measures to Support Biomass Development					
	Objective One - Promote the commercialization of successfully demonstrated environmentally sound biobased technologies					
	U.S. Department of Energy - By OBP Work Breakdown Structure Area	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds
Feedstock Interface	List of the major technical goals of this WBS area as they relate to Roadmap objectives	Challenges that the R&D is trying to overcome	Major technical accomplishments and successes of this WBS area as it relates to this roadmap objective	Important participants i.e., National Labs, Universities, and private companies.	FY2003	\$\$\$\$
					FY2004	\$\$\$\$
					FY2005	\$\$\$\$
Sugar Platform					FY2003	
					FY2004	
					FY2005	
Thermochemical Platform					FY2003	
					FY2004	
					FY2005	
Products					FY2003	
					FY2004	
					FY2005	
Integrated Biorefineries					FY2003	
					FY2004	
					FY2005	
Program Management					FY2003	
					FY2004	
					FY2005	
U.S. Department of Agriculture - By Agency	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
	List of the major technical goals of this	Challenges that the R&D is trying to	Major technical accomplishments and successes	Important R&D participants	FY2003	\$\$\$\$

<b>Agricultural Research Service (ARS)</b>	agency as they relate to Roadmap objectives	overcome	of this agency as it relates to this roadmap objective		FY2003	\$\$\$\$\$
<b>Cooperative State Research Education and Extension Service (CSREES)</b>					FY2004	\$\$\$\$\$
					FY2005	
					FY2003	
<b>Farm Service Agency (FSA)</b>					FY2004	
					FY2005	
					FY2003	
<b>Forest Service (FS)</b>					FY2004	
					FY2005	
					FY2003	
<b>Natural Resources Conservation Service (NRCS)</b>					FY2004	
					FY2005	
					FY2003	
<b>The Office of Energy Policy (OEPNUP)</b>					FY2004	
					FY2005	
					FY2003	

<b>Departmental Administration (DA)</b>					FY2003	
					FY2004	
					FY2005	
<b>Rural Development (RD)</b>					FY2003	
					FY2004	
					FY2005	
<b>Roadmap Main Category Sub-Category &amp; Focus</b>	<b><i>IV. Public Policy Measures to Support Biomass Development</i></b>					
	Objective Two - Outline the institutional and policy changes needed to remove the barriers to economically sound development					
<b>U.S. Department of Energy - By OBP Work Breakdown Structure Area</b>	<b>Technical Goals</b>	<b>R&amp;D Challenges</b>	<b>Accomplishments towards achieving Roadmap Objectives</b>	<b>Major R&amp;D Performers</b>	<b>Federal Funds</b>	
<b>Feedstock Interface</b>					FY2003	\$\$\$\$
					FY2004	\$\$\$\$
					FY2005	\$\$\$\$
<b>Sugar Platform</b>					FY2003	
					FY2004	
					FY2005	
<b>Thermochemical Platform</b>					FY2003	
					FY2004	
					FY2005	
<b>Products</b>					FY2003	
					FY2004	
					FY2005	
<b>Integrated Biorefineries</b>					FY2003	
					FY2004	
					FY2005	
					FY2003	

Program Management					FY2004	
					FY2005	
U.S. Department of Agriculture - By Agency	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
Agricultural Research Service (ARS)					FY2003	\$\$\$\$\$
					FY2003	\$\$\$\$\$
					FY2004	\$\$\$\$\$\$
Cooperative State Research Education and Extension Service (CSREES)					FY2005	
					FY2003	
					FY2004	
Farm Service Agency (FSA)					FY2005	
					FY2004	
					FY2005	
Forest Service (FS)					FY2003	
					FY2004	
					FY2005	
Natural Resources Conservation Service (NRCS)					FY2003	
					FY2004	

					FY2005	
<b>The Office of Energy Policy (OEPNUP)</b>					FY2003	
					FY2004	
					FY2005	
<b>Departmental Administration (DA)</b>					FY2003	
					FY2004	
					FY2005	
<b>Rural Development (RD)</b>					FY2003	
					FY2004	
					FY2005	
<b>Roadmap Main Category Sub-Category &amp; Focus</b>	<b><i>IV. Public Policy Measures to Support Biomass Development</i></b>					
	<i>Objective Three - Ensure that the biomass technologies developed are enviromentally sound and move the country in the direction of sustainable biomass systems</i>					
<b>U.S. Department of Energy - By OBP Work Breakdown Structure</b>	<b>Technical Goals</b>	<b>R&amp;D Challenges</b>	<b>Accomplishments towards achieving Roadmap</b>	<b>Major R&amp;D Performers</b>	<b>Federal Funds</b>	
<b>Feedstock Interface</b>					FY2003	\$\$\$\$\$
					FY2004	\$\$\$\$\$
					FY2005	\$\$\$\$\$
<b>Sugar Platform</b>					FY2003	
					FY2004	
					FY2005	
					FY2003	

Thermochemical Platform					FY2004	
					FY2005	
Products					FY2003	
					FY2004	
Integrated Biorefineries					FY2005	
					FY2003	
Program Management					FY2004	
					FY2005	
<b>U.S. Department of Agriculture -</b>	<b>Technical Goals</b>	<b>R&amp;D Challenges</b>	<b>Accomplishments towards</b>	<b>Major R&amp;D Performers</b>	<b>Federal Funds</b>	
Agricultural Research Service (ARS)					FY2003	\$\$\$\$
					FY2003	\$\$\$\$
					FY2004	\$\$\$\$\$
Cooperative State Research Education and Extension Service (CSREES)					FY2005	
					FY2003	
					FY2004	
Farm Service Agency (FSA)					FY2005	
					FY2004	
					FY2005	
Forest Service (FS)					FY2003	
					FY2004	
					FY2005	
Natural Resources Conservation Service (NRCS)					FY2003	
					FY2004	
					FY2005	
The Office of Energy Policy (OEPNUP)					FY2003	
					FY2004	
					FY2005	
Departmental Administration (DA)					FY2003	
					FY2004	
					FY2005	
Rural Development (RD)					FY2003	
					FY2004	
					FY2005	
<b>Roadman Main Category Sub</b>	<b><i>IV. Public Policy Measures to Support Biomass Development</i></b>					

Roadmap Main Category Sub-Category & Focus	Objective Four - Enhance opportunities for rural economic development					
	Technical Goals	R&D Challenges	Accomplishments towards achieving Roadmap Objectives	Major R&D Performers	Federal Funds	
U.S. Department of Energy - By OBP Work Breakdown Structure Area						
Feedstock Interface					FY2003	\$\$\$\$
					FY2004	\$\$\$\$
					FY2005	\$\$\$\$
Sugar Platform					FY2003	
					FY2004	
					FY2005	
Thermochemical Platform					FY2003	
					FY2004	
					FY2005	
Products					FY2003	
					FY2004	
					FY2005	
Integrated Biorefineries					FY2003	
					FY2004	
					FY2005	
Program Management					FY2003	
					FY2004	
					FY2005	
U.S. Department of Agriculture - By Agency						
Agricultural Research Service (ARS)					FY2003	\$\$\$\$
					FY2003	\$\$\$\$
					FY2004	\$\$\$\$\$
Cooperative State Research Education and Extension Service (CSREES)					FY2005	
					FY2003	
					FY2004	
Farm Service Agency (FSA)					FY2005	
					FY2004	
					FY2005	
Forest Service (FS)					FY2003	
					FY2004	

					FY2005	
<b>Natural Resources Conservation Service (NRCS)</b>					FY2003	
					FY2004	
					FY2005	
<b>The Office of Energy Policy (OEPNUP)</b>					FY2003	
					FY2004	
					FY2005	
<b>Departmental Administration (DA)</b>					FY2003	
					FY2004	
					FY2005	
<b>Rural Development (RD)</b>					FY2003	
					FY2004	
					FY2005	



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

# Biomass R&D Technical Advisory Committee Meeting

*FY 2006 Presidential DOE Biomass Budget*

John E. Ferrell

Office of Biomass Program

Energy Efficiency and Renewable Energy

March 17, 2005



# The Budget Request A Closer Look

(dollars in thousands)

## Energy Conservation

	FY 2004 Comparable Appropriations	FY 2005 Comparable Appropriations	FY 2006 Request	FY 2006 Request vs. FY 2005 Approp.
Vehicle Technologies.....	172,395	165,409	165,943	534
Fuel-Cell Technologies.....	63,782	74,944	83,600	8,656
<hr/>				
Weatherization and Intergovernmental				
Weatherization Assistance Grants.....	227,166	228,160	230,000	1,840
State Energy Program Grants.....	43,952	44,176	41,000	(3,176)
State Energy Activities.....	2,324	2,320	500	(1,820)
Gateway Deployment.....	34,490	34,349	26,657	(7,692)
Total, Weatherization and Intergovernmental.....	307,932	309,005	298,157	(10,848)
<hr/>				
Distributed Energy Resources.....	59,684	60,416	56,629	(3,787)
Building Technologies.....	57,799	65,464	57,966	(7,498)
Industrial Technologies.....	90,450	74,801	56,489	(18,312)
Biomass and Biorefinery Systems R&D.....	6,966	7,253	21,805	14,552
Federal Energy Management Programs.....	19,420	17,931	17,147	(784)
Program Management.....	92,362	93,011	89,036	(3,975)
Subtotal, Energy Conservation.....	870,790	868,234	846,772	(21,462)
Use of prior-year balances.....	(2,823)	-	-	-
<hr/>				
Total, Energy Conservation.....	867,967	868,234	846,772	(21,462)



# The Budget Request A Closer Look

(dollars in thousands)

## Energy Supply

	FY 2004 Comparable Appropriations	FY 2005 Comparable Appropriations	FY 2006 Request	FY 2006 Request vs. FY 2005 Approp.
Hydrogen Technology .....	80,412	94,006	99,094	5,088
Solar Energy.....	80,731	85,074	83,953	(1,121)
Wind Energy.....	39,803	40,804	44,249	3,445
Hydropower.....	4,673	4,862	500	(4,362)
Geothermal Technology.....	24,625	25,270	23,299	(1,971)
Biomass and Biorefinery Systems R&D.....	84,608	80,846	50,359	(30,487)
Intergovernmental Activities.....	14,673	16,776	11,910	(4,866)
Renewable Program Support.....	8,493	5,954	2,901	(3,053)
Departmental Energy Management Program.....	1,963	1,951	2,019	68
Facilities and Infrastructure.....	12,950	11,389	16,315	4,926
Program Direction.....	16,490	19,064	19,043	(21)
Subtotal, Energy Supply.....	369,421	385,996	353,642	(32,354)
Use of prior-year balances.....	(17,126)	(5,648)	-	5,648
Total, Energy Supply.....	352,295	380,348	353,642	(26,706)



**Program Focus:** Expand the use of biomass for energy and industrial products through advanced bioconversion techniques for the production of fuels, chemicals, and materials in integrated biorefineries.

## Budget

Funding (dollars in thousands)			
Subprogram	FY04 Comparable Approp.	FY05 Comparable Approp.	FY06 Request
<b>Biomass and Biorefinery Systems R&amp;D (Energy Conservation)</b>			
Utilization of Platform Outputs	6,570	6,859	21,205
Technical Program Management Support	396	394	
<b>Biomass and Biorefinery Systems R&amp;D (Energy Supply)</b>			600
Feedstock Infrastructure	982	1,984	1,000
Platforms Research and Development	28,874	30,073	43,360
Utilization of Platform Outputs	13,518	13,455	5,999
Congressionally Directed Activities	41,234	35,334	
<b>Total</b>	<b>91,574</b>	<b>88,099</b>	<b>72,164</b>

## Key Activities

- Continue successful multi-agency collaboration toward the integrated industrial biorefinery
- Further lower the cost of sugars through integration of advanced enzymes with optimized pretreatment processes.
- Continue development of advanced technologies for improved economics and performance to biobased products.
- Further utilize and integrate technological advances in the production of sugars and products to improve the effectiveness and efficiency of the industrial biorefinery.



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

# Biomass & Biorefinery Systems R&D EWD Funds

(dollars in thousands)					
	FY 2004 Comparable Appropriation	FY 2005 Original Appropriation	FY 2005 Adjustments	FY 2005 Comparable Appropriation	FY 2006 Request
Feedstock Infrastructure	982	2,000	-16	1,984	1,000
Platforms R&D	28,874	30,969	-896	30,073	43,360
Utilization of Platform Outputs	13,518	13,562	-107	13,455	5,999
Congressionally Directed Activities	41,234	35,616	-282	35,334	0
Total Biomass & Biorefinery Systems R&D	84,608	82,147	-1,301	80,846	50,359



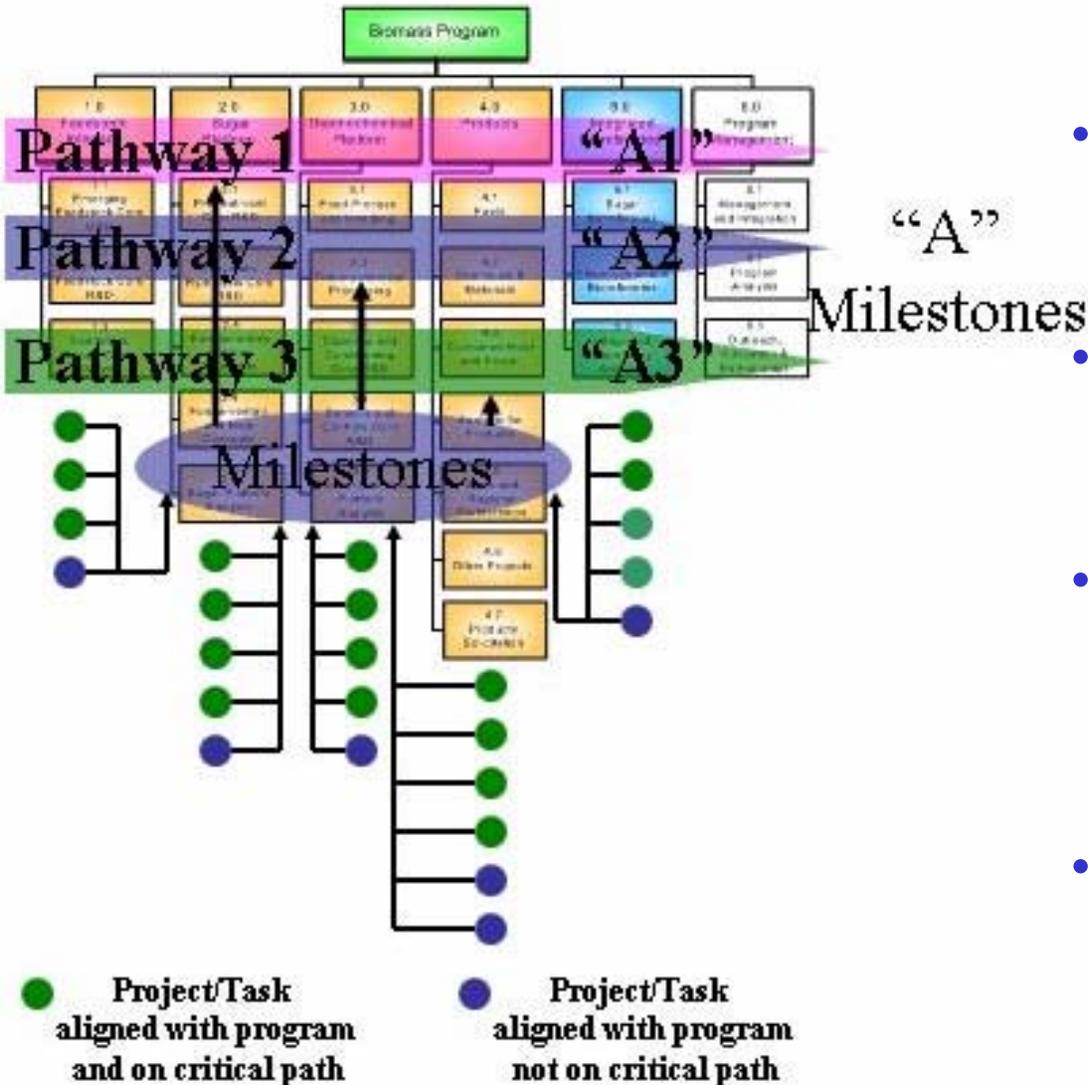
U.S. Department of Energy  
Energy Efficiency and Renewable Energy

# Biomass & Biorefinery Systems R&D Interior Funds

(dollars in thousands)						
	FY 2004 Comparable Appropriation	FY 2005 Comparable Appropriation	FY 2006 Base	FY 2006 Request	FY 2006 Request vs. Base	
					\$ Change	% Change
Utilization of Platform Outputs R&D	6,570	6,859	6,859	21,205	+14,346	+209.2%
Technical Program Management Support	396	394	394	600	+206	+52.3%
Total Biomass & Biorefinery Systems R&D	6,966	7,253	7,253	21,805	+14,552	+200.6%



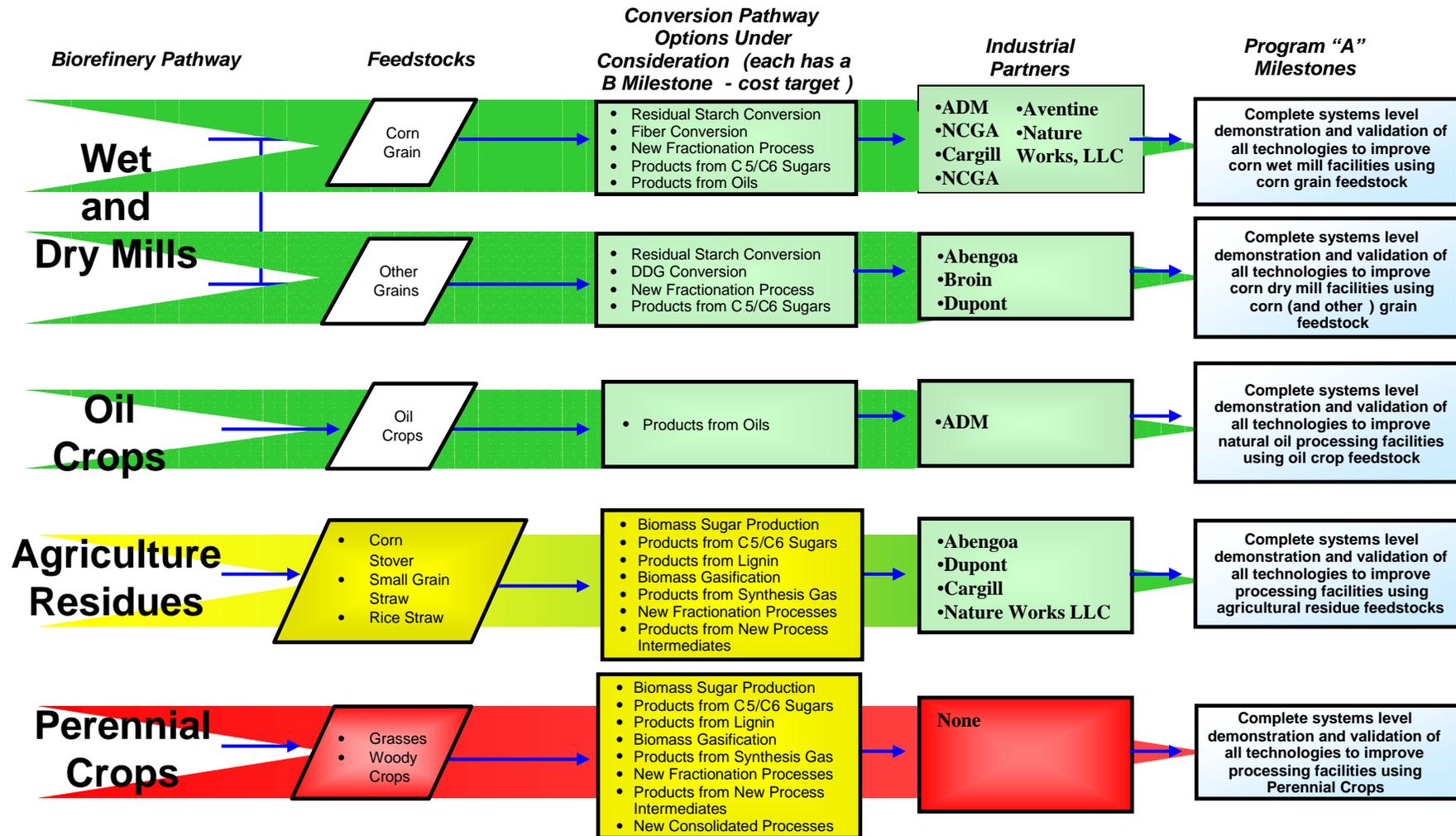
# Pathways 2005 and Beyond



- Integrates Pathways and subsequent “A” Milestones across WBS
- Allows project milestones and cost targets to apply directly to pathways
- Allows resources to be focused on technology development critical to a pathway without sacrificing the long term
- Enables dynamic response to changes in resource loading

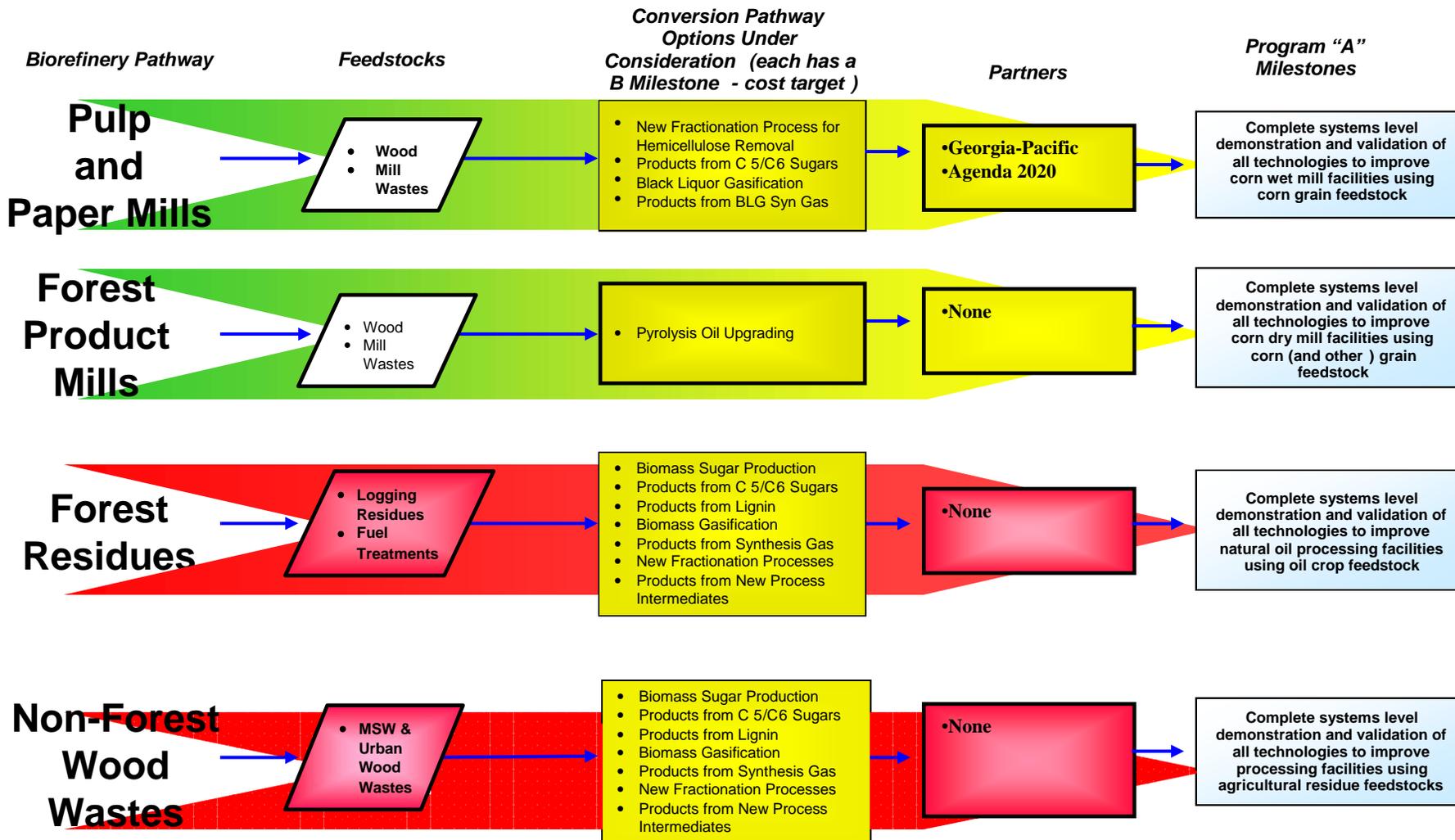


# Agricultural Sector Biorefinery Pathways



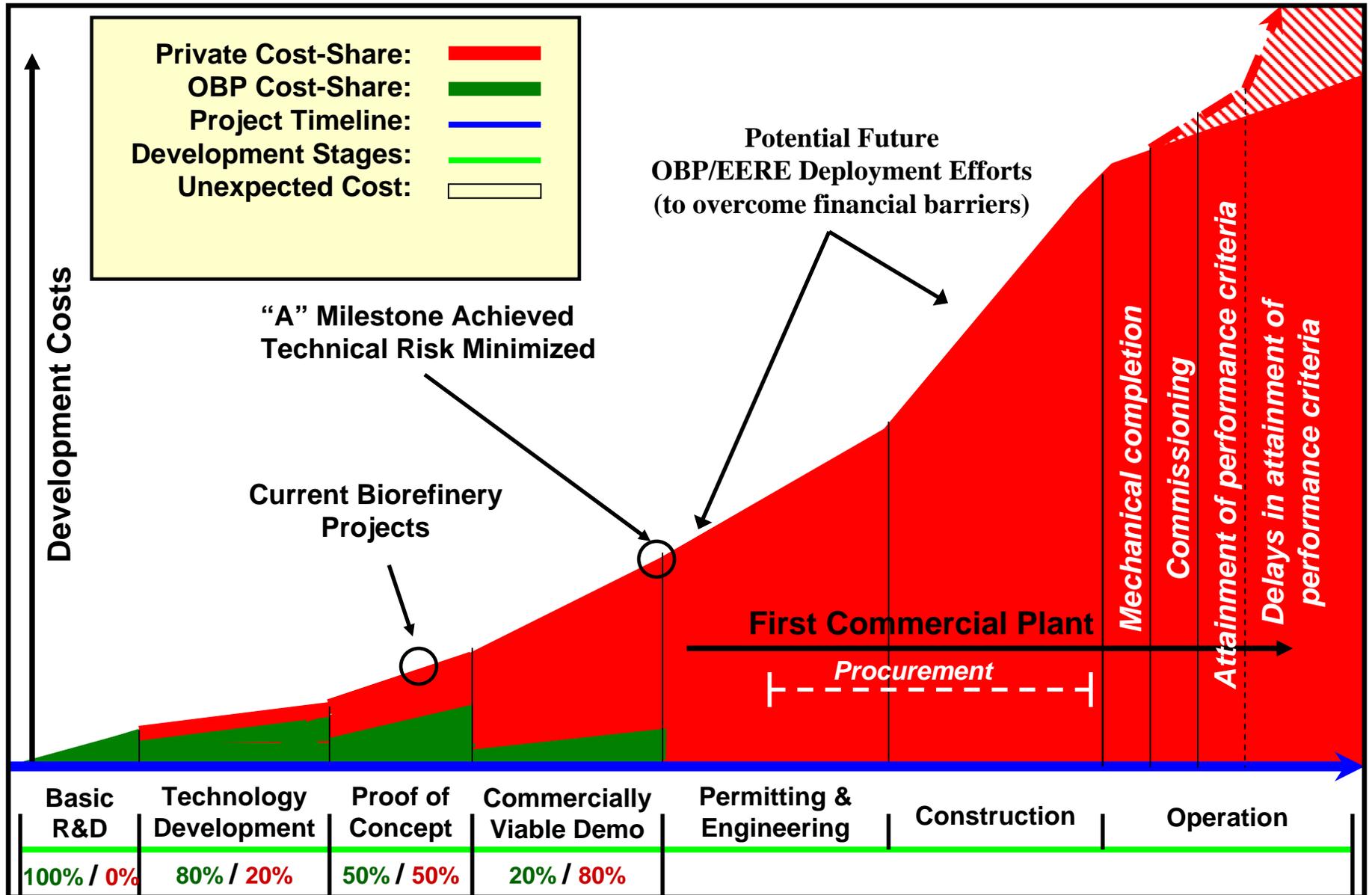


# Forest Sector Biorefinery Pathways



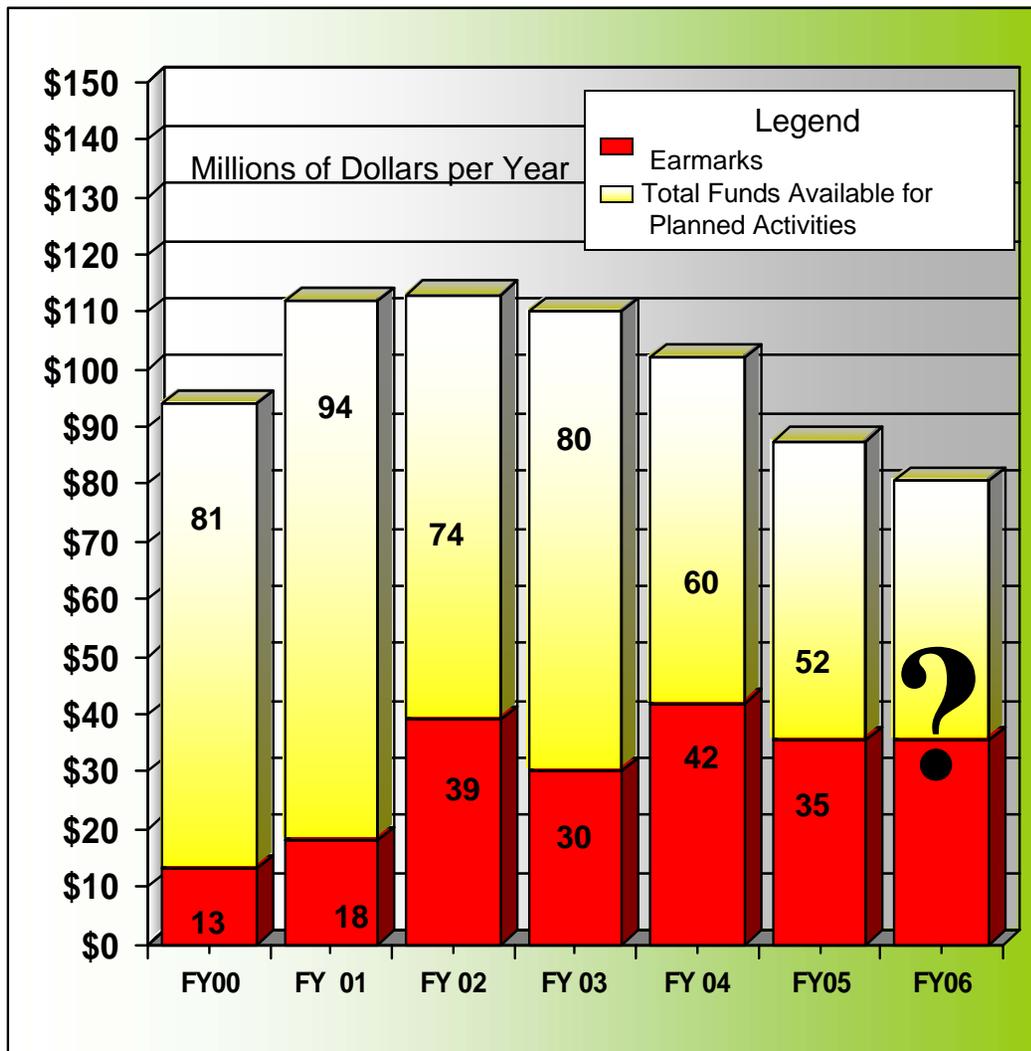


# Deployment – Barriers





# Biomass Funding Today Earmarks and Total Funding



- **Three-fold increase in earmarks since 2000**
- **Earmarks have grown from 18% to over 40% of the total funding**
- **Real decline in the available funds used in support planned R&D and biorefinery support**
- **Objectives can not be achieved if trends continue to FY06 and beyond**

*USDA FY05-06 Update  
Biobased Products and  
Bioenergy*

**Merlin Bartz  
Regional Assistant Chief  
Natural Resources Conservation Service  
Biomass R&D Technical Advisory Meeting  
March 17, 2005**



# USDA FY06 PRESIDENT'S BUDGET

## Estimated Funding Relevant to Biomass Roadmap (\$millions)

Category	ARS	CSREES	FSA	FS	NRCS	OCE	RD	TOTAL
1	15.3			4.9	3.5			23.7
2	39.7	15.3		1.0	2.6		13.6	72.2
3	7.2			1.4	3.5			12.1
4	0.3	0.1	60.0	0.8	2.6	3.5	6.5	71.2
Other				1.4				
<b>TOTAL</b>	<b>62.5</b>	<b>15.4</b>	<b>60.0</b>	<b>9.4</b>	<b>12.4</b>	<b>3.5</b>	<b>20.1</b>	<b>183.2</b>

Note: totals may not sum correctly because of rounding



# USDA

## Estimated FY03-06 Funding Relevant to Biomass Roadmap (\$millions)

FY	ARS	CSREES	FSA	FS	NRCS	OCE	RD	TOTAL
03	71.0	14.1	147.2	5.4	13.9	2.0	78.5	332.1
04	71.7	16.5	149.4	7.4	13.6	2.0	19.7	280.3
05	69.6	19.1	100.0	8.0	14.4	3.5	27.0	241.5
06	62.5	15.4	60.0	9.4	12.4	3.5	20.1	183.2

Note: totals may not sum correctly because of rounding.



## AGRICULTURAL RESEARCH SERVICES Estimated FY03-06 Funding Relevant to Biomass Roadmap (\$millions)

<b>CATEGORY</b>	<b>FY03</b>	<b>FY04</b>	<b>FY05</b>	<b>FY06</b>
<b>1 - Feedstock</b>	<b>4.2</b>	<b>17.1</b>	<b>16.5</b>	<b>15.3</b>
<b>2 - Conversion</b>	<b>63.8</b>	<b>45.0</b>	<b>43.7</b>	<b>39.7</b>
<b>3 - Products</b>	<b>1.5</b>	<b>9.6</b>	<b>9.3</b>	<b>7.2</b>
<b>4 - Policy</b>				<b>0.3</b>
<b>Other</b>	<b>1.5</b>			
<b>TOTAL</b>	<b>71.0</b>	<b>71.7</b>	<b>69.6</b>	<b>62.5</b>

Note: totals may not sum correctly because of rounding



# CSREES

Estimated FY03-06 Funding Relevant to Biomass Roadmap (\$millions)

<b>CATEGORY</b>	<b>FY03</b>	<b>FY04</b>	<b>FY05</b>	<b>FY06</b>
<b>1 - Feedstock</b>	<b>0.8</b>	<b>0.8</b>	<b>0.8</b>	
<b>2 - Conversion</b>	<b>13.1</b>	<b>15.5</b>	<b>18.1</b>	<b>15.3</b>
<b>3 - Products</b>				
<b>4 - Policy</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>
<b>Other</b>				
<b>TOTAL</b>	<b>14.1</b>	<b>16.5</b>	<b>19.1</b>	<b>15.4</b>

Note: totals may not sum correctly because of rounding



# FARM SERVICE AGENCY

Estimated FY03-06 Funding Relevant to Biomass Roadmap (\$millions)

<b>CATEGORY</b>	<b>FY03</b>	<b>FY04</b>	<b>FY05</b>	<b>FY06</b>
<b>1 - Feedstock</b>				
<b>2 - Conversion</b>				
<b>3 - Products</b>				
<b>4 - Policy</b>	<b>147.2</b>	<b>149.4</b>	<b>100.0</b>	<b>60.0</b>
<b>Other</b>				
<b>TOTAL</b>	<b>147.2</b>	<b>149.4</b>	<b>100.0</b>	<b>60.0</b>



# FOREST SERVICE

Estimated FY03-06 Funding Relevant to Biomass Roadmap (\$millions)

CATEGORY	FY03	FY04	FY05	FY06
1 - Feedstock	3.0	4.1	4.5	4.9
2 - Conversion	0.7	0.8	0.8	1.0
3 - Products	0.8	1.0	1.1	1.4
4 - Policy	0.6	1.0	0.6	0.8
Other*	0.3	0.5	1.0	1.4
<b>TOTAL</b>	<b>5.4</b>	<b>7.4</b>	<b>8.0</b>	<b>9.4</b>

Note: totals may not sum correctly because of rounding

\*Small-diameter trees integrated management and use



NATURAL RESOURCES CONSERVATION SERVICE  
 Estimated FY03-06 Funding Relevant to Biomass Roadmap  
 (\$millions)

CATEGORY	FY03	FY04	FY05	FY06
1 - Feedstock		4.7	4.1	3.5
2 - Conversion	13.9	1.9	3.1	2.6
3 - Products		3.9	4.1	3.5
4 - Policy		3.1	3.1	2.6
Other				
<b>TOTAL</b>	<b>13.9</b>	<b>13.6</b>	<b>14.4</b>	<b>12.4</b>

Note: totals may not sum correctly because of rounding



# OFFICE of the CHIEF ECONOMIST

## Estimated FY03-06 Funding Relevant to Biomass Roadmap (\$millions)

<b>CATEGORY</b>	<b>FY03</b>	<b>FY04</b>	<b>FY05</b>	<b>FY06</b>
<b>1 - Feedstock</b>				
<b>2 - Conversion</b>				
<b>3 - Products</b>				
<b>4 - Policy</b>	<b>2.0</b>	<b>2.0</b>	<b>3.5</b>	<b>3.5</b>
<b>Other</b>				
<b>TOTAL</b>	<b>2.0</b>	<b>2.0</b>	<b>3.5</b>	<b>3.5</b>

Note: totals may not sum correctly because of rounding



# Rural Development

Estimated FY03-06 Funding Relevant to Biomass Roadmap (\$millions)

<b>CATEGORY</b>	<b>FY03</b>	<b>FY04</b>	<b>FY05</b>	<b>FY06</b>
<b>1 – Feedstock</b>				
<b>2 – Conversion</b>	<b>78.5</b>	<b>19.7</b>	<b>20.5</b>	<b>13.6</b>
<b>3 – Products</b>				
<b>4 - Policy</b>			<b>6.5</b>	<b>6.5</b>
<b>Other</b>				
<b>TOTAL</b>	<b>78.5</b>	<b>19.7</b>	<b>27.0</b>	<b>20.1</b>

Note: totals may not sum correctly because of rounding

