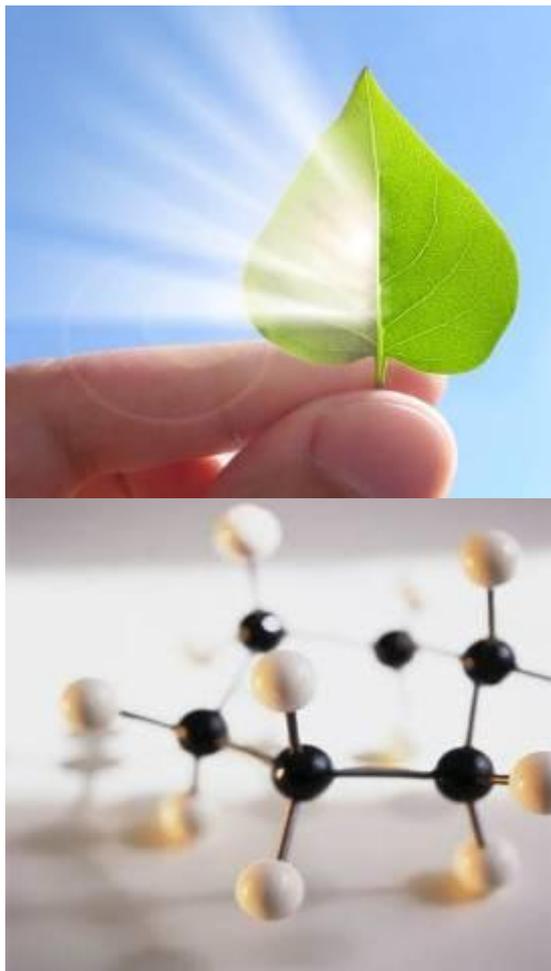


Biomass R&D Technical Advisory Committee

August 23, 2011 – Elliott Levine



Travel Process

- Natalie Roberts is the point of contact for all questions related to TAC travel and reimbursement. natalie.roberts@ee.doe.gov or 202-586-2325
- Reimbursement Deadline for August Meeting: **September 15th**
 - Receipts for all travel, hotels, incidentals, etc. must be sent to Natalie by COB on the above date.

Future Meeting Dates

- Final 2011 meeting will be the week of November 7-10, in the DC metro area
- We will set tentative meeting dates for 2012 at the November meeting based on member availability and other upcoming bioenergy conferences

Travel Process						
NOVEMBER						
M	T	W	T	F	S	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Useful Background Information

- Technical Advisory Committee was formed by the Biomass Research and Development Act of 2000 and later reauthorized by the Food Conservation and Energy Act of 2008
- The Committee provides recommendations to the Sec. of Energy and the Sec. of Agriculture on the technical focus, direction, and review process of requests for proposals issued under the Biomass R&D Initiative and program activities related to the Initiative
- The Committee provides recommendations to the Biomass R&D Board to ensure that funding is consistent with the objectives of the BRD Initiative and that solicitations are open and competitive, with clear selection criteria, minimal prescriptions, and no areas of special interest
- At the last FY 2011 meeting, Committee recommendations must be approved by majority vote for inclusion in an annual report to the Secretaries and to Congress

Biomass Program Review Process

2011 OBP Program Review Portal

2011 Biomass Program Peer Review Meetings

The U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy, Biomass Program will be conducting detailed biennial peer review meetings of its activities throughout the first half of 2011. The process will begin with reviews of the Program's eight technology areas between February 2011 and April 2011. The process will wrap up in June 2011 with a two-day Program Peer Review Conference. The Peer Review is required of the Biomass Program and other Energy Efficiency and Renewable Energy Programs to obtain independent assessments of the Program's current research and development project portfolio.

The 2011 Platform and Program Peer Review meetings provide interested stakeholders an opportunity to learn about these federally funded, state-of-the-art biomass energy technology development activities, and they provide DOE an opportunity to obtain meaningful feedback from stakeholders. The information will be useful as the Biomass Program considers future funding and portfolio balance decisions.

Integrated Biorefineries Platform	→
Infrastructure Activities	→
Analysis Platform and Sustainability Activities	→
Feedstocks Platform	→
Algae R&D Activities	→
Thermochemical Platform	→
Biochemical Platform	→
Program Peer Review Meeting	→
Steering Committee	→
Presenter Information and Login	→



9 Biomass Peer Review Meetings have taken place over the last 7 months:

- IBR: February 1-3, Washington, DC
- Infrastructure: February 3, Washington, DC
- Biochemical R&D: February 14-16, Denver, CO
- Thermochemical R&D: February 16-18, Denver, CO
- Analysis/Sustainability: April 4-6, Annapolis, MD
- Feedstocks: April 6-8, Annapolis, MD
- Algae: April 7-8, Annapolis, MD
- **Program Review: June 27-28, Arlington, VA**

Complete review results will be made available to the Committee as soon as they are finalized.

Biomass 2011: Replace the Whole Barrel, Supply the Whole Market The New Horizons of Bioenergy



- Biomass 2011 took place July 26-27 at the Gaylord National Resort and Convention Center in National Harbor, MD
- Over 600 participants attended; webinar was heard in an additional 33 states and 15 countries
- Over 100 speakers from industry, government, academia and other organizations
- Keynote speakers included:
 - Steven Chu, Secretary of Energy
 - Tom Vilsack, Secretary of Agriculture
 - Jackalyn Pfannenstiel, Assistant Secretary of the Navy (Energy, Installations, and the Environment)



Biomass 2011 also featured a variety of new elements, including a general session debate on the subject: “What is the Best Use of Biomass?”



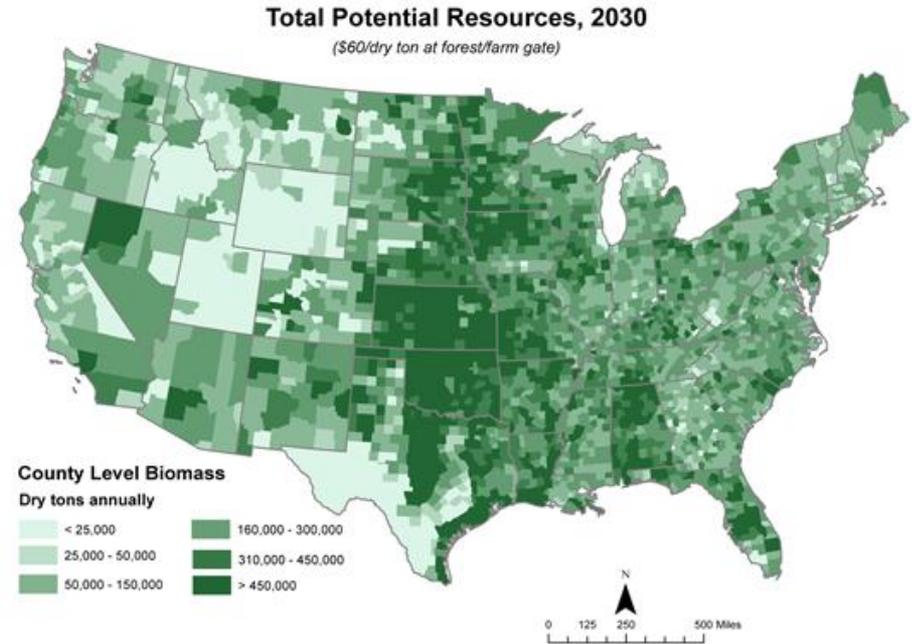
Interactive Exhibit displays highlighted the contributions of the DOE National Labs along the entire bioenergy supply chain.



Long awaited Update to the 2005 Billion Ton Study

More robust analysis:

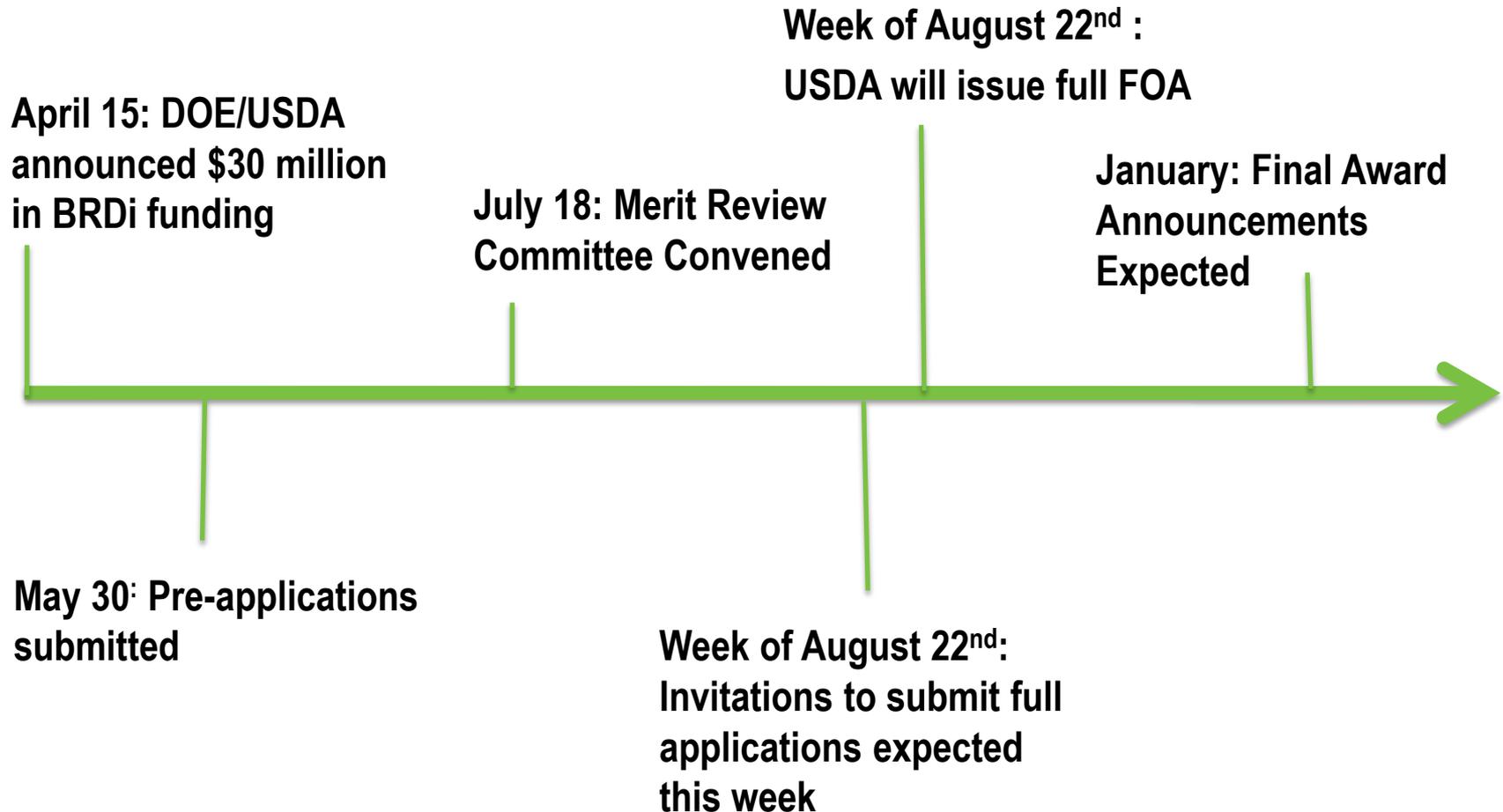
- Sustainability criteria at the field and stand level
- Updated baseline data
- Land use change modeling for energy crops
- County-level inventory and costs for all major feedstocks
- Competition with other commodities and crops



Key findings:

- Total biomass potential is a billion dry tons by 2022 and ranges from about 1.0 to 1.6 billion in 2030 depending on the scenario.
- Sufficient resource potential exists to meet the 2022 RFS2 advanced biofuel goals as well as significant additional biomass for electricity, chemicals, transportation fuels, and other uses.

BRDi Joint Solicitation Timeline



Solicitation Topics: Applicants must propose projects that integrate science and engineering research in all three of the following technical areas:

- ❖ Feedstock Development
- ❖ Biofuels and Biobased Products Development
- ❖ Biofuels Development Analysis

Merit Review Committee

- 23 panel members were selected
- 6 review panels were formed
- All reviewers signed confidentiality and conflict of interest certification and recused themselves from any conflicts of interest

Current Solicitation

- Almost 300 pre-applications were received for 2011
- Nearly 50 were rejected during the compliance review
- Around 50 applicants have been selected; letters are expected to go out this week (August 22nd), followed by USDA FOA

On August 16th, the Obama Administration announced a MOU between the DOE, USDA, and the U.S. Navy

- \$510 million over the next three years to produce advanced drop-in aviation and marine biofuels for military and commercial application via non-food crops
- New plants will be constructed in geographically diverse locations and produce drop-in replacement advanced biofuels meeting military specifications at a price competitive with petroleum
- Competitive solicitation expected to be announced in the “very near future” and will require substantial cost shares from private industry of at least 1-to-1
- Reflects a growing recognition of the potential for biofuels in military applications and the ambitious target set by Navy Secretary Ray Mabus of achieving 50% of energy consumption from renewable sources by 2020.



On August 15, the National Advanced Biofuels Consortium announced the selection of two pathways that will move to Stage II of the funding process.

- NABC is a consortium funded by DOE with \$35 million from the American Recovery and Reinvestment Act
- Consortium is lead by NREL and PNNL, and includes 17 partners from industry, academia, and the National Labs

• Two pathways selected:

- Fermentation of Lignocellulosic Sugars, led by Amyris
- Catalysis of Lignocellulosic Sugars, led by Virent

Projects will be funded with \$26 million from the DOE and leverage an additional \$12 million in cost-share.

• Two other pathways still in the consideration phase:

- Catalytic Fast Pyrolysis
- Hydrothermal Liquefaction

“Transforming Biomass into High-Quality, On-Spec, High Density Feedstocks”

- Idaho National Laboratory, August 23-24, 2011
- Sponsors
 - US-DOE’s Office of Biomass Program (OBP)
 - Office of Science (SC)
 - Advanced Research Projects Agency Energy (ARPA-E)
- Biomass R&D Focus
 - Increasing the bulk and energy density of biomass resources for improved logistics
 - Upgrading biomass through pre-conversion and formulation for improved performance in bioenergy applications.
- Workshop purpose
 - Demonstrate the Deployable PDU (Process Demonstration Unit) to a wider audience of stakeholders
 - Broaden the view of biomass densification to include pre-conversion and formulation concepts
 - Solicit industry opinions on DOE approach and encourage partnership opportunities for use of the PDU



DOE Genomic Science Program

Program Goal: Achieve a predictive, system-level understanding of plants, microbes, and biological communities, via integration of fundamental science and technology development, to enable biological solutions to DOE mission challenges in energy, environment, and climate.

Recent Award Announcements:

1) Systems Biology Knowledgebase

- On July 7th, the DOE announced the selection of a collaboration of top scientists from the National Labs to develop a computer based Systems Biology Knowledgebase.
- Project will receive \$12 million in annual funding
- Designed to accelerate discovery by enabling data integration, mining, and computational analysis of the masses of information currently being produced by rapid genomic sequencing and other high-throughput techniques of contemporary systems biology.

Recent Award Announcements (continued)

2) Plant Feedstock Genomics for Bioenergy

- On August 11th, DOE and USDA announced 10 awards for genomics-based research for improved use of biomass feedstocks for renewable fuels and chemicals
- DOE Office of Science awarded \$10.2 million for 8 projects on sorghum, poplar, switchgrass, sugarcane, Miscanthus, and Brachypodium
- USDA NIFA awarded \$2 million for 2 projects on sorghum

3) Annual Call for Genomic Science Program

- 2011 Topic Areas:
 - Microbial and Plant Processes for Bioenergy
 - Microbial Environmental Processes
 - Advanced Analytical Technologies
- Approximately \$16M in annual funding; 28 projects selected in 2011, 20 focused on bioenergy/sustainability

Links to Press Releases/Sources

- 1) NABC Announcement: http://apps1.eere.energy.gov/news/progress_alerts.cfm/pa_id=597
- 2) MOU Announcement: <http://energy.gov/articles/president-obama-announces-major-initiative-spur-biofuels-industry-and-enhance-america-s>
- 3) MOU Document:
<http://www.rurdev.usda.gov/SupportDocuments/DPASignedMOUEnergyNavyUSDA.pdf>
- 4) Navy renewable energy targets: <http://www.govexec.com/dailyfed/1009/101409kp1.htm>
- 5) Plant Genomics Program – Systems Biology Knowledge Base:
<http://science.energy.gov/news/in-the-news/2011/07-07-11/>
- 6) Plant Genomics Program – Genomics for Bioenergy: <http://energy.gov/articles/usda-and-doe-fund-10-research-projects-accelerate-bioenergy-crop-production-and-spur>

BACK UP SLIDES – Office of Science Awards

Office of Science – 2011 Awards – Plant Feedstock Genomics for Bioenergy

- **"Association Mapping of Cell Wall Synthesis Regulatory Genes and Cell Wall Quality in Switchgrass"**

Laura E. Bartley, University of Oklahoma, Norman DOE-funded project

Goal: Identify natural genetic variation in switchgrass that correlates with lignocellulose-to-biofuel conversion qualities. Most plant dry matter is composed of lignocellulose, and because switchgrass yields high amounts of this material and tolerates drought and other stresses it is an attractive candidate for development into a biofuel crop. This project should enhance understanding of the qualities that critically impact the conversion efficiency of lignocellulose into biofuels.

- **"Functional Interactomics: Determining the Roles Played by Members of the Poplar Biomass Protein-Protein Interactome"**

Eric Beers, Virginia Polytechnic and State University, Blacksburg

DOE-funded project Goal: Identify key interactions between proteins associated with wood formation in poplar, a woody biomass crop. Wood characteristics result from the coordinated actions of enzymes and structural proteins in the cells, which typically interact with other proteins to perform their roles. This project will uncover the potential of the biomass protein-protein interactome to contribute to the development of poplar trees with superior biomass feedstock potential.

- **"Functional Genomics of Sugar Content in Sweet Sorghum Stems"**

David M. Braun, University of Missouri, Columbia

DOE-funded project

Goal: Improve sucrose accumulation in sweet sorghum through investigating the mechanisms regulating carbon allocation to stems. A rapidly growing, widely adaptable crop, sweet sorghum accumulates in the stem high concentrations of sucrose that can be efficiently converted to ethanol, making this a valuable candidate bioenergy feedstock. This research will use a combination of approaches to identify bioenergy-relevant genes and to understand their functions in carbon partitioning in sweet sorghum.

- **"Creation and High-precision Characterization of Novel Populus Biomass Germplasm"**

- Luca Comai, University of California, Davis

- DOE-funded project

- Goal: Provide new genomic tools for poplar breeders to identify germplasm with unique genotypes and increased biomass yields, and develop techniques for creating poplar hybrids with unique combinations of chromosomal regions. Because such properties can confer faster growth, this project addresses a challenge posed by the long generation time of trees through fast and cost-effective nontransgenic genetic manipulation.

- **"Genomic and Breeding Foundations for Bioenergy Sorghum Hybrids"**

Stephen Kresovich, University of South Carolina, Columbia

USDA NIFA-funded project

Goal: Build the germplasm, breeding, genetic, and genomic foundations necessary to optimize cellulosic sorghum as a bioenergy feedstock. This project will facilitate breeding sorghum lines optimized for energy production and selected to maximize energy accumulation per unit time, land area, and/or production input.

- **"An Integrated Approach to Improving Plant Biomass Production"**

Jan Leach, Colorado State University, Fort Collins

DOE-funded project

Goal: Expedite discovery of genes controlling biomass productivity in switchgrass by leveraging results from rice, a well-studied model grass. Switchgrass and other perennial grasses are promising candidates for bioenergy feedstocks; however, the genetic resources necessary to develop these species are currently limited. This work will greatly expand the research tool box for switchgrass and advance its improvement as an energy crop.

- **"Modulation of Phytochrome Signaling Networks for Improved Biomass Accumulation Using a Bioenergy Crop Model"**

Todd C. Mockler, Donald Danforth Plant Science Center, St. Louis

DOE-funded project

Goal: Identify genes involved in light perception and signaling in the model grass *Brachypodium distachyon* to increase yield and improve the composition of bioenergy grasses. Plant growth and development, including biomass accumulation, are affected by the light environment. Finding key genes involved in modulating light perception could be useful in targeted breeding or engineering efforts for improved bioenergy grass crops.

- **"Quantifying Phenotypic and Genetic Diversity of *Miscanthus sinensis* as a Resource for Knowledge-Based Improvement of *M. x giganteus* (*M. sinensis* x *M. sacchariflorus*)"**

Erik J. Sacks, University of Illinois, Urbana-Champaign

DOE-funded project

Goal: Facilitate development of *Miscanthus* as a bioenergy crop by acquisition of fundamental information about genetic diversity and environmental adaptation. *Miscanthus* is among the most promising cellulosic biofuel crops, but its improvement as a feedstock will require a broader genetic base. Identification of molecular markers associated with traits of interest will improve *Miscanthus* breeding efforts.

- **"Discovering the Desirable Alleles Contributing to the Lignocellulosic Biomass Traits in *Saccharum* Germplasm Collections for Energy Cane Improvement"**

Jianping Wang, University of Florida, Gainesville

DOE-funded project

Goal: Improve energy cane by identifying the genetic components contributing to biomass production. Energy cane (*Saccharum* complex hybrids) holds great potential as a bioenergy feedstock in the southern United States. This project will produce foundational genetic resources for energy cane breeders to efficiently develop cultivars with increased biomass production and reduced input requirements.

- **"Sorghum Biomass Genomics and Phenomics"**

Jianming Yu, Kansas State University, Manhattan

USDA NIFA-funded project

Goal: Integrate key genomics-assisted approaches into biomass sorghum research, and combine with high-throughput and traditional field-based phenotyping methods to enable advanced breeding strategies. By both exploiting genetic diversity and understanding the genotype-phenotype relationship, predictive approaches for efficient and cost-effective breeding can be developed.