

U.S. Department of Energy, Biomass Program

Updates to Technical Advisory Committee

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June 2-3, 2009

Biomass Program Peer Review 2009



External, independent review of our research portfolio and strategic direction

MARCH 19 - 20

**Platform Series I
National Harbor, Maryland**

- Integrated Biorefineries
- Infrastructure
- Analysis

COMPLETED

APRIL 8 - 10

**Platform Series II
Washington, DC**

- Feedstocks Technology
- Sustainability

COMPLETED

APRIL 13 - 17

**Platform Series III
Denver, Colorado**

- Biochemical Conversion & Biobased Products
- Thermochemical Conversion & Products

COMPLETED

JULY 14 - 15

**Program Review Meeting
Rosslyn, Virginia**

- Strategic Direction
- Results of Platform Reviews

Peer Review Web Site: <http://obpreview2009.govtools.us/>

Peer Review Process Modifications



- Platform reviews held in coordinated fashion (3 Series)
- Steering Committee actively engaged.
 - Objective group of individuals with knowledge of the Program but no active affiliations with the Program or projects under review
 - Responsibilities:
 - Identifying viable reviewers
 - Organizing agendas
 - Review and approve presentation and report templates
 - Ensuring process consistency
 - Members:

• Neal Gutterson	Mendel Technologies
• Jay Keller	Sandia National Labs
• Roger Prince	ExxonMobil
• Liz Marshall	World Resources Institute
• John May	Stern Brothers
• Terri Jaffoni	Private Consultant
• Susan Schoenung	Private Consultant
• Fred Petok	USDA
• Michael Tumbleson	University of Illinois, IBR Lead
• Mark Maher	General Motors, Infrastructure Lead
• Michael Knotek	Private Consultant, Biochem Lead
• Mark Jones	Dow Chemical, Thermochem Lead
• Tom Miles	Private Consultant, Feedstock Lead

Initial Reviewer Feedback

(example comments from preliminary draft reports)



Series 1

- **Integrated Biorefineries:**
 - Well-funded program to deploy demo- and large-scale facilities
 - IBR Platform essential to progress in reducing foreign oil dependence
- **Infrastructure:**
 - Well-structured, well-planned platform
 - Recent emergence of sustainability and climate change issues into broader platform is positive step forward
- **Analysis:**
 - Funded assessment methodologies are well-developed
 - Technical and economic feasibility analyses are state-of-the-art
 - Under-developed analyses: water use/quality and land use issues

Initial Reviewer Feedback continued

(example comments from preliminary draft reports)



Series 2

- Feedstocks:
 - Ability to achieve feedstock volume goals in a sustainable manner is critical; need to investigate more closely

Series 3

- Thermochemical:
 - The program is generally robust and most assessments are above satisfactory; Platform is robust; enables broad range of biomass feedstocks
 - Expansion beyond ethanol adds needed depth
- Biochemical:
 - Impressive portfolio, including all unit operations in the process
 - Project selection via competitive process is sound strategy

Initial Reviewer Feedback continued

(example comments from preliminary draft reports)



Overall Comments

- Feedstocks:
 - Need more collaboration across Platforms, especially IBR.
- IBR:
 - Most of these projects were not open with reviewers. They did not identify what are the uncertainties and risks.
- Conversion:
 - Diverse portfolio, key unit operations evaluated, the best projects from a competitive process are included, more pyrolysis work is needed.
- Analysis
 - The real platform goals appear to be a moving target, which makes evaluation of the projects presented in this Peer Review extremely difficult.
- Infrastructure
 - Unclear what role the Program has chosen to foster a larger application of biofuels.

Active Solicitations



Advanced Biofuels

- Integrated Pilot-Scale or Demonstration-Scale Biorefinery for Advanced Biofuels
 - Up to \$480M over 5 years for up to 20 projects
 - Pilot-Scale requires $\geq 20\%$ cost share
 - Demo-scale requires $\geq 50\%$ cost share
 - Applications due 6/30/09

Funded by
Recovery Act



Feedstock Logistics

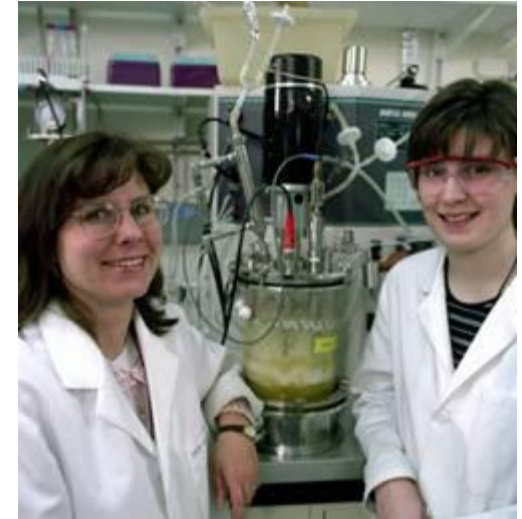
- Integrated Feedstock Logistics Demonstration
 - Up to \$15M over 3 years for up to 3 projects
 - Requires $\geq 20\%$ cost share
 - closed 5/18/09



Active Solicitations



- **Annual USDA/DOE Joint Solicitation for Biomass Research and Development Initiative**
 - Up to \$25M for awards of \$1M-5M for up to 4 years
 - Technical areas for grants:
 - Feedstocks development
 - Biofuels and biobased products development
 - Biofuels development analysis
 - Closed for pre-applications; Selected applications due June 11, 2009
- **Biofuels Outreach and Education (Clean Cities)**
 - Subarea focus on expanding infrastructure and markets for ethanol, E85, and biodiesel
 - Up to \$2.6M for up to 10 awards (closed) for 4 years
 - Education & Outreach Workshops
 - Up to \$1.8M for up to 4 projects (closed) for 2 years
 - Alternative Fuels and Advanced Technology Vehicles Pilot Program
 - Up to \$300M for up to 30 awards for 4 years
 - Applications due: May 29 and September 30



Joint USDA/DOE Solicitation Pre-applications



- TAC recommended % by Topic Areas:
 - Feedstocks – 35%
 - Biofuels/Biobased Products – 50%
 - Analysis – 15%
- Total number of pre-apps received: nearly 1000
- Number received by Technical Area:
 - Feedstocks – slightly below target
 - Biofuels/Biobased Products – slightly above target
 - Analysis – less than target
- Total number invited to submit full applications: less than 25%
- Number invited by Technical Area:
 - Feedstocks – below target
 - Biofuels/Biobased Products – above target
 - Analysis – below target
- Date full applications due to CSREES/USDA: June 11, 2009
- Date joint selections scheduled: July 23, 2009

American Recovery and Reinvestment Act, 2009



- **Renewable Energy Loan Guarantee Program:** \$6 billion to support loan guarantees for renewable energy projects; *promotes rapid deployment* of renewable energy systems that generate electricity or thermal energy, electric power transmission systems, and certain leading-edge biofuel projects. Construction must begin by Sept. 30, 2011.
- **Tax credits:**
 - Extends the Production Tax Credit for biomass and other renewable energy facilities through 2013
 - **Extends the Investment Tax Credit**, allowing owners of biomass and other renewable technology projects eligible for the PTC to use the full 30% ITC previously available only to solar facilities
 - Lets renewable energy project developers apply for Treasury Dept. grant equal to 30% of the cost of an eligible project if construction starts in 2009 or 2010 (in lieu of ITC)
- **Renewable R&D and Demonstration Projects:** \$2.5 billion to support DOE RD&D activities, including **biomass technologies (\$800 million)**

Recovery Act: R&D and Demonstration Projects



- \$480M Pilot & Demonstration-Scale Biorefineries**
Validate technologies for integrated production of advanced biofuels, products, and power to enable private financing and replication;
10 to 20 awards for refineries to be operational within 5 years:
 - Up to \$25M for each pilot-scale project
 - Up to \$50M for each demonstration-scale project
- \$176M Commercial-Scale Biorefineries**
Increase in funding for prior awards; two or more projects
Expedite construction; accelerate commissioning & start up
- \$110M Fundamental Research**
 - \$25M:** Three existing DOE Bioenergy Research Centers and new, small scale pilot plant/user facility for sustainability research
 - \$35M:** Advanced Research Consortium; infrastructure-compatible biofuels
 - \$50M:** Algal Biofuels Consortium to accelerate demonstration
- \$20M Ethanol Infrastructure Research**
Optimize flex-fuel vehicles operating on E85
Evaluate impacts of intermediate blends on conventional vehicles
Upgrade existing infrastructure for compatibility with E85
- \$13.5M Expand NREL Biochemical Pilot Plant**
Expand pre-treatment options and capacity



Modify Integrated Biorefinery Solicitation Program for Pilot and Demonstration Scale Biorefineries – B1



Objective: Pilot and demonstration projects for up to \$480 million DOE share. The projects selected will validate advanced biofuels and bioproducts technologies in an integrated system and provide data that would enable private financing of commercial scale replications.

Procurement Strategy: Solicitation opened May 7, 2009 and closes June 30, 2009. DOE expects to award up to 20 pilot and demonstration scale projects.

Funding: Recovery Act (FY 2009-15)
\$480 M

Timeline: FOA announced – May 2009
Close date for FOA – Jun. 2009
Make selection – Nov. 2009
Award initial funds – Dec. 2010
Complete costing – Sept. 2015



Validate advanced integrated biofuels technologies at pilot and demonstration scale to accelerate commercialization of advanced biofuels and bioproducts.

DOE Commercial and Demonstration Scale Biorefinery Projects– B2



Objective: Reduce the risk of the development and deployment of first of a kind biorefinery operations by raising the federal funding ceiling on existing projects to allow for increased confidence by the lending community to provide debt financing, and expected to lead to more rapid initiation of the construction phase of projects and, ultimately accelerating the timeline for start up and commissioning.

Procurement Strategy: Negotiate with previous recipients for increased ceilings.

Funding: Recovery Act (FY 2009-15)
\$176.5 M

Timeline: Initiate negotiations – Jul. 2009
Begin awarding revised budgets – Nov. 2009
Complete costing – Sept. 2015



Accelerates cellulosic biorefinery projects stalled by the economic crisis.

Fundamental Research in Key Program Areas – B3



Objective: Establish two new Biofuels Applied R&D Consortia to accelerate the development of algal and advanced biofuels. Collaborate with the Office of Science (SC) and the Bioenergy Research Centers (BRCs).

Procurement Strategy: New solicitation for Biofuels Applied R&D Consortia open to National Labs, academia and industry. 1 Algal Biofuels Consortium and 1 Advanced Fungible Biofuels Technology Consortium will be selected for up to \$85M DOE share over three years. Collaboration with SC and their BRCs for \$25M over five years through existing M&O contracts and agreements.

Funding: Recovery Act (FY 2009-13) - \$110M



Timeline:

- Release of FOA for consortia – Jul. 2009
- Public release of algae roadmap – Aug. 2009
- Fund sustainability effort – Sept. 2009
- Make selection for consortia – Nov. 2009
- Award consortia – Dec. 2009
- Fund pilot facility (LBNL) – Jan. 2010
- Complete costing RA\$ – Sept. 2013

Accelerate transformational science to create a sustainable biofuels industry.

DOE Intermediate Blends/E-85/Infrastructure – B5



Objective: Accelerate commercialization of renewable fuels, specifically to increase market potential for cellulosic ethanol, through testing of higher ethanol blends, ethanol-optimization of flex-fuel vehicles, expansion of refueling and storage infrastructure for higher ethanol blends, and related outreach.

Procurement Strategy: Funds will be administered through existing mechanisms within the National Labs, as well as through a new solicitation.

Funding: Recovery Act (FY 2009-14)
\$20M

Timeline: Release FOA – Jul. 2009
Modify existing projects – Sept. 2009
Make selections – Nov. 2009
Award funds – Sept. 2010
Complete costing RA\$ – Feb. 2014



Accelerate deployment of renewable fuels and increase market potential for cellulosic ethanol

Integrated Biorefinery Research Expansion – F1



Objective: Project doubles the national cellulosic research capability available to U.S. industry through this EERE user facility at NREL, and will significantly contribute to the Biomass Program goals. Specifically, expands pretreatment options and capacity.

Procurement Strategy: The existing Integrated Biorefinery Research Facility (IBRF) design/build contract will be modified to add the IBRF-II scope to authorize design and construction.

Funding: Recovery Act (FY 2009)
\$13.5 M

Timeline: Design/Build Sub Contract – May 2009
Complete Construction – Sept. 2010
Complete costing – Dec. 2010



Creates an economically viable process to use waste cellulose feedstock

Summary



- Critical advances are needed at all stages along the biomass/biofuel supply chain.
- The Biomass Program is using its budget increases to aggressively push forward on all fronts.
- Early action to reduce GHG emissions will have greatest impact on temperatures, economics, etc.
- Infrastructure issues pose hurdles to increased market uptake of biofuels in the near term.
- The program is pursuing pathways to lower these hurdles, while proceeding to develop a broad range of clean biofuels from diverse domestic biomass resources.

EISA RFS 2 Nested Production Targets (billions of gallons)

Year	Conventional Biofuels (Grandfathered or 20% Reduction)	Advanced Biofuel				Total Renewable Fuel
		Biomass-Based Diesel (50% Reduction)	Non Cellulosic Advanced (50% Reduction)	Cellulosic Biofuel (60% Reduction)	Total Advanced Biofuel	
2006	4.00					4.0
2007	7.70					4.7
2008	9.00					9.0
2009	10.50	0.5	0.1		0.6	11.1
2010	12.00	0.65	0.2	0.1	0.95	12.95
2011	12.60	0.80	0.3	0.25	1.35	13.95
2012	13.20	1.0	0.5	0.5	2.0	15.2
2013	13.80	1.0	0.75	1.0	2.75	16.55
2014	14.50	1.0	1.00	1.75	3.75	18.15
2015	15.00	1.0	1.50	3.0	5.5	20.5
2016	15.00	1.0	2.00	4.25	7.25	22.25
2017	15.00	1.0	2.50	5.5	9.0	24.0
2018	15.00	1.0	3.00	7.0	11.0	26.0
2019	15.00	1.0	3.50	8.5	13.0	28.0
2020	15.00	1.0	3.50	10.5	15.0	30.0
2021	15.00	1.0	3.50	13.5	18.0	33.0
2022	15.00	1.0	4.00	16.0	21.0	36.0