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

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Biomass Research and Development - Biorefinery Review and Selection Process

Technical Advisory Committee Public Meeting

September 29, 2010

Office of the Biomass Program Golden Field Office



ARRA Funds in Millions of Dollars





Objective and Use of the ARRA IBR Funding

- B1 Issued a Funding Opportunity Announcement (FOA) focused on the design, construction, and operation of integrated biorefineries at the pilot (minimum 1 dry tonne per day) or demonstration scale (minimum 50 dry tonnes per day).
 - Six Topic Areas to promote flexibility on allowable feedstock, scale, and primary output.
 - Secretarial cost share waiver could be requested.
 - Number of awards: 18 selected for \$483.0M
- B2 Allocate federal funding to integrated biorefinery projects that were selected & awarded within the last two years.
 - BlueFire construction phase to be awarded with \$81.1M
 - Enables additional appropriated funds for other existing projects

Background

- Supports existing integrated biorefinery deployment efforts and authorizing legislation
 - FOAs for commercial and demonstration scale biorefineries, Energy Policy Act of 2005, Section 932
 - Energy Independence and Security Act of 2007, Section 207
 - American Reinvestment and Recovery Act of 2009, Title IV



FOA Topic Areas

Topic Area	Minimum Scale (Feedstock Input)	Feedstock (Legislative Authority)	Primary Product	GHG reduction	Award Ceiling	Cost Share %*
1	1 ton per day integrated pilot	Algae, lignocellulosic (LC) biomass (EPAct 2005, Section 932)	Biofuel	50% algae 60% LC	\$25M	20%
2	1 ton per day integrated pilot	Algae, lignocellulosic biomass (EPAct 2005, Section 932)	Bioproduct	n/a	\$25M	20%
3	50 ton per day integrated demonstration	Algae, lignocellulosic (LC) biomass (EPAct 2005, Section 932)	Biofuel	50% algae 60% LC	\$50M	50%
4	50 ton per day integrated demonstration	Algae, lignocellulosic biomass (EPAct 2005, Section 932)	Bioproduct	n/a	\$50M	50%
5	1 ton per day integrated pilot	Any renewable biomass except corn starch (EISA 2007, Section 207)	Biofuel	80%	\$25M	20%
6	50 ton per day integrated demonstration	Any renewable biomass except corn starch (EISA 2007, Section 207)	Biofuel	80%	\$50M	50%

* Secretarial cost share waiver could be requested. A justification was required.



Demonstration of Integrated Biorefinery Operations



- Released December 2009 for up to \$200M from annual appropriations with 2 topic areas.
- Canceled and released May 2009 for up to \$480M from ARRA with 6 topic areas.
- Funds obligated in Dec 2009/Jan 2010
- Budget Period 1 funds released March/April 2010, Budget Period 2 negotiations ongoing



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Merit Review Process

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Merit Reviews Individual and Committee (Sequential)

- Evaluate based on criteria:
- 1: Technical Merit
- 2: Commercialization Plan
- 3: Project Management

Oral Presentations

- Applicants respond to questions from Merit Review Committee panels
- Scores may be adjusted and are normalized after orals

Applications Received

Initial Compliance Review

Evaluate to determine:

- · Applicant eligibility
- · Information submitted
- Mandatory requirements
- Responsive to objectives

Compliant Applications Forwarded for Merit and Independent Review (duplicate or non-compliant applications rejected)

Program Policy Factor Review

Evaluates in regard to:

- Geographic Diversity
- Cost Share
- Technological Diversity
- DOE Portfolio Diversity and Risk
- ARRA Objectives

Selection Recommendations to Selection Official

Management Briefings

Announcement

Independent Review

- NEPA
- Technology Readiness
 (Independent Engineer)
- Risk Assessments
 (Independent Project Analysis)
- Life Cycle Assessment
- Feedstock Sustainability

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Merit Reviewer Qualification Summary

Qualification	Education	Desired Experience	Specific Knowledge
Merit Reviewers	BS Minimum, PhD preferred (85% MS or Higher)	>10 Years experience in Chemical Engineering, Biotechnology, Industrial Operations (average >25 Years)	 Feedstock Infrastructure Thermochemical Conversion (pyrolysis, gasification, catalysts) Biochemical Conversion (enzymes, bacteria, yeast organisms) Algae Cultivation Project Financing Capital Project Management Related Industry Experience (Pulp and Paper, Chemicals, Petroleum Refining, etc.) New Technology Development and Commercialization

Reviewer Qualifications (highest deg	ree obtained)	L
Bachelor of Arts (BA)	2%	
Bachelor of Science/Engineering (BS/E)	13%	
Master of Business Administration (MBA) or Master of Science (MS/ME)	16%	
Doctor of Philosophy (PhD/D.Sc)	69%	



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Crosscut Review Qualification Summary

Qualification	Education	Desired Experience	Specific Knowledge
Crosscut Reviewers	BS Minimum, PhD preferred (70% MS or Higher)	>10 Years experience in Engineering, Industrial Operations, Project Management and Finance (average 15 Years)	 Technology Readiness Risk Assessments Capital Project Management and Project Financing Feedstock Sustainability and Availability Life Cycle Assessments NEPA/Environmental Permitting Intellectual Property Rights

Reviewer Credentials (highest degree ob	otained)	L
Bachelor of Science/Engineering (BS/E)	28%	
Master of Science/Engineering (MS/ME) or Master of Business Administration (MBA)	23%	•
Doctor of Philosophy (PhD/D.Sci)	41%	
Juris Doctor (JD)	8%	



Topic Area	Recommended for Selection	DOE Funding (\$M)	Total Project (\$M)
1: Pilot-Algae/LC-Fuel	11*	\$234	\$384
2: Pilot-Algae/LC-Prod	1*	\$2	\$3
3: Demo-Algae/LC-Fuel	3	\$150	\$376
4: Demo-Algae/LC-Prod	1	\$50	\$140
5: Pilot-Sugar-Fuel	2	\$47	\$61
6: Demo-Sugar-Fuel	0	\$0	\$0
Total:	18	\$483	\$963







Conversion Technologies Before Recovery Solicitation

Conversion Technologies After Recovery Solicitation





Products Products Before Recovery Solicitation After Recovery Solicitation Biopower, 5.06% Butanol, 5.2% Renewable Chemicals Butanol, 1.27%. Hydrocarbons (Waxes, Mixed (Diesel, Gasoline, Alchohols, etc.), Jet Fuel), 11.7% 12.31% Renewable Hydrocarbons Biodiesel, 18.3% (Diesel, Gasoline, Jet Fuel), Ethanol, 57.46% 22.99% Ethanol, 64.8% Biodiesel, 0.92%



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IBR Portfolio

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