



National Institute of Food and Agriculture
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Biomass Research and Development Initiative

Program Assessment and Future

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Overview

- What is BRDI?
- Assessment of USDA-supported projects
 - Program Objectives
 - Program Administration
- Summary of DOE-supported projects
- Future of BRDI



Biomass Research and Development Initiative (2009-2012)

- \$118 M supporting 25 projects
 - Advanced Biofuels
 - Bioproducts
 - Biobased chemicals
- Technical Areas
 - Feedstock Development
 - Fuels/Product Development
 - Development Analysis (LCA)



Evolution of BRDI

- Total Program: \$188M Federal Investment
 - FY 2005: USDA \$12M (average \$1.1M)
 - FY 2012: USDA \$40M (average \$6.2M)
 - Leverages \$78M from private sources
- FY 2009 required all projects address LCA
- FY 2010 required integration of all three technical areas



Nuts and Bolts

- Broad eligibility
- Pre-application Review overseen by DOE
- Full Application Review overseen by USDA
- Awards made by each Department
 - No comingling of funds between Departments
 - No comingling of R&D and Demonstration



Program Objectives

- Development of:
 - Technologies and processes
 - High-value biobased products
 - Diversity of economically and environmentally sustainable sources of biomass



Committee on Science and Engineering for a Biobased Industry and Economy

- Multi-State Committee
- FY 2012 – 2013 review of 28 projects
 - Awards from FY 2005 – 2009
 - \$38.5M Investment
- Research Performance Progress Report Standard



Output Metrics Reviewed

- Defined in the 2008 Farm Bill
 - Business and Economic Development
 - Workforce Development
 - Outreach
 - Productive RD&D
 - Quality RD&D



Program Outputs (28 projects)

- New Patents: 21
- Genetic Products Developed: 15
- Equipment/Processes: 11
- Materials/Chemicals: 14
- Evaluation Tools/Models: 9



Outputs continued

- Peer Reviewed Publications: 257
- Students Educated: 193 (14 new courses)
- Learners Reached: 17,665 (289 events)
- Workforce Trained: 125
- Jobs Created: 100
- Post-BRDI Funds Leveraged: \$128M



“Develop technologies and processes”

- “Improving Biorefinery Economics through Microchannel Hydroprocessing”
 - Velocys (FY 09) \$2.65M



“Develop high-value biobased products”

- “Thermoplastic Composites Reinforced with Natural Fibers”
 - Louisiana State University (FY 06) \$800K
- “High-Value Chemical Production”
 - Virent Energy Systems (FY 06) \$2M



“Diversity of sustainable biomass”

- “Overcoming Barriers to Facilitate Willow”
 - State University of New York (FY 05) \$800K
- “A Demonstration of a Community-Scale Biomass Energy System”
 - University of Minnesota-Morris (FY 05) \$1.9M



Program Administration

- Technical Area Distribution
- Cost-sharing
- Consortium-based, multi-disciplinary awards
- Geographic Diversity

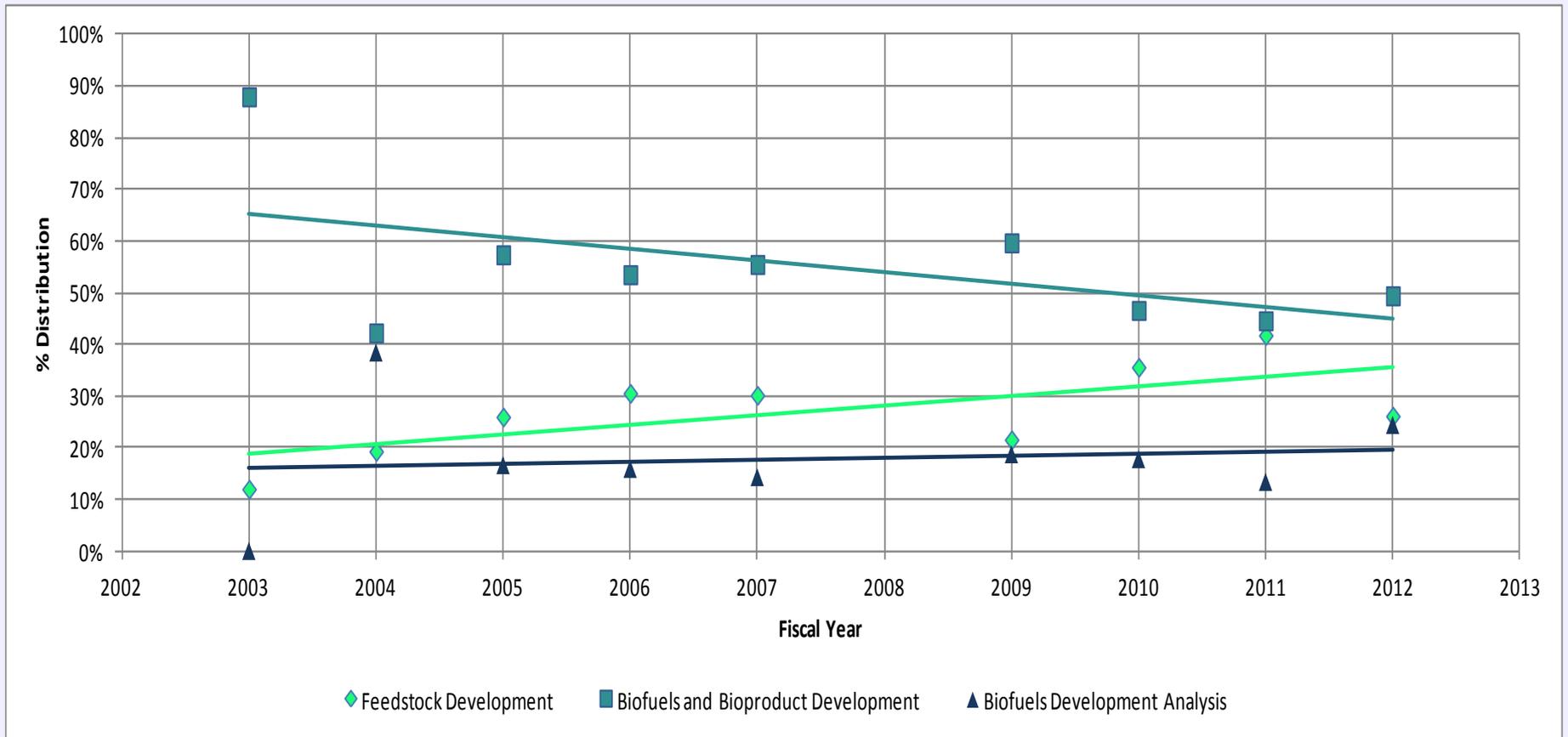


Technical Area Distribution (FY 2003-2012)

Technical Area	Distribution	% Distribution
Feedstock Development	\$55,180,006	29%
Biofuels and Bioproduct Development	\$99,918,168	53%
Development Analysis	\$33,504,689	18%



Technical Area Distribution Trends





Cost-Sharing

- R&D: 20%
- Demonstration: 50%
- Life of the program (2002): \$267M+



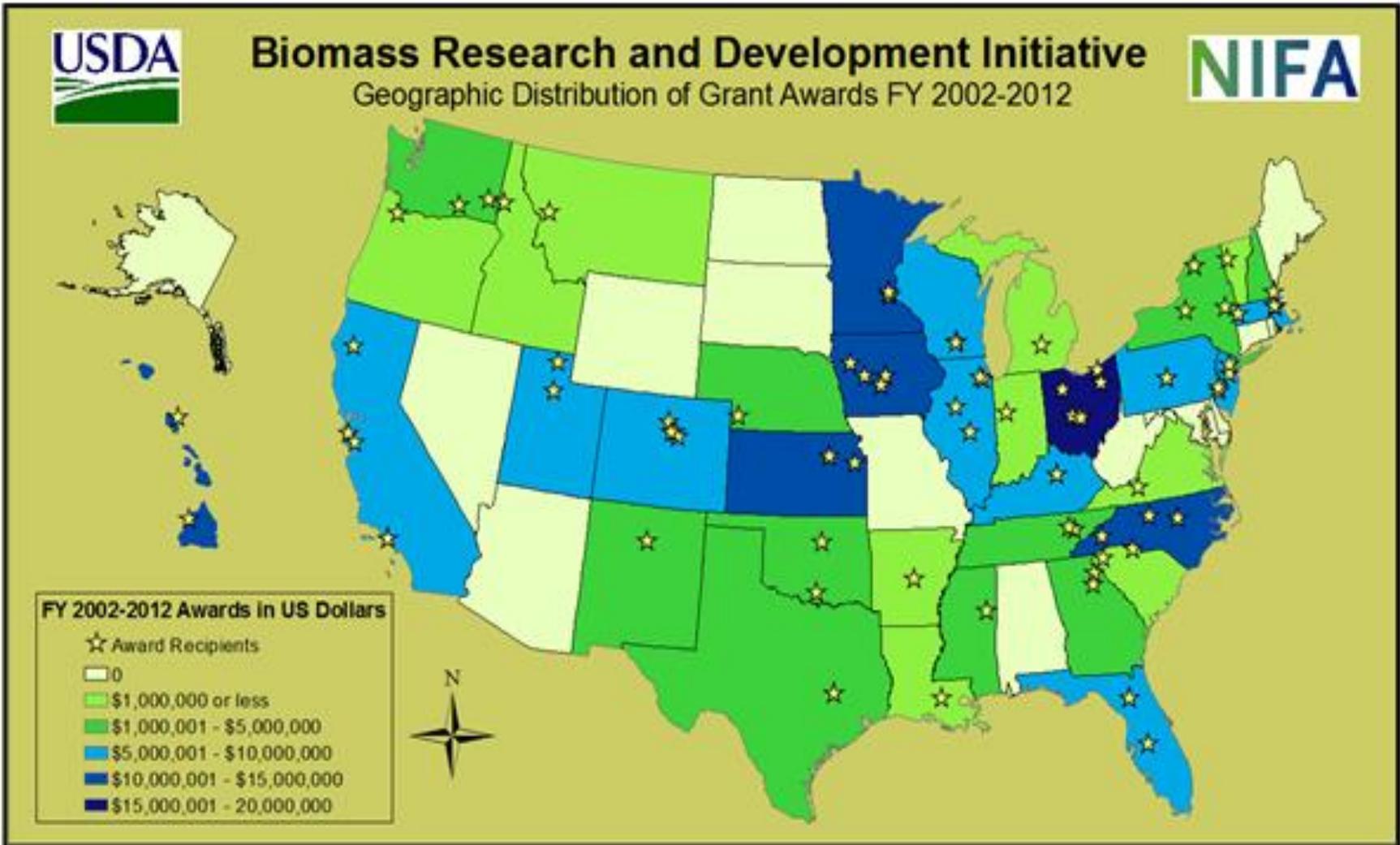
Project Lead and Collaborator Type (2002-2012)

	Project Lead Type	Collaborator Type
NGO	8%	17%
Academia	43%	38%
Small Business	26%	37%
Industry	10%	14%
Federal	12%	16%
State	1%	3%



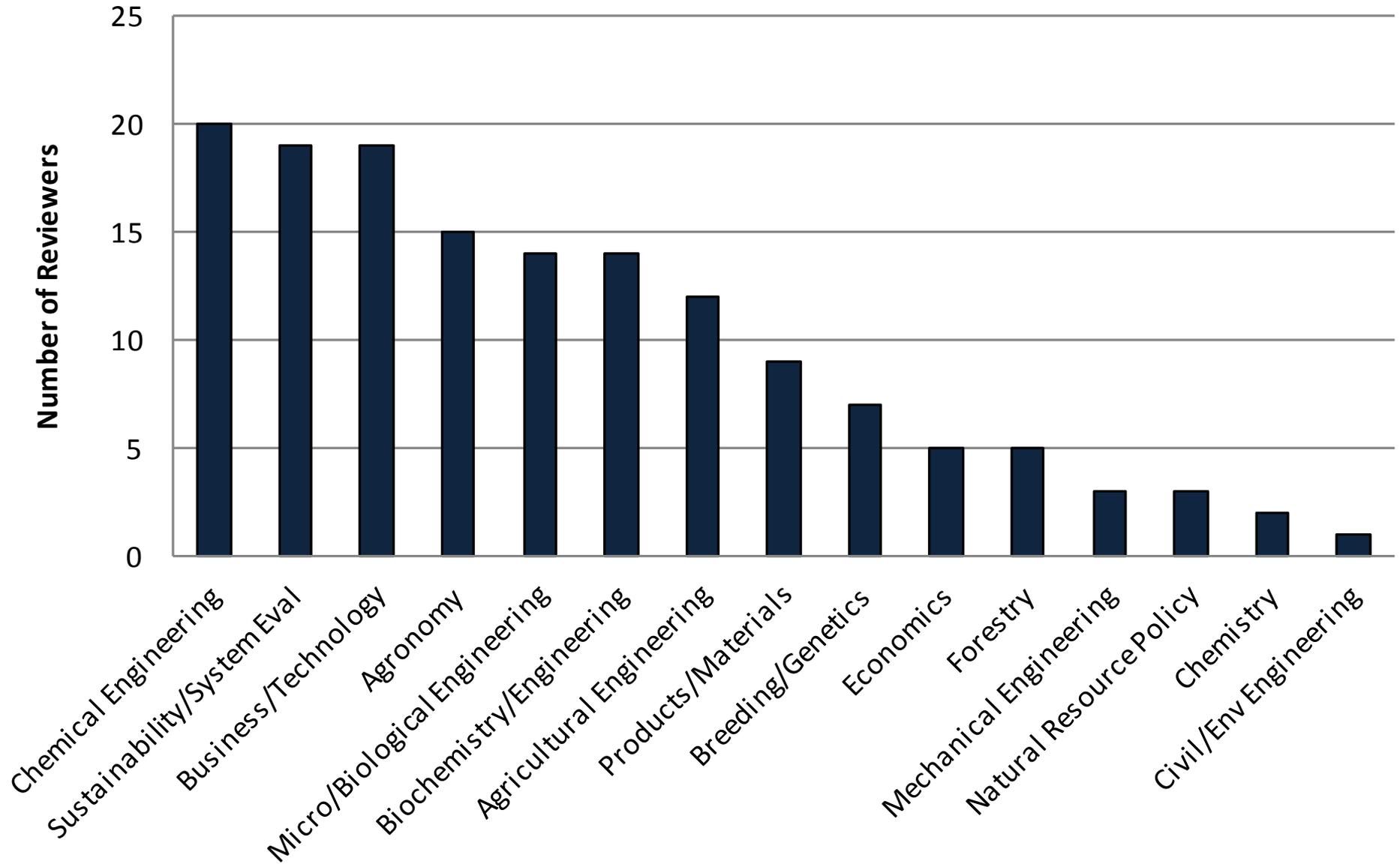
Biomass Research and Development Initiative

Geographic Distribution of Grant Awards FY 2002-2012



BRDI Panelist Expertise

FY 2010-2012





BRDI Reviewers (FY 2010-2012)

Affiliation	% of Reviewers
Industry/Small Business	32%
Federal	14%
Academia	53%
State	1%
NGO	0%



Success Rate by Applicant Type (FY 2010-2012)

	Applications	Awards	% of Awards	Pre-Success	Full Success
Small Business	370 / 62	4	25%	1%	6%
Industry	30 / 8	2	13%	7%	25%
Federal	17 / 5	3	19%	18%	60%
NGO	31 / 4	0	0%	0%	0%
Academia	337 / 68	7	44%	2%	10%
State	8 / 1	0	0%	0%	0%
Total	793 / 148	16			



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Biomass Program

Biomass R&D Solicitation Summary of Awards

Mark Elless
Department of Energy
Technology Manager



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

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Fiscal Year	Recipient	(\$M) Funding	Scope
2002 - 2006	ADM Cargill Natureworks DuPont	4.1 10.9 44.9 37.2	Develop and validate process technology and integrate into pilot plants for use with sustainable agricultural systems to economically produce sugars, fuels and chemicals
2006	Cleantech Partners	2.4	The production and utilization of pentose/hexose sugar solutions and the identification of fermentation systems that are tolerant to low pH and inhibitors.
2006	Lucigen Corporation	1.5	This work is to overcome the recalcitrance of cellulosic biomass by developing enzymes capable of degrading the defatted soybean meal (DSM) into a fermentable substrate suitable for alcohol production.
2006	Edenspace Systems	5.5	This effort, OSU is mining multiple bacterial genomes and cloning the genes of potentially useful enzymes into expression vectors. NREL will characterize and evaluate enzymes cloned by Oklahoma State University for their efficacy in biomass conversion.



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Fiscal Year	Recipient	(\$M) Funding	Scope
2007	General Electric	1.0	In this project, GE Global Research (GE) and the University of Minnesota (UoMn) target to develop an innovative gasifier configuration for selective elimination of tars in syngas produced from lignocellulosic biomass gasification by integrating catalytic partial oxidation (CPO) with gasification,
2007	Iowa State	1.4	Objectives include producing clean bio-oil generated from cornstovers or switchgrass by using fast pyrolysis system and henceforth, producing clean, high pressure synthesis gas from the bio-oil generated from biomass by gasification.
2007	Purdue University	1.7	Successful demonstration of fast-hydrolypyrolysis and HDO along with development of non-sulfided catalysts will allow us to build the process with H2 from an alternative source such as natural gas, coal or biomass. Our approach will include fast-hydrolypyrolysis and HDO with a H2/CO containing mixtures.



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Fiscal Year	Recipient	(\$M) Funding	Scope
2007	University of Minnesota	0.7	This goal being to characterize then utilize the approach to degrading biomass taken by brown rot fungi in order to enhance sugar release, 1) to determine the discrete timing of lignin modifications, 2) to correlate these alterations with the success of enzymatic hydrolysis
2010	Metabolix	9.9	Objective of the Renewable Enhanced Feedstocks for Advanced Biofuels and Bioproducts (REFABB) technology is to reduce the capital intensity of biomass processing and logistics costs inherent in biomass transport, provide for high value co-products that are scalable as the technology is proven with the demand for biofuel, and achieve superior financial returns for biorefinery operations.
2011	Iowa State University	4.4	The overall goals and expected outcomes of this project are to: <ol style="list-style-type: none">1. Complete proof of concept testing for the project partner's solvent liquefaction process with solvent recycle in a continuous research unit.2. Determine hydroprocessing conditions for upgrading solvent liquefaction product bio-oil to refinery compatible biocrude and fuel blendstocks.3. Develop a preliminary design for a large scale pilot demonstration plant.4. Understand biodiversity impact of increasing biomass



2014 Farm Bill and BRDI

- Mandatory Funding FY 2014-2017 @ \$3M
- Anticipate Request for Pre-Applications
 - Late FY 2014 aiming to capture FY 2015 funds
- DoE will lead pre-application review
 - All applications come through USDA
- USDA will conduct Merit Review