

2009 BIOMASS PROGRAM PEER REVIEW REPORT:

An Independent Evaluation of Program
Activities for FY2008 and FY2009

December 2009

THIS PAGE INTENTIONALLY LEFT BLANK

Dear Colleague:

This document summarizes the recommendations and evaluations provided by an independent external panel of experts at the U.S. Department of Energy Biomass Program's 2009 peer review meeting, held on July 14–15, 2009, in Arlington, Virginia. The document also includes summary information from the six separate platform reviews conducted between March and April 2009 in the Washington, D.C., and Denver, Colorado, areas. The platform reviews provide evaluations of the program's projects in applied research, development, and demonstration as well as analysis and deployment activities. The July program peer review was an evaluation of the program's overall strategic planning, management approach, priorities across research areas, and resource allocation.

The recommendations of these expert reviewers are used by the Biomass Program staff to conduct and update out-year planning for the program and technology platforms. It is a critical element of responsible portfolio and program management.

This report includes a description of the review process, a summary of the evaluation and recommendations, the program staff's response to those comments and recommendations, and a brief review of the results of the platform reviews and the review panel's feedback.

Additional details on the 2009 platform and program peer review meetings, including presentations, are available on the program review Web site: www.obpreview2009.govtools.us.

I would like to express my sincere appreciation to the reviewers. It is they who make this report possible, and upon whose comments we rely to help make project and programmatic decisions for the new fiscal year. Thank you for participating in the 2009 platform and program peer review meetings.

John Ferrell
Acting Biomass Program Manager
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

Executive Summary

2009 Program Peer Review U.S. Department of Energy Biomass Program

On July 14–15, 2009, the U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), Biomass Program conducted its biennial program peer review. In accordance with the *EERE Peer Review Guide*, the review provides an independent, expert evaluation of the strategic goals and direction of the program and is a forum for feedback and recommendations on future program planning.

The program review built upon six platform reviews conducted between March and April 2009 to evaluate the individual projects and portfolios of the Biomass Program's technical platforms. The panel for the program review was comprised of 12 external experts in the field. This included the lead reviewer of each of the platform reviews and the steering committee that has provided oversight and guidance to ensure consistency, transparency, and independence throughout the review process. Detailed evaluations are provided in this *2009 Biomass Program Peer Review Report* and the platform review reports for each of the six platform review meetings.

Summary of Evaluation

The Biomass Program is investing in an impressive portfolio of science and engineering research projects and working with highly qualified researchers from academia, industry, and national laboratories. The program is staffed by highly skilled and talented individuals charged with managing a very complex research, development, demonstration, and deployment (RDD&D) portfolio.

The Biomass Program staff has demonstrated an understanding of market factors and other external drivers and responded accordingly. This has been demonstrated, for example, by the program's re-scoping of the Thermochemical platform goals to include advanced biofuels beyond ethanol, and establishing more realistic feedstock prices in the *Biomass Multiyear Program Plan (MYPP)*, February 2009.

Reviewers felt the program's RDD&D portfolio is diverse and balanced. Nonetheless, increased funding should be allocated to feedstocks, infrastructure and sustainability. At the project level, the Biomass Program is managing RDD&D projects effectively. The high quality of the scientific research was expressed consistently by reviewers.

The Biomass Program funded research has led to several important accomplishments such as the Biomass Scenario Model, fermentation of syngas, and the construction of the first generation of cellulosic ethanol plants. In response to comments from the previous review, The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model is widely used for life cycle assessments (LCA) of biofuels. Additional validation of the results is planned, based on the number of potential pathways. The program's new focus on sustainability has been very responsive to current issues. This will be expanded in the future to cover all program areas. The "openness" of program activities is another strong point of the program as is its collaboration with other agencies and organizations.

The Biomass Program has put in place important strategic planning and management tools. In particular, the Biomass Program is to be commended for establishing the Systems Integrator office. However, the Panel does not believe the Biomass Program is on track to achieve the 2012 goals, although 2020 goals may be more achievable. The review panel believes much greater emphasis is needed on strategic program direction and integration, a clear definition of program goals, and focusing project level research on achieving those goals. This should be accompanied by methods for measuring progress, and redirecting or refining the focus of research as needed.

The staff and System Integrator were commended for establishing the Independent Project Analysis activities of the integrated biorefinery projects. However, these tools need to be used more effectively and play a more critical role moving forward.

Recommendations

The Panel recommends that the Biomass Program perform a thorough re-evaluation of its goals, to establish clear, concise, and realistic cost targets. It should implement a change control process for all revisions in the future.

- The Systems Integrator is a crucial function and needs to evolve so that it is providing "big picture", integrated analysis—from science and conversion processes, to large commercial scale integrated biorefinery projects—from both a technical perspective and techno-economic perspective. This should lead to a truly integrated research portfolio focused on program goals. The systems integrator and analysis team need to establish a critical path to achieve the goals and identify how the program, individual platforms and individual projects get aligned and stay aligned with that critical path.
- The Biomass Program should use its technology pathway approach to lead to a focused set of projects and technologies that will address overall program goals. For example, in the early stages of technology readiness, there should be strong diversity of technologies and projects. RD&D investments, guided by technology success, should then lead to a more focused portfolio of research as the technologies mature.

- Due to the complex nature of its portfolio, the program staff must be highly attentive to methods for managing project level progress. Technical barriers are clearly identified but progress in overcoming those barriers is not clearly measured. Interim targets should be established to measure progress in overcoming barriers and achieving both near and long-term goals. This will enable senior management of the program to better evaluate progress, and determine if other pathways must be chosen. Recognize that not all projects will be successful. Mistakes and research failures are a critical part of the learning process.
- The Biomass Program should avoid funding large-scale Integrated Biorefinery projects unless smaller-scale demonstrations in earlier stages of development show that the technology has yielded successful results.
- Greater focus and broader scope is needed on the Infrastructure topic. Several reviewers believe considerable work must be done on planning for fuel distribution, design standards for storage, dispensing devices, cars, trucks, and small engines as well as certification and test fuels. More needs to be done also in public outreach and education in this area as well. The education and outreach should perhaps be a program-level function, not exclusive to Infrastructure.
- Additional emphasis should be placed on feedstocks research and scalability. A major area for improvement is establishing and developing perennial crop feedstocks that can be a resource for delivering the vision of long-term, environmentally beneficial production of biofuels.
- The review panel strongly agrees with program efforts to place greater emphasis on funding and integrating sustainability efforts. The Biomass Program strategy should engage with institutions worldwide who are studying this topic, perform the necessary analysis, and articulate a strategy for achieving a “sustainable” biomass industry, which includes the issue of indirect land use. Only then can there be an effective rebuttal to the negative press surrounding biofuels.
- The review panel recognizes the important value of the program’s analysis activities and recommends the Biomass Program expand the scope and capability of analysis tools. A dedicated effort to maintain consistent assumptions and data sets across the program is recommended.
- Congressionally directed projects (CDP) are a continuing source of disappointment across the portfolio. The program should make every effort to work with recipients of Congressionally directed projects to better align those projects so that they help overcome technical barriers and address program goals.
- The program should continue to increase its level of interaction and collaboration with the other agencies, research facilities, and industry to facilitate development of RDD&D, in particular new activities related to infrastructure and sustainability.
- The Biomass Program should integrate other uses of biomass: heat and power, biobased products, feed and fuel, and chemical feedstock. As a minimum, the program should include these applications within the systems analysis activities.

- Because the life cycle assessment work is so important, and because the GREET model has become so widely used, it is imperative that the model results be validated by comparison with other models or approaches.

Summary of Platform Review Results:

The following series of tables ES-1A-F represents the results of the individual Platform review panel evaluation of the projects and the Program’s response to the review results. Each table identifies the Platform, and each project is identified by the Program’s unique code (WBS Number) for the project. Additional information on the project includes: the project title, presenting organization, and Principal Investigator’s name. Each project was reviewed by no less than reviewers in five scored review criteria. The Average Overall Score represents an aggregation of all five criteria. The Next Steps and Technology Manager Summary Comments provide Program Management’s response to the evaluation.

Table ES-1A: Summary of Integrated Biorefinery Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
5.1.2.1	Making Industrial Bio-refining Happen! (GW); Natureworks, LLC; Dr. Suominen Pirkko	3.2			X	The Project was completed.
5.2.2.1	Advanced Biorefining of Distiller's Grain and Corn Stover Blends: Pre-Commercialization of a Biomass-Derived Process Technology (GW); Abengoa Bioenergy Corporation (GW); Gerson Santos Leon	4.2			X	The Project was completed (July 09).
5.4.4.1	Integrated Biorefinery for Conversion of Biomass to Ethanol, Synthesis Gas, and Heat; Abengoa Bioenergy Corporation (GW); Gerson Santos Leon	4.5	X			This Project will continue under Award 1, with conditions.

Table ES-1A: Summary of Integrated Biorefinery Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
5.4.4.1, 5.4.3.2, & 5.4.3.3	LIBERTY - Launch of an Integrated Bio-refinery with Eco-sustainable and Renewable Technologies in Y2009; POET Project Liberty, LLC; James Sturdevant	3.6	X			This Project will continue under Award 1 and TIA, with conditions.
5.5.5.1	West Coast Biorefinery (WCB) Demonstration Project; Pacific Ethanol, Inc.; Harrison Pettit	2.9	X			This Project will continue under Award 1, with conditions.
5.4.6.1	A Rural Community Integrated Biorefinery Using Novel Solid State Enzymatic Complexes to Convert Lignocellulosic Feedstocks to Ethanol & Vendible Products; Alltech Envirofine; Mark Coffman	Did not present			X	Project partner requested the project be put on hold.
5.5.7.1	MAS10BIO5; Mascoma; Dr. Mike Ladisch	4.2	X			This Project will continue under an Award 1, with conditions.
5.5.8.1	Jennings Demonstration Plant; Verenum Corporation; Russ Heissner	3.6	X			This Project will continue under an Award 1, with conditions.
5.5.3.1	Mecca Ethanol Facility: A Landfill Waste Feedstock to Cellulosic Ethanol Facility; BlueFire Ethanol; William Davis & Neco Sumait	2.3	X			This Project will continue under an Award 1, with conditions.

Table ES-1A: Summary of Integrated Biorefinery Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
5.5.6.1	Lignol Biorefinery Demonstration Plant; Lignol Innovations, Inc.; Michael Rushton	2.7	X			Project partner requested the project be put on hold.
5.6.2.1	Demonstration of an Integrated Biorefinery at Old Town, Maine; RSE Pulp & Chemical; Dick Arnold & Jim St. Pierre	2.6	X			This Project will continue under an Award 1, with conditions.
5.6.1.1	Project Independence: Construction of an Integrated Biorefinery for Production of Renewable Biofuels at an Existing Pulp and Paper Mill; NewPage; Douglas Freeman	3.3	X			This Project will continue under an Award 1, with conditions. under an Award 1, with conditions.
5.6.3.1	Demonstration Plant - Biomass Fuels to Liquids; Flambeau River Biofuels, LLC; Robert Byrne	3.5	X			This Project will continue under an Award 1, with conditions.
5.6.1.2	Cellulosic Based Black Liquor Gasification and Fuels Plant; Escabana Paper Company; Michael Fornetti	2.8			X	The Project has been completed.
5.5.1.1	Commercial Demonstration of a Thermochemical Process to Produce Fuels and Chemical from Lignocellulosic Biomass; Range Fuels, Inc.; William Schafer III	2.9	X			This Project will continue under an Award 1 and TIA, with conditions.

Table ES-1A: Summary of Integrated Biorefinery Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
7.5.4.1	City of Gridley Biofuels Project; City of Gridley; Dennis Schuetzle	2.6			NA	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
7.5.4.5	Louisiana State University Alternative Energy Research (LA); LSU: Agriculture Center; Donal F. Day	1.9			NA	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
7.5.7.2	Biomass Energy Resource Center (BERC) - Core and Program Support; BERC; Chris Recchia	2.7			NA	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.

Table ES-1B: Summary of Infrastructure Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
1.1.1.5	Bioenergy Knowledge Discovery Framework; Oak Ridge National Laboratory, Budhendra Bhaduri	2.75	X			At the time of the review, this project had not yet received its initial funding. The Platform management appreciates the comments made by the reviewers and will take this information into consideration as the project advances.
5.8.3.1.	Freedom Prize, Public Health Foundation Enterprises, Inc., Karen Hanson	2.20	X			This project is the result of the Freedom Prize Foundation and US DOE EERE announced award process intended to lessen America's Oil Dependence. These activities were officially announced on June 26, 2008.
7.6.2.2.	New Uses Information and Entrepreneur Development, Growth Dimensions, Inc., Mark Williams	2.64			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program. Platform management will work with the project leads to address the reviewer comments.

Table ES-1B: Summary of Infrastructure Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
5.10.1.1. and 5.10.1.2.	Intermediate Ethanol Blends Testing, ORNL and NREL, Brian West and Steve Przesmitzki	3.96	X			This is a joint Project funded by the Biomass and Vehicle Technologies Program. This project will continue and reviewer comments will be considered in refining future activities.
7.8.1.7.	National Biofuel Energy Laboratory, Next Energy Center, Chuck Moeser	3.24			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program. Platform management will work with the project leads to address the reviewer comments.
7.8.1.11.	Appalachian State University Biofuels and Biomass Research Initiative, Jeff Ramsdell, Appalachian State University	2.52			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program. Platform management will work with the project leads to address the reviewer comments.
7.8.1.9.	Messiah College Biodiesel Fuel Generation Project, Messiah College, Michael Zummo	2.80			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program. Platform management will work with the project leads to address the reviewer comments.

Table ES-1B: Summary of Infrastructure Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
5.10.1.3.	Pipeline Feasibility Study – EISA Section 243, Deloitte Consulting, Rebecca Ranich	4.08			X	This study has been completed.
7.8.1.6	Missouri Biodiesel Demonstration Project, National Biodiesel Board, Jill Hamilton	3.32			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program. Platform management will work with the project leads to address the reviewer comments.

Table ES-1C: Summary of Analysis Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
1.6.1.5 & 6.2.1.4	"Billion Ton" Vision Update; ORNL; Bob Perlack	4.4			X	This work is important for quantifying feedstock production potential on a county level basis. The project will continue, but will be stage gated during the next fiscal year.
1.6.1.2 & 6.2.1.3	Feedstock Logistics Design; INL; Richard Hess	3.9	X			This project is investigating feedstock logistics and design issues. Feedstock logistics represent an important barrier to cellulosic ethanol and important to better understanding feedstock production costs.
6.2.1.1	State-of-Technology Assessment; NREL; Andy Aden	4.1			X	This project provides an overarching look at the state of the technology and provides synthesis information for the Program and Platforms. The project will continue, but will be stage gated during the next fiscal year.
6.2.1.1	Life Cycle Analysis of EISA; NREL; Andy Aden	4.0	X			This project is looking at the full life cycle costs of the entire biofuel process from a national level.
6.2.1.5.1	GREET Model Development and Biofuel Life-Cycle Analysis; ANL; Michael Wang	4.3	X			The GREET model provides a well recognized and accepted framework for assessing GHG emissions for alternative fuel pathways.

Table ES-1C: Summary of Analysis Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average	Next Steps			Technology Manager Summary Comment
6.2.1.5.2	Analysis of Water Resource and Water Quality Issues for Feedstock and Biofuel Production; ANL; May Wu	3.1	X			Water is a critical issue for expanding biofuel production. This project will estimate the impacts water resources and quality for feedstock and fuel production.
6.2.1.5.3	Alternative Water and Land Resource Analysis; ANL; Christina Negri	4.0	X			This project also investigates water quality issues related to biomass. This project aims at testing possible solutions highlighted in the feedstock and biofuel production project.
6.1.3.1	Biomass Scenario Model; NREL; Brian Bush	4.6			X	This project funds the development and use of a dynamic modeling tool to investigate and gather information on various scenarios relevant to Program goals and policies. The project will continue, but will be stage gated during the next fiscal year.
6.2.1.1	Techno-Economic Comparison of Biochemical, Gasification, and Pyrolysis Conversion of Corn Stover to Biofuels; NREL; David Hsu	3.8			X	This project looks into the near-term comparison of competing technologies and ways to better understand technical challenges and make improvements. The project will continue, but will be stage gated during the next fiscal year.
2.6.1.2	GIS Based Resource Assessment of Algae Biofuels; PNNL; Mark Wigmosta	4.0		X		This project is preparing GIS information and analysis as a necessary step in the evaluation of open-system algal feedstock production systems.

Table ES-1C: Summary of Analysis Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average	Next Steps			Technology Manager Summary Comment
4.5.2.2	Techno-Economic Assessment of Algal Biofuels – Algae Roadmap Workshop and Congressional Report; SNL & NREL; Ron Pate, Phil Pienkos	4.1		X		This project was funded to gather important information on the production of biofuels from Algae and the associated costs and benefits.

Table ES-1D: Summary of Feedstock Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
1.6.1.3	Supply Forecasts and Analysis Task, ORNL, Bob Perlack	3.66	X			This project conducts critical forecasting and analysis on biomass feedstock supply. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.6.1.5	Billion Ton Update, ORNL, Bob Perlack	3.93	X			This project is preparing information as needed to update the Billion Ton Study. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.1.1.5	GIS Bioenergy KDF, ORNL, Dan Getman	3.98	X			This project is preparing GIS data on biomass to enable analysis, synthesis, and visualization of data and facilitate informed decision making. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.1.1.1.a	Regional Partnerships - Residues and Sustainability, Iowa State University, Rob Anex	3.97	X			This project is part of the regional feedstocks partnership effort and develops sustainable, site-specific guidelines and practices for crop management and lower biomass production costs. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.

Table ES-1D: Summary of Feedstock Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
1.1.1.1.b	Regional Partnerships - Stover Removal Tool, Iowa State University, Rob Anex	4.14	X			This project is part of the regional feedstocks partnership effort and is using an integrated suite of accepted agronomic analysis tools to enable greater sustainable and reliable access to crop residue resources. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.1.1.1.c	Regional Partnerships - Energy Crops, South Dakota State University, Vance Owens	3.48	X			This project is part of the regional feedstocks partnership effort and develops crops with enhanced cellulosic yield and ethanol conversion efficiencies. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.1.1.4	Regional Partnerships - GIS Data Collection, ORNL, Mark Downing	4.08	X			This project is part of the regional feedstocks partnership effort and includes the gathering and management of data resources for input into the KDF and other key activities related to the regional partnership at the national scale. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.

Table ES-1D: Summary of Feedstock Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
7.1.2.5	Research and Technology Development for Genetic Improvement of Switchgrass, University of Rhode Island, Albert Kausch	3.52			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
7.1.2.4	The University of Tennessee Switchgrass Demonstration Project, University of Tennessee, Burton English	3.89			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
7.1.2.6	University of Hawaii Development of High Yield Tropical Feedstock , University of Hawaii, Andrew Hashimoto	3.86			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
1.6.1.4.a	Sustainable Biofuels Crops Project - Policy & Field Projects, Conservation International, Justin Ward	2.89	X			This project funds policy and field projects relating to sustainable biofuel crops. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.1.1.6.a	Analyzing indirect effects of biofuels, ORNL, Virginia Dale	4.28	X			This project is analyzing indirect effects of biofuels in land use and relating issues. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.

Table ES-1D: Summary of Feedstock Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
1.1.1.6.b	Land-use change modeling for bioenergy LCA, ORNL, Keith Kline	4.49	X			This project is investigating land-use changes and modeling impacts for biofuels. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.6.1.4.b	Sustainable Biofuels Crops Project - Spatial Analysis, Conservation International, Marc Steininger	2.63	X			This project is conducting analysis related to the siting and managing biofuel crops in an environmentally responsible manner. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
7.1.5.2	Massachusetts Forests - Bioenergy Development Initiative, Massachusetts Division of Energy Resources, Dwayne Breger	4.05			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
7.1.5.4	Laurentian Bio-Energy Project (MN), Laurentian Energy Authority, Bill Berguson	3.97			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.

Table ES-1D: Summary of Feedstock Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
6.2.1.3	Feedstock Supply Chain Analysis - Design Report, INL, Richard Hess	4.16	X			This project is conducting analysis related to feedstock supply chain and supply system designs. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.6.1.2	Integrate Feedstock Models in a Dynamic Simulation Architecture, INL, Jake Jacobson	3.40	X			This project integrating existing models and datasets into a unified dynamic analysis tool. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.6.1.1	Feedstock Supply System Logistics Modeling, ORNL, Shahab Sokhansanj	3.84	X			This project is developing and validating mathematical models to represent biomass supply system logistics. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.3.1.1.a	Feedstock Infrastructure - Harvest and Collection, INL, Kevin Kenney	4.35	X			This project is investigating feedstock infrastructure for harvesting and collecting biomass. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.

Table ES-1D: Summary of Feedstock Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
1.3.1.1.b	Feedstock Infrastructure - Preprocessing, INL, Chris Wright	4.48	X			This project is investigating feedstock infrastructure for preprocessing biomass. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.3.1.1.c	Feedstock Infrastructure - Storage, INL, Alison Ray	3.68	X			This project is investigating feedstock infrastructure for storing biomass. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
1.3.1.1.d	Feedstock Infrastructure - Handling and Transport, INL, Peter Pryfogle	4.20	X			This project is investigating feedstock infrastructure for handling and transporting biomass. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
5.4.7.1	Integrated Demonstration of Corn-Cob and Stover Supply Logistics System , INL, Kevin Kenney	3.80	X			This project is developing and demonstrating corncob supply system designs, storage, and processing. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.

Table ES-1D: Summary of Feedstock Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
1.3.1.2	Feedstock Deployable PDU, INL, Chris Wright	4.04	X			This project is designing and assembling a 10% scale grinding, drying, separation, densification, storage, and queuing system to demonstrate feedstock supply system technologies. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
7.1.1.1	Biofuels Development at Texas A&M, Texas Engineering Experiment Station, Kenneth Hall	3.85			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
7.1.5.5	Bioenergy Cooperative Ethanol Biomass Fuel Plant, United Power, Bob Divers	2.96			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
7.7.1.8	Equipment Request for the Belleville Agricultural Research and Education Center, Southern Illinois University, Brian Young	2.32			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.

Table ES-1D: Summary of Feedstock Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
7.6.2.6	SunGrant Initiative, SunGrant Initiative, Jim Doolittle	4.10			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
6.3.2.5	UC Davis Western Governors Assoc. Biorefinery Siting Model, Western Governors , Ed Gray	3.53	X			This project is developing a model to assist in the siting of biorefineries. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
7.7.1.9	U. of Florida, Gainesville, With the Earth University Foundation Biofuel Project, EARTH University Foundation, B.K. Singh	2.60			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
7.1.5.10	Sorghum to Ethanol Research - NREL CRADA, National Sorghum Producers, Ed Wolfrum	4.13	X			This project is a CRADA to conduct R&D on Sorghum as next-generation feedstock for cellulosic ethanol. The project will continue and Reviewer comments will be taken into consideration in development of FY10 scope.
7.7.1.7	Illinois State University Biomass Research, Illinois State University Biomass Research, Tom Bierma	2.47			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.

Table ES-1D: Summary of Feedstock Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
7.6.2.1	Energy from Biomass Research and Technology Transfer Program, Consortium for Plant Biotechnology Research Inc., Jamie Forbes	2.47			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
2.6.1.1	Biochemical Platform Analysis, NREL, David Hsu, Ph.D.	4.26	X			This project quantifies the platforms technical targets and progress towards achieving that goal. In 2009 this task with support from others will develop an updated biochemical conversion design report.
2.6.1.2	Analysis for Production - Technical and Market Analysis, PNNL, Sue Jones	3.66		X		This project provides analytical guidance on the potential of future research and development pathways. The subtasks of this task are agreed upon yearly between PNNL and headquarters. Reviewer comments will be taken into consideration while choosing FY10 scope.
2.4.1.2	Fungal Genomics, PNNL, Scott Baker	4.26	X			The fungal biotechnology project provides knowledge and technology for filamentous fungal systems to provide industry with the enabling tools to rapidly and effectively develop many new processes.

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
2.1.1.1 and 2.1.1.3	Storage Systems, Feedstock Supply, Etc., Nick Nagle, NREL	4.30	X			The project is to optimize the characteristics of the feedstock for the process and vice versa.
2.1.1.6	Extremophilic Microalgae: Advanced Lipid and Biomass Production for Biofuels and Bioproducts, Montana State University, Brent M. Peyton, Ph.D.	3.49	X			This project is to focus on determining growth and lipid production of existing alkaliphilic populations with intent to utilize selected alkaliphilic algae for lipid production in open test ponds.
2.1.1.7	Improving Cost Effectiveness of Algae-Lipid and Biomass Production for Biofuels and Bioproducts, University of Georgia Research Foundation, KC Das, Ph.D., P.E.	3.20	X			This project is attempting to reduce costs associated with algae production and establish the viability of carbon capture technologies for providing CO ₂ at high-rate to algae ponds.
7.2.1.1	Bioenergy Demonstration Project: Value-Added Products from Renewable Fuels, University of Nebraska-Lincoln, Paul Blum, Ph.D.	4.0			X	This project is investigating thermoacidophilic microbes for establishment of the deconvolution and saccharification of lignocellulose to maximize biofuel yields.
2.2.1.1	Pretreatment and Enzymatic Hydrolysis, NREL, Rick Elander	4.37	X			This task investigates and evaluates pretreatment approaches that are aimed at increasing the digestibility of residual cellulose.

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
2.2.1.2	Value Prior to Pulping, CleanTech Partners, Carl Miller, Ph.D.	3.54			X	This project is fully funded and will be closing out in fiscal year 2010.
2.2.2.2	Energy Corn Consortium, Edenspace Systems Corporation, Michael J. Blaylock, Ph.D.	3.37			X	This project is fully funded and will be closing out in fiscal year 2010.
2.3.1.4	Integration of Leading Biomass Pretreatment Technologies with Enzymatic Digestion and Hydrolyzate Fermentation, CAFI, Charles E. Wyman, Ph.D.	4.66			X	The CAFE3 project examined the effectiveness of multiple pretreatments on several different batches of switchgrass feedstock. This project is coming to it's natural end in FY10.
2.2.2.3	Enzyme Solicitation Support and Validation, NREL, James D. McMillan, Ph.D.	4.49	X			This project continues to monitor and evaluate the developments within the enzyme projects.
2.2.2.5	Enhancing Cellulase Commercial Performance for the Lignocellulosic Biomass Industry, Danisco USA, Mike Arbige, Ph.D.	3.83	X			This is one of the four projects selected from the Enzyme Solicitation. This project is ongoing and supporting the programmatic cost targets.
2.2.2.6	Development of a Commercial Enzyme System for Lignocellulosic Biomass Saccharification, DSM Innovation, Manoj Kumar	3.89	X			This is one of the four projects selected from the Enzyme Solicitation. This project is ongoing and supporting the programmatic cost targets.

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
2.2.2.7	Project Decrease: Development of a Commercial-Ready Enzyme Application System for Ethanol, Novozymes, Paul Harris, Ph. D.	4.37	X			This is one of the four projects selected from the Enzyme Solicitation. This project is ongoing and supporting the programmatic cost targets.
2.2.2.8	Commercialization of Customized Cellulase Solutions for Biomass Saccharification, Verenium Corporation, Justin Stege, Ph.D.	4.03	X			This is one of the four projects selected from the Enzyme Solicitation. This project is ongoing and supporting the programmatic cost targets.
2.2.2.9	Addressing the Recalcitrance of Cellulose Degradation through Cellulase Discovery, Nano-scale Elucidation of Molecular Mechanisms, and Kinetic Modeling, Cornell University, Larry Walker, Ph.D.	3.71	X			The purpose of this task is to identify other potential available cellulases found in the community of highly virulent plant pathogenic fungi and bacteria
7.2.2.2	Advancing Texas Biofuel Production, Baylor University, Kevin Chambliss, Ph.D.	3.80			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The project is focused on fundamental information on plant variety and relative amounts of degradation products
2.3.1.1	Biochemical Processing Integration Task, NREL, Dan Schell	4.60	X			The overall objective of this project is to investigate enzymatic cellulose hydrolysis-based biomass-to-ethanol conversion process technology based on a large-scale domestic feedstock (corn stover is the model feedstock)..

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
2.3.1.5	Integrated Biorefinery - Separations/Separative Bioreactor - Continuous Bioconversion and Separations in a Single Step, ANL, Seth Snyder	4.0	X			The project objective is to address the cost of production of organic acids separation of organic acids and amino acids.
2.3.2.7	Lab Validation for Organism Development Solicitation Recipients, NREL, Nancy Dowe Farmer	4.31	X			This project continues to monitor and evaluate the developments within the ethanologen projects.
2.3.2.1	Biocatalyst for Fermenting Hydrolyzate at Low pH and High Temperature, Cargill, Gary Folkert	4.26	X			This is one of the five projects selected from the Ethanologen Solicitation. This project is ongoing and supporting the programmatic cost targets. This project will receive additional review at the 18 month point of the project.
2.3.2.2	Improvement of Zymomonas Mobilis for Commercial Use in Corn-based Biorefineries, DuPont, Bill Hitz, Ph.D.	4.43	X			This is one of the five projects selected from the Ethanologen Solicitation. This project is ongoing and supporting the programmatic cost targets. This project will receive additional review at the 18 month point of the project.

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
2.3.2.3	Development of Thermoanaerobacterium Saccharolyticum for the Conversion of Lignocellulose to Ethanol, Mascoma, David Hogsett, Ph.D.	4.17	X			This is one of the five projects selected from the Ethanologen Solicitation. This project is ongoing and supporting the programmatic cost targets. This project will receive additional review at the 18 month point of the project.
2.3.2.4	Improvements in Ethanologenic Escherichia Coli and Klebsiella Oxytoca, Verenum Corporation, David Nunn, Ph.D.	3.91	X			This is one of the five projects selected from the Ethanologen Solicitation. This project is ongoing and supporting the programmatic cost targets. This project will receive additional review at the 18 month point of the project.
2.3.2.5	Further Improvement of the Robust Recombinant Saccharomyces Yeast for the Conversion of Lignocellulosic Biomass to Ethanol, Purdue University, Nancy Ho, Ph.D.	3.91	X			This is one of the five projects selected from the Ethanologen Solicitation. This project is ongoing and supporting the programmatic cost targets. This project will receive additional review at the 18 month point of the project.

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
2.3.2.8	A Novel Simultaneous-Saccharification-Fermentation Strategy for Efficient Cofermentation of C5 and C6 Sugars Using Native, non-GMO Yeasts, University of Toledo, Patricia Relue	3.89	X			The objective of this project is to develop cost-effective biocatalysts capable of increasing utilization of C5 and C6 sugars by native yeast in the conversion of lignocellulosic biomass to ethanol.
2.3.3.1	Production of Higher Alcohol Liquid Biofuels via Acidogenic Digestion and Chemical Upgrading of Organic Industrial Wastes, University of Maine, Peter van Walsum, Ph.D., P.E.	3.6	X			This project is trying to determine the optimal yield and productivity of high potential bacteria at moderate to high temperatures, on regionally available feedstock.
7.2.3.1	BioEthanol Collaborative, Clemson University, Mike Henson, Ph.D.	2.57	X			This project assesses the use of regional feedstocks, switchgrass and sorghum varieties in South Carolina and the Southeast for production of cellulosic-based ethanol.
2.4.1.1	Targeted Conversion Research, NREL, Mike Himmel, Ph.D.	4.77	X			This project focuses on developing higher efficiency technologies for sugar generation from lignocellulose, with focus on reduced costs of feedstock, pretreatment (prehydrolysis), and enzymes.

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
2.4.1.3	Lignin as a Facilitator, not a Barrier, during Saccharification by Brown Rot Fungi, University of Minnesota, Jonathan Schilling	4.03	X			This project characterizes the approach taken by brown rot fungi to enhance C5 and C6 sugar release from biomass
7.2.4.1	Ethanol Fuel Development, Arkansas State University, Elizabeth Hood, Ph.D.	3.66			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The project is focused on improving recovery of cellulase enzymes from transgenic corn seed, lowering the cost of production by increasing the amount of enzyme per dry weight of production material and/or enhancing activity
7.4.1.2	Biofuel Production Initiative, Claflin University, Dan Page	2.09			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. This project is to develop cellulosic processes for utilizing sugarcane grown in the state to produce biobutanol as an alternative fuel.

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
7.4.1.4	Sustainable Energy Center Biodiesel from Algae, Western Michigan University, John B. Miller, Ph.D.	2.83			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The project explores the technical and economic feasibility of converting two waste streams into fuels that can be used with existing transportation infrastructure and vehicles
7.4.2.4	Bioeconomy Initiative, MBI International, Susanne Kleff, Ph.D.	3.69			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. This project is investigating the feasibility of producing and recovering organic acids through fermentations using an industrially stable strain for the production of organic acids
7.4.2.6	Intermediary Biochemicals, Doug Burdette, Ph.D.	3.06			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The project is developing platform systems to cost effectively produce intermediate chemicals from renewable feedstocks using sustainable processes.

Table ES-1E: Summary of Biochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
7.4.5.2	Development of Applied Membrane Technology for Processing Ethanol from Biomass, Compact Membrane Systems, Sudip Majumdar, Ph.D.	3.23			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The project focuses on developing separations technologies for separation of ethanol and water
7.4.1.6	Snohomish County Biodiesel Project, Snohomish County, Deanna Carveth	2.94			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. This project focuses on development of catalyst for biodiesel production.
7.4.3.7	Connecticut Biodiesel Power Generator, Greater New Haven Clean Cities Coalition, Carla York and Robert Schmitz	3.31			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The project focuses on working with local, state and regional officials to identify and streamline regulations for biodiesel power facilities.

Table ES-1F: Summary of Thermochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
3.6.1.1, 3.6.1.3	Thermochemical Platform Analysis: Gasification and Pyrolysis; NREL, PNNL; Abhijit Dutta	4.0	X			This project provides analytical information that the Program will use to monitor progress on thermochemical processes on a quantitative basis.
3.1.2.1, 3.1.2.2, 3.1.2.3	Feed Improvement Task, Feed Processing & Handling Task & Feedstock Interface (combined); INL, NREL, PNNL; Judy Partin	3.2	X			The feedstock interface in optimizing the efficiency and control of the subsequent thermochemical conversion process.
3.1.1.1	Evaluation of the Relative Merits of Herbaceous and Woody Crops for Use in Tuneable Thermochemical Processing; Ceres; Bonnie Hames	3.7	X			The project garners information to guide the development of high yield, dedicated energy crops tailored for thermochemical conversion.
3.2.1.1, 3.2.1.3	Gasification Process Modeling and Optimization; NREL, PNNL; Mark Nimlos	3.8	X			This project develops understanding and models to optimize and predict gasifier performance. Uses modern scientific tools: computational modeling, analytical tools (i.e. laser spectroscopy), statistical modeling, microscopy
3.2.1.4	Integrated Biomass Gasification with Catalytic Partial Oxidation for Selective Tar Conversion; GE Global Research; Ke Liu	3.9	X			This project develops a novel method for selective tar CPO conversion via a highly reliable and economically effective process for syngas clean-up and is an important barrier for the platform.

Table ES-1F: Summary of Thermochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
7.3.1.1	Southeast Bioenergy Initiative - Auburn University - Systems based Products and Energy; Southeast Bioenergy Initiative; Steven Taylor	2.7			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
3.2.4.2, 3.2.4.6	Catalytic Hydrothermal Gasification; PNNL, Antares group Inc.; Doug Elliott	3.4			X	The projects 3.2.4.6 and 3.2.4.2 are wrapping up.
7.4.1.3	Center for Producer-Owned Energy; Agricultural Utilization Research Institute; Teresa Spaeth	1.7			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
3.2.1.5	Development of New Gasification Processes for Biomass Residues: Gasification Kinetics at Pressurized Conditions; NREL, Georgia Tech Research Corporation; Kristina Lisa	4.0	X			This project strives to obtain experimental data on the rates of carbon gasification and tar formation during pressurized gasification of biomass leading to a kinetic model of the gasification. This addresses an important barrier for the platform.
3.2.2.8	Dual Layer Monolith ATR of Pyrolysis Oil for Distributed Synthesis Gas Production; Stevens Institute of Technology; Adeniyi Lawal	3.1	X			The project will demonstrate of dual layer monolith reactor technology for distributed production of H ₂ /CO-rich synthesis gas via autothermal reforming of pyrolysis oil with the possibility of improved heat management and syngas quality.

Table ES-1F: Summary of Thermochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
3.2.5.6, 3.2.5.8	Catalyst Fundamentals Integration; NREL, PNNL; Kim Magrini	4.2	X			This project will develop and understand catalyst and sorbent performance to clean/condition biomass derived syngas through rational materials design for use at laboratory through pilot scales. This is a project that enables the platform through a deeper understanding of entities with catalytic/absorbent surfaces.
3.2.5.7	Integrated Gasification and Fuel Synthesis; NREL, Calvin Feik	4.1	X			Demonstrate integrated production of cost competitive ethanol from mixed alcohols produced from biomass derived syngas at pilot scale.
7.7.4.2	Agricultural Mixed Waste Biorefinery Using the Thermo-Depolymerization (TDP) Technology; Gas Technology Institute; Larry Felix	3.3			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
3.2.5.5	Engineering New Catalysts for In-Process Elimination of Tars; Gas Technology Institute; Larry Felix	4.0	X			This project will demonstrate integrated production of cost competitive ethanol from mixed alcohols produced from biomass derived syngas at pilot scale.
3.2.5.3	Biomass Gas Cleanup Using a Therminator; Research Triangle Institute; David Dayton	3.9	X			This project will develop advanced integrated system designs for clean gas production using membranes and circulating beds of catalyst/adsorbent.

Table ES-1F: Summary of Thermochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
3.2.5.12	Validation of the RTI Therminator Syngas Cleanup Technology in an Integrated Biomass Gasification/Fuel Synthesis Process; Research Triangle Institute; David Dayton	4.1	X			This project will validate integrated biomass gasification, syngas cleanup and conditioning and catalytic fuel synthesis to be demonstrated for 500 hours (at least 100 hours continuous).
3.2.5.9	Novel Approach for Biomass Syngas Cleaning and Conditioning for Liquid Fuel Synthesis Applications; Emery Energy; Ben Phillips	3.5	X			This project will validate the capability of a novel tar reformer to effectively reform tar and oil species into additional usable syngas constituents (H ₂ and CO). Subsequently it will identify overall system integration opportunities from gasifier feeding to final liquid products for scale up design.
3.2.5.10	Biomass Synthesis Gas to Liquid Fuels Evaluation; Gas Technology Institute; Dennis Leppin	2.6			X	This project would validate syngas (from wood gasification at a scale equiv. to min. 20 kg/hr wood) cleanup processing for 100 continuous and 300 total hours to stringent specifications suitable for F.T. This project is not continuing due missing the phase I stage review work targets while consuming the budget.

Table ES-1F: Summary of Thermochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
3.2.5.11	Syngas to Synfuels Process Development Unit; Iowa State University; Robert Brown	3.5	X			This project will test an integrated biomass to liquids system that uses gas cleaning through oil scrubbing rather than water scrubbing in order to minimize waste water treatment. The gas-oil scrubbing liquid will then be sent to a coker in existing petroleum refining operations to be used as a feedstock.
3.2.5.13	Pilot-Scale Demonstration of a Fully Integrated Commercial Processes for Converting Woody Biomass into Clean Biomass Diesel Fuel; Southern Research Institute; Steven Piccot	3.6	X			This project will develop and operate syngas cleaning system with TRI Unit and subsequently integrate this first step with a commercial FT diesel line.
3.3.2.7, 3.3.2.8	Fuel Synthesis Catalyst - CRADA with DOW; NREL, PNNL; Tom Foust	4.0	X			This project will develop and demonstrate a Mixed Alcohol Synthesis (MAS) Catalyst that achieves the 2012 performance targets for cost competitive mixed alcohol production.
3.3.2.1, 3.2.2.2	Syngas Quality for Mixed Alcohols; PNNL, NREL; Jim White	4.2	X			This project will improve the performance of mixed alcohol catalysts (productivity and selectivity) to meet or exceed DOE cost targets.
3.3.2.6	Catalytic Production of Ethanol from Biomass-Derived Synthesis Gas; Iowa State University; Victor Lin	3.4	X			This project will work to produce liquid fuels, such as ethanol and other high-energy content alcohols from biomass via pyrolysis of biomass and subsequent gasification of bio oil and fuel synthesis.

Table ES-1F: Summary of Thermochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
3.3.2.5	Thermochemical Conversion of Corn Stover; Bioengineering Resources, Inc.; James Gaddy	3.7	X			This project will develop an economical gasification/fermentation process to produce ethanol from corn stover. Initially corn stover will be gasified and the syngas subsequently fermented to ethanol.
7.7.4.8	Mississippi State University Sustainable Energy Center – Syngas to Fuels Projects; Mississippi State University; Mark White	3.0			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
3.2.2.10	Fast Pyrolysis Oil Stabilization: An Integrated Catalytic and Membrane Approach for Improved Bio-oils; University of Massachusetts at Amherst; George Huber	3.5	X			This project will develop innovative catalytic and membrane technologies to stabilize bio-oils. Furthermore it will research the fundamental causes of bio oil instability.
3.2.2.4, 3.2.2.5	Pyrolysis Oil R&D; PNNL, NREL; Doug Elliott	4.2	X			This project will develop the basic science and engineering for production of liquid fuels needed for fast pyrolysis of biomass through improved pyrolysis methods and upgrading of bio oils and the development of standards for bio-oil applications.

Table ES-1F: Summary of Thermochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
3.2.2.6	Hydrothermal Liquefaction of Agricultural and Biorefinery Residues; Archer Daniels Midland, PNNL; Scott MacDonald	3.3			X	This project is finishing up and has made progress towards hydrothermal processing of biomass to liquid fuels. Progress was made with regard to expanded process development to enable application of the technology to industrial scale demonstration.
3.2.2.7	A Low-cost High-yield Process for the Direct Production of High Energy Density Liquid Fuel from Biomass; Purdue University; Rakesh Agrawal	2.3	X			This project develop a low-cost process for high yield of liquid hydrocarbon fuels from biomass via fast hydrolysis and hydrodeoxygenation enabled by the synergistic use of solar H2 with biomass.
7.4.5.8	Vermont BioFuels Initiative; Vermont Sustainable Jobs Fund, Inc.; Ellen Kahler	2.0			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.
3.2.2.11	Stabilization of Fast Pyrolysis Oils; UOP; Tim Brandvold	3.9	X			This project will develop an innovative system solution (combination of technologies) for the stabilization of biomass pyrolysis oil, a high-performance, commercializable system design suitable for distributed or stand-alone operation.

Table ES-1F: Summary of Thermochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
3.2.2.9	Catalytic Deoxygenation of Biomass Pyrolysis Vapors to Improve Bio-Oil Stability; Research Triangle Institute; David Dayton	3.7	X			This project will develop and utilize catalysts to improve the properties of bio-oil or upgrade it into a more useful intermediate. The intermediate will have more desirable physical and chemical properties to facilitate upgrading to liquid transportation fuels in existing petroleum refineries or in stand-alone, centralized upgrading facilities.
3.2.2.13	A Systems Approach to Bio-Oil Stabilization; Iowa State University; Robert Brown	3.9	X			This project will develop practical, cost effective methods for stabilizing biomass derived fast pyrolysis oil for a minimum of six months of storage under ambient conditions.
3.2.2.1, 3.2.2.2	Pyrolysis Oil to Gasoline (PNNL, NREL CRADA with UOP); UOP, NREL, PNNL; Richard Marinangelli	4.2	X			The objective of this project is to upgrade biomass pyrolysis oils (Bio-oil) to petroleum refinery feedstock in a cost-effective manner. This project is targeted to be completed in or before June 2010.
7.7.4.8	Mississippi State University Sustainable Energy Center – Bio-oils; Mississippi State University; Philip Steele	3.0			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program, but we will work with the performing organization to consider and address to Reviewer comments.

Table ES-1F: Summary of Thermochemical Platform Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comment
			Continue Project	Continue w/ possible adjustments to Scope	Other	
7.3.4.1	University of Oklahoma Biofuels Refining; University of Oklahoma; Lance Lobban	2.9			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program
7.3.2.4	Bio-Renewable Ethanol and Co-Generation Plant, Biomass; Raceland Raw Sugar Corporation; Neville Dolan	3.0			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program
7.3.2.5	Plasma Gasification Waste-to-Energy Project; Koochiching County; John Howard	2.3			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program
7.4.3.11	SUNY Cobleskill Bio-Waste to Bio-Energy Project; SUNY Cobleskill – The Research Foundation; Doug Goodale	1.8			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program
7.3.6.2	Alternative Fuel Source Study - An Energy Efficient and Environmentally-Friendly Approach for Research on Alternative Fuels for Cement Processing; Auburn University; Steve Duke	2.5			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program
7.3.2.3	University of Kentucky Biofuels Research Laboratory; University of Kentucky; Mark Crocker	2.4			X	THIS IS A CONGRESSIONALLY DIRECTED PROJECT. The tasks associated with this project are not defined by the Program

Table of Contents

I.	INTRODUCTION	1
A.	<i>Biomass Program Overview</i>	2
II.	BIOMASS PROGRAM PEER REVIEW PROCESS	3
A.	<i>Biomass Program Peer Review Steering Committee</i>	5
B.	<i>Evaluation of the Program Peer Review Process</i>	6
III.	SUMMARY OF PLATFORM REVIEWS.....	7
A.	<i>The Integrated Biorefinery Platform</i>	7
	i. The IBR platform review	8
	ii. IBR platform review Summary	8
	iii. IBR Platform Evaluation	9
	iv. Summarized IBR Platform Response	10
B.	<i>The Analysis Platform</i>	11
	i. The Analysis Platform Review	12
	ii. Analysis Platform Review Summary	12
	iii. Analysis Platform Evaluation	13
	iv. Summarized Analysis Platform Response	14
C.	<i>The Infrastructure Platform</i>	15
	i. The Infrastructure Platform Review	16
	ii. Infrastructure Platform Review Summary	17
	iii. Infrastructure Platform Evaluation	18
	iv. Summarized Infrastructure Platform Response	19
D.	<i>The Feedstocks Platform</i>	21
	i. The Feedstocks Platform Review	22
	ii. Feedstocks Platform Review Summary	23
	iii. Feedstocks Platform Evaluation	24
	iv. Summarized Feedstocks Platform Response	26
E.	<i>The Biochemical Conversion Platform</i>	27
	i. The Biochemical Conversion Platform Review	27
	ii. Biochemical Conversion Platform Review Summary	27
	iii. Biochemical Conversion Platform Evaluation	29
	iv. Summarized Biochemical Conversion Platform Response	30
F.	<i>The Thermochemical Conversion Platform</i>	31
	i. The Thermochemical Conversion Platform Review	32
	ii. Thermochemical Conversion Platform Review Summary	33
	iii. Thermochemical Conversion Platform Evaluation	37
	iv. Summarized Thermochemical Conversion Platform Response	38

Attachment One

Basic Steps in Implementing the Biomass Program Peer ReviewA1-1

Attachment Two

Program Review Agenda.....A2-1

Attachment Three

Program Review AttendeesA3-1

Attachment Four

Compilation of Steering Committee Responses to the 2009 Program Review FormA4-1

Attachment Five

Steering Committee 2009 Review Process ReportA5-1

EXHIBIT 1 – VALUE OF PROJECT PORTFOLIO PEER REVIEWED1

EXHIBIT 2 – BIOMASS PROGRAM FUNDING2

EXHIBIT 3 – 2009 PLATFORM REVIEW MEETINGS, DATES, AND LOCATIONS.....3

EXHIBIT 4 – BIOMASS PROGRAM PEER REVIEW PANEL4

EXHIBIT 5 – STEERING COMMITTEE SCORES EVALUATING THE PROGRAM REVIEW PROCESS.....6

**EXHIBIT 6 – INTEGRATED BIOREFINERIES PROJECT SCOPE, MAJOR STAGES, AND CONNECTION TO
CORE R&D EFFORTS7**

EXHIBIT 7 – IBR PLATFORM: EVALUATION CRITERIA.....10

EXHIBIT 8 – ANALYSIS PLATFORM: EVALUATION CRITERIA.....14

EXHIBIT 9 – INFRASTRUCTURE PLATFORM: EVALUATION CRITERIA19

EXHIBIT 10 – FEEDSTOCKS PLATFORM: EVALUATION CRITERIA25

EXHIBIT 11 – BIOCHEMICAL PLATFORM: EVALUATION CRITERIA30

EXHIBIT 12 – BIOMASS PROCESSING OPTIONS WITHIN THE THERMOCHEMICAL PLATFORM33

EXHIBIT 13 – GROUPING BY TECHNOLOGY AREA AND TECHNICAL FOCUS FOR THE 40 PROJECTS35

EXHIBIT 14 – THERMOCHEMICAL CONVERSION: EVALUATION CRITERIA.....37

EXHIBIT 15 – PROGRAM PLANNING AND STRATEGIC APPROACH A4-2

EXHIBIT 16 – PROGRAM ORGANIZATION AND RESPONSIVENESS A4-10

EXHIBIT 17 – PORTFOLIO BALANCE AND FUNDING DISTRIBUTION A4-15

EXHIBIT 18 – PROGRAM REVIEW PANEL A5-1

EXHIBIT 19 – STEERING COMMITTEE FEEDBACK PROCESS A5-2

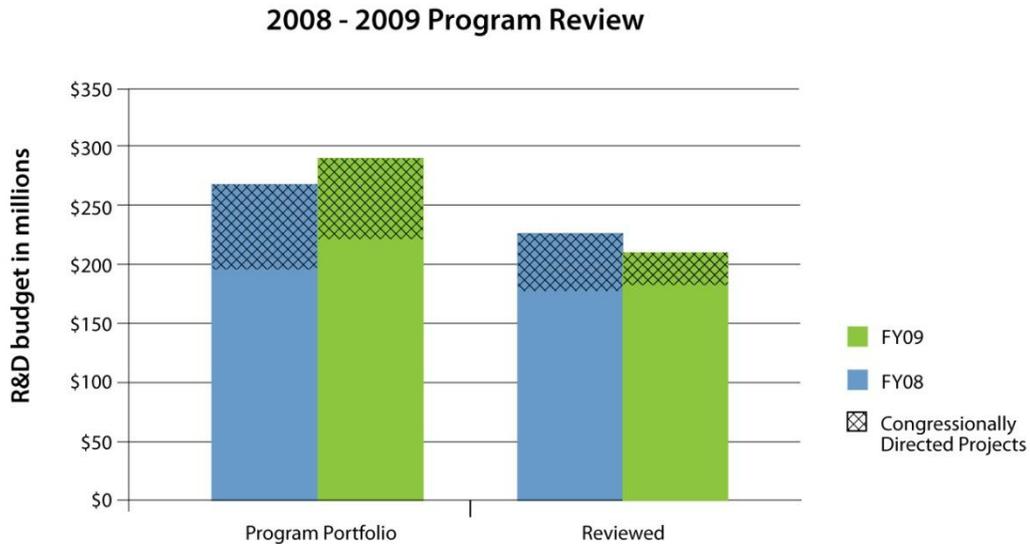
I. Introduction

The U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), Biomass Program held its biennial program peer review July 14–15, 2009. The results of the peer review are used by Biomass Program technology managers in strategic planning and management of the program. The program peer review is a biennial requirement for all EERE programs to ensure:

A rigorous, formal, and documented evaluation process using objective criteria and qualified and independent reviewers to make a judgment of the technical/scientific/business merit, the actual or anticipated results, and the productivity and management effectiveness of programs and/or projects.

The July program-level review culminated a process that involved peer reviews of each of the program’s six technology platforms and the RDD&D and analysis projects within those platforms. Exhibit 1 shows the value of FY08 and FY09 projects in the Biomass Program’s portfolio, including congressionally directed projects. The platform reviews covered 84 percent of this portfolio.

Exhibit 1 – Value of Project Portfolio Peer Reviewed



A. Biomass Program Overview

The mission of the Biomass Program is to develop and transform our renewable and abundant, nonfood, biomass resources into sustainable, cost-competitive, high-performance biofuels, bioproducts and biopower. It is focusing on targeted research, development, and demonstration emphasizing support through public and private partnerships and deployment of technologies in integrated biorefineries. Specific objectives of the program include:

- Make cellulosic ethanol cost competitive, at a modeled cost for mature technology of \$1.76/gallon by 2012
- Help create an environment conducive to maximizing production and use of biofuels, 21 billion gallons of advanced biofuels per year by 2022 (*Energy Independence and Security Act of 2007*, or EISA).

To achieve these objectives, the program was organized around six technology platforms: Feedstocks, Biochemical Conversion, Thermochemical Conversion, Integrated Biorefineries, Infrastructure, and Analysis. Both program- and congressionally directed projects were included in the review process. The program budget and distribution across each platform is shown in Exhibit 2.

Exhibit 2 – Biomass Program Funding

Functional Distribution of Funds (\$M)¹	FY08	FY09	FY10
Feedstocks Platform	13	18	25
Biochemical Platform	49	45	43
Thermochemical Platform	26	20	27
Integrated Biorefinery Platform	90	120	123
Infrastructure Platform	7	5	5
Analysis Platform	6	6	9
Subtotal	191²	214³	232^{3,4}
Congressionally Directed Projects managed by the Biomass Program	80	78	
Total	271	292	

1) Sustainability efforts were funded under the Feedstocks and Analysis platforms in FY08 & 09
 2) Does not include SBIR/STTR and Cellulosic Reverse Auction
 3) Does not include SBIR/STTR
 4) Requested

II. Biomass Program Peer Review Process

The Biomass Program followed guidelines provided in the EERE 2004 *Peer Review Guide* in the design and implementation of the platform and program reviews. A steering committee, comprised of external experts, was established early in the process to provide recommendations and help ensure an independent and transparent review process. A description of the general steps implemented in each review is provided in Attachment 1.

Neil Rossmeissl of the Biomass Program was assigned by the Biomass Program Manager as the peer review leader. Mr. Rossmeissl managed all aspects of planning and implementation. He was supported by a planning team comprised of staff from the Biomass Program, DOE Golden Office, National Renewable Energy Laboratory Systems Integrator and contractor support. BCS, Incorporated was the lead contractor responsible for organizing each of the peer reviews. The team held weekly planning meetings beginning September 2008 to outline the review procedures and processes, to plan each of the individual platform Reviews and subsequent program review, and to ensure that the process followed EERE peer review guidance.

The 2009 Biomass Program peer review process consisted first of a series of six platform review meetings, followed by the overall program review meeting. The platform review meetings consisted of technical project-level reviews of the research projects funded. The overall structure and direction of each platform was also reviewed. The platform review meetings were held between March and April 2009. A separate review panel and panel lead were formed for each platform review and were comprised of external reviewers with subject matter expertise related to the platform. Separate platform review reports were developed for each platform and exist as compendium to this report. Detailed information on each of the platform review meetings held is shown in Exhibit 3.

Exhibit 3 – 2009 Platform Review Meetings, Dates, and Locations

<p>MARCH 19 - 20</p> <p>Platform Series I National Harbor, Maryland</p> <ul style="list-style-type: none"> • Integrated Biorefineries • Infrastructure • Analysis 	<p>APRIL 8 - 10</p> <p>Platform Series II Washington, DC</p> <ul style="list-style-type: none"> • Feedstocks Technology • Sustainability
<p>APRIL 13 - 17</p> <p>Platform Series III Denver, Colorado</p> <ul style="list-style-type: none"> • Biochemical Conversion & Biobased Products • Thermochemical Conversion & Products 	<p>JULY 14 - 15</p> <p>Program Review Meeting Rosslyn, Virginia</p> <ul style="list-style-type: none"> • Strategic Direction • Results of Platform Reviews

During the July 14–15, 2009, program review meeting, program management and staff presented on strategic planning and management approaches, integration of analysis and sustainability in planning, direction and priorities of the RDD&D platforms. In addition, the lead reviewers of the platform panels presented the results of each panel’s evaluation.

The panel for the program review consisted of the steering committee and the lead reviewer from each platform panel. A list of program review panel members is provided in Exhibit 4.

An agenda for the meeting is provided in Attachment 2. A list of attendees is provided in Attachment 3. Presentations given during each of the program review meetings as well as other background information are posted on the registration Web site:

www.obpreview2009.govtools.us.

Exhibit 4 – Biomass Program Peer Review Panel

Name	Organization	Role	Area of Expertise
Susan Schoenung	Longitude 122 West	Steering Committee Chair, Analysis platform review Panel Chair	Technical Analysis
Jay Keller	Sandia National Laboratories	Steering Committee Co-Chair	Technology Management and Combustion R&D
Neal Gutterson	Mendel Biotechnology	Steering Committee	Biotechnology Systems
Terry Jaffoni	Clean Transportation Fuels	Steering Committee	Biofuel Industry
Mark Jones	Dow Chemical Company	Thermochemical review Panel Chair	Chemicals and Hydrocarbons R&D
Michael Knotek	Knotek Scientific Consulting	Biochemical review Panel Chair	Collaborative, Multidisciplinary R&D
Mark Maher	General Motors	Infrastructure review Panel Chair	Biofuel Infrastructure and integration
Liz Marshall	World Resources Institute	Steering Committee	Biofuel Economics and Policy
Tom Miles	Independent Consultant	Feedstocks review Panel Chair	Agricultural and Biomass Energy Systems
Michael Tumbleson	University of Illinois	Integrated Biorefinery review Panel Chair	Agricultural Systems and Biochemistry
Fred Petok	USDA Rural Development	Steering Committee	USDA Programs, Policy, and Funding
Roger Prince	ExxonMobil Research and Engineering	Steering Committee	Biological redox Chemistry

A. Biomass Program Peer Review Steering Committee

EERE Peer Review Guidelines recommend a steering committee be formed to help ensure an independent and transparent expert review of EERE reviews. The Biomass Program elected to adopt this recommendation and formed a steering committee to guide the peer review process for its research, development, demonstration and deployment portfolio. The Committee served as an independent, objective working partner with the Biomass Program staff and was involved throughout the planning and implementation of the review process. The Committee provided recommendations, technical reviewers, comments and direction to ensure the program receives and publishes calibrated, independent and transparent project portfolio feedback. Among the specific activities performed by the steering committee were as follows:

- Review and comment on evaluation forms and presentation templates.
- Review and comment on overall implementation process
- Review and comment on candidate review panelists for each platform
- Review the summary results of the platform reviews and reviewer comments.
- Participate on the review panel for the overall program peer review.

Twenty individuals were nominated to be considered for the steering committee with a target of selecting 7 to 10 members. Two of the nominees declined. Final selection was made by the Biomass Peer review Planning Team and Team Leader. Of the remaining 18 nominees, eight were selected to be on the Committee. Dr. Susan Schoenung was selected by the Committee to be the Chair and Dr. Jay Keller was selected to be Co-Chair. Over the course of the planning process, one of those eight members dropped off of the Committee. See Exhibit 4 above for a list of steering committee members.

Decision criteria in selecting Committee members included the following:

- Absence of any conflict of interest (COI) as demonstrated by receipt of a signed COI form
- Balanced representation of the diversity of expertise required to support the review process such as expertise in finance, conversion technology, environmental sciences, or integrated biorefineries
- Balanced representation by type of organization including research institution, private sector, government, and nongovernmental organization.

The steering committee met through biweekly conference calls which began in October 2008. Committee recommendations were provided to the platform review planning teams as they were made throughout the planning process. As described above, the steering committee along with the lead reviewers of each platform review comprised the program review Panel for the July 14–15, 2009, program peer review meeting.

B. Evaluation of the Program Peer Review Process

In keeping with the steering committee responsibility to ensure an independent and transparent review process, Dr. Schoenung asked Committee members to provide comments on the implementation process for each platform review meeting they attended. In addition, at the completion of the program review, the steering committee was provided a questionnaire to evaluate the Peer review process. The steering committee Chairperson's Report on program Peer review Process, which documents steering committee member responses following each of the platform Reviews as well as the results of the questionnaire following the program review, is provided in Attachment 5.

Overall, steering committee members agreed the review was conducted in a transparent fashion. It was a rigorous, objective and well documented process that was coordinated and managed. The only negative Committee comment was to say the time requirement was more than anticipated at the beginning of the process. Exhibit 5 provides a summary of scores to evaluation questions which had numeric ratings. Detailed steering committee comments and responses to each question are located in Attachment 4.

Exhibit 5 – Steering Committee Scores Evaluating the Program Review Process

Statement	Average Rating*
Review process was a rigorous, formal, and documented evaluation process using objective criteria.	4.7
Review was conducted in an independent, open and objective manner.	4.7
Review succeeded in conducting a qualified and independent review of the technical/ scientific/business merit, and the productivity and management effectiveness of the program.	4.5
There were incidents or anomalies in the planning and implementation of the program review that the Biomass Program should be made aware of.	2.0
Functions steering committee members were asked to perform aligned with the roles and responsibilities provided at the beginning of the process.	5.0
Amount of time required of steering committee members was in line with the estimate originally provided.	3.5

1 = Strongly Disagree; 5 = Strongly Agree.

III. Summary of Platform Reviews

This section provides a summary for each of the six platform Reviews that were conducted to evaluate Biomass Program project portfolio. Additional information and details on the 2009 platform review meetings, including presentations, and links to the six individual platform review Reports, which serve as compendium documents to this report, are available on the program review Web site at www.obpreview2009.govtools.us.

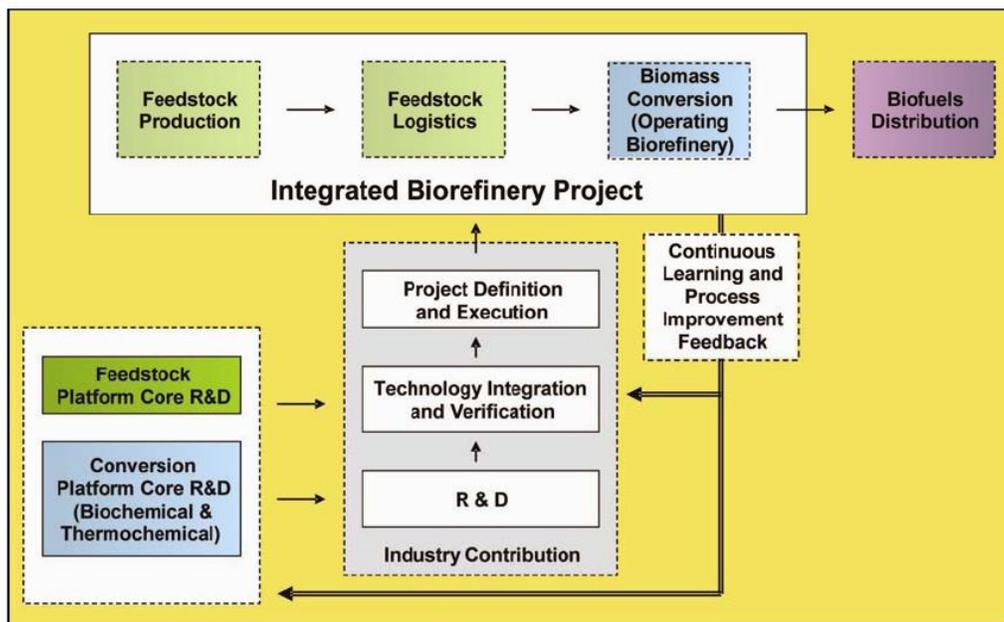
A. The Integrated Biorefinery Platform

The Integrated Biorefinery (IBR) platform’s strategic goal is to demonstrate and validate integrated technologies to achieve commercially acceptable performance and cost pro forma targets. This goal can only be accomplished through public–private partnerships.

The IBR platform is essential to achieving the program’s strategic goal: to develop sustainable, cost-competitive biomass technologies to enable the production of biofuels nationwide and reduce dependence on oil, thus supporting the Energy Independence and Security Act of 2007, Renewable Fuels Standard for “advanced biofuels”.

Government cost share of the final integrated stages of biorefinery development is essential due to the high technical risk and capital investment.

Exhibit 6 – Integrated Biorefineries Project Scope, Major Stages, and Connection to Core R&D Efforts



The scope of the IBR projects and their relationship to the three core R&D platforms (Feedstock and the two Conversion platforms) is illustrated in Exhibit 6 (Figure 3-21 from the MYPP).

While project emphasis is on the biorefinery and its conversion processes, the business plan that provides the project vision also includes strong feedstock supply components.

Currently, the program priority remains focused on enabling biorefineries to efficiently convert lignocellulosic biomass into ethanol and other biofuels at the commercial and demonstration scale. In 2009, the IBR platform released a Funding Opportunity Announcement funded by the American Recovery and Reinvestment Act that includes several topic areas allowing a broader range of feedstock (e.g., lignocellulosic, algae, sugarcane, sugar beets) to produce either primarily biofuels or bioproducts from pilot or demonstration scale integrated biorefineries.

i. The IBR platform review

The IBR platform review was held on February 19–20, 2009, in National Harbor, Maryland, and attended by approximately 90 people. In advance of the meeting, the platform evaluated 12 candidates for its review Panel. Candidates were evaluated based on their subject matter knowledge in the technology platform area, willingness to commit the time and energy needed to serve on the panel, and conflict of interest as represented by receipt of their COI form. review Panel members for the Integrated Biorefinery platform included the following:

- Dr. Michael Tumbleson; University of Illinois–Urbana-Champaign/Professor Emeritus (review Chair)
- Mr. William Cruikshank; Retired – CANMET Energy Technology Centre/Consultant
- Mr. Kent M. Sproat; Jupiter Biotech/Consultant
- Dr. Robert Miller; Air Products and Chemicals/Director Advanced Research
- Dr. George W. Huber; University of Massachusetts Amherst/Armstrong Professor of Chemical Engineering
- Mr. Doug Marshall; Retired – Hartford Steam Boiler
- Mr. David Webster; Ark Resources, LLC/Consultant
- Dr. George Parks; FuelScience, LLC/Retired from ConocoPhillips
- Ms. Bryna Berendzen; Department of Energy, Golden Field Office, Renewable Energy Projects Division (for Verenum and Mascoma projects only)

ii. IBR platform review Summary

The Integrated Biorefinery platform was well structured and the projects in the platform’s portfolio cover a good variety of feedstocks, such as wood, agricultural residue and MSW. However, the project portfolio lacks biorefineries utilizing energy crops. Biorefineries producing primarily liquid transportation fuels are an appropriate focus to meet the aggressive EISA goals. Coproducts would serve to increase the integrated biorefinery’s viability and reduce risks. Thus, coproducts should be evaluated and continue to be funded as part of the overall biorefinery concept. While some projects showed adequate state of technology data to reduce risks and prove readiness for scale up, or projects were conducting pilot plant trails to collect this type of data, it seems that other projects were jumping too far ahead to commercial or near commercial scale without passing through technology validation steps at the proper scales. DOE

is encouraged to continue to coordinate with other programs and agencies working in similar or related areas, such as the Loan Guarantee programs at USDA and DOE.

The summary materials provided by DOE and the principal investigators (PIs) before the platform peer review and the presentations given during both closed and open sessions were incomplete; missing detailed technical and cost data necessary to conduct a thorough independent peer review. Both the prereview and presentation materials should be similar to those expected from an applicant during a solicitation merit review (i.e., process flow diagrams, techno-economic data, pro forma, business plan, and risk analysis). DOE should allow enough time to assess the prereview and presentation materials to ensure they meet these requirements. If the PI's materials are not satisfactory, they should be required to revise before the meeting.

An introductory meeting prior to review would have helped to better orient the reviewers. An orientation meeting should include presentations from the independent engineers and independent project analysis (IPA) so the reviewers could incorporate their knowledge and findings. Previous DOE assessments of project progress and actual milestones achieved should also be included in the orientation meeting. The review process should be mandatory for all selected projects and the continuation of funding should be tied to a positive review. Presentation times, including the question and answer periods, should be extended.

iii. IBR Platform Evaluation

At the conclusion of the project review, the review panel evaluated the overall platform management on the basis of the five evaluation criteria, listed below. The average score represents an equally weighted average of the four scored platform evaluation criteria. In addition to the platform evaluation scores, an evaluation of the subplatform areas was done by aggregating individual project scores. Please see the IBR platform review Report for complete details on the process and the reviewer responses. A summary of the reviewer evaluation scores for the IBR platform is presented below.

Platform Evaluation Criteria and Rating System

Goals – *Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program's goals?*

Approach – *How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program performance goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?*

RD&D Portfolio – *The degree to which the platform RD&D is focused and balanced to achieve Biomass program and platform goals? (WBS, unit operations, pathway prioritization)*

Progress – Based on the presentations given, how well is the platform progressing towards achieving Biomass program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.

Exhibit 7 – IBR Platform: Evaluation Criteria

Evaluation Criteria	Average Score*	Standard Deviation
1) Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program’s goals?	3.6	0.98
2) How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program performance goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?	3.1	0.90
3) The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations, pathway prioritization)	2.9	0.38
4) Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.	2.6	0.79

* Average represents mean of individual reviewer scores. Review panels did not develop consensus scores.

Rating System: 5=Excellent 4=Good 3=Satisfactory 2=Fair 1=Poor

iv. Summarized IBR Platform Response

The platform Management Team realizes that a primary concern of the reviewers was that the platform goals are aggressive in cost and volume. Additionally, the goals are also moving targets because of the fluctuating crude oil prices, and that they might not be achievable due to the economic downturn and technical hurdles. The program is assessing its goals, which were previously tailored for an R&D program. The operational data will be used to benchmark pioneer plants and forecast nth plant potential production costs.

In many cases, the reviewers were not able to properly assess the performance of these projects against the goals because of the lack of information and many reviewers felt the allotted timeslots did not afford sufficient time to review the projects. In the MYPP, the program has

identified, for each biorefinery pathway, the milestones that need to be achieved for all the key unit operations and possible biorefinery outputs. In their PMPs, the projects already identify the milestones that are being worked in each pathway and the R&D plan for the project to meet the milestone. It might be beneficial in future reviews if the program shows the R&D to achieve each milestone by pathway by project and the potential for other pathways. This would also make it easier for the Peer Reviewers to understand the IBR portfolio and ask better questions to the projects if there seems to be duplication of effort or potential for knowledge sharing across platform or projects.

The reviewers expressed concern that many of the projects were not adhering to DOE approach to project management and that weak projects were being kept in the portfolio that would not meet achieve the program's goals. The program will remedy this issue in the near future by conducting a more rigorous Comprehensive Annual Project review to identify poor performing projects that could potentially be cut, and in the two year time conduct a more thorough Peer review.

Additionally, the program will continue to collaborate across platforms, including feedstock (as previously discussed) to balance the portfolio. The program also expects projects selected from the new FOA to broaden its portfolio along with meeting more stringent requirements to validate technology readiness for the next level of scale up.

Reviewers were not adequately presented with information to assess progress. The program will address this by conducting a Comprehensive Annual Project review as soon as possible and planning for a more robust Peer review. The Comprehensive Annual Project review will provide a more rigorous project review (similar to state gate) for each project to determine if projects should be continued, continue with scope changes, or terminated if sufficient progress is not being made. These Comprehensive Annual Project Reviews will be initiated as soon as possible (tentatively, in the new fiscal year or early calendar year 2010). The review will include input from Independent Reviewers, Independent Engineer, IPA, a project Finance consultant and the Golden Field Office's Project Management Team. The Comprehensive Annual Project review should help identify the weaker projects that maybe "weeded out" in the future or help

B. The Analysis Platform

The Biomass Program conducts a broad spectrum of analyses—resource and infrastructure assessment, technical and economic feasibility analysis, integrated biorefinery analysis, deployment analysis, environmental analysis, risk assessment, and benefits analysis—to support decision-making, demonstrate progress toward goals, and direct research activities.

Programmatic analysis (or strategic analysis) helps frame the overall program goals and priorities and covers issues that impact all platforms such as lifecycle assessment of greenhouse gas emissions from ethanol. platform-level analysis helps to monitor and check the program accomplishments in each platform. Maintaining these capabilities at the cutting edge is a

program priority, and is essential to ensuring that the analysis provides the most efficient and complete answers to technology developers and the program management.

i. The Analysis Platform Review

The Analysis platform review was held on February 19, 2009, in National Harbor, MD, and attended by approximately 50 people. In advance of the meeting, the platform evaluated 15 candidates for its review Panel. Candidates were evaluated based on their subject matter knowledge in the technology platform area, willingness to commit the time and energy needed to serve on the panel, and conflict of interest as represented by receipt of their COI form. review Panel members for the Analysis platform included the following:

- Dr. Susan Schoenung; Longitude 122 West, Inc., President (review Chair)
- Mr. Harry Baumes; U.S. Department of Agriculture
- Ms. Mary Bohman; U.S. Department of Agriculture/ Director, Resource & Rural Economics Division
- Mr. James Hettanhaus; CEA, Incorporated; President/CEO
- Mr. Scott Malcolm; U.S. Department of Agriculture, Research Economist
- Dr. Robert Wooley; Abengoa Bioenergy, Director of Process Engineering

ii. Analysis Platform Review Summary

Goals and barriers clearly articulated and the platform manager provided information on how it fits in the program, and how it might feed the program. The focus of these efforts is clearly on the development of cellulosic ethanol, which is appropriate, since most of projected use will be ethanol. Some reviewers felt that improving markets and infrastructure for biodiesel would also advance the volume targets.

The reviewers expressed concern as to how the analysis conducted through this platform either supports other platforms or the program decision making process. They also expressed concern in the amount of work being performed by the National Laboratories and suggests that a wider array of partners should be sought from organizations that have specialized knowledge that DOE's traditional partners lack. The platform is not comprehensive from the top down, but rather, it is mostly a collection of previously identified work.

Reviewers noted that projects appear to be on track and producing peer-reviewed, publically available outputs. Additionally, they noted that there also appears to be a high degree of integration and communication where research objectives overlap.

Reviewers support the recent emergence of sustainability and climate change issues into the broader platform thinking, and recognize it as a good step forward.

Reviewers specifically mentioned that water quality issues are not being comprehensively addressed. One innovative project looks at new strategies for positive environmental complementarities, but does not seek to assess general water quality impacts from biofuels.

Another water quality project with broader goals focuses almost exclusively on irrigated land for corn. As such, there is not a project that looks at the consequences of increased nutrient use from corn or other feedstocks on the entire land base.

Additionally, reviewers also noted that biopower is mentioned as a key assumption in the program description. However, there was no discussion of biopower as an alternative use of feedstocks and how this could affect the outcome, especially in a world with carbon pricing. Given the shifting public priorities, one reviewer recommended additional emphasis on environmental consequences and the effects of GHG policies.

iii. Analysis Platform Evaluation

At the conclusion of the project review, the review panel evaluated the overall platform management on the basis of the five evaluation criteria, listed below. The average score represents an equally weighted average of the four scored platform evaluation criteria. In addition to the platform evaluation scores, an evaluation of the subplatform areas was done by aggregating individual project scores. Please see the Analysis platform review Report for complete details on the process and the reviewer responses. A summary of the reviewer evaluation scores for the Analysis platform is presented below.

Platform Evaluation Criteria and Rating System

Goals – *Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program’s goals?*

Approach – *How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?*

RD&D Portfolio – *The degree to which the platform RD&D is focused and balanced to achieve Biomass program and platform goals? (WBS, unit operations, pathway prioritization)*

Progress – *Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.*

Exhibit 8 – Analysis Platform: Evaluation Criteria

Evaluation Criteria	Average Score*	Standard Deviation
1) Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program’s goals?	4.60	0.55
2) How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?	4.40	0.89
3) The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations, pathway prioritization)	4.40	0.55
4) Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.	4.40	0.89

* Average represents mean of individual reviewer scores. Review panels did not develop consensus scores.

Rating System: 5=Excellent 4=Good 3=Satisfactory 2=Fair 1=Poor

iv. Summarized Analysis Platform Response

The Analysis platform team appreciates the positive comments concerning the platform goals, approach, portfolio, and progress. As one of the newest platforms in the Biomass Program and one that cross-cuts the entire program, we are addressing many needs on a limited funding allocation. The platform will continue to improve through comprehensive reviews. The Analysis platform recognizes there are many overlaps and synergies between the analysis area, feedstocks and infrastructure. We will work to better integrate these activities much more closely in the future. A significant amount of additional analysis is being carried out in the feedstock platform which was not discussed during the review because the focus was on strategic analysis. Similarly, the Analysis platform is not addressing all infrastructure analysis needs.

It must be noted that the Analysis platform does not conduct policy research. DOE has a separate entity assigned to conduct policy analysis. The Biomass Program’s emphasis is on R&D, thus the strategic analysis conducted relates to R&D. We are aware of a number of recent studies that have compared the GHG impacts of biofuels vs. biopower. Biopower is an area that requires attention from a GHG abatement point of view, but due to budget priorities the program

has had to focus exclusively on biofuels. If the program is mandated by Congress or the Administration to look at biopower, we would add that to our portfolio. It should be noted that DOE was heavily involved in the biopower program in the 1980s and supported considerable RD&D into biomass gasification and cofiring. We also had a bioproducts program until fairly recently that also eliminated by Congressional direction to focus us on biofuels.

Regarding the comments made about the water projects; this is the platform's first attempt to analyze water issues. We have relied on publicly available data on USDA, from which we have done fairly simple calculations to determine the quantity consumptions as reported in the Argonne study. We did those calculations carefully and had several external reviewers validate those calculations. We would be happy to present that work in detail to USDA scientists and technical experts. The platform does not wish to have any bias in terms of water consumption analysis and welcomes feedback from USDA and other stakeholders on the analysis methodology.

It is widely recognized that land use change data and analysis are very much in their infancy. DOE and the Biomass Program recently sponsored a land use change workshop in Vonore, Tennessee, to discuss precisely the modeling and data uncertainties in global land use change data sets. We are beginning this research area with the understanding that we will do this in collaboration with USDA and EPA. The workshop will produce a report that will outline what the Federal government needs to do to get a better estimation of the drivers of land use change. Workshop report will form the foundations of the beginnings of a research project that will ultimately result in better data and tools in the area of land use change.

There are a variety of factors that cause this, such as: budget, program priorities, requirements of individual platforms, time constraints, and work being done by other agencies. We view integration of our work with USDA and EPA as critical to provide a comprehensive analysis of biofuels topics.

We have easy access to the staff and knowledge base at DOE's national labs, therefore from a contractual point of view; it is efficient to ask the National Labs to do this kind of analysis. We would like to coordinate more with USDA and EPA in the future and we hope that the peer review meeting provided the starting point for discussions toward enabling that to happen. DOE and the Biomass Program would like to jointly conduct analysis activities with USDA and EPA National Labs; however, we would hope that USDA and EPA funding would allow their labs to participate in these activities without requiring funds from DOE.

C. *The Infrastructure Platform*

The Infrastructure platform has an overall strategic goal to develop a systematic approach to build a cost-effective infrastructure system that can adapt to market changes and ensure widespread biofuels use for transportation applications. The newest platform within the Biomass Program, infrastructure activities began in August 2007 with the commencement of intermediate

ethanol blends testing and other work. An Infrastructure Workshop was held in October 2007 to gain strategic insight from key stakeholders involved with biofuels infrastructure for future development of the Infrastructure platform. Although the Infrastructure platform exists within the Biomass Program, it does not hold full platform status, nor does it have an official platform budget. The Infrastructure platform focuses on transportation of biofuels from the biorefinery to the pump and consumer end use. Infrastructure related to transport of feedstocks remains housed within the Feedstocks platform.

The Infrastructure platform breaks down its work under distribution and end use as they are the primary pieces within the supply chain under fuel transportation. Although ethanol is the largest commercial biofuel in the market today with its own infrastructure challenges, the Biomass Program's Infrastructure platform is also looking at the possibility of current fuel infrastructure-compatible biofuels.

In FY 2010, the Infrastructure platform will continue to expand activities its activities and refine its focus. The total requested program discretionary funds are \$5 Million. There will be an increased emphasis on Analysis, as RD&D for Distribution Networks. A pilot program will be initiated on building the necessary infrastructure, in a single region, with the goal of increasing efficiency and reducing cost.

A Pilot Project is proposed to facilitate the effective distribution of biofuels across the Nation. The project shall support activities to enable evaluation of infrastructure, based on regional characteristics and needs. The objectives are to optimize cost-effective distribution of biofuels within and across regions; understand infrastructure needs under an increased supply and demand scenario; and create the knowledge base necessary to ensure an adequate distribution infrastructure. The primary outcome is a central, broadly accessible resource base that will assist public and private organizations in making complex decisions concerning infrastructure planning and development.

A number of activities are proposed to optimize regional distribution networks for biofuels. These involve working with partners and stakeholders to understand needs and challenges, and conducting competitive solicitations directed toward infrastructure characterization and improvement. In addition, a National Laboratory Infrastructure Coordinating Committee will be established to enable coordination of data and characterization efforts among the National labs as it relates to infrastructure. This will streamline activities, avoid duplication of effort, and accelerate planning for viable solutions.

i. The Infrastructure Platform Review

The Infrastructure platform review was held on February 20, 2009, in National Harbor, MD, and attended by approximately 40 people. In advance of the meeting, the platform evaluated 16 candidates for its review Panel. Candidates were evaluated based on their subject matter knowledge in the technology platform area, willingness to commit the time and energy needed to

serve on the panel, and conflict of interest as represented by receipt of their COI form. review Panel members for the Infrastructure platform included the following:

- Mark Maher; General Motors (review Chair)
- Albert Hochhauser; Fuel Testing Consultant
- John Schmitter; KEP, LLC
- Dave Sjoding; Washington State University
- Shaine Tyson; Rocky Mountain Biodiesel

ii. Infrastructure Platform Review Summary

Currently the program seems to be at the end of the early stages of understanding the infrastructure issues. The next set of projects should be more narrowly focused on specific questions, i.e. truck infrastructure and likely prices. Gas stations, costs, market impacts, etc.

The goals and barriers for this platform were clearly articulated. The focus is on ethanol, which is appropriate, since most of projected use will be ethanol. The program seems on track to answer the overall infrastructure question, but not whether there will be issues in specific areas. More projects should be focused on areas that have been identified as potential issues. The platform team really needs to increase the sophistication of approach with regard to mid level blend assumptions, E85 assumptions, and retail products infrastructure. Where are the studies on blender pumps that will dispense E0 to E85. Where are the consumer behavior studies on blend cost vs. E0? The platform Manager did not spend a lot of time discussing gaps. One obvious gap, platform must figure out how to make better use of the 8 million E85 FFVs on the road today. This does not seem to be addressed.

More attention needs to be focused on economics in parallel with the technical questions. The dedicated ethanol pipeline feasibility study is a good example. Understand the economics because if they do not work, the technical aspects do not matter. The platform may be better served to focus efforts more narrowly from this point forward with fewer projects, more clearly defined goals and timelines, more oversight, and more funding if necessary. The level of funding directed at some of these projects (Freedom Prize, Missouri Biodiesel Demonstration) seems out of line with the value they could or did produce.

Needs

- Need to tie vehicles and end-use distribution infrastructure together. They cannot be separate solutions
- Need to integrate current corn ethanol infrastructure (pipelines, storage, and distribution) with lignocellulosic ethanol infrastructure with timing and impact to the existing industry
- Need an analysis part of the work. Need to address how to address a partial EPA waiver
- Need to address issue that E15–E20 is not equivalent to E0 or E10—need validation
- Need a fixed rigor transition plan(s)
- Need to determine what the rebate structure is and how much the consumer will pay for the transition

- Need a better outreach program that interacts with states and is integrated into technical R&D program areas.

iii. Infrastructure Platform Evaluation

At the conclusion of the project review, the review panel evaluated the overall platform management on the basis of the five evaluation criteria, listed below. The average score represents an equally weighted average of the four scored platform evaluation criteria. In addition to the platform evaluation scores, an evaluation of the subplatform areas was done by aggregating individual project scores. Please see the Infrastructure platform review Report for complete details on the process and the reviewer responses. A summary of the reviewer evaluation scores for the Infrastructure platform is presented below.

Platform Evaluation Criteria and Rating System

Goals – *Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program’s goals?*

Approach – *How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?*

RD&D Portfolio – *The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations, pathway prioritization)*

Progress – *Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.*

Exhibit 9 – Infrastructure Platform: Evaluation Criteria

Evaluation Criteria	Average Score*	Standard Deviation
1) Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program’s goals?	4.00	0.71
2) How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?	3.20	0.84
3) The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations, pathway prioritization)	3.00	0.71
4) Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.	3.40	0.89

* Average represents mean of individual reviewer scores. review panels did not develop consensus scores.

Rating System: 5=Excellent 4=Good 3=Satisfactory 2=Fair 1=Poor

iv. Summarized Infrastructure Platform Response

Ethanol has been the primary focus of the Biomass Program and, consequently, the Infrastructure platform because it has been the predominant renewable fuel available in the marketplace. Because ethanol will be a key fuel in meeting the Renewable Fuel Standard (RFS) set forth in EISA, the infrastructure concerns associated with the fuel are important to consider. In future years, the focus of the Infrastructure platform will expand beyond an ethanol focus to other biofuels, without abandoning the ethanol work. Biodiesel and other advanced biofuel projects will be integrated into the platform goals. We plan to work closely with the Biochemical and Thermochemical Conversion, and Integrated Biorefineries platforms to ensure that infrastructure investments are in line with the type of fuel that is coming to market.

The approval of intermediate ethanol blends is an important step in towards meeting the RFS. We have worked closely with EPA throughout the test program planning and execution in order

to ensure that they will have the information they need to make an informed decision regarding the use of higher level ethanol blends in existing vehicles.

platform goals will continue to be evaluated regularly to ensure that the infrastructure platform responds appropriately to changing fuel type and availability. While we cannot plan for certain at this time for what the platform will focus on beyond 2022, we believe that the 4 core areas that we have identified as our platform focus (biofuel distribution networks, biofuel end use and compatibility testing, analysis, crosscutting activities) will allow us to adapt to changing priorities and address future challenges. Additionally, the increased emphasis on analysis and biofuel distribution networks will allow us to better identify priority focus areas.

While we agree that expanded state outreach will go a long way in helping us meet our goals, we have worked with the States in several capacities in recent years. Over the past two years, we have:

- Cofunded a solicitation with the Department of Energy's Clean Cities program for biofuel outreach and education
- Provided funding to the Governors' Ethanol Coalition to hold a series of workshops to plan for targeted E85 expansion (the first workshop was held in February 2009 in Des Moines, Iowa, in collaboration with the Iowa Office of Energy Independence to develop a joint plan to expand ethanol infrastructure in the region)
- Held quarterly calls with State Energy Offices and Clean Cities Coordinators.

As noted, ethanol has been the main focus of the Infrastructure platform in recent years due to its dominant presence in the marketplace. While there are several congressionally directed projects addressing biodiesel RD&D, this has not been a focus of the program in recent years. While we do not believe the projected quantities of biodiesel in the marketplace merit making it a major focus of the infrastructure platform in future years, we do recognize the importance of biodiesel as a fuel and plan to increase our activities in this area in the near future.

In future years, the Infrastructure platform will be focused on both near term and long term biofuel infrastructure concerns. Near term RD&D will focus on addressing distribution and end use concerns of biofuels that are currently in the marketplace (e.g., ethanol and biodiesel). Longer term RD&D projects will focus on analysis to identify focus areas, biofuel distribution networks to identify barriers to efficient distribution, and compatibility testing projects for new fuels.

We plan to increase our efforts in biofuel distribution by focusing on regional distribution network concerns. The Bioenergy Knowledge Discovery Framework (KDF) will be instrumental in helping us to identify barriers to efficient distribution and targets for infrastructure development. The KDF is not simply an effort to address future infrastructure needs, nor is it a tool to define current needs. Rather, it is a framework to understand the

linkages across the entire bioenergy supply infrastructure. It is still at the initial stages of development and the first phase of the project is focused on meeting the needs of the Biomass Program's Feedstock and Infrastructure platforms. Despite this, several preliminary stakeholder meetings were held in order to gather initial feedback during the early developmental stage and a larger stakeholder meeting is planned for fall 2009 to ensure that the needs of the larger stakeholder community will be met.

While platform gaps were not addressed completely in the overview presentation, the Infrastructure platform Team is aware that gaps do exist in the platform RD&D and is committed to addressing these gaps. The following are responses to the specific gaps highlighted by the reviewers:

- While clearly an area of interest, research on coproducts is largely outside of the appropriate focus of the Infrastructure platform.
- We agree that outreach efforts should be an important component of our work. Several outreach efforts were not presented at the Peer review, including State outreach efforts described below.
- In order to fully address infrastructure concerns, both big-picture and specific infrastructure questions must be addressed. Analysis will be a major focus in future years. The increased focus on analysis in the next year will help us identify specific areas to focus our RD&D efforts.
- Funding for biofuel infrastructure development will be a component of our RD&D efforts in future years.
- As mentioned above, while we recognize that State outreach efforts could improve, we have worked with the States in several capacities in recent years. Activities have included: cofunding a solicitation with DOE's Clean Cities program for biofuel outreach and education; providing funding to the Governors' Ethanol Coalition to hold a series of workshops to plan for targeted E85 expansion; and holding quarterly calls with State Energy Offices.

We recognize that biofuel distribution concerns will vary by region. Moving forward, we plan to increase our efforts in biofuel distribution by focusing on regional distribution network concerns. The Bioenergy KDF will be an instrumental component to this work as a tool to identify barriers to efficient distribution and set for infrastructure development. This framework, combined with related analysis, will also help us answer the question of how to make better use of the existing FFVs on the road today.

D. The Feedstocks Platform

As the Feedstocks platform is the first element in the overall biomass-to-biofuels supply chain, sufficient and secure supply of affordable feedstocks is a critical step in accomplishing the program goals. The Feedstock platform therefore relates strongly to all other facets of the program portfolio, and is specifically linked to the Conversion platforms as feedstock is a necessary component for conversion technologies. The Feedstock platform supports the DOE Biomass Program's mission of developing biomass resources into renewable energy by pursuing

research to optimize sustainable feedstock production regionally and to reduce the costs of producing and delivering feedstocks to conversion facilities. The platform is focused on achieving RFS targets for advanced biofuels in a sustainable and economically viable manner through a research portfolio made up of Feedstock Production, Logistics, Sustainability, and Analysis projects.

Current research, development and deployment efforts within the program are addressing the issues of resource availability and cost, sustainable production and harvest, and feedstock storage and handling in partnership with the SunGrant Initiative, the United States Department of Agriculture (USDA) Regional Biomass Energy Feedstock Partnerships, the DOE Office of Science and other agencies. Through this research and development, the Feedstock platform aims to substantiate the availability of a sustainable, high-quality, accessible feedstock supply of 130 million tons per year by 2012, growing to 250 million dry tons per year by 2017. In addition to increasing the availability of available feedstocks, the platform is focused on reducing feedstock production costs to \$50.70 per dry ton (2007 dollars) by 2012.

As the understanding of feedstock crops develops, the platform will establish trial sites for short-rotation woody and additional herbaceous plants. These trials will be monitored, and the data collected and analyzed will be used to develop synthesis reports. The platform will continue its focus on sustainability throughout the program portfolio by guiding research through our national laboratories, continuing collaborative efforts with NGOs, industry, universities and international partners, and promoting and facilitating sustainable practices throughout the program platforms.

i. The Feedstocks Platform Review

The Feedstock platform review was held on April 8–10, 2009, in Washington, D.C., and attended by approximately 110 people. In advance of the meeting, the platform evaluated 15 candidates for its review Panel. Candidates were evaluated based on their subject matter knowledge in the technology platform area, willingness to commit the time and energy needed to serve on the panel, and conflict of interest as represented by receipt of their COI form. Review Panel members for the Feedstock platform included the following:

- Tom Miles; Consultant (review Chair)
- Phil Rasmussen; Utah State University
- Steven Fales; Iowa State University
- Bob Rummer; USDA/Forest Service
- Ed White; State University of New York, College of Environmental Science & Forestry
- John Guretzky; Noble Foundation
- Britt Lungren; Environmental Defense Fund
- James Lucas; Case New Holland
- Bob Matousek; AGCO Corporation
- Jane Earley; Earley & White Consulting Group, LLC

ii. Feedstocks Platform Review Summary

The Feedstock platform was presented to the review panel in four focus areas: Production, Logistics, Sustainability, and Analysis. While the whole review panel evaluated projects in Sustainability and Analysis due to the cross-cutting nature of the work, subsets of reviewers based on individual expertise evaluated projects in Production and Logistics. The review panel evaluated 35 projects and provided written comments and scores to the project principal investigators and the Feedstock platform management team. Additionally, the panel evaluated the overall platform management and direction based on the strength and coverage of the quality and nature of the evaluated projects. An overall narrative of the platform evaluation is given below.

General Recommendations

- Overall, the review Panel was impressed with the breadth and depth of research, development, and deployment activities focused on solving the challenges of supplying adequate volumes of feedstocks for conversion to advanced biofuels. Reviewers who participated in the 2007 review appreciated the lengths the platform has gone to incorporate the results of that review; specifically on matters relating to feedstock production and collaboration with other federal agencies such as the U.S. Department of Agriculture (USDA).
- After listening to 35 project presentations and several management overviews, the overall recommendations from the 2009 Feedstocks review panel included:
- More emphasis on developing woody biomass feedstocks. If wood is 1/3 of potential biomass supply then it should be adequately represented in the program.
- An increased emphasis on sustainability impacts on soil, water, food, etc.
- A consideration of the potential of other feedstocks such as algae that may have major impact on supply.
- Projects in the Feedstock platform were presented in four related “Technology Areas”: Feedstock Analysis, Production, Logistics, and Sustainability. A summary of the overall reviewer evaluations at the technology area level follows.

Feedstock Analysis

- Project Highlights and Achievements: The review panel commended the strong development of supply forecasts and analysis since the 2005 Billion Ton report.
- Gaps in R&D focus: The review panel noted that increased integration of modeling efforts would be beneficial. Integration of weather and climate data seems lacking, as well as price information from the Policy Analysis System (POLYSYS). The review panel also suggested that there is a need for analysis of policy impacts, forest products supply and demand, and sensitivity analyses in model outputs.
- Recommendations: Overall, the review panel recommended the development of users and applications of the KDF tool through focus groups.

Feedstock Production

- Project Highlights and Achievements: The review panel commended the Regional Feedstock Partnerships (RFP) as a productive strategy for developing and deploying regionally appropriate cellulosic feedstocks production systems. Specifically, the review

panel commended the RFP for: facilitating feedstock work across nation; including woody and other feedstocks; and leveraging support from USDA. The review panel also noted that sorghum has short term potential for large tonnages and that the GIS data collection, including carbon, is particularly relevant to policy.

- Gaps in R&D focus: The review panel noted that more work on the development of agronomic practices for energy crops, as well as work on genetic improvement to meet yield targets, stronger commitment sustainability to meet yield targets, crops with drought resistance (e.g., sorghum, low water corn), more work on woody biomass production, and the inclusion of carbon and GHG in studies is needed.

Feedstock Logistics

- Project Highlights and Achievements: The review panel commended the work presented by the Idaho National Laboratories (INL). The panel agreed that the Uniform Format is a suitable goal for feedstock processing and a good vehicle for logistics development. The panel also thinks that the Deployable Process Development Unit (PDU) is a good platform for testing and development of feedstock supply systems.
- Gaps: The review panel noted that transportation infrastructure needs to be integrated into analysis to help increase load weights and manage impact on rural traffic. Also, feedstock quality measures could be standardized for end use. The reviewers would have liked to hear more emphasis on chemical and other quality characteristics from Conversion platforms, but understand that the Feedstock Conversion Interface project presented at the Conversion platform peer review.

Sustainability

- The review panel emphasized their assessment that feedstock sustainability is a very extensive and interrelated problem and suggested that it needs increased, multiplatform attention and funding.
- Gaps: The review panel suggests that sustainability work should be accelerated to meet the public pressure and policy demands. The panel notes that the problems of integrating physical and social models are complex, though necessary for full consideration of sustainability issues.
- Recommendations: The review panel specifically suggests that the Conversion platforms and industry partners should fund sustainability work. Also, the panel suggests that biodiversity hot spots could be included in existing models like IDB and IBRD.

iii. Feedstocks Platform Evaluation

At the conclusion of the project review, the review panel evaluated the overall platform management on the basis of the five evaluation criteria, listed below. The average score represents an equally weighted average of the four scored platform evaluation criteria. In addition to the platform evaluation scores, an evaluation of the subplatform areas was done by aggregating individual project scores. Please see the Feedstock platform review Report for complete details on the process and the reviewer responses. A summary of the reviewer evaluation scores for the Feedstock platform is presented below.

Platform Evaluation Criteria and Rating System

Goals – Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program’s goals?

Approach – How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?

RD&D Portfolio – The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations, pathway prioritization)

Progress – Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.

Exhibit 10 – Feedstocks Platform: Evaluation Criteria

Evaluation Criteria	Average Score*	Standard Deviation
1) Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass program’s goals?	4.30	0.67
2) How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?	3.90	0.57
3) The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations, pathway prioritization)	3.90	0.57
4) Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.	3.90	0.32

* Average represents mean of individual reviewer scores. review panels did not develop consensus scores.

Rating System: 5=Excellent 4=Good 3=Satisfactory 2=Fair 1=Poor

iv. Summarized Feedstocks Platform Response

The Feedstocks management team appreciated the commendations and positive comments concerning the Feedstock platform goals, approach, portfolio, and progress. Many were a result of heeding and responding to recommendations from past reviews. It has been and will continue to an ongoing pursuit to improve the platform through comprehensive reviews. Such comments are useful feedback in the continued management of the platform, especially in light of previous reviews and efforts to incorporate recommendations from them.

The Feedstock platform is managed as an integrated component of the Biomass Program where efficiency and sustainability are holistically integral to the supply, conversion, and use of feedstocks for energy. To accomplish this goal, projects are prioritized and selected as part of multiyear program planning in order to provide the necessary data for science and/or technology breakthroughs, to test or demonstrate a technology, or to provide a tool that is useful in successful deployment of production and recovery systems that can readily use our nation's abundant feedstocks for renewable energy and bioproducts.

In response to the review, the platform has identified six major areas of action at the platform management level. A summary of the action items follows. See [Section IIC](#) for a more complete response.

In response to the evaluations of the overall platform direction and activities, the Feedstocks management team plans to

- Continue to focus on feedstock sustainability RD&D by utilizing field trials to obtain additional measurements related to sustainability indicators
- Continue to assess the balance and focus of a myriad array of potential feedstocks (including wood), especially in consideration of upstream/downstream integration for improvements in product efficiency and performance
- Continue to have a “balanced” portfolio of data collection and analyses, technology development, testing, and demonstration, and model development
- Undertake additional efforts to better select and manage the overall portfolio of projects to ensure relevance to platform and program objectives and sound technical approaches.
- Utilize resources to address algal feedstock issues developed under the Algae Roadmap
- Utilize the KDF as the central analytical tool for outreach and deployment of the science and technology, as well as continue to collaborate with a wide range of institutions, partners, and users to solicit input as well as develop better ways to provide information and tools.

Additionally, each project evaluation was carefully reviewed by both the project principal investigator and the platform management. Principal investigators were given the opportunity to provide detailed responses and clarifications to the written evaluation comments. The platform management team reviewed each project evaluation and principal investigator response and made a determination on how to respond to the review. Where possible, reviewer comments will be incorporated into the continuation of projects, in accordance with contractual obligations. Congressionally directed projects are not initiated by the platform and, due to the nature of their

funding, are not always responsive to management initiatives, nor is their year to year status known.

E. The Biochemical Conversion Platform

The Biomass Program conducts a broad spectrum of analyses—resource and infrastructure assessment, technical and economic feasibility analysis, integrated biorefinery analysis, deployment analysis, environmental analysis, risk assessment, and benefits analysis—to support decision-making, demonstrate progress toward goals, and direct research activities.

Programmatic analysis (or strategic analysis) helps frame the overall program goals and priorities and covers issues that impact all platforms such as lifecycle assessment of greenhouse gas emissions from ethanol. platform-level analysis helps to monitor and check the program accomplishments in each platform. Maintaining these capabilities at the cutting edge is essential to ensure that the analysis provides the most efficient and complete answers to technology developers and the program Management.

i. The Biochemical Conversion Platform Review

The Biochemical Conversion platform review was held on April 13–17, 2009, in Denver, Colorado, and attended by approximately 110 people. In advance of the meeting, the platform evaluated 15 candidates for its review Panel. Candidates were evaluated based on their subject matter knowledge in the technology platform area, willingness to commit the time and energy needed to serve on the panel, and conflict of interest as represented by receipt of their COI form. review Panel members for the Analysis platform included the following:

- Mike Knotek; Consultant, Knotek Scientific Consulting (review Chair)
- Carl Anderson; Senior Geneticist and Biology Chairman, Brookhaven National Laboratory
- David Berry; Partner, Flagship Ventures
- Mike Cotta; Supervisory Microbiologist, U.S. Department of Agriculture
- Mike Penner; Associate Professor, Oregon State University
- Jan Pero; Director of Specialty Chemicals, BioEnergy International, LLC
- Lise Raleigh; Chief Technology Development Officer, New England Biolabs

ii. Biochemical Conversion Platform Review Summary

Overall, the reviewers thought that the platform presented an impressive overall portfolio that was well chosen and has been productive. They felt that the interactions across private and public entities have provided energy and have kept all parties advancing. Reviewers were of the opinion that with the enormity of the challenge, current funding is not adequate to fully meet the congressionally mandated technical goals. Under current funding, efforts must be focused to better guarantee success and to take advantage of progress.

The review panel concluded that the projects are effectively buying down the risk for the establishment of a biochemically based biofuels industry. There are several approaches to the

various goals and a balance needs to be struck between realizing the benefits of revolutionary technologies and the needs to get a new industrial sector established in a timely way. Choosing winners too early in the cycle can potentially compromise later options but more conservative choices are needed for early systems. An improved set of standards and analytical criteria need to be established to better gauge progress against overall Biomass Program goals. With time the research projects should embrace a wider range of feedstocks and end products, applying the learning that has derived from the current focus on ethanol from corn stover and switchgrass. Analysis of the issues of sustainability, productivity, cost, and scaling potential of feedstock and end product choices should guide system choices. In general there needs to be more outreach and technology transfer to allow industry to benefit from modeling and analytical capabilities and new process IP. Specific topical reviewer comments included the following:

Algal based fuels research

Reviewers did not feel that the Algae projects were a good fit for the platform until there is a better understanding of the research and development pathways required to make algae competitive. Reviewers felt that the algae program should be subject to the same requirements and metrics as the ethanol or other fuels projects. And, that there must be a more robust understanding of the role of DOE funding in advancing the algae industry and of the strategic criteria for DOE long-term investments.

Pretreatment and Enzymatic Hydrolysis

Reviewers noted that there is a robust variety of approaches to solving the enzyme problem which makes a nice portfolio. And, that the skill set developed in metabolic engineering and enzyme optimization is impressive. Much of the work is dependent on Mother Nature however, utilizing screens of natural systems, and manipulation to achieve the needed results. Reviewers felt that there needs to evolve to a more rational approach, more effort in understanding enzyme mechanics, and more high risk research in design and engineering of enzymes. Reviewers felt that while the validation techniques in use were impressive, there would need to be a new generation of diagnostic capabilities, especially to support process integration efforts going forward.

Process Integration and Fermentation

Reviewers noted that process integration research would be critical as new technologies are incorporated into process streams. They noted there is an impressive set of efforts that are well on target to bring the needed elements together and to develop the modeling and diagnostics to support this essential step. Reviewers felt that these efforts need to be expanded to new feedstocks, processing technologies, and end products and the program expands.

Fermentation (Ethanologens)

Reviewers felt the fermentation projects were well chosen, and that with time there should be more analysis of mixed cultures and the focus on C5 and C6 sugars can be expanded to perhaps

C1. Reviewers noted that metabolic engineering capabilities would need to be expanded for success, and consideration should be given to both split or combined streams. They also noted the importance for continued work on inhibitors. Commercially driven projects are important since they are closer to endpoints that will reduce the risk for meeting near and mid-term Biomass Program goals. Key to a process environment is better diagnostics (throughout the process chain)—development of analytical tools that can help support more real-time diagnostics should be encouraged.

iii. Biochemical Conversion Platform Evaluation

At the conclusion of the project review, the review panel evaluated the overall platform management on the basis of the five evaluation criteria, listed below. The average score represents an equally weighted average of the four scored platform evaluation criteria. In addition to the platform evaluation scores, an evaluation of the subplatform areas was done by aggregating individual project scores. Please see the Biochemical Conversion platform review Report for complete details on the process and the reviewer responses. A summary of the reviewer evaluation scores for the Biochemical Conversion platform is presented below:

Platform Evaluation Criteria and Rating System

Goals – *Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program’s goals?*

Approach – *How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?*

RD&D Portfolio – *The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations, pathway prioritization)*

Progress – *Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.*

Exhibit 11 – Biochemical Platform: Evaluation Criteria

Evaluation Criteria	Average Score*	Standard Deviation
1) Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program's goals?	4.14	0.69
2) How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?	4.14	0.69
3) The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations, pathway prioritization)	4.14	0.69
4) Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.	3.86	1.07

* Average represents mean of individual reviewer scores. review panels did not develop consensus scores.

Rating System: 5=Excellent 4=Good 3=Satisfactory 2=Fair 1=Poor

iv. Summarized Biochemical Conversion Platform Response

The platform team has worked with program Management and industry and academic stakeholders to develop a comprehensive and inclusive approach to portfolio management, utilizing suggestions from the 2007 platform Peer review. The timelines and milestones are routinely reviewed and will consider the reviewer comments as part of our 2010 platform planning cycle. Efforts continue within the program and the platforms to ensure that the platform goals are succinct and transparent in how they contribute to the overall program goal. The platform activities are focused on achieving the 2012 targets and is managed and organized to address and overcome the related R&D challenges.

The reviewers' comments on the well-balanced nature of the platform validate the platform team's approach to engaging its stakeholders, a diverse group of partners with varied expertise and disciplines. In the out-years, the platform plans to target a broader suite of biofuels renewing focus on long-term, high-risk, high-reward activities. Additionally, the platform fully expects

that biochemical processes that produce infrastructure-compatible biofuels will be included in the Recovery Act efforts.

The platform team agrees that —“There is still much technical advancement needed to accomplish the ultimate goals.” Analysis activities are underway to address the reviewers concern as to how progress is measured and will be incorporated into the platform planning efforts.

F. The Thermochemical Conversion Platform

The Thermochemical platform develops technology to convert biomass to fuels, chemicals and power via thermal and chemical processes such as gasification, pyrolysis and other nonbiochemical processes. Intermediate products include clean synthesis gas or syngas (a mixture of primarily hydrogen and carbon monoxide, resulting from gasification), bio-oil (liquid product from pyrolysis), and gases rich in methane or hydrogen. These intermediate products can then be upgraded to products such as ethanol, other alcohols, green gasoline, green diesel, ethers, synthetic natural gas, chemical products, or high-purity hydrogen, or may be used directly for heat and power generation. It is important to recognize that some of these products are direct substitutes for fossil-fuel-based intermediates and products and therefore, can likely use portions of the existing fossil fuel processing and distribution infrastructure.

Based on the current stage of development of thermochemical conversion technologies, gasification provides higher potential for near-term deployment, while pyrolysis will be important in meeting longer-term biofuels goals. The program, therefore, has prioritized gasification R&D in its near-term efforts. Pyrolysis technologies are being evaluated by the program and efforts may increase in the future based on the outcome. Pyrolysis presents the additional benefit of leveraging investments in the petroleum industry since its intermediate product of bio-oil can, after stabilization, be potentially used as a petroleum refinery feedstock. Thermochemical conversion technology options can maximize biomass resource utilization to produce biofuels because they can more easily convert low-carbohydrate biomass materials such as forest and wood resources than biochemical conversion options. In addition, they can convert the lignin-rich, nonfermentable residues from biochemical conversion processes. Advanced conversion technology scenarios rely on considerable yield enhancements achievable by combining the two conversion technologies into an integrated biorefinery; such integration would maximize the liquid fuel yield per ton of biomass and enable higher overall energy efficiencies by allowing integration of high-efficiency heat and power production systems, such as combined cycle gas turbines or fuel cells.

The Thermochemical platform’s strategic goal is to *develop technologies for converting feedstocks into cost-competitive commodity liquid fuels, such as ethanol, as well as bioproducts and biopower.*

The Thermochemical platform directly addresses and supports production of fuels in the Agricultural Residues Processing, Energy Crops Processing, and Forest Resources Processing pathways. It also indirectly supports the production of bioproducts from these pathways.

Thermochemical conversion technologies provide options for improving the economic viability of the developing bioenergy industry by their ability to convert whole biomass as well as the fractions of the biomass resources that are not amenable to biochemical conversion technologies (e.g., lignin-rich process residues and other low-carbohydrate feedstocks or process intermediates).

The overall performance goal of the Thermochemical platform is to reduce the estimated mature technology processing cost for converting cellulosic feedstocks to ethanol to \$0.82 per gallon by 20123 and \$0.60 per gallon by 2017 (2007 dollars) based on integrated pilot-scale data. The overall performance goal is the same for the pyrolysis route based on the energy output. The performance goals for the pathways under investigation are as follows:

Agricultural Residues Pathway

- By 2009 (Q4), validate integrated gasification of lignin derived from corn stover and wheat straw to produce clean syngas at pilot scale.
- By 2010 (Q4), validate integrated gasification of corn stover and wheat straw to produce clean syngas at pilot scale.
- By 2012, validate integrated production of ethanol from mixed alcohols produced from corn-stover- and wheat-straw-based (lignin or biomass) syngas at pilot scale.
- By 2015, validate integrated production of biomass to gasoline and diesel via pyrolysis routes at pilot plant scale.

Energy Crops Pathway

- By 2009 (Q4), validate integrated gasification of hybrid poplar- and switchgrass-derived lignin to produce clean syngas at pilot scale.
- By 2010 (Q4), validate integrated gasification of hybrid poplar and switchgrass to produce clean syngas at pilot scale.
- By 2012, validate integrated production of ethanol from mixed alcohols produced from hybrid poplar- and switchgrass-based (lignin or biomass) syngas at pilot scale.
- By 2012, validate integrated production of biomass to gasoline and diesel via pyrolysis routes at pilot plant scale for woody biomass.

i. The Thermochemical Conversion Platform Review

The Biochemical Conversion platform review was held on April 13–17, 2009, in Denver, Colorado, and attended by approximately 110 people. In advance of the meeting, the platform evaluated 15 candidates for its review Panel. Candidates were evaluated based on their subject matter knowledge in the technology platform area, willingness to commit the time and energy needed to serve on the panel, and conflict of interest as represented by receipt of their COI form. review Panel members for the Analysis platform included the following:

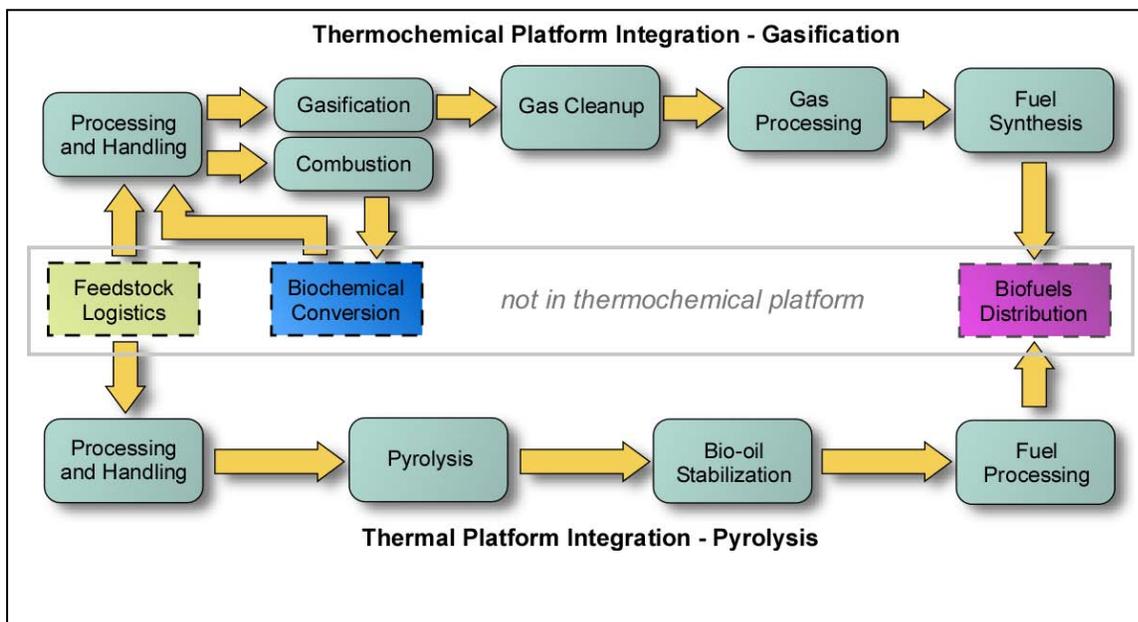
- Mark Jones; Dow chemical (review Chair)
- John McDermott; General Electric
- Charles Kinoshita; University of Hawaii
- Robert Fireovid; USDA
- Curtis Krause; Chevron
- Craig Brown; Weyerhaeuser

ii. Thermochemical Conversion Platform Review Summary

Thermochemical conversion of biomass to liquid transportation fuels continues to show great promise. Thermochemical conversion offers a universal solution for production of liquid transportation fuels from lignocellulosic biomass, including the lignin fraction. Ethanol production is but one option being explored in the program. The program spans a variety of approaches including some that are compatible with existing fuels distribution infrastructure.

Gasification and pyrolysis are the two foundation technologies upon which the platform is built, shown in Exhibit 12 an adaptation of figures 3-16 and 3-17 from the *Biomass Multi-year Program Plan (MYPP), February 2009*. Gasification and subsequent fuels synthesis holds the potential to make alcohol and hydrocarbon fuels. Gasification involves the reaction of carbonaceous material with steam, completely breaking all carbon-carbon bonds. A mixture of carbon oxides, hydrogen and water is the result. This synthesis gas, or syngas, can be fed to a range of catalytic processes capable of producing a range of products. The fuels synthesis thrust currently focuses on mixed alcohol synthesis.

Exhibit 12 – Biomass Processing Options within the Thermochemical Platform

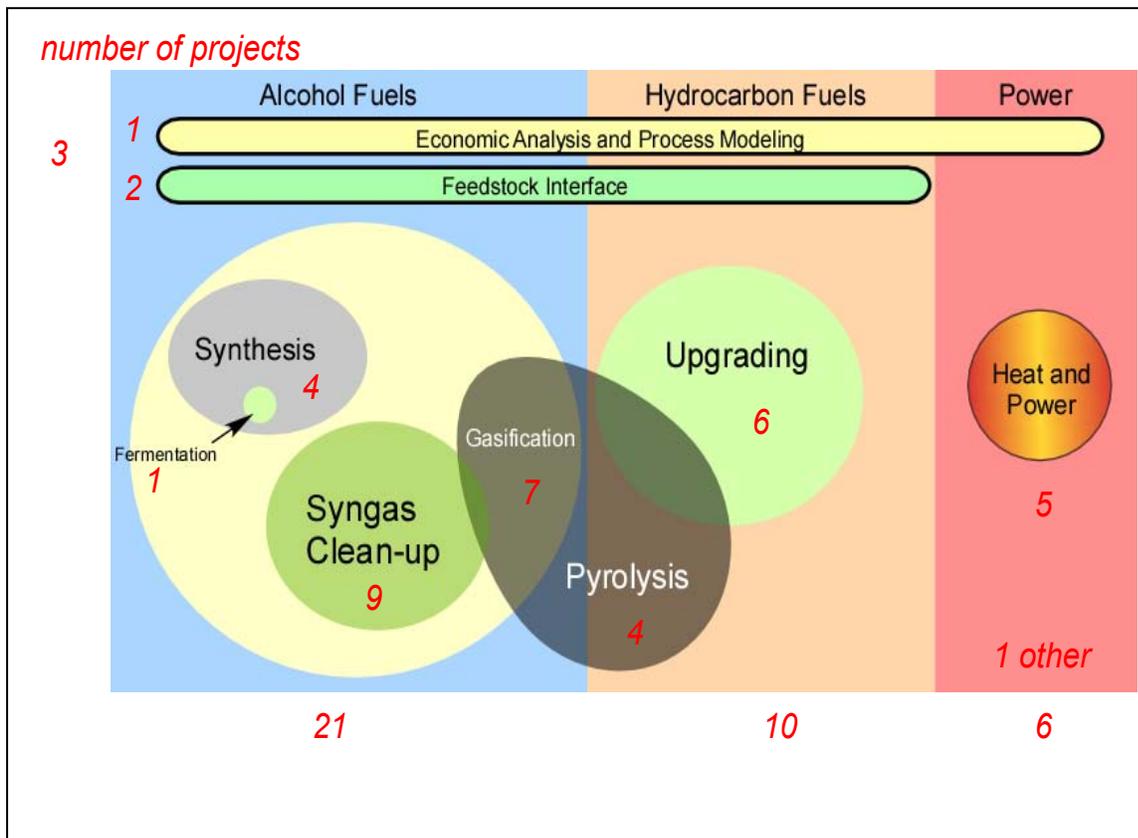


Pyrolysis is the anaerobic, high-temperature decomposition of carbonaceous feedstocks. The process produces a range of primary products including light gases and a pyrolysis oil. This oil can be further processed to produce a diesel range product. Processing of pyrolysis oil forms hydrocarbon fuels compatible with existing processing and distribution.

The review panel noted several notable omissions. The first is the complete exclusion of fossil fuels, in spite of the benefits that commingled biomass and fossil feedstocks are known to offer. Additionally, municipal solid waste is a lignocellulosic feedstock that is not represented in the feedstock portfolio.

Exhibit 13 shows an overview of the platform projects reviewed. In total, 40 projects were reviewed and scored. Gasification-based projects are in the majority. Pyrolysis and gasification have much in common and fundamental studies have considerable overlap, as the figure attempts to show. The single largest area of investigation is in syngas clean-up. These projects attempt to understand and correct issues caused by incomplete gasification, leading to tar components that cause problems in fuel production.

Exhibit 13 – Grouping by Technology Area and Technical Focus for the 40 Projects



The power projects in the platform do not align with the platform goals. In all cases, these projects are congressionally directed projects that were included in the review.

The platform has several strengths:

- DOE economic evaluations show that thermochemical processing can produce lower cost alcohol fuels based on current technology state, near term and long term technology estimates.
- Pyrolysis-based processes are estimated to be even lower cost transportation fuels that have the added benefit of being compatible with existing refinery processes and current distribution networks for hydrocarbon fuels.
- Programs nurtured by the platform have been taken up by commercial concerns and are heading toward commercialization without further DOE funds.
- The platform responded to previous review panel suggestions and expanded into pyrolysis oil processing, an area that looks to be bearing considerable fruit in the short two-year period since the last review.

The platform would be improved by:

- The increase in funding for pyrolysis should continue leading to a program approximately equally weighted between gasification and pyrolysis.
- More nonethanol projects, such as hydrocarbon production from biomass should be considered.
- State-of-technology reports on key areas should be undertaken. For example, re-examination of tar formation during gasification should be considered.

Portfolio refinement should continue:

- Include exploration into new and novel ways of deoxygenating pyrolysis oils during production phase (*in situ*).
- Begin to examine new and novel ways of liquefaction (i.e., expand hydrothermal processing)
- Must prepare to pare programs that have reached technical limits or have transitioned to the commercial market. Similarly, guidelines should be developed on whether to include programs that are already in the commercial realm. Methanol-to-gasoline and Fischer-Tropsch liquids are examples of processes that have reached commercial readiness that could be based on bio feedstocks.
- A disproportionate amount of the budget is being spent on syngas cleanup with few technical breakthroughs. Specifically, the endothermic reaction of tar with water is the focus multiple projects and may have reached technical limits. More emphasis on other tar management options is warranted. These include means to reduce tar by gasifier design and other process approaches to tar management.
- It is the panel's opinion that a wider exploration, including an emphasis on process options is in order. The platform is one of two R&D centered platforms in the program and has the responsibility of fostering exploratory efforts. The current program seems weighted toward development end of the spectrum. Recognition that several of the platform's issues may be best addressed by novel process combinations. An example may be tar control, where gasifier improvements may allow solutions other than endothermic reforming.
- Widening feedstock options should be considered, especially comingled fossil and biomass feeds, inclusion of the lignocellulosic component of municipal solid waste and the inclusion of algal biomass. Several options could be explored in the algal realm. These include, but are not limited to, thermochemical processing of algal biomass and processing of algal oils with pyrolysis oils.

Comments about the platform must be prefaced by recognition that the wide range of topic areas makes comparison scoring difficult. In general, the program appears to be well balanced and responsive to new information. The managed part of the portfolio is in good shape. The lowest rated projects were disproportionately congressionally directed projects that did not match the platform objectives. The lack of relevance was a major reason for the low scores among the directed projects. It is the opinion of the review panel that funding of the reviewed projects, both directed and competitively awarded, is adequate. The platform would be improved considerably by competitively awarding and managing funds currently in the directed projects.

iii. Thermochemical Conversion Platform Evaluation

At the conclusion of the project review, the review panel evaluated the overall platform management on the basis of the five evaluation criteria, listed below. The average score represents an equally weighted average of the four scored platform evaluation criteria. In addition to the platform evaluation scores, an evaluation of the subplatform areas was done by aggregating individual project scores. Please see the Thermochemical Conversion platform review Report for complete details on the process and the reviewer responses. A summary of the reviewer evaluation scores for the Thermochemical Conversion platform is presented below:

Platform Evaluation Criteria and Rating System

Goals – *Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program’s goals?*

Approach – *How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?*

RD&D Portfolio – *The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations, pathway prioritization)*

Progress – *Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.*

Exhibit 14 – Thermochemical Conversion: Evaluation Criteria

Evaluation Criteria	Average Score*	Standard Deviation
1) Are platform goals, technical targets and barriers clearly articulated? Are platform goals realistic and logical? Do the platform goals and planned activities support the goals and objectives of the Biomass Program as outlined in the MYPP? How could the platform change to better support the Biomass Program’s goals?	4.67	0.52
2) How well does the platform approach (platform milestones and organization, RD&D portfolio, strategic direction) facilitate reaching the program Performance Goals for each platform as outlined in the MYPP? What changes would increase the effectiveness of the platform?	4.33	0.52
3) The degree to which the platform RD&D is focused and balanced to achieve Biomass Program and platform goals? (WBS, unit operations,	4.33	0.52

pathway prioritization)		
4) Based on the presentations given, how well is the platform progressing towards achieving Biomass Program and platform goals? Are we meeting our performance targets? Is it on track to meet the goals presented? Please provide recommendations on improvements for tracking progress in the future.	3.83	0.75

* Average represents mean of individual reviewer scores. Review panels did not develop consensus scores.

Rating System: 5=Excellent 4=Good 3=Satisfactory 2=Fair 1=Poor

iv. Summarized Thermochemical Conversion Platform Response

In general, the thermochemical platform agrees with the comments although this year there have been refinements on modeled costs to arrive at more realistic, but aggressive cost targets as is reflected by the new higher cost targets in the MYPP. The Thermochemical platform will be developing cost, quality and yield goals for both pyrolysis and gasification processes to nonethanol fuels (e.g., green gasoline, green jet fuel, green diesel, and other hydrocarbon fuels), and for a petroleum blending stock biofuel derived from pyrolysis of biomass.

The thermochemical platform believes that implementation of the proposed transition strategy (via R&D planning and budget requests) and the aggressiveness of program goals will push the technology, and US industry, to commercial success in a shorter time frame.

The platform agrees that a more appropriate level of resources (e.g., higher) is needed for exploratory research. More exploratory research is needed to fully understand and improve upon the process chemistry in gasification, pyrolysis, upgrading/improving intermediates (syngas and pyrolysis oil) and fuel synthesis catalysts. This is needed for all various “levels of quality” of product from these process steps. The thermochemical platform also believes that an increased level of resources is needed to adequately address the research barriers currently identified.

Two other large needs are research on: (1) the different requirements for thermochemical processing a matrix of additional feedstocks, and (2) the characteristics of the intermediate products (syngas, pyrolysis oil) that result from altering the feedstock and process parameters. Unfortunately the size (funding and manpower) of the current platform and management inertia are limiting factors.

Regarding the other recommendations for expanded RD&D, in multiple areas, the platform wholeheartedly agrees. The thermochemical platform will first develop a strategy to transition into nonethanol fuels, and then RD&D plans to develop technology and systems to produce these other biofuels. These plans will most likely focus on liquid transport fuels, and will seek

industry partners for guiding the technologies to the market place. The implementation of these plans will be wholly dependent upon available appropriations.

DOE agrees with all the comments provided above and will continue to try to perpetuate an environment that is achieving the current program goals, developing new goals and transitioning to those goals. Further, the platform and the GO project office will continue to work with and manage all projects (including congressionally mandated) so that they are focused on those goals.

Attachment One: Basic Steps in Implementing the Biomass Program Peer Review

1. Biomass program establishes internal planning team to organize and implement program review. Team meets weekly starting August 2008.
2. Steering committee of external, independent experts formed and begins meeting biweekly starting October 2008. Committee provides recommendations and guidance for designing and implementing the review, scope of the review, presentation templates, review forms and overall content and structure of the evaluation.
3. The program's RDD&D and analysis project portfolio is organized by the six platform areas.
4. A Lead is designated for each platform review. platform review Leads are responsible for all aspects of planning and implementation including coordinating the review panel, coordinating with principal investigators, and overall planning for the platform review.
5. Each platform identifies projects for review. Target: review at least 80 percent of program budget.
6. Draft Project-level, platform-level and program-level evaluation forms developed for the 2009 platform review meetings. Similarly, draft presentation template and instructions are developed. EERE Peer review Guidelines and previous forms are evaluated in developing the drafts. Forms are reviewed and modified by the steering committee before being finalized.
7. Each DOE platform Lead identifies candidate members for platform review Panel. Peer review Lead requests steering committee feedback of candidate reviewers. Available biographies are provided to the steering committee for review. Committee provides recommendations on candidates, and in some cases alternate candidates. Results provided to DOE platform leads for consideration in final selection of review panels.
8. Upon confirmation, review Panels are provided background information on the review, evaluation forms, presentation templates and other information needed to perform duties. Project lists and COI forms are provided to each reviewer in advance of the review meeting and COI forms were collected. At least one conference call is held for each review Panel to provide instructions, discuss panel member responsibilities and to address any questions. To the extent possible steering committee members participate in those calls.

9. Biomass program performs outreach to encourage participation in each of its platform review meetings by sending announcements to over 3,000 program stakeholders. The program reviews are also announced on the Biomass program website.
10. Platforms invite PIs to present their project(s) at the platform review. PIs are provided with presentation templates and instructions, reviewer evaluation forms, and background information on the review process. Follow-up calls held with PIs to address questions. If PIs chose not to present they are requested to submit a form stating such.
11. Platform review meetings are held according to guidelines. At least one member of the steering committee participates in each review to ensure consistency and adherence to guidelines.
12. Review panel evaluations are collected during each platform review meeting using an automated tool. These evaluations are posted to a password-protected Web site following each review and panelists are provided approximately 10 working days to update and edit their comments. PIs are then provided approximately 10 working days to go to the same password protected website, review comments on their projects, and respond to review Panel evaluations.
13. Results of review panel evaluations and PI responses are provided to each DOE platform Review Lead for response.
14. A program review Panel is formed comprised of the steering committee and the lead reviewer from each platform review panel.
15. A series of conference calls are held with program review Panel to provide background and instructions for the program review meeting.
16. Draft platform review reports including Biomass Program responses are provided to the program review Panel for review in advance of the July program review meeting. To the extent possible, presentations were provided in advance.
17. Program peer review meeting conducted July 2009.
18. Program review panel submits completed program review evaluation forms approximately one week following the review. Steering committee submits evaluation on the quality and objectivity of overall program review process. These responses are used to draft the Program Peer Review Summary Report.
19. Program Peer Review Summary Report is provided to Biomass Program for review and response.

Attachment Two: Program Review Agenda

Biomass Program Review July 14–15, 2009, Key Bridge Marriott, Arlington, Virginia Tuesday, July 14, 2009 – Day 1 Potomac Ballroom			
7:00 a.m. – 5:00 p.m.		Registration	
7:00 a.m. – 8:00 a.m.		Continental Breakfast	
8:00 a.m. – 8:20 a.m.	20 min.	Opening Remarks and Overview of Biomass Program Peer Review Process	Neil Rossmeyssl, Technology Manager, Biomass Program
8:20 a.m. – 8:25 a.m.	5 min.	Welcome and Introductions	Jacques Beaudry-Losique, Deputy Assistant Secretary, DOE, EERE
8:25 a.m. – 8:35 a.m.	10 min.	Welcome Address	Cathy Zoi Assistant Secretary DOE, EERE
8:35 a.m. – 8:50 a.m.	15 min.	Break	
PROGRAM MANAGEMENT OVERVIEW			
8:50 a.m. – 9:20 a.m.	30 min.	Biomass Program Overview <ul style="list-style-type: none"> DOE Biomass Program – Mission, Key Drivers, and Strategic Organization Communications & Outreach 	John Ferrell, Feedstock Technology Manager Presenting for Valri Lightner, Acting Program Manager, Biomass Program
9:20 a.m. – 10:20 a.m.	60 min.	Program Management and Integration <ul style="list-style-type: none"> Biomass Program Systems Integration Activities 	Debbie Sandor, Systems Integrator, NREL; Kevin Craig, DOE Golden

		<ul style="list-style-type: none"> DOE Golden Field Office, Project Management Center 	Office
10:20 a.m. – 10:40 a.m.	20 min.	Q&A Period	Program Review Panel
10:40 a.m. – 11:00 a.m.	20 min.	Break	
11:00 a.m. – 11:20 a.m.	20 min.	Intra- and Interagency Collaboration Activities <ul style="list-style-type: none"> Discussion of Intra- and Interagency Activities including algal based biofuels 	Valerie Reed, Conversion Technology Manager, Biomass Program
11:20 a.m. – 11:40 a.m.	20 min.	Biomass R&D Board Federal Advisory Committee and Working Group Reports <ul style="list-style-type: none"> Discussion of the recent efforts by the R&D Board, including an overview subcommittee reports 	Sharlene Weatherwax, DOE Office of Science, Bioenergy Research Centers
11:40 a.m. – 12:00 p.m.	20 min	Q&A Period	Program review Panel
12:00 p.m. – 1:30 p.m.	90 min.	Lunch (General Attendees on their own)	
PROGRAM PLANNING AND ANALYSIS			
1:30 p.m. – 1:50 p.m.	20 min.	Sustainability, A Guiding Principle in Program Planning <ul style="list-style-type: none"> A discussion of sustainability issues and their role in the program 	Alison Goss Eng, Sustainability Lead, Biomass Program
1:50 p.m. – 2:20 p.m.	30 min.	Strategic and Project Analysis Activities <ul style="list-style-type: none"> review the use of strategic and project analyses in guiding program and platform planning Overview of the Analysis platform 	Zia Haq Analysis Lead, Biomass Program
2:20 p.m. – 2:50 p.m.	30	Analysis Platform Reviewer Report	Susan Schoenung, Analysis Review

	min.		Panel Chair
2:50 p.m. – 3:10 p.m.	20 min.	Q&A Period	Program Review Panel
3:10 p.m. – 3:30 p.m.	20 min	Break	
REVIEW OF BIOMASS PROGRAM R&D PLATFORMS			
3:30 p.m. – 4:00 p.m.	30 min.	Feedstock Infrastructure <ul style="list-style-type: none"> • Overview of Feedstock Infrastructure platform 	John Ferrell, Feedstocks Technology Manger, Biomass Program
4:00 p.m. – 4:30 p.m.	30 min.	Feedstocks Platform Reviewer Report	Tom Miles, Feedstocks Review Panel Chair
4:30 p.m. – 4:50 p.m.	20 min.	Q&A Period	Program Review Panel
4:50 p.m. – 4:55 p.m.	5 min	Day One Wrap-up Remarks; Adjourn	Neil Rossmeissl, Technology Manager, Biomass Program
Wednesday, July 15, 2009 – Day 2 Potomac Ballroom			
7:00 a.m. – 3:00 p.m.		Registration	
7:30 a.m. – 8:30 a.m.		Continental Breakfast	
8:30 a.m. – 8:45 a.m.	15 min	Opening Remarks	Neil Rossmeissl, Technology Manager, Biomass Program
REVIEW OF BIOMASS PROGRAM R&D PLATFORMS (Continued)			

8:45 a.m. – 9:30 a.m.	45 min.	Conversion Technology R&D <ul style="list-style-type: none"> Biochemical Conversion R&D Overview Thermochemical Conversion R&D Overview 	Valerie Reed, Conversion Technology Manager, Biomass Program
9:30 a.m. – 10:00 a.m.	30 min.	Biochemical Platform Reviewer Report	Mike Knotek, Biochemical Review Panel Chair
10:00 a.m. – 10:30 a.m.	30 min.	Thermochemical Platform Reviewer Report	Mark Jones Thermochemical Review Panel Chair
10:30 a.m. – 10:45 a.m.	15 min	Break	
10:45 a.m. – 11:30 a.m.	45 min.	Q&A Period	Program Review Panel
11:30 a.m. – 1:00 p.m.	90 min	Lunch (General Attendees on their own)	
REVIEW OF BIOMASS PROGRAM DEPLOYMENT PLATFORMS			
1:00 p.m. – 1:30 p.m.	30 min.	Infrastructure <ul style="list-style-type: none"> Infrastructure Platform Overview 	Shabnam Fardanesh, Infrastructure Platform Lead, Biomass Program
1:30 p.m. – 2:00 p.m.	30 min.	Infrastructure Platform Reviewer Report	Mark Maher, Infrastructure Review Panel Chair
2:00 p.m. – 2:20 p.m.	20 min.	Q&A Period	Program Review Panel
2:20 p.m. – 2:40 p.m.	20 min	Break	
2:40 p.m. – 3:10 p.m.	30 min.	Integrated Biorefineries (IBR)	Larry Russo IBR Platform Review Lead,

		<ul style="list-style-type: none"> Integrated Biorefineries Platform Overview 	Biomass Program
3:10 p.m. – 3:40 p.m.	30 min.	Integrated Biorefineries Platform Reviewer Report	Mike Tumbleson, IBR Review Panel Chair
3:40 p.m. – 4:10 p.m.	30 min.	Q&A Period	Program Review Panel
PROGRAM REVIEW PANEL OBSERVATIONS AND COMMENT			
4:10 p.m. – 5:10 p.m.	60 min.	PROGRAM REVIEW PANEL <ul style="list-style-type: none"> Program review panel members will provide initial observations and comments on program activities 	Program Review Panel
5:10 p.m. – 5:20 p.m.	10 min.	Closing Remarks	
5:20 p.m.		Adjourn	

Attachment Three: Program Review Attendees

First Name	Last Name	Organization
Henry	Balikov	GEC
Jacques	Beaudry-Losique	U.S. DOE
Bianca	Beeks	ITECS Innovative
Linda	Beltz	Weyerhaeuser Company
Christopher	Bordeaux	Bordeaux International Energy Consulting, LLC.
Stephen	Bransfield	Independent Project Analysis
Adam	Bratis	National Renewable Energy Laboratory
Marilyn	Buford	U.S. Forest Service R&D
Daniel	Burciaga	TRI – ThermoChem Recovery International, Inc.
Clinton	Burklin	Eastern Research Group
Tom	Butcher	Brookhaven National Laboratory
James	Cash	U.S. DOE
Chris	Cassidy	USDA
Sumita	Chaudhuri	Syngenta
Jean Marie	Chauvet	IAR Industries & Agroresources (visiting scholar USDA OEPNU)
Alice	Chen	U.S. EPA
Shulin	Chen	Washington State University
Larry	Christner	LGC Consultant LLC
Chris	Clark	Energetics Incorporated
Kevin	Craig	U.S. DOE
Anthony	Crooks	USDA
Nathan	Danielson	DuPont
Mark	Decot	U.S. DOE
Chris	Detjen	NextEnergy

Jay	Diedzic	William & Mary Research Institute
Chris	Doherty	TRI – ThermoChem Recovery International, Inc.
Paget	Donnelly	Energetics Incorporated
Anjelica	Dortch	McKenna Long & Aldridge LLP
Glenn	Doyle	U.S DOE
Shabnam	Fardanesh	U.S. DOE
John	Ferrell	U.S. DOE
Lauren	Fillmore	Water Environment Research Foundation
Daniel	Fishman	BCS, Incorporated
Thomas	Foust	National Renewable Energy Laboratory
Hiroyuki	Fukui	Toyota Motor Corporation
Cindy	Gerk	National Renewable Energy Laboratory
Jovan	Gaiamuccio	Independent Project Analysis
John	Gordon	Los Alamos National Laboratory
Alison	Goss Eng	U.S. DOE
Paul	Grabowski	U.S. DOE
Robin	Graham	Oak Ridge National Lab
Daniel	Green	BCS, Incorporated
Ken	Green	BCS, Incorporated
Prasad	Gupte	National Institute of Standards and Technology
Neal	Gutterson	Mendel Biotechnology
Jose	Haaker	Independent Project Analysis
Milford	Hanna	University of Nebraska
Zia	Haq	U.S. DOE
Jalal	Hawari	National Research Council Canada
T.J.	Heibel	BCS, Incorporated

J Richard	Hess	Idaho National Laboratory
Eric	Hixson	Alion Science &Technology
Douglas	Hooker	U.S. DOE
John	Houghton	U.S. DOE
David	Huber	BCS, Incorporated
David	Hyndman	Performance Plants Inc.
Maro	Imirzian	Catchlight Energy LLC
Joanne	Ivancic	Advanced Biofuels USA
Gilbert	Jackson	US AID /EGAT
Terry	Jaffoni	Clean Transportation Fuels
John	Jaudel	ACORE
Kelly	Jeziarski	NextEnergy
Mark	Jones	General Electric
John	Kasbaum	Albemarle Corporation
Jay	Keller	Sandia National Laboratories
George	Kervitsky	BCS, Incorporated
Courtney	Kirk	BCS, Incorporated
Melissa	Klembara	U.S. DOE
Michael	Knotek	Knotek Scientific Consulting
Sandra	Knox	Wilson Sonsini Goodrich & Rosati
Christopher	Lawrence	BCS, Incorporated
David	Lax	API
Audrey	Lee	U.S. DOE
Alicia	Lindauer-Thompson	U.S. DOE
Mark	Maher	General Motors
Jonathan	Male	U.S. DOE

Michael	Manella	Archer Daniels Midland Company
Philip	Marrone	SAIC
Liz	Marshall	World Resource Institute
Maxwell	Marshall	ACORE
Taylor	Marshall	ACORE
Andras	Marton	Independent Project Analysis
Wendy	Matthews	Lockheed Martin
Taite	McDonald	Wilson Sonsini Goodrich & Rosati
Loula	Merkel	Coskata
Babu	Metgud	Innovation Technology & Enterprise Development Center
Tom	Miles	T R Miles Technical Consultants, Inc.
Shelia	Moynihan	U.S. DOE
Laura	Neal	U.S. DOE
M. Cristina	Negri	Argonne National Laboratory
Theodore	Nelson	Noblis
Apostolos	Nikolopoulos	Independent Project Analysis
Seema	Patel	BCS, Incorporated
Pinakin	Patel	FuelCell Energy
Donna	Perla	U.S. EPA
Fred	Petok	USDA
Leslie	Pezzullo	Biomass program
Frans	Plantenga	Albemarle Corporation
Todd	Polanowicz	Mascoma Corporation
Roger	Prince	ExxonMobil Biomedical Sciences, Inc
Vicky	Putsche	National Renewable Energy Laboratory
Valerie	Reed	U.S. DOE

Michelle	Rodrigues	SRI International
Neil	Rossmeyssl	U.S. DOE
Debbie	Sandor	National Renewable Energy Laboratory
Christophe	Schilling	Genomatica, Inc
Susan	Schoenung	Longitude 122 West, Inc.
Amy	Schwab	National Renewable Energy Laboratory
Hosein	Shapouri	USDA
Sayaka	Shioiri	GWU
David	Sjoding	WSU Extension Energy program
Wade	Smith	Noblis
Seth	Snyder	Argonne National Laboratory
Glenn	Sonntag	U.S. DOE
Paul	Spindler	Catchlight Energy LLC
Don	Stevens	Pacific Northwest National Laboratory
Bryce	Stokes	Navarro Research and Engineering, DOE Golden Field Office
Brett	Storey	Placer County
Susan	Susanke	SESI
Claudio	Ternieden	Water Environment Research Foundation
B. A.	Thorp	B. A. Thorp, INC
Valentino	Tiangco	Sacramento Municipal Utility District
Mike	Tumbleson	University of Illinois
Barbara	Twigg	U.S. DOE
Sharlene	Weatherwax	U.S. DOE
Candace	Wheeler	General Motors
Erin	Wilkerson	U.S. DOE
Robert	Wimmer	Toyota Motor Corporation

Carl	Wolf	BCS, Incorporated
Christopher	Wright	Idaho National Laboratory
Yunhua	Zhu	Pacific Northwest National Laboratory
Cathy	Zoi	U.S. Department of Energy, Energy Efficiency and Renewable Energy

Attachment Four: Compilation of Steering Committee Responses to the 2009 Program Review Form

U.S. DEPARTMENT OF ENERGY
BIOMASS PROGRAM PEER REVIEW

Questions	Page (A4-x)
1. Strategic Approach	2
2. Responsiveness of Program Organization to Market Drivers	10
3. Portfolio Balance and Organization	15
4. Program Strengths	
a. Program Planning and Management Strategy	22
b. Program R&D Strategy and Implementation	24
c. Program Deployment Strategy and Implementation	26
5. Program Accomplishments	29
6. Areas for Improvement	
a. Program Planning and Management Strategy	31
b. Program R&D Strategy and Implementation	33
c. Program Deployment Strategy and Implementation	36
7. Actionable Recommendations	
a. Program Planning and Management Strategy	40
b. Program R&D Strategy and Implementation	43
c. Program Deployment Strategy and Implementation	45
8. Other Adjustments or Recommendations	48
9. Adjustments to R&D/Deployment Priorities	50
10. Additional Comments	53
11. Comments on Review Process	56

1. **How would you assess the overall quality of the Program’s strategic approach as outlined in program presentations and the Multi-year Program Plan (MYPP): Is the program’s strategic approach clear and well defined? Are Barriers, Targets, Goals, and Milestones clear, appropriate, logical, and sufficient to meet Program objectives? Are Program priorities well-defined? What improvements can be made to the MYPP effort? What changes or adjustments would you recommend OBP implement to improve the Program’s strategic approach?**

Exhibit 15 – Program Planning and Strategic Approach

5-Excellent. The quality of the plan is exceptional and clearly defines strategic approach to achieve program objectives.
4-Good. The quality of the plan is above average and defines the program’s strategic approach to achieve program objectives.
3-Satisfactory. The quality of the plan is average and sufficiently defines the strategic approach to achieve program objectives.
2-Fair. The quality of the plan is below average; the strategic approach and program objectives lack sufficient definition.
1-Poor. The quality of the plan is inadequate and defines few program objectives.

Average Score: 3.5
Range: 3–5

Reviewer 1

Program personnel do an excellent job in working within the limits of continuing changes effected as a function of outside influences. Integrating congressionally directed projects, especially those not tuned directly to the program plan, may take time and effort from staff tracking and guiding reviewed projects. For a program with aims and objectives of commercializing processes which have little basic information available, OBP personnel have conducted themselves professionally and worked diligently to encompass the various earmarked projects. For each congressionally mandated project, prior to initiation there should be a review by qualified industrial and academic personnel; this could result in adjustments to designs which to provide collection of data useful for future projects. Ongoing reviews will enable OBP personnel to aid in providing appropriate suggestions for cooperative involvement with other investigators.

Reviewer 2

Although the MYPP did a good job identifying specific goals, objectives, barriers, targets etc, strategies were lacking for addressing each goal. For example, what makes them think the goal of \$1.76/gal is attainable and what will be the strategic approach for getting there?

We were asked to assess whether MYPP goals, targets etc were appropriate, logical etc but got a revision to those goals during the review. Understandably, the MYPP is a living doc however the recent revision did make it more challenging for the review team to provide a thoughtful assessment on the spot. However, here are some initial reactions:

- The 130myn tons/yr 2012 biomass goal reasonable in light of the Billion Ton study but a lot depends on yet to be determined carbon value and additional information on nutrient replacement; also the development of viable technologies for harvesting, transport and storage.
- \$51/DT is very optimistic when considering drying costs, cost to harvest deliver biomass, there is a lack of development on sufficient scale to accurately assess
- 3 commercial scale biomass plants in 3 yrs is a huge leap from what I saw during IBR Platform review.
- \$1.76/gal goal is big change from earlier lower targets given in prior MYPPs which has the effect of lowering ones confidence in the attainability of the goal.

Overall, with the influx of significant additional funding as well as new senior level management, the current state at OBP is one of managed chaos lacking an overarching strategic approach. OBP excels at data collection, project management and systems integration but again, it is not clear why we are doing what we are doing and more importantly, how we will know when success is achieved.

Programmatic approach appears to be reactive to legislation and to the availability of dollars. This has resulted in a scattered portfolio of activities and unclear priorities. Maybe this is unavoidable given the pace of recent policy initiatives. But a process is needed for narrowing the focus to a coordinated and complementary set of activities across feedstocks, conversion, demonstration and deployment to expedite attainment of program goals and objectives.

Reviewer 3

I find myself quite concerned about this question. The program is well run, well stewarded at the individual project level, and with a broad range of approaches aimed fairly well at the goals outlined by the program. Much of the research is absolutely First Class.

But the Program seems disconnected from some very real deadlines on the very near horizon. There are Congressionally mandated levels of cellulosic ethanol in the VERY near future; the earliest seems to kick-in in 2012, but perhaps not absolutely until 2015, but these are for SUBSTANTIAL amounts of cellulosic ethanol. The program ought to be substantially further along if it is to meet these goals.

A simple example of the problem is the figure presented by Debbie Sandor on the second page of her presentation. I recognize that this is not meant to be a quantitative figure, but it is illustrative. It correctly shows how project management should align and direct research towards the assigned goal, but only addresses the very earliest stages of this process. Achieving a shared vision should be done by the first twenty percent or so of the allotted time – after that there needs to be a winnowing down of the different projects so that those most directed at the target are accelerated. In cartoon form there should now be a much longer, narrower arrow with a few well aligned internal arrows, moving rapidly towards the goal.

[I recognize that Ms Sandor is not responsible for making these decisions – overall management should be doing it].

If this program was aiming at commercial cellulosic ethanol as part of meeting the RFS of 2022, I would be confident we were well on the way, and rank it EXCELLENT. But for commercial production in 2012 we are woefully ill prepared. I recognize that the current economic climate is a further handicap, but I am concerned that support for this program will evaporate if failing to meet Congressional mandates comes as a surprise...

So my assessment comes with a huge caveat – I would answer the question even more optimistically if there were either (a) more time until the proposed deployment, or (b) a real sense of urgency in the management presentations. It clearly does define a strategic approach to achieve program objectives – but not by 2012.

Reviewer 4

The program needs to be able to clearly, succinctly articulate its goals and objectives even if these are vague and handed to them by the administration and congress. A 5 floor elevator story is needed.

In the pathway focus across platforms one should be able to see a relatively large number of technology/idea/approaches to start narrowing down to a much smaller number of technologies as we approach commercialization. A systematic focusing from the topically broad areas to topically more narrow technologies needs to be driven by concrete cross-cutting systems analysis. This should be done in every platform and across platforms. The SI is a great concept but it appears to fall short of truly providing cross-cutting critical analysis to drive the program down select process to yield successful technologies out the end of this technology funnel. In the language of TRLs (Technology Readiness Level) – there should be lots of projects with diversity at TRL 1,2 scaling down to a very small number as technologies mature (TRL 5,6). This focusing of technologies must be guided by technical success / down selects and defensible analysis across the technologies, and maturity. This down selection process needs to be guided by defensible analysis and defensible technology assessment NOT on the frequent desire to pick the favorite “winner”.

I would like to see a larger scale systems analysis that truly ties the platforms together to provide a defensible methodology to down select technologies and projects to better focus the resources to success.

A project should never have right to life but be held accountable to the milestones and guidance provided by analysis that integrates the basic science to the large scale commercial projects.

Reviewer 5

The overall quality of the program’s strategic approach measured in milestones, achievements and accomplishments is notable; however, progress toward meeting the overarching tangible goal of significantly reducing our dependence of foreign petroleum has yet to be demonstrated.

The quality, quantity and breath of the research efforts are very well organized. Significant data collection, cataloging feedstock resources are major accomplishments requiring a sustained effort.

Logistical, storage, nutrient management and standardization of feedstock for use in integrated biorefineries remain issues deserving of continued funding.

Many review panel members including myself, are concerned that the program objectives may fall short of achieving the strategic goals set for Biomass Development Research and Initiatives while a still satisfying program strategies for R&D in within a particular program.

As an example, the strategy and R&D goals for the integrated biorefinery platform can be met by building bio-chemical and thermo-chemical biorefineries independent of whether not these plants produce at levels capable of meeting the half billion gallon per year goal of producing cellulosic ethanol by 2012. Results matter for the overall program objectives, clearly setting achievable and realistic goals for individual program segments is important in achieving the overarching program goals. It remains to be seen whether or not the goals of achieving half a billion gallons of cellulosic ethanol will be reached in 2012 or if it is even possible to produce 100 million gallons of cellulosic ethanol by 2010.

The program has excelled at organizing and addressing a wide range of processes and barriers that exist in developing feedstock, data resources and modeling techniques to implement a robust biomass program capable of producing fuels and products to replace petroleum. Program Strategies and R&D efforts have engaged a broad spectrum of stakeholders, academic and commercialization interests.

The strategic approach is clearly defined generally, however, the focus and objective goals of the overall program could benefit by intensifying efforts to reach tangible objectives in terms of quantifiable outcomes by definitive dates. Multi year program plan adjustments taking into account the amount of progress or lack of progress would benefit with from initiating quicker response mechanisms to drive program goals.

The system integration platform lags program implementation as opposed to unifying program goals and facilitating program synergies.

Pathways in the various platforms which encounter progressive technological and scientific barriers and the correlation between these events and redirection of funds should be looked at, paring costs associated with unproductive pathways.

Reviewer 6

The program has a well thought set of goals and milestones, which are adequately linked to defined barriers and targets. The issue is how strongly those drive the actual projects and programs on a working basis. Much of the portfolio is quite eclectic and while monitored as to progress toward goals, it is not as actively managed as might better befit a technology development program.

Reviewer 7

The major issue with the OBP is confusion around goals. The program is technically impressive, but the lack of a clear and concise focus is at a minimum troubling and at most unconscionable. The review process rolls up a collection of projects as a means to define platforms and, subsequently, rolls

up a collection of platforms to define the program. Everyone participating in a project should know how their project reflects upon the program's goals. Some do. Some are doing quality science related centered on key issues of great importance to the production of biofuels. Sadly, many have only tenuous connection to the goals. At the program review, I came to understand that this is because the program does not have a strategic approach and does not actively manage the portfolio against the aggressive time and economic targets. In fact, leaders of the program virtually all provide different responses when asked specifically about the program goal. I am left having to say that the program is average due to the lack of an underlying singular strategic focus. The science and engineering that is being done is truly impressive, but much may fall off the program's critical path.

Reviewer 8

Strategy: Past strategy appeared to be to support feedstocks with certain tonnage or acreage thresholds and technologies with clearly identified scales. The current focus seems to be the use of the IBRs as the lead means of measuring progress. A technology evaluation and forecasting process does not seem to be in place.

Strategic planning seems to be work in progress. Planning seems to be a combination of organizing existing programs toward common goals. A strategy seems to be evolving. No results or clear progress was reported against stage gate criteria or MYPP objectives. It was not clear what, besides meetings, was driving the selection of projects, besides the overall production goals.

Targets and Goals: Without specific measurable goals (acres, tons, gallons; capacity t/d, gpy; efficiency, thermal; financial, \$/gal net with coproducts) it is difficult to measure progress. I would have expected to see the overall goals broken down into short term goals with projects directed toward specific targeted accomplishments. This may occur at the project level but it is not clear how they are used to guide the development of each platform. Clearly there are specific targets and goals as well as an extensive list of barriers and goals listed for each of the programs and projects. It is not clear however if projects are retired when targets are met or how meeting the targets advances toward cost and production goals. It is not explained how cost reductions have occurred. What strategies have worked and why?

How are goals and targets measured in solicitations? Do the projects have metrics for each of the goals they list or address? What is the method at the program level to account for accomplishment (and retirement) of goals that may lead to reduction in costs, increase in capacity that should lead to commercial adoption?

When in the conversion platform for example a 63% cost reduction is claimed in a "modeled" cost what factors are considered at the program level to claim the reduction? How are those achievements considered in program strategy?

The program has developed a number of new analysis and planning tools for making use of the measures toward stated goals. It appears that these have been applied in preliminary fashion to project management but not fully integrated into the program strategic planning.

Reviewer 9

Most of these items were only addressed by Conversion presentation, which occurred on the second day. Valerie Reed should have been one of the first presenters, since she put the whole MYPP topic in perspective. Because the MYPP is constantly changing, it is hard to answer this question, in any case.

A very simple milestone chart would have been useful.

A more thorough discussion of the EISA and EPAct —mandates” would also have been helpful. Reviewers were uncertain about the responsibilities of the DOE and what happens if targets are not met.

The priorities seem to be set by the funding. It should be the other way around.

If the goals are real, the program needs to move faster.

More collaboration is needed.

Need annual reviews, not biennial, at least for some portions of the program. IBR especially, because this is where the targets are likely to be missed.

Reviewer 10

The MYPP is a well-crafted document. The Targets and Major Goals are clear. A wide range of barriers are described.

The strategic approach and strategic assessment processes are not so clearly articulated. This may be a reflection of the changes in the DOE OBP management currently. The need for strategic reassessment of the current goals and metrics seems clear given the struggles of the IBR projects, and the highly diverse conversion projects. However, neither the conduct of such a review nor its outcomes were cast clearly in the review process.

While barriers are identified in the MYPP, and were included in the platform review presentations, neither the most critical barriers today nor status and progress of research specifically towards eliminating those most critical barriers were a significant subject of the program review.

One area for consideration is the development of feedstock supply chains targeted towards biopower projects. With the likely growth in biorefineries not to occur until the middle of the next decade, there is a very strategic opportunity for DOE to foster partnership projects with power companies toward the development of full supply chains for perennial, biomass crops. These supply chains are likely to be very similar to those needed for biofuels production, so that biofuel supply chains could already be established and shown to be scalable by the time biorefinery build-out begins in a major way well into the next decade.

Reviewer 11

Primary program focus is on R&D. This perhaps is not surprising given the historical nature of research funded thru DOE. However, many of the roadblocks (outside of Conversion) to achieving EISA volumes are less based in fundamental science and more in practical research, engineering solutions, and removal of roadblocks to the creation of markets. OBP needs to consider roadblocks to implementation that are more centric to deployment, infrastructure and end-use. These issues will remain the roadblock to attaining EISA volumes that they are today unless there is a broadened perspective in the Biomass Program. Strength in the fundamental science of fuel creation need not be compromised by enhanced focus on infrastructure and end use.

One area of fundamental science that is not sufficiently addressed by the Biomass Program is indirect land use. The Biomass program cannot afford to leave the indirect land (IDL) use issue up to EPA. IDL is the most critical issue in front of biomass derived fuels taking on their potential role in energy security, independence and CO2 reduction. The science behind IDL does support the roadblock it has become. DOE's research focus should be directed on this roadblock. While Congressional efforts to delay the inclusion of IDL from short term consideration in ranking the CO2 benefits of various biofuels and biofuel pathways may be successful, this issue will hang over the head of biofuel growth until the science is much more clearly understood. The fact that the science behind IDL is too immature for good policy will not stand in the way of it becoming a critical roadblock to EISA volume attainment. The direction that the State of California establishes thru CARB on IDL independent of the Federal Government's approach will be very substantial and is not constrained by the immaturity of the science.

Reviewer 12

I think the program needs a clearer statement of overall program goals. There are two areas in particular that should be clarified. The first is the relationship between the program's long-term goal and vision of a "sustainable domestic biomass industry" and the shorter term performance goals associated with cost-competitiveness and volume increases. This clarification should include the role that bioproducts and biopower play in the Program's vision for that biomass industry and in its strategy for achieving it. The long-term goals set out in the MYPP are broadly stated on page i as "... (EERE's) Biomass Program is focused on developing biofuel, bioproduct and biopower technologies in partnership with other government agencies, industry, and academia." This broad objective, however, is teetering precariously, like an upside-down pyramid, on two much narrower performance goals, both of which have to do with advancing the volume and cost-competitiveness of cellulosic ethanol. The program appears to be reacting to policy mandates and establishing goals based on those, rather than developing a broader subset of performance goals, and using policy mandates to steer resources into them or emphasize certain subsets.

The second, related issue to be clarified is the role of sustainability in the Program's mission. The program needs to reconcile its "strategic" vision, which almost always includes sustainability in its description, with its performance goals (which never do), and with its strategic approach both at the program and platform levels. In the flow chart on page ii of the MYPP, sustainability appears in the Vision, disappears in the Mission, re-appears in the Strategic Goal, and then disappears altogether in the Performance Goals. Sustainability is emphasized in several places in the MYPP, particularly in

the description of the Feedstock platform, and yet there is no accompanying strategy articulated for how to achieve a –sustainable” biomass industry or explanation of what institutions and tools must exist to be able to differentiate such an industry from a biomass industry (or producer) that would not be considered –sustainable”. Throughout the MYPP, and the program presentations, we see flow charts indicating the obstacles or points of resistance to advancing a biofuel industry at different points along the supply chain; I think a similar chart indicating the obstacles or points of resistance to advancing sustainability in a biofuels industry, together with an explicit strategy for dealing with them, would be invaluable.

It is critical at this point in the development of biomass-based industries to acknowledge that sustainability in production is not a given. The success of this industry hinges on creating the conditions that allow us to differentiate between what is sustainable and what is not (and how that is defined). Only then will there be an effective rebuttal to the bad press about the environmental impacts of biofuels; many of those impacts are real, and the only way to address them is to develop a strategy early on that guides the industry, tempers the expectations placed on it (if necessary), and gives sustainable practitioners something to point to that differentiates their production from bad practice. The efforts of OBP’s sustainability program to participate in processes currently in place are Herculean, especially given the limited resources available to them, but OBP should be a leader in this area. The existing processes are scattered and not coordinated across the entire supply chain; there is a niche to step into if OBP dedicates the necessary resources and staff.

Finally, the Program’s review process has been fascinating and very transparent, but it has not been clear what OBP’s internal performance assessment processes are and how they result in changes in program direction or emphasis. A more formal method for reporting and accounting against a broadened set of performance goals that is consistent with OBP’s broader mission would be very helpful for determining whether in fact the Program has developed an effective strategy for achieving its goals.

2. Is the OBP program organization responsive to external market drivers and stakeholder needs? Does the Program effectively consider and monitor these external factors in setting realistic targets and goals?

Exhibit 16 – Program Organization and Responsiveness

5-Excellent. The program organization is exceptional, realistic and fully responsive to markets and stakeholder needs.
4-Good. The program organization is above average, realistic and responsive to markets and stakeholder needs.
3-Satisfactory. The program organization is average, sometimes realistic and considers markets and stakeholder needs
2-Fair. The program organization is below average, and does not consider markets and stakeholder needs.
1-Poor. The program organization is poor, and does not consider markets and stakeholder needs.

Average Score: 3.6
Range: 2–4

Reviewer 1

OBP personnel have selected knowledgeable reviewers who aid in updating specific and overall goals. As a result the program has been, and will continue to be, responsive to stakeholder ideas and needs.

Whims and WAGs of outside individuals who have little background and awareness of markets lead to sharp directional changes which hog tie OBP personnel.

Unrealistic response times requested for congressionally mandated projects places the program as a whole under unfair scrutiny.

DOE has an excellent record of reporting results and publications from peer reviewed funded proposals; this will be more difficult with the congressionally mandated programs resulting in findings not shared with the public as a whole.

Reviewer 2

Overall, the program does a very good job staying on top of market developments and other externalities. The enhancement of the analysis and infrastructure platforms, will add to this capability.

Since biofuels will still have to fit into the existing infrastructure (at least in the near term), I would like to see more direct involvement with the petroleum industry. Members of the OBP peer review steering committee and the Biomass R&D TAC have been from oil companies in recent years and this has been a big plus.

The MYPP demonstrates a keen understanding of biofuels market drivers and current policy. However, an area of weakness is in infrastructure and it is here where the expertise of the petroleum industry is needed.

OBP needs to ramp up collaboration with other agencies like EPA and DOT, who are doing critical work in the area of materials compatibility, products testing etc.

It is not clear to me how the work of OBP and the National Labs works together with the work going on in the Bioenergy Centers. These centers come under the Office of Science and are well-funded (\$75-100myn). There is a great opportunity to leverage expertise thru collaboration.

Reviewer 3

I see Congress as the primary stakeholder, and I think they expect DoE to deliver to their legislation. I don't think the Program is responding effectively, and so I give the 3. If there were only the 2022 mandates in play, I would rate the Program EXCELLENT.

Given the urgency to deliver cellulosic ethanol in the very near future, it seems inappropriate to spend so much on new concepts (25% of total biochemical funding). If this is perceived as responding to external market drivers, I think it should be re-evaluated.

With over a billion dollars in play in the construction of the integrated biorefineries, is everything that can be done to help this being done?

The substantial influx of funds from ARRA will certainly exercise the management to ensure it is spent wisely and effectively.

Reviewer 4

Within the constraints of the office's reality (Administration, Congress, and Industrial Stakeholders) they do a good job at understanding and articulating the problems and challenges to meeting the targets and goals. I have concerns about the setting of targets and goals. As in some other DOE programs these (arguably) seem to be set in the absence of technical and scientific guidance rather set by political will void of real defensible analysis. Largely this is not the fault of the program but the political environment. With that said, I do think it is the job of the program to provide defensible analysis (integrated across the platforms) that would defend or not the goals being proposed. This reviewer has not seen such an independent defensible analysis.

Reviewer 5

The program has been very responsive to stakeholder needs and external market drivers, particularly to research needs, data mapping and commercialization attempts to demonstrate pilot or larger scale projects. Organizational methods and administration are well coordinated. The program is inclusive and comprehensive to the point that multiple pathways of conversion and multiple feedstocks' are included in the portfolio. Progress made under the program is attributable to ability to fund pragmatic

research through grants. Guaranteed loans through DOE and USDA coupled with grants to develop integrated biorefineries are tools to build new industries necessary to achieve program objectives.

The program coordinates with other Departments and Agencies; EPA, DOT, USDA, and Interior at multiple levels. The complexity of the program along with the programs comprehensiveness, inclusiveness and multiple stakeholders constrains the ability of the programs organization to remain agile and focused. Considering the broader goals of the program and the timeline for achieving the EISA targets for transportation fuels, a more focused accountable approach is desirable.

Reviewer 6

The program has a well developed sense of the technical requirements to meet the various goals that have been established largely by statute. But there seems to be a sense that once an activity is in the commercial sector that the program has little or no responsibility for the ensuing results. In fact there are a wide variety of creative ways that the program can help reduce the risk of commercial ventures and the program should continually strive to find ways to assure success of commercialization attempts – after all taxpayer resources dominate these endeavors and congress and the administration are strongly committed to establishing this strategic capability for the nation.

Reviewer 7

The OBP has proven to be responsive to external drivers and needs. Examples are the re-scoping of the Thermochem platform goals away from only ethanol to a wider slate of biofuels. At the program level, the opaque nature of the goals presents a problem. Some of the goal statements discuss commercial implementation by 2012. If these truly reflect the program goals, they are not realistic. Rather, they ignore the capital and project timing likely required for the implementation of a new technology.

Reviewer 8

The program appears to have made a concerted effort to identify and respond to external market drivers and stakeholder needs. Unfortunately energy and financial markets have not recently been conducive to active stakeholder participation.

In the past DOE Biomass Program support has been most effective when working in collaboration with industry and academia to support industry needs. More attention should be paid to showing how Program targets and goals relate to stakeholder needs. In this way I think many barriers and goals may disappear and the program will appear more relevant to stakeholder needs. Resources can be shifted accordingly. Vehicles for doing this are usually projects involving production, such as the INL support for harvesting techniques, where useful and valuable data is exchanged, rather than workshops and seminars. These circumstances are also more conducive to information sharing. Another vehicle is DOE guided stakeholder use of new tools like the KDF or process models. Industry collaboration provides opportunities to validate these tools and provide useful information to industry about feedstocks and processes.

One area where stakeholder needs can be addressed and infrastructure can be built for future production is in the integration of liquid fuel production with heat and power generation. With coming renewable portfolio standards there will be short term markets for the production, supply and conversion of biomass feedstocks for heat and power generation. These systems can be used to develop the equipment, infrastructure and new businesses required for supplying large quantities of biomass feedstock in the future. Processing and pretreatment system can be tested on the industrial scale since feedstock for biochemical or thermal conversion is often similar to the form required for co-firing in a coal boiler (viz. Chariton Valley Biomass Project 1994-2006) or for commercial biomass pellet production.

Reviewer 9

The program organization is good from a research perspective. How the organization responds to external drivers could have been clearer. Are the Intra- and Inter-agency activities as effective as they might be? There were lots of words. It might have been nice to have someone from one of those groups on the panel or at least at the review.

The program is certainly aware of external drivers, both legislative and societal. Public perception is one of the most compelling drivers.

The program needs to respond to those factors. Legislative drivers clearly have priority, but Outreach to the public is sorely needed. Maybe this should be a clear organizational element, not buried in the already under funded infrastructure platform.

Especially, sustainability, food vs. fuel, customer concerns about their engines and gas mileage, and climate change issues all need more attention.

Reviewer 10

One clear advantage of the IBR program is the close relationship it affords the OBP staff with companies at the cutting edge of deployment of critical refining technology. In this area in particular the DOE is well connected and responsive to refinery stakeholder needs.

The feedstock price targets of the recent MYPP are much more realistic than those of the earlier DOE vision, reflecting the OBP's efforts to better monitor the external environment, and to set realistic targets. I would encourage the OBP, nonetheless, to articulate more clearly the meaning of the targets. The price projections in terms of nth plant that could be developed with a particular state of technology represents a very complex concept, and the projections are often misinterpreted to mean the actual cost as of the target date. And the parallel for feedstock pricing is a bit unclear in the context of the "nth plant". What is the parallel?

Reviewer 11

The lack of sufficient emphasis on infrastructure and end-use gives the appearance of poor responsiveness to external market drivers. This already is an issue in attaining EISA volume targets and the issue will only grow.

The OBP's primary focus away from deployment and end use seems to have grounding in the idea that 3rd generation biofuels with simple hydrocarbon structures will be fungible with petroleum derived traditional fuels like gasoline and diesel. While there is much promise in this regard, OBP should not be drawn into the idea that the infrastructure roadblocks to high volume usage of grain and cellulosic pathway ethanol can be avoided because they will be unnecessary when 3rd generation biofuels arrive. As OBP works to fund the fundamental science that will yield 3rd generation biofuels, it should not be taken in by the idea that tens of billions of gallons will be available to displace petroleum based fuels in a near or mid-term time horizon. It has taken 30 years for grain derived ethanol in the U.S. to reach the saturation point with a 10% limit in gasoline. It could easily take in excess of 30 years for 3rd generation biofuels with simple hydrocarbon structures to be available in quantities ranging into the tens of billions of gallons – given that we are funding and performing the fundamental science today. OBP needs to get about the business of enabling structured infrastructure transition that will allow tens of billions of gallons of ethanol (independent of feedstock origin) to be delivered efficiently and used without concern in various end-use devices (cars, trucks, boats, lawnmowers, chainsaws, etc.).

OBP can show enhanced responsiveness to external factors by driving structured transition in ethanol blends and in the associated end use devices. This means new emphasis on design standards for storage, dispensing devices, cars, trucks, and small engines as well as certification and test fuels that reflect in-use realities. There is no excuse for the fact that U.S. automotive certification fuels do not contain 10% ethanol when 70-80% of the gasoline sold is E10.

The apparent willingness to let EPA deal with the indirect land use (IDL) issue shows poor responsiveness to the most critical issue in front of OBP.

Reviewer 12

The program has been very flexible in responding to changing market opportunities and new research directions, as illustrated by the relatively recent integration of thermochemical conversion and algae-based biofuel technologies into the research portfolio. However, the establishment of strategies and goals for those new research directions does not seem to have tracked adoption of new research directions (and in fact *should* predate them); performance goals are still driven by a set of objectives for cost-effectiveness and volume relevant for 2012-2017, which may not be consistent with the long-term potential associated with algae, for instance.

The fact that program goals aren't well articulated exacerbates the tendency for research directions to diversify—external drivers need to be screened by a set of internal objectives. It was unclear in our review, for instance, how biopower fits within the Program's mission because no clear strategy or objective addresses that. The ill-defined nature of the relationship between a very broad mission and very much narrower set of "goals" also makes it more difficult to articulate whether or not CDPs fit within the strategic goals for the platform.

The question about whether OBP sets realistic goals is an interesting one, because in fact it seems that OBP is largely driven by the expectation that it will help achieve goals and targets set by others—Congress through the RFS, for example—in time frames imposed externally as well. The fact that

OBP’s performance goals are limited to those externally imposed numbers, however, does not seem to capture the full scope of OBP’s mission. When OBP adopts a broader set of performance goals (hopefully including some related to sustainability) in support of its broader mission, the question of whether those goals are realistic and commensurate with the resources devoted to them will be more relevant.

3. Is the overall Biomass Program portfolio appropriately organized and balanced, are research areas well-integrated (over the supply chain, and across R&D and deployment) to effectively address priority barriers and achieve goals? Is funding allocated appropriately across the Program Platforms and projects in order to effectively meet Program goals?

Exhibit 17 – Portfolio Balance and Funding Distribution

5-Excellent. Ample resources are, well justified, appropriately distributed and fully support achieving program objectives.
4-Good. The resources are sufficient, justified, appropriately distributed and supports achieving almost all program objectives.
3-Satisfactory. The resources are adequate, documented, sometimes appropriately distributed and support achieving the majority of program objectives.
2-Fair. The resources are adequate, sometimes appropriately distributed, not justified and support achieving some program objectives.
1-Poor. The resources are inadequate, inappropriately distributed, not justified and support achieving few program objectives.

Average Score: 3.4
Range: 2–4

Reviewer 1

Not having constraints and requirements associated with funding priorities negates reviewer constructive input on a numerical basis.

OBP personnel have redirected available resources when available.

Reviewer 2

Specific Comments:

This program consists of a mind boggling, complex set of activities. *There are a lot of extremely talented people doing a lot of impressive work.*

I am concerned about duplicity and reinventing the wheel and stress the importance of communication and coordination across agencies for optimal results.

I don’t know how long the program director’s position has been vacant but this slot needs to be filled pronto. This is the person who can provide the strategic direction that is currently missing from the program.

The areas of Sustainability and Analysis need to be given more focus and more resources. They each need to be designated as Platforms and need dedicated funding.

Organizational structure is confusing. Sustainability shows up under feedstocks and analysis

CDPs almost always rank low vs. platform objectives. We're not going to do away with earmarks but OBP needs to work with them to improve their value to and fit with overall program. This must happen given state of federal deficit and need to spend dollars wisely. In 2008 and 2009, CDP projects accounted for 29.5% and 26.7% respectively of total funding dollars. This level of spending must be accountable to the goals of the program.

Requested FY2010 funds (exclusive of ARRA and CDPs) seems balanced. Biochem flat which makes sense. Good to see ramp up of funding to thermochemical as they have to meet lower cpg goals than biochem (which was interesting). Also approve extra funding for feedstocks as logistics side of this platform needs more focus. Within the biochem platform, agree with funding allocation decisions and in particular over half funding to enzymatic hydrolysis and new concepts. Rest of effort in biochem has been in progress for years and has stalled out.

Reviewer 3

Again, if the 2012 mandates were not in play I would rate the program EXCELLENT.

The portfolio seems quite well balanced, although perhaps more effort should be placed on feedstocks, and particularly the yields that can be reliably attained in different regions. But perhaps this is covered elsewhere? By USDA perhaps?

There should be more effort to focus and/or steer the work towards the near-term goals set by legislation, and probably a sterner view of removing those projects that are not succeeding. Any funds that are saved should be reinvested in exploratory work, while increased funding to the program should be principally steered to enhancing the most successful projects – especially those closest to commercialization.

I am concerned that current resources may already be overstressing the ability to spend large additional funds wisely... Will more program management staff be hired to handle and steward the ARRA funds?

Reviewer 4

Large scale projects should never be funded unless it is clear from earlier stages of development the technology has yielded successful results (several IBR projects are guilty of developing commercial or near commercial scale plants before the technologies have been proven at smaller scale). The SI should be in a position to identify these gaps before projects are funded. I appreciate that OBP was responding to scheduling and pressures coming from outside the office to fund some of the IBR projects before they were "ready" in the best judgment of OBP. This is unfortunate.

The IPA activity is recognized as a very good and important element the program has implemented. Its reporting and contractual alignment should give them the important independence that is needed for them to perform their tasks correctly. The program needs to be commended for this. The SI office is also positioned in principle to function independently as intended. I would like to see the SI office move to truly provide big picture, integrated analysis from science and conversion process all the way to large commercial scale IBR projects, from a technical perspective along with a traditional techno-economic perspective. This is a gap and needs attention.

In the analysis platform it was noted that all the analysis projects were performed by a relatively small set of national laboratories totally excluding the NGO's, while there is excellent talent in the labs excluding NGO's excludes the excellent talent that exists outside the labs. This is a loss to the program. This reviewer has noticed the same issue in other parts of the program, for example, the single use of the NREL thermo-chemical facility is by default excluding other thermo-chemical technologies from being pursued. The program needs to expand the contributors beyond the "historical" players. The issuance of open competitive solicitations across the board is strongly encouraged. When the National Laboratories are desired then an open and competitive Lab call should be used. All projects should be held accountable to milestones, targets, and finite life.

This reviewer understands the problem CDP presents to the program, the program is encouraged to continue to work with these projects to raise the level of performance and focus on program goals to those exhibited by those projects which have been selected through competitive bid.

Reviewer 5

The feedstock platform are driving the standardization, logistics, uniformity and storage of feedstock supplies, allowing for increased scale of operations. Feedstock funding often is drawn from other program areas. The Feedstock platform deserves and is receiving increased funding which is well utilized by its professional staff. Considerable effort has been spent in cataloging a diverse and broad base of biomass resources covering a wide swath of geographical areas and a multitude of feedstocks. There are considerable barriers in developing feedstock production such as switchgrass when there are no existing biorefinery conversion plants to buy potential crops.

Prioritizing feedstock selection designed to overcoming these barriers and concentrating efforts on the best potential feedstock, albeit a smaller number, would bolster standardization, develop viable storage and transportation methodologies and foster replicable projects while accounting for some degree of geographical diversity of biomass availability.

Reviewer 6

The program has developed a detailed set of goals and plans, but have not integrated and focused them to the extent necessitated by the very high importance and priority placed on the biofuels program at the national level, and the exceptionally aggressive goals that have been set. This is not just another program. While the projects of each of the platforms sit in a venue that has a well articulated set of goals and aspirations and supporting systematic analyses, the portfolio structure does not reflect a targeted approach driven by the various pathways that have

been defined, but is more eclectic. These pathways should form more of the basis for actively integrating the projects toward evolving shared goals on a timeline that promises to impact technology insertion decisions for the IBR program. The program must make every effort to take advantage of progress and focus efforts to achieve substantial successes in the various pathway areas to provide the next round of IBRs.

Reviewer 7

This question is a commingling of two concepts: budget and portfolio. It is my opinion that the total budget is adequate to slightly inadequate. Allocated funds are disproportionately directed toward the demonstration projects. The funds allocated to these programs have not been completely disbursed. I take that as clear indication that the funding is in line or in excess of the ideas required to effectively use those funds. I believe that the current budget should be refined, paring some projects and increasing funding to others. Therefore, I believe that the program is likely nearly adequately funded.

The distribution of activities in the portfolio is more difficult to divine from the information provided. I see two gaping holes: one in planning and one in focus. Through the course of the review, I have been continually amazed by the sheer number of different program goals that have been verbalized and how rarely the connection of particular projects are related back to a concise, specific program goal. Clearly stated and understandable goals form the basis for good project planning. Strategic planning is the mortar that cements a robust portfolio together. It is close to non-existent in the OBP. The connections of the R& D part of the portfolio, planning and demonstration are not evident. Matriculation of projects through the program was similarly not evident.

The portfolio needs active management. Activities should be added and dropped as information is gained and technology limitations illuminated. Congressionally directed projects (CDP) are a continuing source of disappointment across the portfolio. Frequently, CDPs fail to fit even the poorly articulated goals of the program. Factoring both budget and portfolio, I'm loathe to rate higher than satisfactory.

Reviewer 8

The recent inclusion of other fuels besides ethanol helps to balance the overall portfolio. Co-production of other products such as heat and power would further balance the portfolio. After the overview it would have been very useful to have had presentations from each of the conversion technology managers to explain their programs. The review presentations did not give a clear picture of specific platform goals and accomplishments for biochemical and especially thermochemical conversion.

There is an ongoing gap between feedstocks and conversion platforms. This will always be a challenge. We did not see conversion needs and feedstock requirements clearly expressed in the feedstock logistics program. We see in the uniform format as a goal of the feedstock program but we see little in the form of intermediate product characteristics that the conversion platforms required. It is therefore not clear what pretreatment processes could effectively be transferred

outside the plant or are best left in the plant. For example, working with one biochemical IBR it was clear that the conversion technologists did not have clear idea of what they wanted and so they provided an arbitrary and unrealistic specification to the feedstock group. After several months of working together practical solutions were devised. In another example, working with a thermochemical IBR, the process engineers were searching for pretreatment alternatives to solve reactor feeding problems. According to the thermochemical platform review leader feeding was not considered to be a problem, however at the end of the previous thermochemical program (~1998) it was still a significant problem and currently remains a challenge for all commercial and development thermal reactors. At least one commercial gasifier supplier has dodged the feeding problem by densifying the feedstock. This is an area where the platforms could spend more time working together to develop practical alternatives. The general recommendation is to not let critical processes slip through the cracks in the interface between platforms.

Biopower projects can be used as a means to demonstrate the feedstock and conversion interface and validate models about how conversion facilities will operate. They are also at a sufficient scale to validate assumptions about costs, reliability and efficiency.

Funding appears to be reasonably balanced. It is not clear where funding for new or newly emphasized areas, such as sustainability, will come from since it is likely that overall funding may be reduced due to the current economic circumstances. I would recommend finding projects and barriers that could be eliminated due to achievements in industry or in research.

Reviewer 9

The portfolio appears to be well laid out and suitably balanced, with the exception of infrastructure and sustainability, which need individual support and funding.

The Analysis Platform is not really a platform, since it does not have individual funding but draws from the other platforms. This is awkward. Since it was difficult for the reviewers, both at the platform review, and at the Program review, to understand exactly how it is implemented, perhaps it is also not effective within the program. Who checks the assumptions across the board? Who verifies the GIS data layers are consistent and appropriate? Who has responsibility to determine if a new analysis activity is required?

Integration will require the System Integrator process to mature and work as designed, which it isn't doing yet because of understaffing. Consistency in assumptions across the program needs to be instituted.

Funding has increased over the past years. And the stimulus bump is very timely.

The solicitation process both provides opportunities for new innovative work, but also constrains that which can be proposed. The whole DOE procurement process is ungainly, but there it is.

Reviewer 10

Portfolio balance is generally good. The increase in thermochemical projects over the past several years a prominent example of effective portfolio rebalancing.

The portfolio balance is most challenging in terms of what “graduates” from DOE-supported effort to commercial effort, and when new ideas and concepts are started. The entire pipeline, and its relationship to the efforts from the new BioEnergy Research Centers, should be reviewed with a goal to timing for actual deployment of BERCC results, and likely impacts on 2015/2022 objectives.

Integration of efforts across the entire biofuels supply chain has not been adequately developed and is one gap that needs addressing urgently if the core goals of the OBP are to be met. The organization has focused on integration of all processes of the biorefinery itself, of which there are many, but the conversion of feedstock to biofuels is only one of several supply chain components. Specific gaps include: a) the evaluation of biofuel conversion processes with a full range of candidate feedstock varieties, production systems, regionally-produced feedstock, etc.; b) the reliable establishment of plantations with perennial grasses that represent excellent feedstock targets; c) the regionally-relevant harvest and logistics practices.

Reviewer 11

Balance and funding is focused upfront on the fundamental science of feed stocks and conversion. There is insufficient focus and funding on infrastructure and end-use. The strategy seems to be “hope” that the problems in infrastructure and end-use will go away thru the enhanced viability of 3rd generation biofuels or pretending that ethanol blends can be shown equivalent to gasoline thru endless testing. Need focus on making EISA volumes happen with ethanol while driving the fundamental science on 3rd generation fuels.

Mid level blend testing, however complete it may end up being, does not address the fundamental issue of fuel compatibility. Mid level blend testing can only delay an inevitable structured transition to higher ethanol blends in the 10% to 85% range. We are wasting time and resources every day by allowing motor vehicles and other end-use devices to be produced and enter the “parc” that are not designed to operate on a wide range of ethanol blended gasoline. Fundamental science makes it clear that gasoline-ethanol blends are increasingly less equivalent to gasoline as the concentration of ethanol increases. No amount of testing to demonstrate equivalency will change this. It is time to establish certification fuels and design standards that deal with the problem directly. These are key elements of a structured transition to higher level blends.

Reviewer 12

Given the limited current performance goals of the program—cost-effectiveness and volume of cellulosic ethanol—I think the Program has done a good job of trying to distribute resources across the obstacles that exist to those particular goals. However, as I mentioned, I think those goals are not fully reflective of the Program’s actual mission or vision, and a full set of

“implied” objectives in the MYPP does not receive adequate resources. In particular, issues related to sustainability need more emphasis and funding. There is definitely a disconnect between the emphasis placed on sustainability in the MYPP and the resources actually committed to it within the Program. Sustainability needs its own funding pool, which I understand is expected for the future, as well as more funding and more staff. It is equally important, however, that sustainability issues be better integrated across all of the platforms and projects. When the sustainability projects have their own budget, it will be easy for other platforms to consider that sustainability is someone else’s job, but I think that every project should be evaluated against not only how it contributes to the barriers to commercialization, but also how it contributes to barriers to sustainability in the industry. While not every project will address “sustainability” directly (depending on how it is defined), I would expect every platform, on average, to reach some level of consideration for sustainability across its portfolio of projects. That is the difference between building an industry with opportunities for sustainability and building a sustainable industry.

I also think that greater integration of platforms is required—feedstock and conversion, feedstock and IBR, etc. The Systems Integration work seems largely responsible for identifying gaps, synergies, etc., among all the efforts, and it is reassuring that that effort finally has staff. However, it is not clear how that work, and its impressive array of evaluation tools, loops back into actual project management, allocation of resources, RFP design, etc.

The analysis work is also critical for the “big picture” issues associated with the industry—how the steps along the supply chain fit together and what the “downstream” implications of changes in one stage are. Questions related to how different interests (biofuel, biopower, etc.) will compete for limited feedstocks and implications of that for regional infrastructure requirements can only be addressed at this level, and yet they are critical to get a picture of how/whether these technologies will penetrate regional markets. Given the importance of putting the pieces together into a whole and developing a strategy for deployment in the real world, I think analysis should also receive more funding. Existing products such as the “Billion Ton Vision” have been seminal, and OBP has been responsive to the stakeholder response to that report. I’d like to see this program funded sufficiently to considerably broaden the types of “real world integration” issues that it can analyze. In particular, we need a more comprehensive deployment transition analysis that looks at timing issues for market penetration, vehicle issues, current fleet impacts, etc. The technological capacity for production is only one factor in how/whether these fuels will be adopted in the real world and what the consumer response will be; potential problems (i.e. small engine issues, overlapping engine technologies as fleets age, competition with biopower for biomass feedstocks, etc.) must be addressed and a comprehensive strategy articulated for smoothing over these hurdles as the fuel production technologies become available.

4. Please note any specific program *strengths* related to:

4.a. Program Planning and Management Strategy

Reviewer 3

Program MANAGEMENT (which I envision as stewarding grants effectively, discovering any problems in deliverables and financing) seems to be state of the art. But the larger picture, ensuring the projects are integrated with the Program goal, seems less under control.

Program PLANNING has to wrestle with down-selecting as planned work is done. It would not be unreasonable to defund a third of projects at each major review, and bring in new ideas.

The external funding of the enzyme companies and the ethanologen development is well directed, valuable, and on-target. But targets here are still VERY challenging.

Reviewer 4

Creating the Systems Integration office is to be commended. Fully utilized this office with its firewall between itself and NREL reporting directly to HQ should be in a good position to provide independent, defensible analysis of the program, its technologies, its direction, identification of gaps ...

Reviewer 5

The program benefits from experienced managers and staff who are motivated, engaged, professional, and resourceful. Intermediate program objectives are realistic; the program demonstrates collaborative efforts with academic resources, National Laboratories and commercial firms interested in developing projects. The planning and management strategy has incorporated a wide spectrum of technical pathways to achieving broader program goals and properly identified barriers with accompanying strategies to overcome these obstacles.

Reviewer 6

There is an extensive set of plans and roadmaps, which have been developed in consultation with the community from researchers to commercial entities.

Reviewer 7

This is a glaring deficiency. The program seems completely unplanned, completely reactionary to appropriations. It would be well served by actually program planning. Management, if it is defined as budget tracking, is well done. Projects are tracked, cataloged and bills are paid. What is lacking is the use of modeling and planning to aid in establishment of policy and to anticipate trends.

Reviewer 8

The development of analysis, management and planning tools is impressive. These provide methods for interaction and sharing of information.

Reviewer 9

Openness to the public. Advertising and inviting the public to reviews. Making the review materials publicly available in a timely and easily accessible way.

Technical goals and metrics are set and prioritized, based on policies. There is logic and method. System integration appears to be methodical, although not completely implemented.

Analysis tools impressive in their number and function and are in use by competent researchers. Sustainability finally included, but not adequately.

The Intra- and Inter-agency activities are very important as the topic of biomass for fuel and energy cries out for collaboration. The list of activities seems appropriate. Now it is time for accomplishments.

Reviewer 10

The systems integration approach and the related management functions tied to milestone performance are well developed, and appear quite effective given the limited staff. The auditing and validation strategy seems to be an excellent way for the OBP to continue to foster progress towards achievement of critical commercial targets while not intervening specifically in projects.

Excellent science in the conversion platforms. Many of the biochemical and thermochemical projects have top-notch scientists working with excellent technologies both internal to DOE national laboratories and external to the DOE. The selection strategy for projects is working well.

Reviewer 11

OBP approaches to program planning and administration range from sufficient to outstanding. This area is not impeding the strategy that is being followed.

Reviewer 12

The program review process is thorough and very transparent.

4.b. Program RD&D Strategy and Implementation

Reviewer 3

Outstanding Research teams.

The validation projects of the biochemical platform are an excellent investment. Efforts to broaden this approach should be actively pursued.

Having a well-funded expert group at NREL (Himmel et al) is a very valuable resource – particularly as it is continually refocused on the goals of the program as new techniques and new scientific findings become available.

The CAFI rounds have been very useful – somewhat akin to the validation projects in ensuring that commercial partners can make useful judgments.

The thermochemical platform is a good investment, appropriately added and enhanced as the program has evolved.

Reviewer 4

The program really executes a very robust, broad spectrum of projects, largely covering the topical areas necessary for success. It truly impressive the amount of excellent work that is being accomplished.

Reviewer 5

The program has selected multiple pathways to research and implement using a stage gate analysis methodology.

Reviewer 6

The so-called Work Breakdown Structures of the platforms are well chosen and for a nice contiguous whole, and these seen to have elicited a portfolio that covers the needed topical areas.

Reviewer 7

The R&D portfolio is robust, wide-ranging and truly top-flight. Both the thermochemical and biochemical R&D platforms are generally well-balanced and both suffer from inclusion of irrelevant congressionally directed projects. Focusing on the managed part of the portfolio shows that the quality of technology is good and the platforms are generally good. Both relate to cost goals that could stand some clarification, but the platforms have done a better job at defining goals than both other platforms and the overall program. The thermochemical program has shown the ability to change and grow in response to new data. In particular, the inclusion of

the pyrolysis efforts and the move away from a singular ethanol focus to a broader transportation fuels mandate are very great examples of responsiveness and flexibility that served to strengthen the program.

Reviewer 8

Analysis, planning and management tools are clearly available to measure technical and economic progress. The increased leverage of related institutions, such as the USDA and EPA in areas of feedstock production and sustainability is impressive. The use of regional projects to identify suitability for local implementation help to show where to put resources based on productive capability.

Reviewer 9

Feedstock – very good. Within the budget limits, the Feedstock program is doing a good job. It is extremely competently managed by John Ferrell.

Conversion – very, very good. The conversion program is also extremely competently managed by Valerie Reed and her deputies Paul Grabowski and Leslie Pezzullo. It is focused on meeting cost targets and addressing barriers defined by the Program to meet policy goals.

The breadth of both conversion platforms is laudable, but at the same time somewhat disturbing. Soon there should be some down select.

Reviewer 10

Despite some of the limitations noted above in overall strategy, much of the science in the platforms is first-rate.

The sustainability program is being well implemented given the limited resources at the disposal of the program.

Reviewer 11

The strategy to drive fundamental science in feed stocks and conversion is evident in the projects that are being funded. The strategy insufficiently addresses deployment, infrastructure and end use. The projects funded under deployment, infrastructure and end use are inadequate.

Reviewer 12

The program has done a good job of developing tools and collaborative stakeholder relationships for soliciting input on whether program is going in the right direction (systems integration tools, BRD board, etc.).

Excellent emphasis on verification and reporting in the systems integration effort

Existing sustainability effort has been very responsive to current issues in the field (i.e. land-use change, water use).

In the feedstock platform, the effort to move toward watershed-scale environmental analysis is critical and should receive substantial support. This will facilitate more sophisticated analysis of water and GHG issues associated with biofuel production and will enable a broader consideration of other dimensions of environmental sustainability, including habitat and biodiversity impacts, etc.

The recognition of and focus on land-use implications of feedstock production is very important, and capacity should continue to be expanded in this area.

Efforts to address data consistency and availability in the systems integration effort and the Feedstock platform (Knowledge Discovery Framework), and to articulate a common set of baseline assumptions in the systems integration and analysis work, are very valuable in supporting the work of the entire biofuels research community.

4.c. Program Deployment Strategy and Implementation

Reviewer 1

Continuing to utilize findings from a particular strategy to initiate efforts for new processes has been a real strength provided by OBP personnel. With the numerous types of unanticipated shortcomings encountered by fund recipients, OBP personnel have demonstrated excellent abilities in attempting to aid those companies with alternate plans and projections.

Reviewer 2

I am very concerned about the large sums of money allocated to the IBR commercial demonstration projects. I participated in both the open and closed IBR Platform review sessions and I am not encouraged by what I heard. Most presentations were lacking substance and to my knowledge, only one of the 4 major projects (Abengoa) is actually under construction and showing real progress. I caution OBP to closely monitor their progress and make the attainment of measurable progress a condition for release of funds. Projects that are stalled for long periods or don't show satisfactory progress should be cut from the program.

Another area of concern has to do with the availability of private equity in the current financial climate. Without a doubt, investors are more risk averse and that has had the effect of stalling some projects. Now with the influx of ARRA funds, it may be a temptation to allow these underfunded projects to proceed. This would reduce the cost share for companies and propel forward projects that very possibly should not have gone forward in the first place.

There are inconsistencies in some of the funding information. John Ferrell's presentation showed FY2010 requested funds at \$42myn for the biochemical platform and \$27myn for thermochemical. But I believe Valerie Reed's presentation showed approximately equal funding requests for both platforms (\$27.3 myn for thermochem and \$31.0myn for Biochemical. I would support the latter request but which way is it?

It was not clear to me how allocation decisions are made. What criteria are used to support these decisions?

I don't know if this is happening but I could see where the same company could be getting funds from different areas of the program (or even from other programs in other agencies). The result could be overinvestment in a particular technology.

Throughout the review I would hear one person saying that the program needed to focus efforts on "winners" and in the same breath, expand other activities. These messages may seem contradictory but given the size and complexity of what needs to be done, the influx of funding and the legislative directive to get it done within a specified time frame, it quickly becomes an exercise in "managed chaos"! The way I see it, the program needs to do two things: (1) quickly identify 2-3 technology combinations with the most promise for delivering results near term, putting increased focus on those pathways and (2) concurrently expand efforts in other areas that either need increased focus/resources (e.g. analysis) or are new areas that need to be evaluated (e.g. algae). The program must be at once focused like a laser beam on what works while being flexible and nimble enough to make adjustments.

Reviewer 3

The potential crown jewel, but it appears the review process was not as fruitful as was hoped.

Reviewer 5

The program has cast a wide net approach, identifying and proceeding to deploy assets that engage multiple feedstock's and technological solutions to overcome recalcitrance in both bio-chemical and thermo-chemical approaches.

Reviewer 6

There is a good portfolio in the sense of coverage of the necessary topics and the involvement of very capable personnel and institutions that are committed to solving these problems and establishing a viable biofuels sector. Productivity is high and a significant set of capabilities have been put in place.

Reviewer 7

Industry hates risk. Using DOE funding and loan guarantees to reduce risk should spur the commercial deployment of biofuels production facilities. I remain convinced that the DOE spurring of these efforts will bare fruit someday.

Reviewer 8

The planning structure and improved organizational structure is good. There is a clear definition of technical and economic barriers. At least in good economic circumstances the program has drawn a large number of companies into the demonstration and scale up activities.

Reviewer 9

Infrastructure is well meaning. Personnel seem to know what is needed, but are not yet doing any of it.

Reviewer 10

The IBR platform has grown extremely quickly. It was difficult to assess from the Platform review given the lack of information provided by the Review chair due to the lack of information received by the reviewers at the Platform level.

The overall quality of the companies in the IBR platform is excellent.

Reviewer 11

Deployment strategy and implementation approach are inadequate. Infrastructure is not a fully recognized platform in the Biomass Program. The funding reflects this lack of emphasis. This is a major deficiency.

Reviewer 12

The emphasis on public/private partnerships is critical.

5. Please note any specific program accomplishments

Reviewer 2

Joint solicitation-over 900 applications this year

Great progress since last review in 2007 on infrastructure but more is needed

Testing of intermediate ethanol blends

Algal Biofuels Roadmap

Regional approaches to both feedstock and infrastructure challenges

Reviewer 3

Although I understand that only a single cellulosic biorefinery is truly underway, this is a very clear success. It should be helped as much as possible.

The fermentation of syngas is a clear success that the program should celebrate.

So is the UOP commercialization

Reviewer 5

Geo Spatial biomass feedstock and knowledge base tools and data sets

Roll out of the first generation of cellulosic ethanol plants

Reviewer 6

The biochem platform has achieved a number of important advances in the application of state of the art techniques from systems and structural biology to the bioconversion problem. The scientists and institutions are first rate and have assembled a set of complementary capabilities which can now be applied to better developing the pathways most likely to be central to the first wave of successful IBRs.

Reviewer 7

It is nice to see that some R&D programs have moved toward commercialization without requiring continuing government funding. Feedstocks also is making progress in defining costs and viable options. Modeling is used effectively to provide an economic framework that forms the foundation for many projects. In general, this is well done in the R&D programs.

Reviewer 8

This is difficult to specify since in some cases program achievements (e.g. cost reduction) are claimed without sufficient explanation.

Reviewer 9

Update of the Billion Ton study.

Progress on the Biomass Scenario Model

Reviewer 10

The development of the uniform feedstock approach is a very positive step. The decision to fund construction of a mobile processing unit to further test emerging concepts is very good.

Reviewer 11

The projects under way in biochemical and thermo chemical conversion seem very promising. Patience will be required to allow the projects time to mature to fruition. Timing expectations may be unrealistic. We must not expect every project to be successful. Mistakes and failure are a critical part of learning.

Reviewer 12

The work of the analysis group – the “Billion Ton” research effort in particular – has been a seminal work in the analysis of scale potential for biomass-based industries.

GREET is also the industry standard for LCA analysis for biofuels.

The activities and presence of the sustainability group at key industry and NGO events have been remarkable given its limited budget and poorly defined status within the program and its objectives.

6. Please note any specific program *weaknesses and areas for improvement*

6.a. Program Planning and Management Strategy

Reviewer 2

Coordination across agencies, with outside organizations

Need for development of robust strategic rationale to support program implementation

More emphasis needed on woody biomass to match increased funding to thermochemical platform.

Algae not a good fit with biochemical platform.

Sustainability needs increased focus.

Terminology can be problematic. For example, EISA distinguishes between Cellulosic Biofuels and Advanced Biofuels (non-ethanol). Yet these terms are used in the program not consistent with these EISA definitions.

Reviewer 3

The Program needs to decide whether the cellulosic ethanol goals can be achieved, and, if so, focus as much as possible on this goal. If not, start negotiations with Congress, USEPA, etc. ASAP!

Program PLANNING has to wrestle with down-selecting as planned work is done. It would not be unreasonable to defund a quarter of projects at each major review (at least in the biochemical and thermochemical platforms), and bring in new ideas.

Need clearer GO/NO GO decision points – reveal terminated programs at the review?

Reviewer 4

The program really needs to develop a short concise program goal structure that is easy to understand and that provides a unified direction for the program at large (see comments above). The review panel asked of several people and several times to articulate the principle driving goal that aligns the entire program. The program really needs to engage in an ongoing analysis activity that truly spans the program space, technically, and from a deployment perspective to guide research investment decisions, provide defensible down select guidance, understand unintended consequences of deployment ... The SI office is in a good position to maintain such an activity, but is not doing that yet.

Reviewer 5

There is an insufficient amount of effort expended on feedstock and R&D with respect to biodiesel which is called to contribute 5 Billion Gallons of the RFS.

Reviewer 6

It seems unclear how the statutory goals translate into program goals and precisely what OBP is held accountable for in terms of technologies, performance end-to-end, and specific cost and volume targets. That needs to be clarified early and clearly translated into platform/project management and assessment guidelines.

Reviewer 7

Planning and management models have the most value as predictive tools that allow the program to be anticipatory and to help set policy. I failed to see any attempt to reach out and draw conclusions about the “best” use of biomass, whether for transportation fuels or combined heat and power. Similarly, the lack of conclusions from the modeling work means that it is poorly used in the shaping of the program.

Reviewer 8

How does systems integration interface with staff and projects?

Fine tune sustainability goals, objectives and metrics and ends use of information.

Need: reporting of progress against specific goals within each platform area. I do not see use or reporting of Stage gate categories to move technologies forward.

Need: integration with other biomass uses: biopower, feed, fuel and fiber and chemical feedstocks. Use analysis tools to explore risks associated with feedstock supply or opportunities for co-production of fuels and power, and other products.

Conduct ongoing technology assessment (OBP vs. others) to redirect research.

Reviewer 9

Immature process for decision-making, or not well described

Need to enable the pathways / pipeline

Not going to make goals – what to do? Quantitative – not enough; Qualitative – efficiency is too low.

Working under too many political constraints.

Analysis is insufficient in the areas of sensitivity studies, water assessment, economics, and scenarios.

Climate debate, low carbon motivation could shift the economics. This must be addressed.

Need more collaboration with EPA, USDA, others

The efforts are too dominated by entrenched National laboratories. Open the program up to others – other labs and industry.

Even National lab efforts should have defined budgets and milestones. No one should have an “ongoing” activity.

Reviewer 10

The analysis and assessment of progress towards overcoming barriers was not well or consistently presented, leaving uncertainty as to whether the barriers are used effectively to inform prioritization of R&D. I encourage the leadership to ensure that the platform resource allocation discussions are framed in terms of efforts to overcome barriers and the most critical bottlenecks, and the success of these efforts. This would enable the senior management of the program to evaluate whether barriers are being overcome, or whether other pathways must be chosen.

This pertains to a key challenge for the program, which is how to prioritize technologies along a progress curve. The OBP is right to focus on supporting a range of technologies and not abandoning approaches too early, but focus is the key to success.

Reviewer 11

None noted.

Reviewer 12

It would be nice to have a little more information, both at the program level and at the project/platform level, about how the results of the review will be used, and whether there is any official plan for follow up, response, or accountability to the review, both on the part of PIs and the platforms themselves.

6.b. Program RD&D Strategy and Implementation

Reviewer 1

There is a need for reporting of information that can be utilized throughout the industry. The lack of interindustry and interdisciplinary cooperation must be corrected. For successful commercial deployment, sharing of research data is critical to timely accomplishments.

Reviewer 3

Trying to steer the Congressionally Mandated Projects towards the overall goals should be continued and strengthened. There will be real problems if the Department returns to budgets where these come from requested funds.

Reviewer 4

I am concerned in about several areas. 1) the program relies heavily on a relatively small number of national laboratories to the exclusion of other national labs and to NGOs to support the R&D activities. While there is a lot of very good talent in the program as currently structured the program is missing out on a lot of very good talent and new thinking by not including a broader spectrum of contributors. Open competitive bidding in response to FOA / RFPs both for the labs and for NGOs would go a long way to broaden the spectrum of contributors. 2) the program relies on the thermo chemical platform at NREL as a test bed. By doing so the program has limited itself to that one platform to the exclusion of other technologies. This is a significant short coming and needs to be fixed and 3) this program needs to develop a robust, broad based, cross-cutting integrated systems analysis activity. The SI office could manage such a task but it is not doing so as of this review.

Reviewer 6

The program has adopted a single approach to funding research projects which must be refined to properly manage “exploratory” as well as “development” phases of RD&D (currently mostly exploratory). They are considerably different in their management requirements and they should be treated so.

Reviewer 7

The programs would benefit from better portfolio management. Focusing on the pipeline and mixture of projects is important. Both programs suffer from trying to be both a fundamental program and an applied program. The funds devoted to the fundamentals of enzymatic hydrolysis, pyrolysis and gasification will likely not bare fruit on severe timeline pressure the program as a whole finds itself under. Portfolio refinement should be raised in importance. Efforts should be expended to insure that the projects are all pulling together toward the same goals. Different approaches, same goal. Furthermore, the R&D platforms should be encouraged to impact and be influenced by the demonstration projects.

Reviewer 8

Need to measure and report progress against specific program and platform goals in MYPP

Reviewer 9

Collection of projects in both conversion areas rather than focused development. Exploration vs. development. Where does DOE responsibility end?

Scalability needs to be addressed in the Feedstock program. How much land is required for which fuels?

Feedstocks needs to include algae on a greater scale. Since Exxon just made a huge partnership with an algae start-up, they must believe there is something there.

Reviewer 10

A major area for improvement is establishment and development of the perennial crop feedstocks that need to be the most important source for long-term success in delivering the vision of environmentally beneficial production of biofuels. The 80% GHG reduction target cannot be addressed through corn starch/stover systems. This includes work to advance the understanding of the conversion of different feedstocks, harvested at different stages, in different regions, of different varieties.

Lack of funding for sustainability objectives is a major gap, even though some work (e.g., ILUC analysis) is being done through the Analysis platform. Given the national and international importance that is associated with the environmentally sensitive deployment of the biofuels industry, goals should be set for sustainable production of biofuels.

As noted above in (3), there is inadequate integration across the complete supply chain, starting with establishment of crops in the field, particularly for those crops that offer the most sustainable option. The biochemical conversion platform is working with too limited a set of feedstock materials in most of the program. Additionally, there is inadequate appreciation for the extent of variation in feedstock properties due to genetic diversity, variation in production system or region of production.

Reviewer 11

Deployment, infrastructure, end use lacks viable strategy. A structured transition approach is needed. Too much dependency on ethanol blend equivalency and the hope for 3rd generation hydrocarbon structure fuels to avoid the need to deal with infrastructure.

Reviewer 12

The program needs a more expanded set of measurable performance goals and targets that are tied to a well-articulated Program vision and strategy. There also does not seem to be an explicit strategy for evaluating progress against those goals and reacting if/when they are not met. While the early stages of technology development require supporting a number of promising technologies to see what trickles to the top, the later stages involve narrowing support to build on the earlier successes, and it is not clear how the Program intends for that winnowing process to occur. This of course raises the tension between “picking winners” and “focusing resources.” At least two presenters mentioned the need to focus on a particular pathway as the program moves forward, but there was no explanation of how that narrowing of focus is to occur and who is going to drive it. It would be great to see a guiding strategy for this transition articulated, which includes a section on how the Program builds on its past successes while dedicating a

portion of its resources to continuing to explore new ideas through programs such as the “New Concepts” funding that Valerie Reed mentioned.

As mentioned earlier, as the Program develops a broader set of goals that is more comprehensively tied to its vision and strategy, it should pay close attention to the role that the concept of “sustainability” plays in that vision. The resources committed to sustainability at the platform/project level should be commensurate with the emphasis placed on this issue in the vision/strategy/goals. The current disconnect between emphasis and resources does not help fortify the industry against claims that it is trying to sell a product as “green” or “sustainable” that is not necessarily so.

6.c. Program Deployment Strategy and Implementation

Reviewer 2

A few areas jump out as needing more focus. The most obvious was infrastructure. This is an area that always draws the short straw when it comes to allocation of resources (with some justification). However, marketplace problems/barriers could stand in the way of successful biofuels deployment. The following areas are critical and must be addressed: intermediate blends, pipeline transportation of biofuels, optimized ethanol vehicles, storage tank, small engine and legacy vehicle issues. There is a lot of work going on in these areas across many government agencies as well as non-government organizations. Collaboration is essential to ensure key learnings are shared and duplicity is minimized. The Biomass R&D Board should be playing a key role in coordinating across the different agencies (EPA and DOT in particular). Additionally, OBP must work closely with CRC, ASTM, SAE, RFA and companies like Kinder Morgan.

We also need to shift focus away from E85. Over 15+ years of market development efforts in this area, the E85 market has failed to develop. There are 7 myn FFVs but few service stations that carry E85 (< 1%). The problem is that service stations don’t want to tie up one or more of their dispensers and tanks with a product that doesn’t sell. It has not been priced in a way that encourages consumer interest. Auto manufacturers have not educated consumers about their vehicles capability to use E85. Plus, vehicles have not been optimized to run on E85, and therefore get less miles/gallon.

More work is also needed on interfaces between feedstocks and conversion technologies and between the biorefinery and distribution infrastructure.

Algal projects should be part of a new pathway. The creation of the Algal Fuels Roadmap and the proposed Algal Biofuels Consortium are all positive steps.

Reviewer 3

Helping the commercialization projects, even though they were forced on the program rather too soon, should be the highest priority because it has the highest visibility to Congress and the public.

Reviewer 4

As mentioned above this reviewer is particularly concerned that some IBR projects were funded at rather substantial levels before the technologies being deployed were demonstrated at smaller scale and that were admittedly recognized by the office as not being ready.

An observation made by this review panel is that frequently the CDP were at the bottom of the scoring as compared to those projects that were awarded through the normal solicitation process. Frequently, this was caused by lack of relevance to the program direction, goals ... Also, many of these projects simply did not respect this review process. This makes it very difficult for the program office to manage the portfolio. There needs to be a mechanism put in place that will help align the CDP with the program direction and that will improve the performance and quality of work.

Reviewer 6

There needs to be a solicitation under a more focused and rigorously managed set of scenarios, perhaps along the lines of pathway development projects with highly defined milestones and ties to imminent commercialization efforts. These efforts would be managed under true project management control to better assure performance and schedule.

Reviewer 7

The implementation projects clearly are wanting. The information available left the feeling that there was no one thing that caused trouble. The economy, inadequacies of technology and naïve views about how long projects actually take all mixed together to cause issues. Suggestions were made that

Reviewer 8

The problem of lag between identification of barriers and funding and technical support to scale up plants could be effectively addressed at the project management level. Create collaborative multiyear projects to provide technical support as barriers emerge in specific applications, especially in the IBR and in industry. (Model: Alkali Deposit Investigation: A Preliminary Investigation of their Extent and Nature, for NREL 1990-1995)

The IBR program needs to recognize that there are problems that simply result from scale up that can't be anticipated in pilot facilities.

Reviewer 10

NA.

Reviewer 11

Too much dependency on ethanol blend equivalency and the hope for 3rd generation hydrocarbon structure fuels to avoid the need to deal with infrastructure. Need an implementation plan that proactively embraces structured transition in ethanol blends.

Reviewer 12

Early and substantial IBR support, before the core R & D has had a chance to establish a track record of success on which to build, would be more effective at expediting the overall process of sustainable industry development if there were more explicit integration of the IBR platform with the work of the other platforms and analysis areas. It is not clear how the lessons of the IBR are being used to inform the future directions of the other platform, or how/whether the lessons of the other platform and analysis areas are useful in guiding the IBR effort. This is particularly true in the case of sustainability. While industry has an incentive to adopt cost-effective technologies that shake out through the core R&D process, and to integrate those advancements into future funding requests for integrated systems, the same is not necessarily true for “sustainable technologies”. Institutions will need to be designed and introduced to provide the appropriate incentives and enabling mechanisms for players all along the supply chain to adopt these technologies and practices.

OBP’s strategy for “focusing” its resources down from support of multiple research pathways to particular pathways is unclear.

Although the focus on private/public partnerships in developing deployable technologies is a strength of this program, better strategies for dealing with the complexity of private IP issues are clearly necessary for effective program review and for better integration of the IBR platform with other platforms.

The infrastructure “platform” lacks a comprehensive strategic approach to infrastructure issues and how OBP can address them. It appears, however, that this is one of the Platform’s planned activities, and will be critical for effective allocation of resources within that platform.

General Comments:

Reviewer 2

The OBP program has many strengths:

First, it’s people. They are very talented, well-informed, hard working and have a Herculean task in managing and executing the objectives of this highly complex program.

Second, their in-house expertise. There are many people in the organization that have many years of hard to acquire expertise. This should be highly valued, as the learning curve in this industry is very steep.

Project management and systems integration capabilities are top shelf.

The program has impressive modeling and analytical tools.

Program places proper focus on liquid transportation fuels vs. products or power

Program has made great strides in working with global partners

Reviewer 5

Program budgets potentially impacted by recessions from program areas because of Earmarks

Failure to down select any projects in the IBR platform

The need to dramatically increase funding in R & D and project development along with policy changes that provide realistic market signals for the development of liquid transportation fuels and bi-power fuels

Not selected a project is not the same as down selection

Scattered shotgun approaches as opposed to focused efforts

Perceived substandard performance and relevance of Congressionally Directed projects

Reviewer 9

Infrastructure work is inadequate. There needs to be real attention to analysis and hardware. In the analysis area, there needs to be transition planning, for both cases: ethanol-dominated scenarios and advanced “drop-in” fuels. The UC Davis transition work for hydrogen is a good example to follow.

In the hardware area, of course the engine research must continue. There should be collaborative work on pipelines, storage, dispensers, etc.

The Outreach efforts and Codes and Standards are in their infancy and need dedicated support.

IBR project progress is behind schedule. Continue to support these efforts, but also push to be open to innovation.

7. Please provide *actionable recommendations* which will address any weaknesses or areas for improvement noted above.

7.a. Program Planning and Management Strategy

Reviewer 3

Make the Infrastructure work much more aligned with USEPA and DoT work on the same topic. Joint ownership should be acknowledged.

How is siting of the Integrated Biorefineries determined? It probably should be where energy crops grow well....

A simple metric of number of patents and peer-reviewed publications would be a useful addition.

Reviewer 5

Provide an integrated system strategy that does more than down select projects in the initial process, more progress needs to be made in utilizing the stage gate analysis as a means to enforce cessation of projects that are marginally meeting overall program criteria

Provide funding commitments and budget levels sufficient to enable the program able to make cellulosic ethanol cost competitive by 2012 and replace 30 % of transportation fuel supply with biofuels by 2030

Dedicated funding for projects in core program areas; feedstock development, Infrastructure, Sustainability, biochemical and thermo-chemical conversion technologies and commercialization of advanced biorefineries

Increase feedstock and technological research in biodiesel

Development of biofuel markets for the production of distributed power and contributing to renewable portfolio standards as an intermediate market in the process of developing biorefineries producing transportation fuels

Reviewer 6

There needs to be a more evolutionary element of the program and can pursue specific targets as they emerge. Organized more like a movie company, teams would form around specific problems and exist only for the time needed. Pathways are obvious targets.

Reviewer 7

Develop clear and concise goals for the overall platform. Translate these to platform and project goals that are directly measurable and quantifiable, but that clearly reflect back to the program goal.

Develop and implement portfolio plans for the program capable of evaluating and recommending the make-up of the overall program and balancing the portfolio. Use this portfolio plan to set targets for the portfolio composition based on research stage and to establish guidelines for movement of projects through the pipeline from proof-of-concept to demonstration.

Develop models that include all uses, including combined heat and power, for biomass and use these models to make conclusions concerning best use of the biomass resource. Insure that biofuels related models appropriate anticipate competition from use of biomass for power production.

Reviewer 8

1. Articulate a clear strategy with measureable goals and objectives.
2. Continue to evaluate progress of each platform against overall goals and specific sub-goals. Set specific achievable targets for the extensive list of project objectives. Show means of measurable progress.
3. Develop means to abandon non productive areas.
4. Analyze impact (positive or negative) of other factors affecting biomass supply and potential productions such as power (export pellets, Co-firing, feed, fuel and fiber or feedstocks for chemicals) that would affect potential or enhance conversion and plan strategy accordingly.
5. Target multiple products for economy in transition – liquid, bioproduct, biopower.
6. Better define short term goals and measures for projects and platforms.
7. Improve technology forecasting.
8. Assess potential impact of carbon tax or value of carbon products.
9. Use analysis tools to explore risks associated with feedstock supply or opportunities for co-production of fuels and power, and other products.
10. Use existing industry (power, chemicals) to build infrastructure to supply and operate full scale systems.
11. Thoroughly test and validate analysis tools such as KDF
12. Find opportunities to make better use of analysis tools for markets and feedstocks.
13. Use sustainability to support and assess market opportunities of biofuels. Analyze total cost, LCA compared with real costs of energy dependent inputs such as fertilizer, nutrients, carbon etc.

Reviewer 9

Plan to review every year.

Find a way to use the review comments to influence selection criteria of solicitation awards.

Beef up the SI efforts. Work on pathways. Focus strategically toward end goals.

Set up analysis approach to ensure consistency of assumptions, not only across OBP activities, but also in concert with other agency efforts and published works.

Develop a true indirect land use analysis tool. Collaborate with NASA data centers to obtain global data on vegetation inventories. Build in a dynamic interface to change data.

Execute a comparison between GREET results and other environmental models to build credibility for the GREET results.

Work with other agencies on sustainability metrics.

Develop a true economic tool to optimize the use of biomass for fuel vs. power production.

Develop an economic tool to look at the impacts of carbon tax or trade on cost / price targets.

Reviewer 10

To address the challenge of prioritizing conversion technologies to focus on, I recommend a matrix approach to compare the critical barriers for the set of technologies that are being tested for a particular part of the overall biofuel supply chain would be helpful. This would allow a mapping of progress in time, and support prioritization.

Reviewer 11

None.

Reviewer 12

As emphasized earlier, the program needs to better articulate the scope of its mission (biopower, bioproducts?) and develop a more comprehensive set of research strategies and performance goals to support that mission

While I only observed the platform reviews, it would have been nice for reviewers, and observers, to have had some information about how and whether feedback would be used to actively guide projects or PIs, and, along the same lines, what kind of recommendations might be appropriate. At the level of platform and program, it would be nice to include as a formal part of the review process a detailed description of the results of prior reviews, and how/whether changes were made in response. Some of the presenters alluded to prior reviews, but a more systematic analysis of what they contained, together with the Program response, would complete the loop of transparency in the review process.

7.b. Program RD&D Strategy and Implementation

Reviewer 3

Down-select lowest ranked programs and either add funds to best performing ones, or look for new projects.

Need more work on energy crops – corn stover is at best an intermediate crop.

Reviewer 5

Apply Pareto Optimality criteria to future R&D Strategy and Implementation

Reviewer 6

Develop a pathway based set of (crosscutting) programmatic initiatives which would be more project-like (fixed length, defined targets, fixed budget) than program-like.

Reviewer 7

Winnow biofuels projects to reduce redundancy and to foster collaboration. Clarify the goals and success metrics and pare the portfolio to remove those projects off the critical path and add projects consistent with meeting project goals.

State of technology reports on gasification and tar remediation technologies should be commissioned. Tar reforming by the conventional endothermic reaction with water should be de-emphasized and replaced by engineering and/or alternative methods for tar control.

Widen the search and evaluation of alternative gasifier technology to determine the true magnitude of the tar issue.

Reviewer 8

1. Report progress against technology barriers and implications for cost reduction and commercial adoptions.
2. Support industry efforts in related areas that can enable more collaboration with industry
3. Provide EPA with specifications for fuels from waste and add waste resources to ORNL database. e.g. urban wood waste, clean wastes.
4. Benefit from the developments in thermochemical conversion from 1979-1999, from related clean coal programs in the interim, and from developments overseas. The reported progress in gas cleanup and pyrolysis appears to be behind the EU.
5. Use sustainability and analysis results. – require new projects to have sustainable plans and require GHG LCA for new projects. Provide tools.
6. Provide guidelines to help align CDP projects to program goals.

Reviewer 9

Initiate a sustainability platform and budget line.
Include a scalability analysis in feedstock studies.

Reviewer 10

Better input from industry, along with validation of that input and care in assessment, to improve the analysis of feedstock potential yields over the next 10-15 years could have a substantial impact on perception of utility of different feedstocks. This can be done both through expanded funding of the Regional Partnership program, as well as through workshops to get industry data and projections, and perhaps databases that allow industry input without compromising intellectual property.

Increased efforts are needed at the interface between feedstock production and biochemical conversion. I recommend that specific feedstocks be targeted for a larger range of production system and genetic evaluation in association with efficiency of biochemical conversion. This may benefit most from a specific solicitation taking advantage of the trials already being conducted by companies. Or the Regional Partnership approach can be expanded, to include more sites, and to better coordinate with DOE labs on conversion of a range of generated feedstocks. There has been some discussion of a feedstock material library for testing in different conversion systems. This should be developed into a reliable resource strategy.

The sustainability program needs to receive line-item budget status, and be budgeted at a higher level. The DOE, in partnership with the USDA, needs to leverage its expertise toward the development of non-governmental, voluntary standards. Both the DOE and the USDA have sponsored the Council for Sustainable Biomass Production at very modest scales. This group, whose focus on cellulosic bioenergy, is fully consistent with DOE OBP objectives, should receive high-level support to enable staff to engage at a technical, not policy level. It should also receive some funding to ensure that sustainable standards are developed at this very early stage of the industry.

Reviewer 11

Identify a strategy for better approaching indirect land use and begin funding projects in this area.

Reviewer 12

Sustainability should occupy a more formal position within the program:

- Sustainability needs its own budget and greatly expanded funding and staff
- Every project/proposal needs to be judged against how it contributes to development of sustainable, cost-effective biofuels deployment, not just cost-effective biofuels deployment. Although individual projects don't have to reach specific scores for "sustainable" relevance, it could be appropriate for platforms to have "sustainability"

relevance objectives. For many issues of environmental sustainability, this is particularly important for the feedstock platform.

- Performance goals and metrics for development of a –sustainable” industry should be developed and reported against.
- A strategic analysis of obstacles to sustainability in industry development, potential strategies to overcome those hurdles, and the impact that OBP could have on those various points of resistance should be performed and used to guide OBP’s workplan and development of performance of goals. A significant part of this effort will be defining what OBP means by –sustainability” and what social, environmental, and economic dimensions are emphasized through their work.

7.c. Program Deployment Strategy and Implementation

Reviewer 3

The Integrated Biorefineries are undoubtedly the most visible part of the program, and the goal in the eyes of Congress. They should be stewarded as closely and as helpfully as possible, and if necessary, should be terminated if not delivering. A HUGE amount of money is in play.

Reviewer 5

Focus refinement and intensify efforts to overcome recalcitrance

Secure a dedicated line item for developing, promoting and building out Infrastructure to support cellulosic ethanol and other advanced biofuels used for transportation. The current level of funding and effort is not sufficient to overcome challenges in this area.

Increased collaboration with USDA to develop and provide incentives for feedstock price supports and biorefinery assistance development activities.

Intensify efforts and funding to produce cellulosic ethanol in commercial
Focus and intensify research to produce yields exceeding 100 gallons cellulosic ethanol per dry ton of biomass.

Reviewer 6

More integrated teams across current platform performer groups and topics.

Reviewer 7

Develop a review metric that matches the needs of the IBR with its special needs.

Reviewer 8

Continue to improve means for industry to learn and understand technologies developed that can be used or incorporated into their processes.

Provide technology assistance to industry with PDU's etc. Offer to do technology assessment of private technologies and make recommendations.

Assess potential of using European technologies. EU has spent much more on biomass to liquids than the US in the last 10 years.

Use technology market assessment to determine market entry. What companies and industries are likely to adopt liquid fuels and related conversion technologies? Are their fossil applications for technologies that can help develop the technologies such as use of clean coal, power, or petroleum (e.g. Ensyn) as bridge to fuel use.

CDP: Provide guidelines to help align CDP projects to program goals.

Use other conversion system opportunities (e.g. fuel, feed) to test feedstock preparation and feeding programs. Develop long term testing e.g. 2000 hrs (3 month 24/7) with production and testing plans. Provide enough money for field testing.

Use performance based contracts for payment of IBR scaleups.

Provide DOE Funded technical support (at national labs, university or consultants) to IBR plants once they have begun commissioning to solve common technical barriers.

Reviewer 10

NA

Reviewer 11

Improve collaboration with the Coordinating Research Council (CRC) in all mid level blend test efforts. Follow accepted project control practices.

Understand and implement end use strategies that support the evolution of ethanol blends that can change with availability growth such as blender pumps. Blender pumps can be designed to deliver ethanol blends ranging from 0% to 85% ethanol. Coordinate pump functionality with ASTM ethanol blend specifications.

Change certification fuels to reflect in-use fuel with adjustment for energy density for fuel economy determination.

Implement design standards for vehicles, boats, and small engines to force compatibility with a range of ethanol blends.

Consider the interaction of vehicle emission standards and diagnostic requirements in the rollout of design standards. Include both CARB and EPA emission and diagnostic requirements.

Treat fuels, dispensing, end-use devices as a system that must be carefully engineered to work together.

Reviewer 12

A comprehensive analysis of the transition issues associated with introducing large amounts of biofuels into the transport fuel supply should help guide increased allocation of resources to the infrastructure platform and to the systems analysis effort.

Development of guidelines for how future OBP support will pare down research directions to a few focused pathways, while still maintaining opportunities for ~~new~~ "concepts" to enter the support pool.

General Comments:

Reviewer 2

Joint solicitation-over 900 applications this year

Great progress since last review in 2007 on infrastructure but more is needed

Testing of intermediate ethanol blends

Algal Biofuels Roadmap

Regional approaches to both feedstock and infrastructure challenges

Reviewer 9

Initiate an Infrastructure platform and budget line.

Build a transition analysis for both ethanol-based and advanced fuel-based scenarios.

Build an economic model for IBR profitability that includes power generation.

8. What other adjustments would you recommend: reallocation of funding, decreased or increased funding, etc., if any?

Reviewer 1

Considerable discussion re use of algae for biodiesel. If the estimate of 8000 gal/diesel/acre and 40 to 50% of algae dry matter is lipid, we must have experimentation to verify these numbers. At this time, a number of individuals are espousing the diversity of species to be used; studies need to be designed to ascertain those species of interest. Also, there must be evaluation of markets.

Reviewer 2

Coordination across agencies, with outside organizations

Need for development of robust strategic rationale to support program implementation

More emphasis needed on woody biomass to match increased funding to thermochemical platform.

Algae not a good fit with biochemical platform.

Sustainability needs increased focus.

Terminology can be problematic. For example, EISA distinguishes between Cellulosic Biofuels and Advanced Biofuels (non-ethanol). Yet these terms are used in the program not consistent with these EISA definitions.

Reviewer 3

Ensure that feedstock research includes large enough scale, and realistic harvesting (likely including material that will damage grinding equipment).

Reviewer 5

Congressional directed funding can provide valuable additional funds to research and program development areas providing they do not otherwise compromise dedicated program funding.

Increased funding for biorefinery development and loan guarantees to overcome technical and credit barriers inherent in these projects.

Increased funding to develop R&D that will improve the effectiveness and reduce the costs of enzymatic conversion.

Increased funding for R&D on advanced micro-organisms for fermentation of sugars.

Increased funding for Infrastructure deployment, education efforts and research which supports the use of advanced biofuels for transportation.

Reviewer 6

With the release of a further \$650M in IBR funding which (with matching funds) will result in well over \$1B invested, the feedstock and conversion platforms should do whatever is needed to reduce the risks to those IBRs which have pathways OBP can support.

Reviewer 7

The funding is approximately correct. The increases proposed are about correct and CDPs should not be funded from the current budget. In fact, linking CDPs to the program goals or diverting funding from them to the managed portfolio would be the best option. The thermochem platform shows considerable promise and warrants additional focus even if it must come at the expense of funds currently allocated to the biochem area.

Fossil, municipal solid waste and algae should all be considered as potential feedstocks. In the case of fossil, recognition that fossil co-mingling can reduce some of the processing difficulties in thermochemical processing would be advantageous. Fossil inclusion is not intended as part of the biochem platform.

Reviewer 8

Increased funding in feedstock processing handling and feeding for bio and thermochemical conversion platforms.

Prepare for potential reduction in funding.

Remove unproductive projects. If they don't meet goals cut the project.

Reviewer 9

The budget is heavily dominated by IBR, as it must be. As for the rest of the budget, the Conversion R&D is well balanced, but Feedstock is too small.

Of course, the stimulus boost is nice. Spend it well.

Two areas need their own budget lines: sustainability and infrastructure

Reviewer 10

We have heard that algal biofuel funding will increase. This is presumably at the expense of other efforts. This reviewer remains unconvinced that the economic challenges to the direct production of biofuels by algae can be overcome. In essence, the technology curve seems far more daunting for algal production than cellulosic feedstock-based production. I recommend that algal biofuels not receive any additional funding from OBP other than funds already committed.

Sustainability initiative needs more certain funding, and expanded funding (as already described above). This should be devoted, in next 3-5 years, to R&D efforts to establish best practices to achieve various objectives (e.g., water quality and quantity, soil quality, etc.), preferably in collaboration with other government agencies such as USDA/NRCS and EPA.

Reviewer 11

Infrastructure needs to be recognized with Platform status in the Biomass program. Funding needs to be very substantially increased or reallocated from other areas. See comments above.

Reviewer 12

For all of the reasons mentioned above, analysis, infrastructure and sustainability need to receive more funding. The non-technical obstacles to sustainable deployment of biofuels are under-represented in the commercialization strategy and the portfolio of research.

9. What R&D/deployment topics should be given a higher priority? Are there any current areas that over- or under- represented? Please explain the benefit to increased emphasis on this topic and quantify potential impact.

Reviewer 3

Sustainability should become a funded line-item – although a relatively small one. I am not sure it should be an independent platform, but rather an essential part of all projects.

In my opinion, infrastructure should probably NOT be a platform in this program. Most, if not all, of the infrastructure work should be sent to other groups – DoT, pipeline and engine manufacturers, California air board, etc. ANSI, ASTM, NIST, API etc – DoE funding should focus on the goals of PRODUCING liquid transportation fuels. [I note that in the Q&A it was revealed that this work was being done with USEPA and DoT... why this was essentially kept a secret in the presentation is a mystery to me – it was certainly not highlighted (how about including a logo?)] DoE should be involved – but I question whether in this program, or in the lead.

If the 2012-2015 legislative goals are serious, all efforts should be focused on meeting them. I fear that failure will derail the Program.

If those goals can be finessed, then the program seems very well placed for the 2022 goals, but will need serious down-selection as progress is made. Since this is exploratory research, it is NOT a failure to discover that something doesn't work as well as was hoped. But once there are some clear indications of reality, funds should be directed to other, now more likely, approaches. Appropriately timed down-selection as progress moves from exploration to commercialization is the hallmark of a well managed Research Program.

Reviewer 5

Improvements to the yield of liquid fuel per dry ton of biomass, the percentage of liquid fuels for transportation versus other products and the production of fuels which already are distributed namely biodiesel and ethanol will be necessary to achieve volumetric goals for alternative liquid fuels.

Reviewer 6

Conversion is a critical path item for all foreseeable IBR strategies and the relevant research should be scaled up to be able to meet the processing demands with acceptable risks in a timely way. The platforms have acquired the needed skill sets but aren't at the necessary scale given the timelines that are in play.

Reviewer 7

Thermochem is showing continuing process and warrants a higher priority. The difficulty with the thermochem program is that several technologies are already commercially proven or have been taken up by industry. Determining the underlying philosophy on what to do when technologies are commercially ready – how they graduate – is an open question. Algae have been mentioned several times and, while considerable skepticism exists, plotting a course to do the minimum amount of work to validate or discredit claims is demanded.

Reviewer 8

Sustainability is probably the area that should receive more attention both from a practical, soil fertility and productivity point of view and providing information to justify the production and use of biomass for liquid fuels for policy. This would include both analytical and research projects. It may be possible to leverage a lot of information from USDA. The use of large quantities of wood waste will require justification of the sustainability of the resource probably more than the use of crops or field crop residues. The large landscape impacts will have to be analyzed for the sustainable information and arguments to be credible.

Feedstock production needs to be refocused and trimmed. The program started out with corn stover and wheat straw as main areas. Wood needs to be increasingly incorporated. Lesser or local feedstocks need to be trimmed or included in regional and projects. The database plant siting analyses should help direct feedstock production research(e.g. identify a good potential feedstock area for energy crops such as grasses and orient research accordingly.)

Reviewer 9

R&D priorities to be emphasized:

- "Drop in" fuels – benefit: would avoid needing new engines and new infrastructure
- Algae - benefit: research indicates drastically reduced footprint and reduced water requirements compared to other feedstocks.

Deployment priorities:

- Vehicle testing on new blends
- Codes and standards for vehicles running on biofuels
- Transition analysis: for moving vehicles to biofuels
- Outreach is crucial; half the public are absolutely opposed to putting biofuels in their vehicles

Reviewer 10

While it was a logical decision a few years ago to focus efforts of the OBP on biofuels, rather than on biopower, OBP should re-evaluate that decision. There is an excellent opportunity to develop cellulosic feedstock supply chains through the deployment of biopower projects. This alternative energy industry can, and likely will – with a Renewable Power Standard – develop much sooner than the cellulosic biofuel industry due to delays in economic-technological success of biorefineries for cellulosic ethanol. Either the department should dedicate some additional funding for feedstock pre-processing for use in power generation systems, with most of the funding targeted towards the supply chain itself, or the OBP should collaborate with other agencies (e.g., the USDA) to promote this opportunity. Also, given recent publications that suggest that more miles are available per acre using electric motors and biopower compared with the internal combustion engine and biofuels (recent article by Campbell et al. in *Science*, 2009), and the efforts by the administration to support electrification of the fleet, biopower/fleet electrification might contribute significantly to enhancing energy security with environmental protection by 2022. The potential impact of the creation of a major biopower industry on the demand for petroleum-based transportation fuels will be determined by the extent to which the fleet can be electrified. With incentives for development of plug-in electric vehicles under ARRA, perhaps we could look toward a fleet with more than 30 million vehicles by 2022, allowing for as much as 10% of the driven miles to come from biomass-generated electricity.

I have a concern about infrastructure investment. Much of this is more an issue for the first generation, starch-based ethanol industry. Why is it not being addressed in that context, leaving more resources for the next generation, more sustainable biofuel developments. This could leave \$\$, for example, available for the Sustainability initiative.

Reviewer 11

This has been fully explained above.

Reviewer 12

For all of the reasons mentioned above, analysis, infrastructure and sustainability need to receive more funding. The non-technical obstacles to sustainable deployment of biofuels are under-represented in the commercialization strategy and the portfolio of research. The position of sustainability within the program needs to be more formally recognized, measured, and allocated resources commensurate with its importance to Program goals.

The use of system integration tools continues to be one of the Program's strengths. These efforts should be expanded to more comprehensively target limited Program resources to a broader set

of measurable performance goals. A more explicit articulation of how the results of these efforts actually influence the direction and resource allocation of other research areas would be very helpful as well at closing the “influence loop” and maximizing the value of that work.

10. Additional Comments

Reviewer 1

What is the definition of sustainability as related to investigative endeavors? Models have been used primarily as a result of assumption based on theoretical considerations. Until data, which can be used to validate the opinion based models, are generated, success of the overall program will be on thin ice. Those objectives based upon cellulose to ethanol must be completed.

As we go forward with newer, conjecture based efforts, e.g., algal work there is concern that in progress efforts will be placed on the sideline because of lack of sexiness.

Annual, comprehensive reviews are essential to program success.

A critical component of the review process was the well managed phone calls conducted during the period prior to the July meeting; also, the review members meeting periodically during the meeting resulted in good exchanges of ideas. IPA personnel and IBR reviewers must coordinate efforts to enhance forward studies.

The integrated efforts by OBP and BCS were critical and conducted professionally. For the reviews, it was obvious considerable planning and cooperative effort had been accomplished throughout the review processes, report filing, coordination of reports for Biomass program peer review. BCS personnel were available, willing to assist and forceful in organizing the review; their continued push, pull and demands were not only appropriate but absolutely necessary for completion. For the review of OBP in total, it is imperative to select reviewers knowledgeable not only in their disciplinary expertise but cognizant of peripheral information. For example, an enzymologist reviewing the biochemical platform must understand the criticality of logistics.

Reviewer 2

I would like to make some comments about the overall review process. The steering committee process was robust, complete and thorough. There was good participation and close management throughout (largely thanks to our esteemed chairpersons). The committee reviewed the majority of key documents and made many refinements that greatly improved the quality of the review (e.g. review questions, presentation templates, agendas, schedules). Calibration across platform reviews was challenging. Some of the reviews occurred concurrently. Nevertheless, the steering committee and BCS did a good job during the planning phase to cover reviews. The two co-chairs were present at most. There was good consistence and transparency across reviews.

Review activities were well organized by BCS. They kept the process moving and kept us all on track. Roles and responsibilities were clearly delineated. Steering committee work began in Oct 2008 with conference calls every two weeks.

Process management shortcomings: Project summaries were not available in time for platform reviews. This would have been tremendously helpful to have two weeks in advance of these meetings. Also, it would have been helpful to have steering committee members participate with review team on one or more conference calls prior to the platform reviews. In some cases this happened but not all. Project presenters were not properly prepared. Templates were not followed, presentations were of poor quality (one reviewer commented that the IBR presentations were good for the “Rotary Club”), presenters did not seem aware of the background of their audience. Platform reviews were too compressed. This was especially true for the IBR projects. In the case of IBR, reviewers should have 1-2 hours with projects to gain a true understanding of the details, and merits. As far as the platform review teams, it would have been more effective to use subteams of 2-3 reviewers to tackle project groups. This would result in a more focused approach and would allow for the leveraging of expertise. DOE presenters need to provide context-how does the platform fit with the overall objectives of the OBP program? The open IBR session should be held before the closed session to reduce risk of compromising intellectual property. DOE presentations for program review not ready ahead of time-this is not the biggest deal but just would have been helpful.

Given the level of funding, I would recommend IBR platform reviews be conducted on an annual basis.

Reviewer 3

This program is a really exciting opportunity – but a really challenging one, especially when some areas are funded too soon. Best of Luck!

I think it will have a very high visibility, and expectation of success, in the current administration, and note that the first expectations of large amounts of cellulosic ethanol will occur during its tenure.

Reviewer 5

The peer review process was conducted carefully, openly, transparently and fairly and was facilitated by an engaged contractor BCS. The Peer Review Guide specifies that a clear line is required which delineates a contractor led review process or a DOE program led review. The steering committee planning process, reviewer selections, platform evaluations were led by the contractor. At scheduled meetings prior to reviews there were DOE program managers who made significant contributions, explanations and provided background. Therefore the perception of who was leading the review process was occasionally blurred between the model of an independent contractor led review process and a DOE led process.

Reviewer 6

This program has a tremendously important national goal to achieve which will have incalculable impact on the national economy and national security. In the largest sense nationally and internationally the development of a renewable source of energy and transportation fuel is critical to achieve the simultaneous goals in energy growth, energy security, and climate that are emerging. The scientific and technical challenges are daunting and the goals aggressive, with an inordinately short timeline. With that in mind, the effort seems underfunded and the program is understaffed – the staff was quite obviously spread too thin and have been for some time. The staff also did not seem to have a sense of accountability for success in pursuing the overall cost and volume targets as defined in legislation.

Reviewer 7

It is completely disheartening that the goals of the program are so ambiguous. Everyone asked gave a different answer. This can't be good in a program. Everyone from privates to generals should know who the war is with. In this program they don't. Ditto for the funds being spent. Everyone gave different answers for the budget and its division. It seems that this should be a better defined number for a review that covers the past.

These goals have a big impact on whether the program will meet expectations, whether they be Congress' or society's. Goals seem to be split between cost and quantity. Cost can be a modeled goal, but quantity requires capital to be allocated and plants built. 2012 is occasionally

The quality of the science is high and the passion of the researchers is similarly high. A smart, motivated group. At the risk of sounding self-serving, the quality of the reviewers is high, as is the diversity. It is good to see so much industry involvement and that it isn't just a group of –DOE friends” reviewing the DOE. This should be a technical review. The budgeting process has been mentioned too much for my taste. Keep things on a technical plane, leave politics to a different meeting.

Reviewer 8

Overall the program has researched an impressive number of aspects of biomass production, conversion, marketing and distribution. Currently the program appears to have the tools and the means to move forward. Hopefully these recommendations can help support those efforts. To private individuals the amount of organization, personnel, and required reporting appears somewhat overwhelming but it looks like the organizational infrastructure is in place to handle the task. The focus should be on improving what you are doing.

Reviewer 9

- Coordinate with EPA
- Coordinate with DOT
- Coordinate with Vehicle Technologies
- Coordinate with whoever is bio-power

- Codes and standards development
- Coordinate with SAE
- Participate actively in IEA and other international activities

Reviewer 11

Comments above are sufficient.

11. Comments on the Review Process

Reviewer 3

Overall, the Review Process was EXCELLENT.

The emphasis on pseudo-quantification is too much. It is worth doing some numeration, but the numbers should not be taken too seriously – a judgment from an expert should be weighted more highly than one from a well-meaning amateur.

And only one question should be asked at a time – those used here are examples of asking several at once, implying a linkage that may not exist. DOE presentations should be available on the same time schedule as those from investigators and reviewers! Reviewers MUST have hard copies to expedite their reviews. I was not present at the IBR review, but it clearly needs careful thinking to ensure a more fruitful review next time.

Reviewer 6

The level of technical support and preparation was helpful, but the review teams needed more time in executive sessions where frank and open discussions could be pursued and allowed to run their course. In most cases the details mattered less than the high level conclusions that the panel was able to reach. It would be unfortunate if any reviewers went away feeling that the atmosphere wasn't as open as they are used to in other venues.

Reviewer 7

The review process is a lot of work for the reviewers. Much of this work is devoted to administrative rather than technical issues. The data required to address these issues should be covered by BCS, DOE or Golden Office and should not be left to the reviewers to tease out or occasionally recalcitrant presenters. A goal should be to make the most efficient use of the reviewer's time and *technical* acumen.

Consensus is not a dirty word. There should be not stated desire to drive toward consensus, but concerns over consensus should not limit open and frank discussion about the platforms or program.

The review process has all the indications of being a necessary but unwelcome exercise. I think it was completely backward having the new under secretary address us at the beginning of the review rather than listening to the panel's recommendations at the end of the review. The poor attendance by the DOE program folks is an indication that the review process is NOT viewed as important.

The expectations of the review process to impact an individual project should be clearly explained. It appears that the focus on projects is only because the projects sum to form the program. Therefore, the individual project scores go largely unused in managing the projects. This OK, but it should be explained clearly. It would curtail the rebuttal process and the careful focus on each individual project review. This would be especially liberating for the reviewers.

Reviewer 8

I have few comments regarding the review process. The preparation of materials and support was very good. There was a reasonable turn around in information. Many specific questions I have regarding how biochemical and thermochemical platforms fit into the overall biomass program would have been answered by structured presentations similar to what John Ferrell presented for the feedstocks platform by the technology managers for those platforms. That was a major omission.

Reviewer 9

The review process was managed by BCS magnificently. They did a great job preparing, coordinating, facilitating, keeping people on time. Two thumbs WAY UP. Nonetheless, everything was not perfect. Materials for review need to arrive much earlier. Some disconnect between BCS and DOE in terms of what should be covered at Platform and especially Program reviews. Last minute changes. Avoid this, it is frustrating. The bottleneck seems to be at DOE. The review forms and presentation templates will need tweaking for the next time. We learned a lot!

Reviewer 10

BCS did a very good job of organizing the entire process starting in October 2008 with steering committee meetings. I would note that having been through the process one time now, I would bring a different perspective to the utility of forms and processes. Fortunately there was continuity in the steering committee and the chairs of the different platform reviews, and this should remain an important element of assembling the steering committee and review teams going forward.

I was very impressed with the quality and commitment of the members of the biomass program review panel. The OBP and BCS are to be commended for the selection of my ten colleagues on the panel.

Attachment Five: Steering Committee 2009 Review Process Report

This brief report summarizes the experience of the steering committee in participating in the 2009 Biomass Program review. The program review panel members, summary of the overall implementation process and raw comments from steering committee members for each of the platform reviews are presented.

Steering Committee Members and Roles

The program review panel members and roles are presented in Table 1 below. Steering committee members participated in conference calls, planning, preparation, reviewing, and preparing feedback for the entire program Peer review process. In addition, chairs of the platform reviews joined the Steering for the overall program review.

Exhibit 18 – Program Review Panel

Steering Committee Members		
Name	Affiliation	Additional Role(s)
Neal Gutterson	Mendel Technologies	Feedstock and Biochemical Platform Attendee
Jay Keller	Sandia National Labs	SC Co-Chair, IBR, Feedstocks, Thermochemical Platform Attendee
Roger Prince	ExxonMobil	Biochemical Platform Attendee
Liz Marshall	World Resources Institute	Infrastructure and Analysis Platform Attendee
Terri Jaffoni	Private Consultant	IBR Platform Attendee
Susan Schoenung	Private Consultant	SC Chair, Infrastructure, Feedstocks, Conversion Platform Attendee
Fred Petok	USDA	IBR and Feedstock Platform Attendee
Platform Chairmen		
Name	Affiliation	Platform
Susan Schoenung	Private consultant	Analysis Platform Chair
Mike Tumbleson	University of Illinois	IBR Platform Chair
Mark Maher	General Motors	Infrastructure Platform Chair
Michael Knotek	Private Consultant	Biochemical Platform Chair
Mark Jones	Dow Chemical	Thermochemical Platform Chair
Tom Miles	Private Consultant	Feedstocks Platform Chair

Feedback on the Steering Committee Process: Steering Committee Response Summary

Six of seven steering committee members completed the questionnaire reviewing the overall implementation process. In addition to being asked for comments, the committee members numerically evaluated the first six statements on a scale of 1 to 5, 1 indicating strong disagreement and 5 indicating strong agreement.

Exhibit 19 – Steering Committee Feedback Process

Statement	Average Rating*
1. Review process was a rigorous, formal, and documented evaluation process using objective criteria.	4.7
2. Review was conducted in an independent, open and objective manner.	4.7
3. Review succeeded in conducting a qualified and independent review of the technical/ scientific/business merit, and the productivity and management effectiveness of the program.	4.5
4. There were incidents or anomalies in the planning and implementation of the program review that the Biomass Program should be made aware of.	2.0
5. Functions steering committee members were asked to perform aligned with the roles and responsibilities provided at the beginning of the process.	5.0
6. Amount of time required of steering committee members was in line with the estimate originally provided.	3.5

1 = Strongly Disagree; 5 = Strongly Agree

1. The program and platform review process was a rigorous, formal, and documented evaluation process using objective criteria.

Response Average: **4.7**

Steering committee members are of a consensus that the review achieved these goals. The success was attributed to the early start on organizing the committee, with “~~lose~~ management and coordination” on the part of BCS. Committee members were engaged at every step of the review process. They were given access to the platform-level materials to review well in advance, leaving ample time for questions and revisions.

The Committee members provided a few suggestions of actions they felt would further improve their evaluation process. This included changing how congressionally directed programs are incorporated into not only the review, but the overall program. They also felt that the “~~overabundance of barriers~~” makes it difficult to truly assess platform level progress. Instead key barriers should be identified for each of the platforms. Finally it was recommended that there be greater interaction between the review teams and steering committee members prior to the platform Reviews.

2. The review was conducted in an independent, open and objective manner.

Response Average: **4.7**

Steering committee members agreed that the review as a whole was conducted in a transparent fashion. There were however some unanswered questions as to how reviewers are selected and how a person can petition to become one. Also one committee member expressed disappointment over the level of disclosure for IBR projects, even within the closed sessions.

3. The program review succeeded in conducting a qualified and independent review of the technical/ scientific/business merit, and the productivity and management effectiveness of the program.

Response Average: **4.5**

Steering committee members felt that, with the exception of the IBR platform, the review process was successful in this. The key to this success was the individuals selected to participate in the review panels. They were noted as being well qualified, objective and interested in seeing the success of the overall program.

The challenge with the IBR review was not the individuals selected to participate but rather the information presented. The reviews did not have enough time to “gain a complete understanding of the technical and business attributes of a given project.” And, as noted above, it was felt that the information presented by many of the projects was insubstantial.

4. There were incidents or anomalies in the planning and implementation of the program review process that the Biomass Program should be made aware of.

Response Average: **2**

The steering committee members noted only one specific incident in the implementation of the review. An IBR presentation was allowed to extend past its allotted time, in the absence of the next presenter. This should be avoided in the future as all other projects were expected to strictly adhere to agenda designated time limits.

A more general complaint was that project-level presentations arrived late, with a few being uploaded immediately before being given. Last minute updates are not unusual for events of this type or magnitude but they do make it more difficult for reviewers to effectively evaluate projects.

5. **The functions you were asked to perform as a member of the steering committee aligned with the roles and responsibilities provided to you at the beginning of the process.**

Response Average: 5

6. **The amount of time you spent as a steering committee member was in line with the estimate originally provided to you “4 hours per month during the early planning and 8 hours per month the last two months prior to the reviews as well as attending the final program Peer review meeting”.**

Response Average: 3.5

The steering committee members felt that these estimates were low overall. The greatest disparity lay with the time necessary to prepare for and fully participate in the specific platform Reviews. A significant amount of time was required for the background reading needed to fully understand the process. It was suggested that this burden might be in part alleviated by an early-on presentation to the Committee addressing the relationship between the platform Reviews and overall program review.

7. **Should the program and platform Reviews continue to be a biennial requirement?**

The majority of the steering committee is of the opinion that the biennial requirement is insufficient. Projects receiving large amounts of funding should receive annual oversight; particularly the IBR platform projects.

8. **What aspects of the overall planning, coordination and implementation worked well?**

The steering committee had a positive experience working with the the Biomass Program Planning Team and BCS. They felt that the process was well coordinated from beginning to end. The biweekly conference calls were an ideal means of communication. They kept the Committee informed and provided the opportunity to ask questions or share suggestions.

9. **What areas of planning, coordination and implementation could be improved?**

The steering committee members put a significant amount of effort into evaluating the potential reviewers’ qualifications for the various platform reviews and even went so far as to make suggestions for additional reviewers to fill in gaps. They felt that their evaluations and suggestions were not given sufficient consideration.

10. **Other recommendations or comments:**

The Committee members suggest that a universal program presentation be developed for the reviewers. It could be presented before each platform review and would provide an overview including –structure, motivation, goals, critical path...” of the Biomass program. They feel that it

is important to understand how projects fit into the overall picture when evaluating them. Also, it would have been useful for the steering committee to meet with program Managers at the beginning of the process and receive an introductory briefing on the program.

Comments on the Platform Review Process

Steering committee members who attended platform reviews were asked immediately following the review to answer six questions. The responses provided here are the raw comments, not attributed to individual steering committee members.

Integrated Biorefinery Platform Review Steering Committee Responses

1. For yourself: did the process go pretty much as you expected, based on all the planning that was done? Were there any surprises?

I thought the planning that the steering committee did in advance of these meetings paid off. We had all the meetings well covered and the I/P concerns with the open/closed sessions proved to be a nonevent. For BCS' part, I thought the agendas/meetings were well-organized and time management was very good. However, I was disappointed with the caliber of the presentations. Many projects did not provide detailed pro formas showing projected IRR on the nth plant vs. where they stand currently or the pathway to get to the target. One of the reviewers summed it up perfectly when he said the presentations were good for the "Rotary Club". They simply lacked sufficient detail so that the reviewers, most of whom are engineers, could adequately evaluate the merits of the project. I was also annoyed by the whole NDA signing process. First of all, the documents were not sent well enough in advance for there to be adequate time to review and discuss changes. Then after the scramble to get the NDAs signed, I do not know why they needed them in the first place. There was not much difference between what was presented in both sessions and, with one exception, most of the presenters were not willing to share details (for example yield information). So what was the point to signing an NDA?

The process went according to plans, although I cannot honestly say what I expected. I noticed a polarity in perception based on the public presentations and the reactions of the reviewers in closed session at least for own part. That difference was surprising and reinforces the validity of the process.

2. For the reviewers: did the review seem to go as the reviewers had been prepared to expect, based on the planning done with the reviewers (materials sent, phone call preparation, etc.)? Were there any surprises?

I know that the reviewers were very critical of the lack of detail in the presentations. They felt the PIs needed to be more aware of the background and experience of their audience. From the wrap-up discussion, many reviewers seemed very disappointed in the merits of many of the projects and questioned continued funding. Because I was not on any of the reviewer calls prior

to the review, I cannot assess how the actual review may or may not have met reviewer expectations.

In closed session where reviewers were summarizing their reactions, the reviewers challenged the process, criticized the purpose of the reviews in light of their role and their ability to direct the program review process and elicit meaningful responses from presenters in closed sessions.

3. For the PIs / presenters: did the review seem to go as the presenters expected? Were they appropriately prepared? Were there any surprises?

I did not interview any of the PIs but my impression is that they did not understand their audience and did not understand what was expected of them, particularly in the closed session.

There was no expression of anxiety that I detected, the presenters seemed confident for the most part. I made no observations of closed session presentations, from what I have heard, there was a different dynamic at work in these presentations.

There was difference in interactions between the reviewers and presenters in the open session with respect to at least three open presentations; during these presentations fairly aggressive questioning resulting. Later on I learned that that the presenters had received earmarked grants and therefore had not presented in closed session.

4. Were there any incidents or anomalies during a review that the DOE should be made aware of?

No. I was not aware any incident or anomaly that would be a concern for DOE occurring in the sessions I attended.

5. If you attended more than one review, were they consistent with each other?

The open and closed IBR sessions were quite similar in content, with the exception of the additional projects at the end (i.e., Alltech, City of Gridley, LSU, and Vermont BERCC).

6. What suggestions (of any kind) would you make to improve the review process?

First, I think the open session should be before the closed. Content of the presentations in the closed session should be more robust, with specific details, pro formas shared with reviewers. PIs need to understand the expertise of their audience and provide the appropriate level of detail to ensure a thorough and effective review. It is difficult for reviewers to get a thorough understanding of a project in 20 minutes. I would suggest a different structure for future reviews. Reviewers should be able to sit across the table from PIs and spend one to two hours discussing project details. This type of venue would allow for more give and take and more probing and challenging questions. SC members should be integrated into the process from the outset. They should be on reviewer calls and on some PI calls. There were no SC members (to my knowledge)

on any of the IBR reviewer calls. Project summaries and, to the extent possible, presentations should be provided ahead of time.

Overall the entire process must be more rigorous. This particularly applies to the IBR platform, which accounts for the majority of DOE funding.

The reviewers clearly expressed the desire to obtain more information from the presenters, specifically questioning the value of financial information and quantitative information not forthcoming from presenters. Empowering the reviewers or enabling them to obtain better more complete information would be a recommendation.

Infrastructure Platform Review Steering Committee Responses

1. For yourself: did the process go pretty much as you expected, based on all the planning that was done? Were there any surprises?

The Infrastructure review went very smoothly. The BCS people had prepared everyone well. There was plenty of time and snacks. No surprises. I especially appreciated the introduction of the program, platform structure and review process by Alicia and Leslie.

The logistics of the reviews went smoothly. Reviewers requested that they receive copies of the presentations more in advance so that they had time to prepare. One reviewer suggested a week.

2. For the reviewers: did the review seem to go as the reviewers had been prepared to expect, based on the planning done with the reviewers (materials sent, phone call preparation, etc.)? Were there any surprises?

The reviewers did well. The chairman was ready. The presentation packets had been sent and reviewed in advance. There were no problems using the laptops for review input. Everyone stayed till the end. The only new material that the reviewers had not seen in advance was the set of report-out questions. They got through the process fine, but could perhaps have been better prepared for it. No surprises.

Mediators did a good job of keeping presentations on time. For fairness, it is important that reviewers stick to the time allotted and the presentation template provided. Presentations should be reviewed by staff when submitted and returned to PIs if they are not in the proper template.

3. For the PIs / presenters: did the review seem to go as the presenters expected? Were they appropriately prepared? Were there any surprises?

The PIs seemed comfortable with the process. Most stayed on schedule, most used the template provided. A few did not seem to have put much effort into their presentations.

It would be great if the person opening the meeting and describing the review process could provide information about how the reviews will be used, what sort of feedback will be provided to PIs, and what type of accountability or follow-up measures take place.

4. Were there any incidents or anomalies during a review that the DOE should be made aware of?

No.

I think reviewers would also benefit from a little advance notice about how #3 works, and more specifically about what the range of their recommendations could include. At one review, for instance, reviewers felt that the PI could benefit from additional training in the area—is that a valid recommendation to make? Are there other legitimate reviewer suggestions that go beyond reactions to what has been presented into the realm of proactively guiding the project?

5. If you attended more than one review, were they consistent with each other?

Yes, although I think the Infrastructure platform did a better job of putting things in context. The processes were the same.

6. What suggestions (of any kind) would you make to improve the review process next time?

I think the reviewer questions should include a separate question about the presentation itself. Was it detailed enough? Did it follow the template? Was it legible, logical? Were there units on the charts?

I think it is important for reviewers to stay for all the presentations and for the reviewer feedback discussion at the end of the day—that is where much of the substance of #3 and #4 comes out.

Analysis Platform Review Steering Committee Responses

1. For yourself: did the process go pretty much as you expected, based on all the planning that was done? Were there any surprises?

Yes, although the DOE lead seemed not completely familiar with the process. The BCS folks did a great job keeping things on track. A brief discussion of the process was added in real time at the opening. No surprises.

The logistics of the reviews went smoothly. Reviewers requested that they receive copies of the presentations more in advance so that they had time to prepare. One reviewer suggested a week.

2. For the reviewers: did the review seem to go as the reviewers had been prepared to expect, based on the planning done with the reviewers (materials sent, phone call preparation, etc.)? Were there any surprises?

There were several reviewers who left early. This is not really acceptable. They should be very clear about what their time commitment is. If a reviewer cannot commit to the full time, find someone else. One reviewer was unhappy/argumentative (at first) about using the laptop tool and being expected to complete his review during the review time. In the end, he found himself comfortable with it and the whole process. The reviewers did not get the presentations until the evening before. This was not enough time to prepare in advance. No real surprises, except the reviewers leaving early.

Moderators did a good job of keeping presentations on time. For fairness, it is important that reviewers stick to the time allotted and the presentation template provided. Presentations should be reviewed by staff when submitted and returned to PIs if they are not in the proper template.

3. For the PIs / presenters: did the review seem to go as the presenters expected? Were they appropriately prepared? Were there any surprises?

Many of the presentations were too long and had to be cut off. The reviewers did not get their full time for questions. PIs should be given a strong reminder that they will only have the allotted time. Several did not use the template and so were difficult to review. No significant surprises.

It would be great if the person opening the meeting and describing the review process could provide information about how the reviews will be used, what sort of feedback will be provided to PIs, and what type of accountability or follow-up measures take place.

4. Were there any incidents or anomalies during a review that the DOE should be made aware of?

No.

I think reviewers would also benefit from a little advance notice about how #3 works, and more specifically about what the range of their recommendations could include.

5. If you attended more than one review, were they consistent with each other?

The two I attended had consistent processes. The introduction / setting the stage was better in the Infrastructure review. Also there was more time for reviewers to write.

6. *What suggestions (of any kind) would you make to improve the review process next time?*

I think the reviewer questions should include a separate question about the presentation itself. Was it detailed enough? Did it follow the template? Was it legible, logical? Were there units on the charts?

The set of report-out questions should be sent to reviewers in advance.

The slide titled "Success Factors and Barriers" was not used consistently by presenters. For next time, I think these need to be separate or reworded.

Feedstock Platform Review Steering Committee Responses

1. *For yourself: did the process go pretty much as you expected, based on all the planning that was done? Were there any surprises?*

There were few surprises, in fact this section went very well and was facilitated by the program personnel from DOE. The atmosphere between reviewers and presenters was collegial, productive and informative.

The process was as I expected.

2. *For the reviewers: did the review seem to go as the reviewers had been prepared to expect, based on the planning done with the reviewers (materials sent, phone call preparation, etc.)? Were there any surprises?*

The reviewers benefited from an introductory dinner, outlining the work schedule ahead. Compliments to the DOE team effort in facilitating the reviews, job well done.

The reviewers generally seemed comfortable with the process.

3. *For the PIs / presenters: did the review seem to go as the presenters expected? Were they appropriately prepared? Were there any surprises?*

The PIs were well prepared and were made appropriate focused presentations. The PIs kept to the schedule for presentations and questions. They were no surprises. The division of some presentations to a smaller room was made clear in the schedule documents but was not anticipated. The atmosphere in the smaller room was more presented opportunities for more discussion, almost a seminar like feeling. To be objective, I only attended one presentation in the smaller room.

The interaction between reviewers and the presenters seemed very good. The PIs followed the format generally very well.

4. Were there any incidents or anomalies during the review that the DOE should be made aware of?

No incidents, there was a member of the public who was present at the Reviewers only summary session. He sat at the rear of the room and had no influence on the discussion. Most of the reviewers sat with their backs to the individual and were not necessarily aware that he was even in the room. Someone placed a sign up that the session was "For reviewers only" afterwards. I do not believe that any influence was exerted or felt because of this presence.

None I can think of.

5. If you have attended more than one review, were they consistent with each other?

The format was similar, but I would characterize the content and the reactions of reviewers as quite different. The integrated biorefinery reviewers were privy to proprietary information, information they did not receive. The biorefinery platform reviewers felt short changed by the PI's presentations.

The feedstock and biochemical platform reviews were similar in nature. I felt that the reviewer team in the feedstock review had been a bit better prepared, and therefore was better organized, than the group for the biochemical platform. This may have been a function of the group chairs. Tom Miles was extremely organized and focused. I didn't get quite that sense from the biochemical platform chair, although in one-on-one conversations Mike was very thoughtful in the needs of the biochemical conversion platform.

Only the Feedstock review held a feedback session for the PIs.

There was consistency in each review (Feedstock, Thermochemical and Biochemical) about the purpose of the review and how it all works. Leslie did a good job with this. There was inconsistency, however, in how much introductory / programmatic information was provided. The more overview provided at the beginning, the better for the reviewers to put things in context. The very best introductory talk was made by John Ferrell at the Feedstock review.

6. What suggestions (of any kind) would you make to improve the review process next time?

With respect to feedstock presentations, more time and a smaller setting would produce more interchange and facilitate the process.

Some reviewers in private and in public comments were concerned about overlapping research efforts in data collection sets and potential uses. Overall the process functioned well and was perceived to by reviewers and the public to be valuable in my opinion.

I would recommend that the lunchtime be better utilized, and that time be set aside at the end of each day for at least an hour for the review team to meet and discuss progress with the review, specific projects, etc. One way to better utilize the lunch hour would be for the entire review team to eat together, with anyone from the steering committee focused on that platform. The lunch tables, for example, could have been marked by reviewer groups & staff to foster review panel interaction.

Certainly the process was fair, equitable and very well put together by BCS and DOE.

Biochemical Platform Review Steering Committee Responses

1. For yourself: did the process go pretty much as you expected, based on all the planning that was done? Were there any surprises?

It was reasonably well organized, although sobering to see the inability of the overseers to work the computer system. The overview NREL talks were not nearly as professional (or competent) as I had hoped for. The “just in time” delivery of the agenda from Kinko's would have been fine if they had produced the correct agenda. Does it have to be so rushed?

The process was as I expected, and the biochemical platform review was generally quite similar to the feedstock platform review. I found it a bit unfortunate that the biochemical reviewer group did not meet at the end of the first day to discuss process and initial projects being reviewed.

The process went pretty much as planned. The BCS folks have this pretty well worked out. It was a bit awkward with two reviews going on at the same time, but the schedules were not completely coordinated.

The first morning in the Biochemical review, the “timer” person was not timing the presentation and the Q&A separately, which meant some Q&A time was cut short. This was fixed and then worked out much better.

One hour was apparently not enough for lunch, for the attendees to go out into town and get back for the afternoon start. After the first day, most went for fast food at the food court.

2. For the reviewers: did the review seem to go as the reviewers had been prepared to expect, based on the planning done with the reviewers (materials sent, phone call preparation, etc.)? Were there any surprises?

They appeared reasonably well prepared—it was good that the computers worked well enough, and that a mouse was available for the reviewer who asked for it. The numerous pull down menus required for their reviews seemed somewhat onerous—it was a lot to ask of them, and it clearly reduced the number of questions because they were all so busy. It might be good to suggest that each reviewer ask at least an average of half a question per presentation.

The reviewers generally seemed comfortable with the process.

The reviewers seemed prepared; they adapted the laptop functions fairly easily. There was some inconsistency about "Stage" terminology—the reviewers were expecting something different from what the presenters were using. There were some questions among the reviewers about why projects which had only received their funding in February were being reviewed. There was also a question about a project on "stop work." Also some general questions about how some projects were ever awarded in the first place, but these were mostly earmarks.

3. For the PIs / presenters: did the review seem to go as the presenters expected? Were they appropriately prepared? Were there any surprises?

They seemed well prepared. It would probably save time if only proposals funded for at least a year were invited; it would certainly save some embarrassment.

The interaction between reviewers and the presenters seemed very good. The PIs followed the format generally very well.

In general, the presenters were appropriately prepared. Some presentations were simply too long. The presenters respected being told to stop, if that became necessary. In the Biochemical platform review, some presenters' times were shortened, which was a surprise to the presenters.

4. Were there any incidents or anomalies during the review that the DOE should be made aware of?

No. None I can think of.

5. If you have attended more than one review, were they consistent with each other?

The feedstock and biochemical platform reviews were similar in nature. I felt that the reviewer team in the feedstock review had been a bit better prepared, and therefore was better organized, than the group for the biochemical platform. This may have been a function of the group chairs. Tom Miles was extremely organized and focused. I did not get quite that sense from the biochemical platform chair, although in one-on-one conversations Mike was very thoughtful in the needs of the biochemical conversion platform.

For the most part, Feedstocks, Biochemical and Thermochemical were similar, although I was a bit surprised that the Biochemical review agenda did not follow the same format as all the others. Only the Feedstock review held a feedback session for the PIs.

There was consistency in each review about the purpose of the review and how it all works. Leslie did a good job with this. There was inconsistency, however, in how much introductory / programmatic information was provided. The more overview provided at the beginning, the better for the reviewers to put things in context.

6. *What suggestions (of any kind) would you make to improve the review process next time?*

Ensure the chair people for the sessions were shown how to work the computer.

I would recommend that the lunchtime be better utilized, and that time be set aside at the end of each day for at least an hour for the review team to meet and discuss progress with the review, specific projects, etc. One way to better utilize the lunch hour would be for the entire review team to eat together, with anyone from the steering committee focused on that platform. The lunch tables, for example, could have been marked by reviewer groups & staff to foster review panel interaction.

Please insist that all presenters (including DOE) spell out acronyms. There is enough terminology already, without trying to interpret hundreds of acronyms.

There were many unclaimed badges, indicating people who registered but did not come. Apparently there were also many people who came without having registered. This is a problem for a free meeting, but it seems there should be some way to manage it better.

There were some issues with the hotel—finding the room, cell coverage, internet access. Also, the continental breakfasts were better at all the other reviews.

Thermochemical Platform Review Steering Committee Responses

I think Mark Jones (the review panel chair) did an outstanding job running the review process. There were on the order of 40 projects that were reviewed. BCS did an excellent job keeping the review on schedule, hence, all projects were given fair opportunity to present and respond to the Q&A. The review panel did an excellent job at evaluating each project in a fair, just, and transparent manner. During the review panel discussions after the review the panel did ask (and I authorized) BCS perform a statistical analysis of the numeric scoring. This amounted to calculating the average and a high and low score for each project. This was used to look for outliers so that the review team could focus its discussion on those projects where there seemed to be some significant disagreement on performance. This was in no way used to drive the team to consensus only to highlight those projects that deserved further discussion to make sure that the review team interpreted the presentation and work in an internally self consistent way. As the cognizant steering committee present, I can testify that the review team used this analysis only as a tool to highlight for discussion and did NOT drive to consensus. The review team found this tool to be particularly useful in eliminating the need to discuss all 40 projects in detail. Indeed, it also provided additional information about why some of the projects scored high and particular those that scored low. It was noted that most of the CDP scored on the low end of the ranking and many did so because of lack of relevance to the platform goals and direction. This was noted as a frustration and a hardship for the department.

On a slightly different issue, there were some projects that did not follow guidelines nor took the review process seriously. Indeed, one project simply blew off the review by not showing up to present, without even providing an alternate. This was particularly disturbing.

1. For yourself: did the process go pretty much as you expected, based on all the planning that was done? Were there any surprises?

The process went as I expected and there were no surprises.

The process went pretty much as planned. The BCS folks have this pretty well worked out. It was a bit awkward with two reviews going on at the same time, but the schedules were not completely coordinated.

One hour was apparently not enough for lunch, for the attendees to go out into town and get back for the afternoon start. After the first day, most went for fast food at the food court.

2. For the reviewers: did the review seem to go as the reviewers had been prepared to expect, based on the planning done with the reviewers (materials sent, phone call preparation, etc.)? Were there any surprises?

A frequent comment from the reviewers was a desire to get presentation materials from the PIs earlier so they could be better prepared. It was also noted that the projects at the bottom of the scoring (mostly CDP) did not follow the provided templates, did not send ahead presentation materials sufficiently in advance, did not take the process seriously, and a couple simply blew off the review meeting. This made it particularly difficult on the review panel to perform their job. There were no surprises.

3. For the PIs / presenters: did the review seem to go as the presenters expected? Were they appropriately prepared? Were there any surprises?

The reviewers seemed prepared and they adapted the laptop functions fairly easily. There was some inconsistency about "Stage" terminology—the reviewers were expecting something different from what the presenters were using. There were some questions among the reviewers about why projects which had only received their funding in February were being reviewed. There was also a question about a project on "stop work." Also some general questions about how some projects were ever awarded in the first place, but these were mostly earmarks.

For the most part, the review seemed to go as presenters expected and PIs were prepared for the most part. I was amazed at how many presenters did not respect this process. For the most part they were the CDP; however, some of the CDPs did respect the process and some of the non-CDP projects, but large industrial projects also disrespected the process. I think most of the later

categories were concerned about IP issues, even though the program went out of its way to have a behind closed doors, limited access review of those projects.

In general, the presenters were appropriately prepared. Some presentations were simply too long. The presenters respected being told to stop, if that became necessary. In the Thermochemical platform review, there were some missing presenters, which was unfortunate for the schedule.

4. Were there any incidents or anomalies during the review that the DOE should be made aware of?

The DOE needs to have some recourse on the PIs of ALL projects to instill a sense of respect for this process.

5. If you have attended more than one review, were they consistent with each other?

Taking into account necessary differences the answer is yes. Where it is important, internal self consistency across the platforms, transparency in the process this review was very well executed.

For the most part, Feedstocks and Thermochemical platform reviews were similar. There was consistency in each review about the purpose of the review and how it all works. Leslie did a good job with this. There was inconsistency, however, in how much introductory / programmatic information was provided. The more overview provided at the beginning, the better for the reviewers to put things in context.

6. What suggestions (of any kind) would you make to improve the review process next time?

All PIs need to take the process seriously (how DOE will make this happen is a good question), and prepare presentations according to the guidelines as well as do so sufficiently far in advance so the review panel can get advance copies to prepare for the review.

Please insist that all presenters (including DOE) spell out acronyms. There is enough terminology already, without trying to interpret hundreds of acronyms.

There were many unclaimed badges, indicating people who registered but did not come. Apparently there were also many people who came without having registered. This is a problem for a free meeting, but it seems there should be some way to manage it better.

There were some issues with the hotel—finding the room, cell coverage, internet access. Also, the continental breakfasts were better at all the other reviews.

Comments on the Program Review Process

Raw comments regarding the overall program review process follow:

Overall, the review Process was EXCELLENT.

The emphasis on pseudo-quantification is too much. It is worth doing some numeration, but the numbers should not be taken too seriously; a judgment from an expert should be weighted more highly than one from a well-meaning amateur.

And only one question should be asked at a time—those used here are examples of asking several at once, implying a linkage that may not exist.

DOE presentations should be available on the same time schedule as those from investigators and reviewers! Reviewers MUST have hard copies to expedite their reviews.

The level of technical support and preparation was helpful, but the review teams needed more time in executive sessions where frank and open discussions could be pursued and allowed to run their course. In most cases the details mattered less than the high level conclusions that the panel was able to reach. It would be unfortunate if any reviewers went away feeling that the atmosphere was not as open as they are used to in other venues.

The review process is a lot of work for the reviewers. Much of this work is devoted to administrative rather than technical issues. The data required to address these issues should be covered by BCS, DOE or Golden Office and should not be left to the reviewers to tease out or occasionally recalcitrant presenters. A goal should be to make the most efficient use of the reviewers' time and *technical* acumen.

Consensus is not a dirty word. There should be not stated desire to drive toward consensus, but concerns over consensus should not limit open and frank discussion about the platforms or program.

The review process has all the indications of being a necessary but unwelcome exercise. I think it was completely backward having the new under secretary address us at the beginning of the review rather than listening to the panel's recommendations at the end of the review. The poor attendance by the DOE program folks is an indication that the review process is NOT viewed as important.

The expectations of the review process to impact an individual project should be clearly explained. It appears that the focus on projects is only because the projects sum to form the program. Therefore, the individual project scores go largely unused in managing the projects. This OK, but it should be explained clearly. It would curtail the rebuttal process and the careful focus on each individual project review. This would be especially liberating for the reviewers.

The preparation of materials and support was very good. There was a reasonable turn around in information. Many specific questions I have regarding how biochemical and thermochemical platforms fit into the overall biomass program would have been answered by structured presentations similar to what John Ferrell presented for the Feedstocks platform by the technology managers for those platforms. That was a major omission.

The review process was managed by BCS magnificently. They did a great job preparing, coordinating, facilitating, keeping people on time. Two thumbs WAY UP.

Materials for review need to arrive much earlier.

Some disconnect between BCS and DOE in terms of what should be covered at platform and especially program reviews.

Avoid last minute changes; it is frustrating. The bottleneck seems to be at DOE.

The review forms and presentation templates will need tweaking for the next time. We learned a lot!

BCS did a very good job of organizing the entire process starting in October 2008 with steering committee meetings. I would note that having been through the process one time now, I would bring a different perspective to the utility of forms and processes. Fortunately there was continuity in the steering committee and the chairs of the different platform reviews, and this should remain an important element of assembling the steering committee and review teams going forward.

I was very impressed with the quality and commitment of the members of the biomass program review panel. The Biomass Program and BCS are to be commended for the selection of my ten colleagues on the panel.

EERE Information Center

1-877-EERE-INF (1-877-337-3463)

www.eere.energy.gov/information_center

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

DECEMBER 2009

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 10% post consumer waste.