U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

BIOMASS PROGRAM

SUSTAINABILITY

2011 Platform Review Report

An Independent Evaluation of Platform Activities for FY 2010 and FY 2011

Review Date

April 5, 2011

February 2012

Department of Energy
Washington, D.C. 20585

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 Sustainability Platform Review meeting, held on April 5, 2011, at the Doubletree Hotel in Annapolis, Maryland.

All programs in the Department of Energy's Office of Energy Efficiency and Renewable Energy are required to conduct a formal peer review of their project portfolios as a means for enhancing the management, relevance, effectiveness, and productivity of the activities. This report documents the process utilized by the Biomass Program in conducting its fiscal year 2011 Peer Review, the resulting opinions and recommendation from the Review Panel who was tasked with evaluating the Sustainability Platform, and the Program's response to the results and recommendations. Additional information on the 2011 Biomass Program Peer Review Process—including all presentations and a full compilation of reviewer comments for each of the individual Platform Review meetings and Program Review meeting—are available on the Program Review website at http://obpreview2011.govtools.us.

The Biomass Program Peer Review process involves a systematic review of the project portfolios of eight separate technology platforms managed by the Program and a separate meeting where the entire Program was comprehensively reviewed. The Biomass Platform Reviews were conducted from February through April 2011 in the Washington, D.C., and Denver, Colorado, areas. The Platform Reviews resulted in the Peer Review of the Program's projects in applied research, development, and demonstration, as well as analysis and deployment activities. The Program Peer Review, held in June 2011, was conducted to evaluate the Program's overall strategic planning, management approach, priorities across research areas, and resource allocation.

The recommendations and evaluations provided by the expert Peer Review Panels are routinely used by the Biomass Program staff to conduct and update out-year planning for the Program and technology platforms. The review results are considered in combination with other critical project information to result in a complete systematic evaluation of the progress and accomplishments achieved by the individual projects, the platforms, and the Program toward programmatic milestones, project goals, and objectives.

I would like to express my sincere appreciation to the reviewers. They make this report possible, and we rely on their comments to help make project and programmatic decisions for the new fiscal year. Thank you for participating in the 2011 Sustainability Platform Peer Review meeting.

Alison Goss Eng
Sustainability Platform Technology Manager
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

EXECUTIVE SUMMARY

Summary from Review Panel

The reviewers appreciate the opportunity to participate in the Sustainability Platform Review. The reviewers were impressed with the quality of work in all of the projects and the cross collaboration. The international collaboration projects were stressed as beneficial by the reviewers, and the reviewers were impressed with how the Department of Energy's (DOE) involvement is making a strong impact. The projects that were presented confirmed that feedstock production dominates the sustainability performance of biofuels. The reviewers encourage the Biomass Program to include a detailed on-the-ground case study to understand the variations and deviations in feedstock production pathways due to locally important attributes. The field case studies are a key to success and need to be maintained.

The projects addressing water use should be more nuanced. Plants do not "use" water in the same way that oil production uses water. Plants perform the valuable service of regulating soil moisture content and reducing runoff by removing excess moisture through transpiration. In this process, they purify and recycle the water from one watershed to another. However, if a bioenergy crop increases transpiration and reduces stream flows in a water-limited region, this imposes a new cost on downstream consumers or ecosystems, even if there is a potential benefit elsewhere from the atmospheric moisture. Therefore, the water use metric should be applied in a way that reflects the situation in which the bioenergy crop is grown.

As part of the Sustainability Platform, the reviewers urge an evaluation of the Renewable Fuel Standards (RFS) petroleum baseline alongside the biofuel evaluations. The evaluation for both pathways should follow a common methodology, especially for evaluating the water use for both pathways. In addition to the RFS petroleum baseline, a comparison of the thermochemical pathways to the gas-to-liquid process is needed. DOE has chosen life-cycle analysis methodology to understand the environmental impacts of the biofuel pathways. The life-cycle analysis methodology is a useful tool for these evaluations; however, DOE needs to be exemplary in its adherence to life-cycle analysis principles around boundary conditions, allocations, and sensitivity analysis.

All of the projects in the Sustainability Platform aimed at achieving the sustainability technical targets set by the Platform. The targets set by the Sustainability Platform, however, do not include an evaluation of the social effects of sustainability as described by the Sustainability Platform objective. The reviewers suggest integrating social scientists to address two key research area needs: (1) research barriers that landowners will face for growing the biomass and what incentives will influence the landowners, and (2) research and develop metrics for social impacts of land-use change, such as impacts on labor and population displacement.

In general, all metrics and targets identified should be rationalized and externally validated. All modeling approaches should include sensitivity analyses and be kept flexible as DOE continues to bring in data from outside sources. Finally, the Biomass Program has several positive sustainability stories to share with the public. The reviewers encourage the Program to communicate these sustainability stories about the environmental improvements that large-scale biofuel production systems can provide for our country.

Summary of Results: Platform

Criteria	Average	Range	Std.Dev.
1. Relevance	8.3	*7-9*	0.70
2. Approach	7.9	*7-9*	0.64
3. Progress	8.0	*6-9*	1.20

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

Summary of Results: Project Portfolio

WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comments
			Continue Project	Continue with Possible Adjustments to Scope	Other	
11.1.1.5	Bioenergy sustainability: how to define and measure; Oak Ridge National Laboratory; Virginia Dale	9.1	X	-	-	This project will continue to improve understanding of how bioenergy choices can affect sustainability and how those effects can be measured.
6.5.2.4	International: Sustainability A; Oak Ridge National Laboratory; Keith Kline	9.1	X	-	-	This project will continue to support cooperation among DOE labs and other partners to improve understanding and increase the environmental sustainability of bioenergy production systems, particularly by developing international support for standard definitions, criteria, and methods to assess land-use change and sustainability.
11.1.1.4	Forecasting water quality and aquatic biodiversity; Oak Ridge National Laboratory; Yetta Jager	8.1	X	-	-	This project will continue to quantify relationships between bioenergy production and water quality and the aquatic biodiversity needed to demonstrate long-term sustainability of the biofuel industry.
11.1.1.3.c	Life-cycle assessment of EISA; National Renewable Energy Laboratory; Daniel Inman	7.9	X	-	-	This project will continue to provide a consistent life-cycle assessment framework to assess multiple feedstock-to-fuel pathways, from producing the feedstocks to vehicle end use.

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WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comments
			Continue Project	Continue with Possible Adjustments to Scope	Other	
6.3.2.26	International: IEA; Idaho National Laboratory; Richard Hess	7.8	X	-	-	This project will continue participating in the International Energy Agency's Task 40 efforts to reduce greenhouse gas emissions, secure energy supplies, and achieve rural development in bioenergy.
6.5.8.1	International: Sustainability B; National Renewable Energy Laboratory; Helena Chum	7.6	X	-	-	This project will continue to collaborate with domestic and international partners, particularly the Intergovernmental Panel on Climate Change and the Brazilian bilateral project, to synthesize and integrate existing knowledge, identify gaps, and improve the understanding of the multiple uses of biomass for energy, as well as factors that contribute to sustainable practices.
11.1.1.1	Analysis efforts for water use impact of biofuels production; Argonne National Laboratory; May Wu	7.4	X	-	-	This project will continue to quantify relationships between bioenergy production and the water quality and water resource availability needed to demonstrate long-term sustainability of the biofuel industry.
11.1.1.3	Identification of sustainability metrics; National Renewable Energy Laboratory; Daniel Inman	7.1	X	-	-	This project will continue life-cycle assessment, conversion process modeling, air-quality modeling, and system dynamic modeling platforms are used to provide detailed environmental modeling of the biofuel supply chain, at a high resolution, for a broad range of sustainability metrics.

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WBS Number	Project Title; Presenting Organization; PI Name	Final Average Score	Next Steps			Technology Manager Summary Comments
			Continue Project	Continue with Possible Adjustments to Scope	Other	
3.1.2.4	Sustainability metrics for thermochemical conversion; Pacific Northwest National Laboratory; Lesley Snowden-Swan	7.0	X	-	-	This project will continue to research sustainability metrics, baselines, and targets for thermal conversion processes likely to be used for producing advanced biofuels and contribute to the development of conversion facilities that are optimized for both cost and environmental benefits.
11.1.1.6	Impacts of biomass production related to climate change and water availability; Pacific Northwest National Laboratory; Mark Wigmosta	6.5	X	-	-	This project will continue to compare potential and optimal locations under current and altered climate to identify the most sustainable feedstock locations with high productivity under a changing climate.

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INTRODUCTION

On April 5, 2011, the U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), Biomass Program held a peer review of its Sustainability Platform. The Platform Review was part of the overall 2011 Program Peer Review implemented by the Biomass Program. The peer review is a biennial requirement for all EERE programs to ensure the following:

> *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 results of the Program Peer Review are used by Biomass Program Technology Managers in the generation of future work plans and in the development of annual operating plans, multi-year program plans, and potentially in the redirection of individual projects.

Alison Goss Eng was designated by the Biomass Program as the lead for the Sustainability Platform. In this capacity, she was responsible for all aspects of planning and implementation including coordinating the Review Panel, coordinating with principal investigators (PIs), and overall planning for the Platform Review. She was assisted in this effort with resources from a Peer Review implementation team comprised of logistics and Peer Review implementation contractors and DOE staff from the Golden Office.

Approximately 100 people attended the Sustainability Platform Review meeting. An agenda for the meeting is provided in Attachment 1. A list of attendees is provided in Attachment 2. Presentations given during each of the Platform Review meetings, as well as other background information, are posted on the Peer Review website: http://obpreview2011.govtools.us.

The remainder of this section provides a brief description of the implementation process for the Platform Review meetings, identifies the Sustainability Review Panel, and describes the role of the Steering Committee.

This report represents the results of the Sustainability Platform Review and evaluation of the Platform and the individual projects in its research portfolio. A separate Program Review Report has been developed following the June Program Review meeting. The Program Review Report may also include additional comments related to this Platform.

Biomass Program Peer Review Process

The Biomass Program followed guidelines provided in the EERE Peer Review Guide in the design and implementation of the platform reviews and Program Peer Review. An outside Steering Committee was established to provide recommendations and help ensure an independent and transparent review process. A description of the general steps implemented in each of the Program Peer Reviews is provided in Exhibit 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 comprising staff from the Biomass Program, DOE Golden Office, National Renewable Energy Laboratory Systems Integrator, and contractor support. The planning team held weekly planning meetings beginning in September 2010 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 planning activities included input from the following committees:

1. **Biomass Program Internal Peer Review Committee** – To ensure the quality of the process, exchange information efficiently, and communicate meeting and activity specifics throughout the review process, all of the Platform Leads were invited to participate in weekly conference calls involving contractor and DOE Program Review Lead.

2. **Biomass Program Peer Review Steering Committee** – Following EERE Peer Review guidance, a Steering Committee was formed to help ensure an independent and transparent expert review of the Biomass Program's research, development, and deployment (RD&D) portfolio. They serve as a working partner with the Biomass Program and are involved throughout the planning and implementation of the review process, providing comment 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 are

    - 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
    - Be present at the overall Program Peer Review, participate as Program Peer Reviewer, and complete required review forms for the Program Peer Review. This includes reviewing the Biomass Program structure, Program management decision-making processes, selection processes, portfolio balance, and progress in achieving Program mission and goals.

Twenty individuals were nominated to be considered for the Steering Committee, with a target of selecting seven members. In the end, only six Steering Committee members were selected to be on the Committee. Decision criteria included:

- 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 non-governmental organization.

Final selection was made by the Biomass Peer Review Planning Team and Team Leader. A list of Steering Committee members is provided in Attachment 3. The Steering Committee met through biweekly conference calls, which began in September/October 2010. Committee recommendations were provided to the Platform Review planning teams as they made throughout the planning process.

Exhibit 1 | Basic Steps in Implementing the Biomass Program Peer Review

1. The Program's research, development, and demonstration (RD&D) and analysis project portfolio was organized by the eight platform areas.
2. A Lead was designated for each Platform Review. The Platform Review Lead was responsible for all aspects of planning and implementation, including coordinating the Review Panel, coordinating with PIs, and overall planning for the Platform Review. Each Platform Lead was assigned contract support resources to assist in the implementation of the associated activities.
3. Each platform identified specific projects for review from its portfolio. Target: Review at least 80% of the Platform's total budget.
4. An internal Peer Review committee (IPRC) comprised of leads of each of the eight platforms, the DOE Program Review Lead, and the Peer Review Implementation team was formed to enhance communications, discuss relevant issues and concerns, and ensure the quality of the process. Meetings of the IPRC were held weekly.
5. A Steering Committee of external, independent experts was formed to provide recommendations for designing and implementing the review and the scope, criteria, and content of the evaluation. Meetings with Steering Committee members were held every two weeks.
6. Draft Project-level, Platform-level, and Program-level evaluation forms were developed for the 2011 Platform Review meetings. Similarly, draft presentation and project abstract templates and instructions were developed. EERE Peer Review Guidelines and previous forms were evaluated in developing the drafts. Separate forms were used for RD&D and analysis projects. The Steering Committee reviewed and modified the forms before they were finalized.
7. Each Platform Lead identified candidate members for the Platform Review Panel. The Peer Review Lead requested Steering Committee feedback of candidate reviewers. Biographies that were available were provided to the Steering Committee for review. The Committee provided yes/no recommendations on candidates, and they recommended other candidates for the platforms to consider. Results were provided to Platform Leads for consideration in the final selection of Review Panels.
8. Upon confirmation, each Review Panel member was contacted by the Golden Office and registered as an individual contractor for the purpose of the Peer Review Process. The Golden Office also communicated important information on their responsibilities, reimbursement procedures, and issues regarding COIs to the reviewers. Each reviewer received COI forms prior to the review meeting; forms were also collected prior to the meeting. A minimum of two conference calls were held for each Platform Review Panel, as well as Peer Review organizers, Golden Office and reviewers to verbally discuss background information on the review, instructions, evaluation forms, presentation templates, and other information pertaining to the Platform Review process. Project lists, abstracts, and presentations were provided to each reviewer in advance of the review meeting via a secure meeting website. To the extent possible, representatives from the Steering Committee participated in those calls.
9. The Biomass Program performed outreach to encourage participation in each of its Platform Review meetings by sending announcements to more than 3,000 Program stakeholders, PIs, and attendees at previous Program events. The Program Reviews were also announced on the Biomass Program website.
10. Platforms invited PIs to present their project(s) at the Platform Review. PIs were provided with presentation templates and instructions, reviewer evaluation forms, and background information on the review process. Conference calls were held with PIs to address questions. PIs who chose not to present received requests to submit forms stating such.
11. Platform Review meetings were held according to guidelines developed by the Steering Committee, IPRC, and the Peer Review Implementation team. Members of the Steering Committee participated in each review to ensure consistency and adherence to guidelines.
12. Review Panel evaluations were collected during each Platform Review meeting using an automated Web-based tool. These evaluations were accessible via a password-protected website following each review, and review panelists had approximately 10 working days to edit and finalize their comments. PIs then had approximately 10 working days to access the review results using the same password-protected website. PIs were also given the opportunity to respond to Review Panel evaluations via the same tool, and all comments are made publically available with the issuing of the final Platform Report.
13. Results of Review Panel evaluations and PI responses were provided to each Platform Review Lead for overall evaluation and response. The compilation of these inputs was then used to develop this report.

Biomass Program Peer Review Meetings

The Biomass Program organizes its research and analysis activities into technology platform areas, and for the purposes of the Peer Review process the individual Platform Review meetings are held, information is processed, Platform Review comments and scoring outputs generated, and from this rolled-up information, the Biomass Program is reviewed. The 2011 Biomass Program Peer Review process reviewed eight platforms in three distinct series of meetings held from February through April of 2011. The Peer Review schedule was as follows:

Series 1 Peer Review Meetings, held February 1–3, 2011:

- Integrated Biorefinery
- Infrastructure

Series 2 Peer Review Meetings, held February 14–18, 2011:

- Biochemical Conversion
- Thermochemical Conversion

Series 3 Peer Review Meetings, April 4–8, 2011:

- Analysis
- Sustainability
- Feedstock
- Algae.

The eight Platform Review meetings focused on the technical project-level reviews of the research projects funded in each of the eight Biomass technology platform areas. The overall structure and direction of the Platform was also reviewed. A separate Review Panel and a designated Lead Reviewer were selected for each Platform Review. Review Panels were comprised of independent, external, technical reviewers with subject matter expertise related to the platform being reviewed.

The Program Review was held June 27–28, 2011. This allowed sufficient time to complete and verify the gathering of reviewer comments and to process comments and scoring outputs for use by the Program reviewers. At the Program Peer Review, an independent, external panel evaluated the strategic organization and direction of the Biomass Program, using the results of the Platform Reviews and presentations from the Platform Leads and Lead Reviewers as input. The Biomass Program Review Panel comprised the six members of the Steering Committee and the Lead Reviewer from each of the eight Platform Review Panels.

Sustainability Platform Review Panel

Each Platform portfolio was reviewed by a Review Panel of experts from outside the Program. The purpose of the Review Panel is to provide an objective, unbiased, and independent review of the individual RD&D or analysis projects, as well as the overall structure and direction of the Platform. Alison Goss Eng, the Biomass Program lead for the Sustainability Platform, designated Ms. Alison Brady of Life-Cycle Management as the Lead Reviewer for the Analysis Peer Review Panel. Ms. Brady was responsible for coordinating Review Panel activities, ensuring independence of the Panel, overseeing the production of the Platform Review Report, and representing the Panel at the Program Peer Review in June.

In forming its Review Panel, the Sustainability Platform evaluated 10 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 absence of COI, as represented by receipt of their COI forms. An outside, objective Steering Committee, established to help ensure the independence and transparency of the overall Peer Review process reviewed available biographies for Review Panel candidates during the planning process and provided feedback. Platform Review planning teams considered the Steering Committee feedback in making final decisions on its Review Panel. Exhibit 2 lists Review Panel members for the Sustainability Platform.

Exhibit 2 | Sustainability Review Panel

Name	Affiliation	Expertise
Alison Brady*	Life-Cycle Management	Life-Cycle Assessment
Sylvie Brouder	Purdue University	Agro-Ecology, Water Quality, and Soil Fertility
Randy Bruins	Environmental Protection Agency	Assessing Ecosystem Risks and Benefits
Bruce Dale	Michigan State University	Sustainability Analysis and Biomass Conversion
Libby Jewett	National Oceanic Atmospheric and Administration	Watershed Nutrients and Hypoxia Research
Theresa Selfa	SUNY College of Environmental Science and Forestry	Social and Community Factors of Biomass Sustainability
P.T. Vasudevan	University of New Hampshire	Biofuels via Enzymatic Conversion

* Denotes Lead Reviewer

Organization of this Report

The remainder of this document provides the results of the Feedstock Platform Review meeting, including the following:

- Results of Review Panel comments on the overall Sustainability Platform
- The Biomass Program Sustainability Platform Technology Manager response to Review Panel comments and discussion of next steps for each project
- General results information processed from Review Panel comments on projects evaluated during the Platform Review
- Additional information, including the full compilation of Review Panel comments on projects evaluated during the Platform Review and PI responses to reviewer evaluations for their projects can be found in a compendium document.

PLATFORM OVERVIEW AND EVALUATION

Platform Overview

The Biomass Program's overarching strategic goal is to develop sustainable, cost-competitive biomass technologies to enable the production of bioenergy nationwide and reduce dependence on oil through the creation of a new domestic bioenergy industry, supporting the Energy Independence and Security Act of 2007 (EISA) goal of 36 billion gallons per year of renewable transportation fuels by 2022, and increase biopower's contribution to national renewable energy goals by increasing biopower generating capacity.

Sustainability is an integral part of the Biomass Program's vision and strategic goal. The Sustainability Platform's strategic goal is to understand and promote the positive economic, social, and environmental effects and reduce the potential negative impacts of bioenergy production activities.

Sustainability activities interface with and impact all elements of the biomass-to-bioenergy supply chain and at each stage of the development of bioenergy.

The overall performance goals for the Sustainability Platform are as follows:

- By 2012, identify metrics and set targets for climate, water, and land use for agricultural residues, energy crops, and forest resources pathways.
- By 2013, identify metrics and set targets for soil quality and air quality for agricultural residues, energy crops, and forest resources pathways.
- By 2022, evaluate, quantify, and document sustainable integrated pilot performance along the agricultural residues, energy crops, and forest resources pathways.

The performance goals for the pathways under investigation are

Analysis

- By 2012, establish baseline and targets for all sustainability categories for the integrated biomass to biofuel process for agricultural residues, energy crops (woody or herbaceous), and forest resources.
- By 2017, evaluate and compare the sustainability of agricultural residues, energy crops, and forest resources pathways for biofuel production.
- By 2022, evaluate and compare the sustainability of biofuel production pathways.

Demonstration

- By 2015, demonstrate sustainable production of biofuel from agricultural residues at the pilot scale, including all sustainability categories.
- By 2017, demonstrate sustainable production of biofuel from woody or herbaceous energy crops at the pilot scale, including all sustainability categories.
- By 2022, demonstrate sustainable biofuel production from all feedstocks.

Best Practices Deployment

- By 2017, implement best practices for all sustainability categories for a sustainable integrated biomass-to-biofuel process for agricultural residue.
- By 2022, implement best practices for all sustainability categories for a sustainable integrated biomass to bioenergy process for energy crops (woody or herbaceous) and forest resources.

Additional information about the Sustainability Platform is in the Biomass Program Multi-Year Program Plan (MYPP) and on the 2011 Biomass Program Review Portal.

RESULTS

Reviewers evaluated the Sustainability Platform and scored projects on a scale of 1–10 for each applicable criterion, and they provided written comments on approved criteria. The Platform was reviewed on five criteria: Relevance (1–10), Approach (1–10), Progress (1–10), Overall Impressions (no score), and Additional Recommendations, Comments, and Observations (no score). The individual projects funded by the Platform were evaluated on six criteria: Project Approach (1-10), Technical Progress and Accomplishments (1–10), Project Relevance (1–10), Benefits and Expected Outcomes (1–10), Technology Transfer and Collaborations: (no score), and Overall Impressions (no score). The two tables that follow present the Summary of Platform results and comment, as well as the detailed Project Scoring Summary information from the review of the individual projects.

The detailed scoring includes the work breakdown structure number (WBS); project reference information; recipient information; average scores and associated standard deviation information for each criterion; total average project score; and information on the projects percentile rank. Overall, total average project scores in the Sustainability Platform ranged between 9.1 and 6.5, with a mean of 7.8. The presentation of the percentile rank shows the percentage of scores in the frequency distribution that are score exactly the same or less than

Platform Review

Results of Platform Evaluation

Criteria	Average Score*	Range	Standard Deviation
1. Relevance	8.3	*7-9*	0.70
2. Approach	7.9	*7-9*	0.64
3. Progress	8.0	*6-9*	1.20
4. Overall Impressions	n/a	n/a	n/a
5. Additional Recommendations, Comments, and Observations	n/a	n/a	n/a

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

Relevance

Reviewer Comments
Clearly sustainability is relevant to biofuels.
I like that the projects are addressing the different biomass pathways, but comparing pathways without evaluating the common methodology might cause inaccurate comparisons. Accounting methodology should be set before the metrics can be identified. Biogenic carbon dioxide is the same methodology being used across the Platform?
There is a tremendous need for information about how the growing of advanced bioenergy feedstocks will affect the outflow of nutrients into the Gulf of Mexico. I have not seen this particular goal articulated in any of the specific projects, or even the Platform as a whole. Given the importance of the health of the northern Gulf of Mexico, the various Soil and Water Assessment Tool (SWAT) and other models being developed should also be able to predict the overall generation of nutrients flowing into the Gulf and what changes in practice could reduce this.
I think the goals and targets are identified, and the activities are relevant. However, I think some of the important barriers are not being examined, and I have addressed these in overall impression and recommendations.
Alison Goss Eng gave a very compelling and lucid presentation on the Platform goals and targets. The planned activities certainly support the goals and objectives outlined in the MYPP, and it is quite evident from this presentation as well as other presentations on sustainability that the Platform goals will increase the commercial viability of biofuels. However, this is a work in progress and it is important to address some of the crosscutting issues. Once these are addressed, sustainability criteria can be applied to biorefineries and the focus can shift to commercial viability.

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Reviewer Comments

The emphasis is on Carbon neutrality, Carbon footprints, water and water footprints and nutrients (primarily nitrogen). While these are certainly critical, sustainability is fairly narrowly defined as reflected in the portfolio. Social aspects are largely ignored as are some of the other ecological aspects. These are areas that are chronically orphaned as the fall between the explicit missions of the major funding agencies (DOE, U.S. Department of Agriculture (USDA), National Science Foundation, etc.).

Achieving the Platform goals is critical to ensuring commercial viability of biofuels.

Platform goals are in the main adequate, but the treatment of social sustainability in the MYPP (p. 2–89) is too narrow, as a recent news item makes clear. The finding on biofuels by the Nuffield Council on Bioethics cited issues such as indigenous peoples displacement, worker exploitation, etc. These concerns undermine confidence in the biofuel concept, undermine investment and thus undermine MYPP goals. The mechanisms and relationships for addressing social sustainability seem to be in place within the Platform but more specific targets and more urgency seem warranted.

Platform Response

The Technology Manager appreciates the positive comments concerning the relevance. As one of the newest platforms in the Biomass Program and one that crosscuts the entire Program, we are addressing many needs on a limited funding allocation. The Platform strives for consistent methodologies and baselines in the analysis focused on comparing differing pathways. Working groups have been created to ensure consistent methodologies and baselines between projects. Project performers are engaged with other areas of the Program, but these relationships can always be strengthened. This aspect is a continual focus of the Technology Manager. The Technology Manager recognizes the importance of examining the potential relationship between bioenergy production and hypoxia in the Gulf of Mexico. Land-use change and water-quality analysis is underway for two sub-basins of the Mississippi River Watershed. This effort will lead to a full modeling framework for the watershed, which will enable more thorough examination of the changes in practices required to improve the health of the northern Gulf.

Approach

Reviewer Comments

Thus far, sustainability efforts in DOE seem to be mostly reactive, rather than proactive.

I suggest DOE envision, propose, and study scenarios in different areas employing different technologies that are more sustainable

I am concerned that there is not an explicit comparison with sustainability of business as usual, which is dependence on fossil fuels.

The life-cycle analysis approach is good. Insist on adherence to fundamental life-cycle analysis principles of boundaries, allocation, and sensitivity analysis.

Net energy balance is important, but it is critical that it be executed properly. What are the accounting rules being applied for energy return on investment?

The Platform is balanced. There are national efforts and international efforts.

Something to increase the effectiveness of the Platform is showing and understanding the baseline of the alternative.

I would like to see more inclusion of laboratories and PIs outside of DOE. Maybe this will happen in the next round of funding. There is considerable expertise existing in USDA and universities that would benefit the platform. I would also like to see the PIs funded do more outreach to potential users—unless the end users of the data and tools are DOE, which isn't clear. Some of the projects do this but not all. The Project Manager needs to make sure this is happening.

With many of the projects, especially certification projects, it was hard to identify milestones or targets. It is difficult to measure the quality of participation or collaboration in various roundtables or workshops.

The EISA goal of producing 36 billion gallons of renewable transportation fuel is not an easy one. The blueprint to achieve this is contained in the Platform goals and the strategies appear to be focused and clear. The Sustainability Platform's strategic goal of promoting environmental, economic, and social effects is comprehensive. It is also critical to establish the relationship between the three.

The approach for each biorefinery pathway includes

1. Development of metrics, baselines, technical targets
2. Evaluation and selection of indicators
3. Establishment of baseline conditions
4. Evaluation of indicator values
5. Identification of trends
6. The development of best practices.

To achieve commercial viability, it is important to ensure that the studies incorporate optimization, especially economic optimization studies. To achieve this, it is critical to compare this technology with established technologies (production of transportation fuels from fossil fuels) as well as new technologies such as gas-to-liquids (GTL) from natural gas and production of not just ethanol, but also drop-in fuels. It is also useful to determine incremental values, not just absolute values. For example, what is the net water consumption per gallon of final product between two competing technologies?

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Reviewer Comments

The Platform has many great projects underway. Some projects would be greatly strengthened by explicit integration with other projects. For example, numerous projects seem to be pursuing similar objectives. Structuring these projects such that they were more collaborative would ensure that redundancy of efforts is minimized.

The Knowledge Discovery Framework (KDF) seems like a good idea but data workflows, standards, etc. for having seamless ingestion of data into the KDF would help ensure buy-in and use.

Some aspects of sustainability are listed as Platform strategic objectives, but are not addressed (e.g., social effects, environmental aspects other than C/N/H_2O). Partnering with non-national lab entities would pick up needed expertise and capability.

The research portfolio is covering most of the necessary bases very admirably, but social criteria and fossil fuel baselines need more attention. Regarding the social sustainability issue raised above, methodology and data development are needed, so it is necessary to step up this particular effort. At the same time, and especially for this reason, it is important to apply all sustainability analyses back to fossil energy baselines, since the relevant question is (or ought to be) not only how to select among alternative bioenergy supply chains, but also how bioenergy fits within the whole energy portfolio.

I would also like to add a word of caution on the heavy use of SWAT throughout this and other platforms. In some applications (not necessarily those in these platforms), SWAT is well-calibrated for flow, but not for water quality loadings (sediment, N, P). It may be useful to complement SWAT with the use of empirically based models such as SPAtially Referenced Regressions On Watershed attributes, more commonly known as SPARROW.

Platform Response

The Technology Manager appreciates the significant comments from the reviewers with regard to baselines, outreach, and integration among projects. The Platform will be undergoing an effort to ensure all analysis projects are working from a baseline that is based on the same assumptions. This is true for both the fossil and the conventional fuel baseline. Outreach of project results is an important component of research. Our outreach efforts are best exemplified through our participation in, and organization of, multi-stakeholder efforts. For example the goal of DOE participation in projects like the Council on Sustainable Biomass Production is to ensure the best available research is being integrated into sustainability certification efforts. Also, the primary focus of the Bioenergy KDF is communication of the status of bioenergy research and data collection to the research community and other interested stakeholders. Through this effort, the Program hopes to more effectively communicate its research outputs and how they relate to the larger field. In addition to these outreach efforts, the Platform is working to increase the integration of projects within the portfolio and the greater Program. Project performers meet on a regular basis (at least monthly) to discuss project outputs and opportunities for collaboration and integration. These discussions have led to an improved understanding of how projects relate to one another and often joint work plans. Quarterly, in-person meetings are held across the entire portfolio to further discuss crosscutting issues and integration efforts.

Progress

Reviewer Comments
The progress is good. I recommend a critical external review external of appropriate metrics. Define precisely how these are to be calculated and how the data for the calculations is to be generated.
The Platform is making progress toward its technical targets for 2012 and 2013. The social effects mentioned in the Sustainability Platform goal are not being evaluated in any of the projects. For the projects, it is best to see how the metrics were chosen and an uncertainty analysis around those metrics. Some of the projects are missing the methodology piece. There is a lot of good work in the projects presented.
Good progress is being made, however, this progress will not continue unless funding can be secured to continue this work.
Platform is making good progress, but see discussion in impressions and recommendations.
Progress appears to be reasonable even though many challenges still remain. The final target (36 billion gallons in 2022) is a formidable one and requires close cooperation between different players. It is certainly achievable with continuous monitoring and a few course corrections. There are activities associated with each of the goals. Development of metrics/indicators, baseline levels, and targets appear to be on track. The rate limiting step is improving sustainability of technology development and deployment of best practices. Technology is evolving at a rapid pace and hence it is critical to keep track of competing processes (non-biofuel technology), as well as new developments in the biofuel conversion process (for example, new processes for the production of drop-in fuels).
See "Approach" for Sustainability goals that are not sufficiently addressed by the portfolio. While progress is good on many projects, it is important to note that achieving goals requires a long-term research to track management impact evolution; commitment to long-term continuation of these studies seems uncertain. Progress on modeling projects could be accelerated by requesting/requiring these projects to collaborate among themselves and with field research projects to promote calibration, validation, and utility.
The impression given by a review of the particular projects is a very positive one, in that all of the work is focused on Platform objectives, but it is hard to give a definitive answer on progress based on individual project presentations—a synthesis presentation would be needed for this. While good progress is being made, my impression is that there will be gaps in the 2012 and 2013 goals. Metrics seem to be progressing, but it is not clear that defensible targets will be completed.

Platform Response

The Technology Manager thanks the Review Panel for their comments with regard to Platform progress. Because this is the first review for the Sustainability Platform, progress is a challenging metric to evaluate. We agree that sustainability research requires a long-term funding commitment, and we will be focused on ensuring adequate resources to complete the work that is underway and continue to stay current with evolving technologies. External review of sustainability metrics is an ongoing area of focus and is seen as a necessary step in providing the framework for the Sustainability portfolio.

Overall Impressions

Reviewer Comments
I think industry mostly needs guidance on broadly what practices are sustainable and which are not. Our society is really confused. We need some clarity.
Gaps: Reviewing appropriate baselines for comparison, it should be the 2005 gasoline baseline, but there should be a review of the boundary conditions to be sure the comparison with the alternative is apples-to-apples. Host presentations describe the three aspects to sustainability: environmental, economic, and social. However, only environmental sustainability is addressed in all presentations. The economic and social aspects are not addressed.
Good progress is being made, however, this progress will not continue unless funding can be secured to continue this work.
If you look across both the Sustainability Platform and the Feedstock Sustainability Platform, there is fairly broad coverage of issues (environmental, economic, greenhouse gas) that need to be analyzed through both models and field work. There is a good balance between smaller scale, experimental work and entire large watershed modeling enterprises. There is always room for more interconnection between the individual projects, but actually this collaboration seems strong.
The Platform has spent considerable resources on modeling efforts to examine the feasibility of growing sufficient biomass for bioenergy industry and on assessing the sustainability of various feedstocks, conversion technologies, etc. Many projects are working on developing metrics, targets, criteria for producing sustainable feedstocks and for measuring sustainability, both through modeling and in the field efforts. A few projects stood out as quite novel—Negri's Argonne National Lab project that combines field studies with phytoremediation was one; Knowledge Discovery Framework was another. Overall, while I value the certification efforts that are being funded, it was very hard to evaluate them relative to criteria given, because they are ongoing, they don't necessarily have particular "products," they rely on a lot of meetings and workshops, and so we are trying to measure the quality of the engagement or interaction, which is very hard. In addition, I found it also very challenging to evaluate the outcome of the certification projects that have such divergent budgets—from $51,000 to more than $700,000—and it wasn't clear that the projects with larger budgets had accomplished much more than those with minimal funding. Also, it is unclear why there are four separately funded projects all on certification because they seem to have a lot of overlap, really. And finally, in all of the certification projects that were presented, I saw a need for more social science expertise.
The presentation was cogent and cohesive. As stated earlier, there needs to be added focus on economic and social sustainability and the link with environmental sustainability. Economic optimization is key to success of the Platform goals. Metrics should include comparison with competing technologies. Within the biofuels industry, establishment of sustainability metrics for different final products (for example, ethanol versus drop-in) is also critical. DOE's effort (through National Renewable Energy Laboratory) in the area of drop-in fuels is laudable and National Institute for Food and Agriculture also had a major request for proposals recently. New companies such as Joule have shown a lot of promise for drop-in fuels. This will certainly speed up the commercialization of biofuels.

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Reviewer Comments

See previous sections.

Strengths are in the projects' strong goal focus and the degree of collaboration across the labs. I did not see a serious weaknesses. Gaps are with regard to social sustainability and comparative analysis with fossil fuel sustainability.

Platform Response

The Sustainability Platform strives for collaboration and cohesion among the projects and project performers both within the Platform and throughout the entire Program. As a crosscutting area, it is critical for the analysis activities that are part of the Sustainability portfolio to be integrated with the technology specific activities in other parts of the Program. This is particularly true with regard to economic sustainability, which is the focus of the technology platforms. Through their technical targets, which are focused on cost, the aim is to achieve cost-competitive alternatives to petroleum fuels. The Sustainability portfolio of work aims to integrate this techno-economic assessment with the environmental and social assessment work being conducted within the Sustainability Platform.

Additional Recommendations, Comments, and Observations

Reviewer Comments
As breadth of technologies and biofuels approaches, the DOE national labs will have less and less of the necessary expertise to do the integrated, crosscutting assessments. How do you get expertise, information from outside sources?
For the social indicators, there are databases available to evaluate the complexity of this effect. The social hotspot database is now available for reviewing.
I recommend that funding at the very least be maintained, if not increased, in Fiscal Year 2012 and beyond for this important work, given that the requirement for the development of sustainable bioenergy crops is mandated in legislation. It isn't clear why the Sustainability Platform is entirely focused on DOE labs. Please open this up in future competitions. Very elaborate modeling is happening in coastal ecosystems, which is getting more and more integrated into the watershed. Encouraging collaboration with the water quality and coastal modelers could be very important for also meeting the need to reduce hypoxia, or low oxygen, in coastal water bodies.
If the Platform is going to suggest that biofuels sustainability has three pillars (social, environmental, and economic), the scope of projects funded need to be broadened to include social and economic sustainability. I did not see that social sustainability really integrated in any project, and those that are trying to integrate it really do not have the expertise in that area. I realize that DOE and the national labs' expertise is not in social analysis, but because the focus is on sustainability (which needs to include economic and social factors), I suggest that the Program works to integrate this expertise, perhaps via contractors who are social scientists. Related to this, I think the Platform should fund some projects that would examine the willingness of farmers and landowners to grow or harvest biomass because these are critical questions and barriers that are not at all being addressed by any of the research you are funding. The research that has been looking at this issue in Europe and in certain regions of the United States suggests that there are barrier beyond economics to expanding biomass production and use, and I think the Program would benefit from funding this sort of research. Finally, as was brought up in the general discussion, we need more analyses of public attitudes toward biomass and renewable energy and education and outreach to the public, if the widespread transition to a biomass economy will be successful. If we recall the successful energy conservation campaigns during the 1970s, public education was key to energy conservation and I think we need to revitalize similar efforts. Again, in Europe, there are research institutes focused on educating the public, policy makers, and elected officials about the importance of bioenergy and renewable energy in general, which probably partly explains why they are more accepted in Europe than they are in United States. I did value the Knowledge Discovery Framework project, which is focused on extending data, knowledge, and tools about bioenergy to policy makers and other researchers. We need to get information and data to the public as well.
I have no additional recommendations.
Several areas that are identified as goals here are not really addressed by the portfolio. These are critical items that are chronically orphaned among the funding priorities of the major U.S funding agencies. If DOE has these items as a strategic goal—and this is commendable—these areas need to be funded much more aggressively than their current level. DOE has facilitated some partnering, but there are still needs to look beyond the existing lab infrastructure to leverage the breadth of expertise that is needed to address sustainability goals.
In addition to the setting of the Program's sustainability criteria and targets, it would be interesting to have a comparative analysis of the degree of progress being made within each of the (international) collaborating organizations and degree of similarity in results.

Platform Response

We agree that social sustainability considerations are critical. Within the existing Sustainability portfolio, research to define social sustainability indicators will continue in FY 2012. We also acknowledge the value in partnering with other agencies and universities. With other agencies that are focused on social impacts of renewable energy, we are exploring avenues to address this gap in our portfolio.

Project Review

Project Scoring Summary Table

Project Number	Project Title; Presenting Organization; PI Name	Approach		Progress		Relevance		Benefits & Expected Outcomes		Total Average Score	Percentile Rank %
		Average	SD	Average	SD	Average	SD	Average	SD		
11.1.1.1	Impact of projected biofuel production on water use and water quality; ANL; May Wu	7.3	1.03	7.6	0.73	7.4	0.49	7.4	1.18	**7.4**	33%
11.1.1.4	Forecasting water quality and aquatic biodiversity; ORNL; Yetta Jager	8.3	0.88	8.4	0.49	8.3	0.88	7.4	0.43	**8.1**	77%
11.1.1.6	Biomass Production Under Climate Change; PNNL; Mark Wigmosta	6.6	1.29	6.7	1.28	6.1	1.25	6.7	1.48	**6.5**	0%
11.1.1.3	Sustainability Metrics: Tracking and Optimizing Environmental Emissions and Resource Consumption for Biomass Conversion Processes; NREL; Daniel Inman	6.8	0.90	7.3	1.37	7.3	1.25	6.8	1.07	**7.1**	22%
11.1.1.5	Bioenergy sustainability: how to define and measure; ORNL; Virginia Dale	8.9	0.64	9.1	0.83	9.6	0.49	9.0	0.53	**9.1**	100%
3.1.2.4	Thermochemical Conversion Sustainability Interface; PNNL; Lesley Snowden-Swan	7.2	0.90	6.7	1.37	7.5	0.50	6.8	0.69	**7.0**	11%

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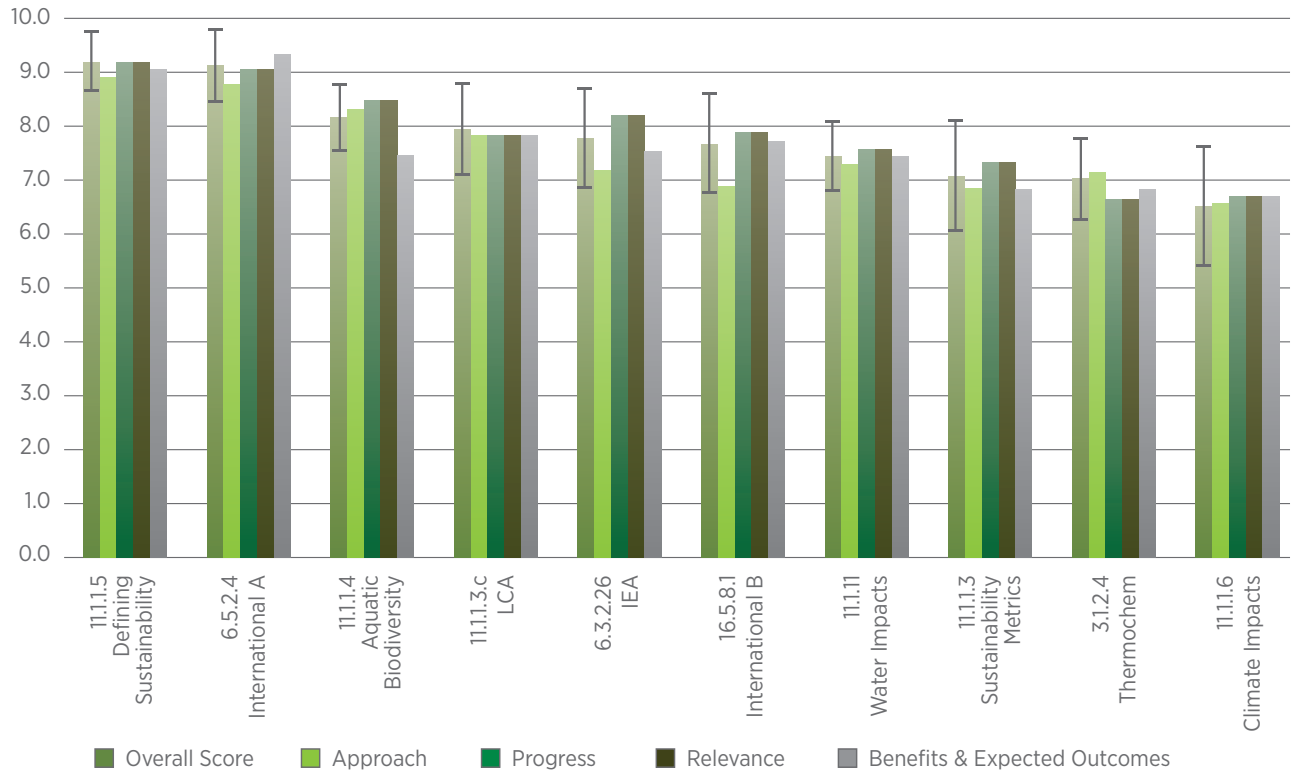
Project Number	Project Title; Presenting Organization; PI Name	Approach		Progress		Relevance		Benefits & Expected Outcomes		Total Average Score	Percentile Rank %
		Average	SD	Average	SD	Average	SD	Average	SD		
11.1.1.3.c	Life-Cycle Assessment of Renewable Liquid Transportation Fuels; NREL; Daniel Inman	7.8	1.47	7.8	0.98	8.2	0.75	7.8	0.40	**7.9**	66%
6.5.2.4	International: Sustainability A; ORNL; Keith Kline	8.7	0.88	9.0	0.53	9.3	0.70	9.3	0.70	**9.1**	88%
6.5.8.1	International: Sustainability B; NREL; Helena Chum	6.9	1.25	7.9	1.36	8.1	1.12	7.7	0.70	**7.6**	44%
6.3.2.26	International: International Energy Agency; INL; Richard Hess	7.2	1.67	8.2	1.07	8.2	0.69	7.5	0.96	**7.8**	55%

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

Project Scoring Chart



COMPENDIUM INFORMATION

1. Biomass Program MYPP: www.eere.energy.gov/biomass/pdfs/mypp_november_2011.pdf
   Sustainability Platform: Page 128 (PDF)

2. Full Compilation of Reviewer Comments for the Sustainability Platform
   Reviewer Comments are direct transcripts of commentary and material provided by the Platform's Review Panel. They have not been edited or altered by the Biomass Program.
   www.eere.energy.gov/biomass/pdfs/2011_sustainability_review_comments.pdf

3. Peer Review Portal Website Peer Review Page: http://obpreview2011.govtools.us
   Sustainability Page: http://obpreview2011.govtools.us/analysis/

ATTACHMENTS

1. Platform Review Meeting Agenda
2. List of Attendees
3. Biomass Program Review Steering Committee
4. Project Evaluation Form
5. Platform Evaluation Form

Sustainability Platform Review Meeting Agenda

Time	WBS#	Project Title	Presenter/ Recipient	Performing Organization
Date: 4/5/2011				
8:00 a.m. – 8:30 a.m.	0.0.0.7	Welcome & Sustainability Platform Overview (Presentation)	Alison Goss Eng	U.S. Department of Energy, Biomass Program
8:30 a.m. – 9:00 a.m.	11.1.1.1	Impact of Projected Biofuel Production on Water Use and Water Quality (Abstract, Presentation)	May Wu	Argonne National Laboratory
9:00 a.m. – 9:30 a.m.	11.1.1.4	Forecasting Water Quality and Aquatic Biodiversity (Abstract, Presentation)	Yetta Jager	Oak Ridge National Laboratory
9:30 a.m. – 10:00 a.m.	11.1.1.6	Biomass Production Under Climate Change (Abstract, Presentation)	Mark Wigmosta	Pacific Northwest National Laboratory
BREAK				
10:15 a.m. – 11:00 a.m.	11.1.1.3	Sustainability Metrics: Tracking and Optimizing Environmental Emissions and Resource Consumption for Biomass Conversion Processes (Abstract, Presentation)	Daniel Inman	National Renewable Energy Laboratory
11:00 a.m. – 11:30 a.m.	11.1.1.5	Bioenergy Sustainability: How to Define and Measure It (Abstract, Presentation)	Virginia Dale	Oak Ridge National Laboratory
LUNCH				
12:30 p.m. – 1:00 p.m.	3.1.2.4	Thermochemical Conversion Sustainability Interface (Abstract, Presentation)	Lesley Snowden-Swan	Pacific Northwest National Laboratory
1:00 p.m. – 1:45 p.m.	11.1.1.3.c	Life Cycle Assessment of Renewable Liquid Transportation Fuels (Abstract, Presentation)	Daniel Inman	National Renewable Energy Laboratory
1:45 p.m. – 2:30 p.m.	6.5.2.4	International: Sustainability (A) (Abstract, Presentation)	Keith Kline	Oak Ridge National Laboratory
BREAK				

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Time	WBS#	Project Title	Presenter/ Recipient	Performing Organization
2:45 p.m. – 3:30 p.m.	6.5.8.1	International: Sustainability (B) (Abstract, Presentation)	Helena Chum	National Renewable Energy Laboratory
3:30 p.m. – 4:00 p.m.	6.3.2.26	International: International Energy Agency (Abstract, Presentation)	J. Richard Hess	Idaho National Laboratory

List of Attendees

First Name	Last Name	Last Name
Janaki	Alavalapati	Virginia Tech
Mark	Allen	Algal Biomass Organization
Andrew	Argo	National Renewable Energy Laboratory; Systems Integration
Bob	Avant	Texas AgriLife Research
Budhendra	Bhaduri	Oak Ridge National Laboratory
Alison	Brady	Life Cycle Management
Adam	Bratis	National Renewable Energy Laboratory
Amy	Braun	U.S. Department of Agriculture
Brian	Bush	National Renewable Energy Laboratory
Calvert	Churn	Renewable Algal Energy
Leon	Clarke	Pacific Northwest National Laboratory
Aaron	Crowell	BCS, Incorporated
Virginia	Dale	Oak Ridge National Laboratory
Stacy	Davis	Oak Ridge National Laboratory
Yonas	Demissie	Argonne National Laboratory
Roxanne	Dempsey	U.S. Department of Energy, Golden Office
Chris	Detter	Los Alamos National Laboratory
Daniel	Drell	U.S. Department of Energy, Office of Science
Joshua	Elliott	Computation Institute/Argonne National Laboratory
Daniel	Fishman	BCS, Incorporated
Yaa-Yin	Fong	University of Hawaii
Ed	Frank	Argonne National Laboratory
Christian	Fritsen	Desert Research Institute
Roxanne	Garland	Department of Energy, Fuel Cell Technologies Program
Alison	Goss Eng	U.S. Department of Energy, Biomass Program
Robin	Graham	Oak Ridge National Laboratory
Benjamin	Gramig	Purdue University
Zia	Haq	U.S. Department of Energy, Biomass Program
Andrew	Hashimoto	University of Hawaii
John	Heissenbuttel	Council on Sustainable Biomass Production
Becky	Herron	AGCO Corporation
Laura	Herron	AGCO Corporation
Richard	Hess	Idaho National Laboratory
John	Hewson	Sandia National Laboratories
Kelly	Ibsen	Lynx Engineering, LLC

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First Name	Last Name	Last Name
Daniel	Inman	National Renewable Energy Laboratory
Cesar	Izaurralde	Joint Global Change Research Institute
Jake	Jacobson	Idaho National Laboratory
Yetta	Jager	Oak Ridge National Laboratory
Libby	Jewett	National Oceanic and Atmospheric Administration
Susanne	Jones	Pacific Northwest National Laboratory
Doug	Karlen	U.S. Department of Agriculture, Agricultural Research Service
Steve	Kelley	North Carolina State University
Pat	Kendrick	AGCO Corporation
George	Kervitsky	BCS, Incorporated
Keith	Kline	Oak Ridge National Laboratory
Susan Carson	Lambert	Earthworks, LLC
Bruce	Lippke	Consortium for Research on Renewable Industrial Materials
Patrick	Luckow	Pacific Northwest National Laboratory/Joint Global Change Research Institute
sebnem	madrali	Natural Resources Canada
Andras	Marton	Independent Project Analysis, Inc.
Laura	McCann	U.S. Department of Energy, Biomass Program
John	McGowen	Arizona State University
Sheila	Moynihan	U.S. Department of Energy, Biomass Program
Todd	Munson	Argonne National Laboratory
Jami	Nettles	Weyerhaeuser Company
Terry	Nipp	Sun Grant Association
Jeff	Obbard	Cellana, LLC
Gbadebo	Oladosu	Oak Ridge National Laboratory
Vance	Owens	South Dakota State University
Mark	Paster	Self-Employed
Valerie	Reed	U.S. Department of Energy, Biomass Program
John	Rezaiyan	3E Consulting, LLC
Richard	Rhodes	University of Rhode Island
Mary	Rosenthal	Algal Biomass Organization
Martin	Sabarsky	Cellana, LLC
Richard	Sayre	Donald Danforth Plant Science Center
Leslie	Schulte	Kansas State University
Amy	Schwab	National Renewable Energy Laboratory
Theresa	Selfa	State University of New York – College of Environmental Science and Forestry

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First Name	Last Name	Last Name
Kelvin	Shen	GENEWIZ
Nagendra	Singh	Oak Ridge National Laboratory
Lesley	Snowden-Swan	Pacific Northwest National Laboratory
Wally	Tyner	Purdue University
P.T.	Vasudevan	University of New Hampshire
Rich	Venditti	North Carolina State University

Biomass Program Review Steering Committee

Reviewer Name	Role	Professional Title and Affiliation
Neal Gutterson, Ph.D.	Co-lead	President & CEO, Mendel Biotechnology, Inc.
Mark E. Jones, Ph.D.	Co-lead	Research Fellow, Dow Chemical Company
Elizabeth Marshall, Ph.D.	-	Staff, Economic Research Service, U.S. Department of Agriculture
Janet Hawkes, Ph.D.	-	Consultant, Biobusiness, Environmental Services, and Academic Administration
Roger C. Prince, Ph.D.	-	Scientist, Biomedical Sciences Division, ExxonMobil
Robert Miller, Ph.D.	-	Consultant, Retired Air Products & Chemicals

Sustainability Project Evaluation

Using the following criteria, reviewers are asked to rate the project work presented in the context of the Program objectives, both numerically and with specific, concise comments to support each evaluation. **Please provide both strengths and weakness to support your score**.

Superior		Good		Satisfactory		Marginal		Unsatisfactory	
10	9	8	7	6	5	4	3	2	1
All aspects of the criteria are comprehensively addressed. There are significant strengths and no more than a few weaknesses that are easily correctable.		All aspects of the criteria are adequately addressed. There are significant strengths and some weaknesses. The significance of the strengths outweighs most aspects of the weaknesses.		Most aspects of the criteria are adequately addressed. There are strengths and weaknesses. The significance of the strengths slightly outweighs aspects of the weaknesses.		Some aspects of the criteria are **not** adequately addressed. There are strengths and significant weaknesses. The significance of the weaknesses outweighs most aspects of the strengths.		Most aspects of the criteria are **not** adequately addressed. There may be strengths, but there are significant weaknesses. The PI fails to demonstrate the project's capability to meet objectives.	

1. Project Approach (1–10):
Please evaluate the degree to which

a) The project performers have implemented technically sound research, development, and deployment approaches and demonstrated necessary results to meet their targets

b) The project performers have identified a project management plan that includes well-defined milestones and adequate methods for addressing potential risks.

2. Technical Progress and Accomplishments (1–10):
Please evaluate the degree to which the project has made progress in its objectives and stated project management plan and has met its objectives in achieving milestones and overcoming technical barriers.

3. Project Relevance (1–10):
Please evaluate the degree to which:

a) The project both identifies with and contributes to meeting the Platform goals and objectives of the Biomass Program Multi-Year Program Plan

b) The project has considered applications of the expected outputs.

4. Benefits and Expected Outcomes (1–10):
Please evaluate the degree to which the project has advanced the state of technology that impacts commercial viability and environmental performance through activities such as

a) Supplying sustainability data across the supply chain

b) Defining indicators or a methodology for evaluating sustainability

c) Defining best practices for sustainable bioenergy production

d) Considering potential interactions and trade-offs among different goals (energy security, environmental protection, low-cost commodities) and different bioenergy scenarios.

5. Technology Transfer and Collaborations (no score):
Please comment on the degree to which the project adequately interfaces and coordinates with other institutions and projects to provide additional benefits to the Biomass Program, such as publications, awards, or others.

6. Overall Impressions (no score):
Please provide an overall evaluation of the project, including strengths, weaknesses, and any recommendations to the project approach and scope, as well as any other overall comments.

Platform Evaluation

1. Relevance (1–10):
Please evaluate the degree to which

a) Platform goals, technical targets, and barriers are clearly articulated and logical

b) Platform goals and planned activities support the goals and objectives outlined in the MYPP

c) Achieving Platform goals will increase the commercial viability of biofuels.

How could the Platform change to better support the Biomass Program goals?

2. Approach (1–10):
Please evaluate the degree to which

a) The Platform approaches are effective, as demonstrated by the extent to which Platform milestones and organization, project portfolio, and strategic directions facilitate reaching Program Performance Goals as outlined in the MYPP

b) The Platform portfolio is focused and balanced to achieve Biomass Program and Platform goals, as demonstrated by Work Breakdown Structure; unit operations; and pathway prioritization.

Please explain your score by commenting on the strengths and weakness evaluated.

What changes would increase the effectiveness of the Platform?

3. Progress (1–10):
Please evaluate the degree to which the Platform is progressing toward achieving Biomass Program and Platform goals, specifically in reference to meeting performance targets and the likelihood of achieving the goals presented.

Please provide recommendations for improvements for tracking progress.

4. Overall Impressions (no score):
Please provide an overall evaluation of the Platform, including strengths, weaknesses, and any gaps in the Platform portfolio.

5. Additional Recommendations, Comments, and Observations (no score):
Please provide any additional recommendations, comments, and observations you have about the Platform or the Platform portfolio.

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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