

2009 Integrated Biorefinery Platform Review Report:

An Independent Evaluation of Platform Activities
for FY2008 and FY2009

December 2009

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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 Integrated Biorefinery (IBR) platform review meeting, held on February 18–19, 2009, at the Westin National Harbor, National Harbor, Maryland.

All programs in the Department of Energy's Office of Energy Efficiency and Renewable Energy are required to conduct a biennial peer review of their project portfolios, and this report is intended to officially document the process utilized by the Biomass Program, the results of the review, the program's response to the results and recommendations, and a full compilation of information generated during the review of the IBR platform. Additional information on the 2009 platform and program review meetings—including presentations for all of the individual platforms and the program review—is available on the program review Web site at www.obpreview2009.govtools.us.

The Biomass Program peer review process included a systematic review of the project portfolios in the six separate technology platforms managed by the program and a separate meeting where the program was comprehensively reviewed. The Biomass platform reviews were conducted between March and April 2009 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 July 2009 was conducted to evaluate the program's overall strategic planning, management approach, priorities across research areas, and resource allocation.

The recommendations of these expert reviewers 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 reviewed in combination with other critical project information to result in a complete systematic evaluation of the accomplishment of programmatic milestones, project goals, and objectives.

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 IBR platform peer review meeting.

John Ferrell
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U.S. Department of Energy

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Executive Summary

2009 Integrated Biorefinery Platform Peer Review U.S. Department of Energy Biomass Program

On February 18–19, 2009, the U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), Biomass Program held a peer review of its integrated biorefinery (IBR) platform. The peer review meeting featured introductory presentations by program staff to provide information on the platform and presentations by the principal investigators of the federally funded projects that make up the IBR platform project portfolio. Approximately 115 people attended the IBR platform review meeting and learned about the state-of-the-art research, development, and deployment activities being performed by the program. Among the attendees was a panel of independent experts from outside the program who were tasked with reviewing the research, development, and demonstration (RD&D) activities managed by the IBR platform.

Presentations given during each of the platform review meetings, as well as other background information, have been posted on the registration Web site: www.obpreview2009.govtools.us. Additional information—such as the reviewer comments, recommendations, meeting agendas, and a list of attendees—can be found in the individual platform reports.

IBR Platform Peer Review Process

The IBR platform review was one of six platform reviews and one program review held as part of the 2009 Biomass Program peer review. The peer review is a biennial requirement for all EERE programs. The results of the peer review are used by Biomass Program technology managers in the generation of future work plans and in the development of Annual Operating Plans, Multiyear Program Plans, and potentially in the redirection of individual projects.

The goals of the independent review panel were to provide an objective and unbiased review of the individual RD&D projects, as well as the overall structure and direction of the IBR platform. In forming its review panel, the IBR platform evaluated 12 candidates from industry, academia, and environmental groups with a range of experiences in agronomy, crop production, logistics, and sustainability. 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 and recommendations to the platform teams. Nine reviewers were selected to ensure a breadth of experience and expertise relevant to the platform portfolio. A list of review panel members for the IBR Platform can be found on page 4 of this report.

At the platform review meeting, project principal investigators (PIs) presented their project budgets, goals, accomplishments, challenges, and relevance to the IBR platform and answered questions from the review panels and general audience. Projects were evaluated by the review panel solely on the basis of information that was either presented by the PI or contained in a standard program management plan. Reviewers used a software tool developed to facilitate both scoring and constructive comments on a range of evaluation criteria. The results of these evaluations (along with those of the other five platforms) formed the basis for the overall Biomass Program review meeting, which was held on July 14–15, 2009.

IBR Platform Information

The IBR platform is essential to achieving the program’s strategic goal: to develop sustainable, cost-competitive biomass technologies that 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.”

The IBR platform’s strategic goal is to demonstrate and validate integrated technologies to achieve commercially acceptable performance and cost pro forma targets. Since the demonstration and validation of the final integrated stages of biorefinery development involves large capital investment and high technical risk, the goals of the platform can only be accomplished through public-private partnerships and federal government cost-shared funding.

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 Fig 3-21 from the Biomass Multi-year Program Plan (MYPP), February 2009. 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.

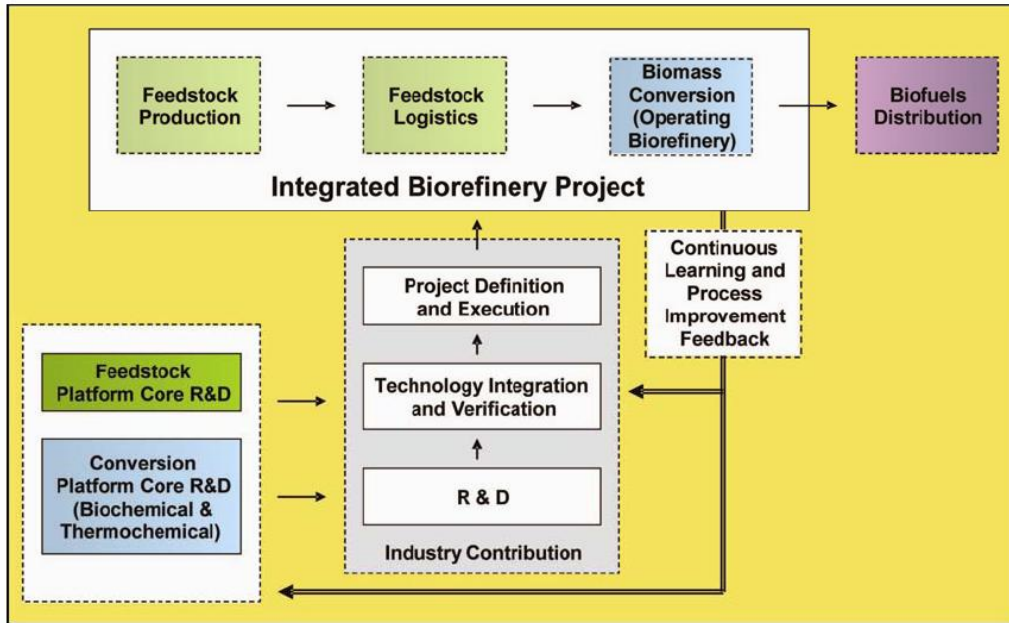


Figure 3-21: Integrated Biorefineries Project Scope, Major Stages and Connection to Core R&D Efforts

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 (ARRA) 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.

FY 2008 and FY 2009 Budgets

The IBR Platform directed \$102.7 million and \$131.4 million of federal funding toward its research, development, demonstration, and deployment activities in FY 2008 and FY 2009, respectively. The IBR platform oversees a number of congressionally directed projects that relate to the platform objectives and goals. Additionally, the platform also funds transportation fuels infrastructure efforts for testing intermediate ethanol blends on legacy vehicles, distribution systems, small engines, and materials and related analysis. The funding for these activities is included in the FY2008 and FY2009 budgets. The portion of the IBR budget for the projects that attended the peer review was estimated at more than 87% of the platform portfolio.

The Utilization of Platform Outputs (INT) budget item was phased out starting with the FY 2006 budget, leaving the Integration of Biorefinery Technologies (EWD) item. Note, transportation fuels infrastructure efforts for testing intermediate ethanol blends on legacy vehicles, distribution systems, small engines, and materials and related analysis are included in these totals.

Platform Direction for FY 2010

Fiscal year 2010 funding is planned for continuing to support the mortgages of commercial and demonstration scale biorefineries competitively selected in FY 2007 and FY 2008, respectively. Funds are also planned for crosscutting integrated biorefinery activities, such as analysis, NEPA review, and other oversight.

There are additional ARRA funds for IBR activities that were not included in the budget request, which include up to \$480 million for the new IBR Funding Opportunity Announcement (FOA) for pilot and demonstration scale integrated biorefineries and \$166 million for increased funding to existing commercial scale integrated biorefineries, under section 932 of the Energy Policy Act of 2005.

The IBR Platform will direct approximately \$132.98 million of federal funding toward its research, development, demonstration, and deployment activities in FY 2010.

Key Accomplishments and Deliverables

Since the 2007 IBR Review, the IBR platform increased its funding to further industry involvement and progress towards commercialization. Additionally, the platform has implemented stronger use of systems analysis, independent project analysis (IPA), and independent engineering services to analyze activities and reduce risk.

The IBR platform uses a system of milestones that include project level milestones, platform level milestones, and joule targets to address program planned accomplishments. The platform level milestones are generally based on the following criteria:

- Downselect: Based on bench scale evaluation of viable processes/technologies, select the process design configuration that will move forward for demonstration in an integrated pilot plant.
- Demonstrate: At pilot scale and beyond, verify that the unit operations operate as designed and meet the complete set of performance metrics (individually and as an integrated system).
- Validate: At pilot scale and beyond, ensure the process/system meet the desired expectations/original intent. Validation goes beyond just meeting all of the performance metrics; it is an assessment of whether the system actually fulfills/completes a portion of the program effort so that the program can move on to the next priority.

Program level milestones consist of the quarterly and annual joule targets (included in budget requests, projected two years out). The project level milestones are linked to quarterly and annual joule targets. Project management plans (PMPs) capture the project level milestones that are managed out of the Golden Field Office (along with more detailed information that establishes the project baseline in order to track approved scope, timeline, and budget changes). Weekly updates are held by the Golden Field Office for HQ, and quarterly reports are received at HQ. The independent engineer also provides oversight and reporting, specifically for risk

assessments and on a monthly basis to ensure invoices submitted by the PIs are tied to actual progress made.

The following are the joule targets relevant to the time period discuss in the review process.

FY2007 Joule

Complete a preliminary engineering design package, market analysis, and financial projection for at least one industrial-scale project for near term agricultural pathways (corn wet mill, corn dry mill, oilseed) to produce a minimum of 15 million gallons of biofuels per year (as mandated by the Energy Policy Act). This milestone was met as required.

FY 2008 Joule

Approve a final engineering design package of at least one commercial-scale biorefinery capable of processing up to 700 metric tons per day of lignocellulosic feedstocks. The approved design package must address any findings from an independent engineering review to validate contractor costs and scheduled timeline. Validation of biorefinery concepts will reduce technological risk and attract additional sources of capital to accelerate deployment and oil displacement. This milestone was met as required.

FY 2009 Joules

- Initiate construction of at least one commercial-scale biorefinery project (designed to process 700 tons per day of feedstock) including orders for long lead items, vendor packages, and structural steel. Validation of biorefinery concepts will reduce technological risk and attract additional sources of capital to accelerate deployment and oil displacement.
- Approve engineering design of one additional commercial-scale biorefinery (two in total) including orders for long lead items, vendor packages, and structural steel. The result of this ultimately will be to complete construction by 2011.
- Approve preliminary engineering design package, market analysis, and financial projections for at least four demonstration scale biorefineries (designed to process 70 tons per day of feedstock) selected in FY 2008. These efforts work toward validating the programmatic \$2.01–2.87 per gallon estimated cost competitive target range in integrated biorefineries by 2017 (in 2007 dollars).

These milestones were met as required.

FY 2010 Joules

- Initiate construction of two additional commercial-scale biorefinery projects selected in FY 2007 (three in total).
- Complete sufficient engineering design to allow initiating construction (after financial and other requirements, i.e. National Environmental Policy Act (NEPA), are met) for two demonstration projects selected in FY 2008.
- Complete at least one trial run of an innovative integrated biorefinery process to demonstrate the integrated operation of processing biomass into a biofuel. This will

support validating the programmatic \$1.76 per gallon estimated cost competitive target range in integrated biorefineries by 2017 (in 2007 dollars).

Summary from the Review Panel

The IBR platform was well structured, and the projects in the platform's portfolio cover a good variety of feedstocks, such as wood, agricultural residue, and municipal solid waste (MSW). However, the project portfolio lacks biorefineries that utilize energy crops. Biorefineries producing primarily liquid transportation fuels are an appropriate focus to meet the aggressive Energy Independence and Security Act of 2007 (EISA) goals. Coproducts would serve to increase the integrated biorefineries' 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 trials 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 PIs before the platform peer review and the presentations given during both closed and open sessions were incomplete and 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 PIs' 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 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.

General Recommendations

Based on the overall comments from the peer reviewers, the IBR platform should undergo a comprehensive annual project review to conduct a more rigorous project assessment (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. During this review, a determination will be made as to the stage of the project, and the reviewers will categorize the current project portfolio based on the results of the comprehensive annual project review. The information gathered could then be utilized in preparation for a future down select.

Platform and Project Evaluation Results

The IBR platform management actively uses the qualitative and quantitative information resulting from the review process to consider the future direction of the platform RD&D activities, project and platform goals, approach, and targets and milestones. The numerical rating scale used for this review was a whole number scale, where 5=Excellent, 4=Good, 3=Satisfactory, 2=Fair, and 1=Poor.

Overall, the platform activities were evaluated positively. The overall average score given to the platform was a 3.05. The average of the 17-project score was 3.13. Copies of the platform and project evaluation forms can be found in Attachments 1 and 2 at the end of this report.

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.

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.

A summary of the reviewer evaluation scores of the IBR platform is presented in Exhibit 1. 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 performed by aggregating individual project scores.

Exhibit 1 – Average Evaluation Scores of the Biomass Program IBR Platform for Each of the Four Scored Criteria

Evaluation Criteria	Average Score*	StdDev
Platform Goals	3.6	0.98
Platform Approach	3.1	0.90
Platform RD&D Portfolio	2.9	0.38
Platform Progress	2.6	0.79

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

Please see Section IIB for detailed explanations of the criteria. Please see the detailed responses to each evaluation criteria throughout Section IIB as well as Section IIC for the full summary response.

Project Evaluations

The review panel evaluated individual RD&D projects in four blocks by technology focus area (Production, Logistics, Analysis, and Sustainability). This breakdown of work mirrors the platform management. Each project was evaluated on both the strength of the work and the relevance of the work to the platform objectives. Five scored evaluation criteria were used, applying the same 1–5 whole-number rating system used for the platform evaluations.

Project Evaluation Criteria

Relevance – The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program MYPP. Market application of the expected project outputs has been considered.

Approach – The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Technical Progress – The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the Biomass Program MYPP and overcoming technical barriers outlined in the MYPP.

Success Factors – The degree to which the project has identified critical success factors (technical, business, and market factors) that will impact technical and commercial viability of the project and

the degree to which the project has identified potential show-stoppers (technical, market, regulatory, legal) that will impact technical and commercial viability.

Future Research – *The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off-ramps, or identified other opportunities to build upon current research to further meet Biomass Program goals and objectives.*

The evaluation scores were aggregated at the technology focus area level. Overall, the strength of work of the individual projects was clear—as, on average, the RD&D work in the four focus areas was evaluated as highly relevant to platform objectives, of sound technical approach, making good technical progress, aware of challenges and success factors, and generally on track for the future. The project presentations are available in PDF format at <http://obpreview2009.govtools.us/IBR>. Each project was reviewed by 3–9 reviewers in five scored review criteria. The overall average scores of projects in each technology focus area are given in Exhibit 2.

Exhibit 2 – Review Panel Average Scores* for Each Project Evaluation Criteria

Technology Area	Relevance	Approach	Technical Progress	Success Factors	Future Research	Overall
All IBR Projects	3.35	3.29	3.13	2.88	3.00	3.13

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

Detailed explanations of the project evaluation criteria are can be found in Section IIIA with the individual project evaluations. The scores presented below are the mean scores of the all the projects evaluated in the IBR platform.

Summary Platform Management 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 fluctuating crude oil prices, as well as the fact 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 project management plans (PMPs), the projects already identify the milestones that are being worked toward in each pathway, as well as the R&D plan for the project to meet the milestone. It might be beneficial in future reviews for the program to show the R&D needed 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 the 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 timeline 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. Exhibit 3 lists each project that presented at the review and a summary of next steps determined by the platform management.

Exhibit 3 – Summary of Evaluation Scores of Projects in the IBR Platform Portfolio

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.
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.

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	
5.5.5.1	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; Verenium 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 & Necy 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.

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	
5.5.1.1	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.
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.

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	
7.5.7.2	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.

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

Each project is identified by a unique code (WBS Number), as well as the project title, presenting organization, and PI name. Projects are listed in the chronological order by which they presented at the review meeting. The average overall score is the mean of the five evaluation criteria scores. The Next Steps column is a summary of the management response to the evaluation.

I. Introduction

On April 8–10, 2009, the U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), Biomass program held a peer review of its IBR platform. The platform review was part of the overall 2009 program peer review implemented by the Biomass program. The 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 results of the peer review are used by Biomass Program Technology Managers in the generation of future work plans and in the development of annual operating plans, Multiyear Program Plans (MYPPs), and potentially in the redirection of individual projects.

Melissa Klembara was designated by the Biomass program as the lead for the IBR platform. Ms. Klembara was responsible for all aspects of planning and implementation for the platform review, including coordinating the review panel and the PIs of individual projects.

Approximately 115 people attended the IBR platform review meeting. The project and platform review forms that were used to collect information from the reviewers are presented in Attachments 1 and 2 of this report. An agenda for the meeting is provided in Attachment 3. A list of attendees is provided in Attachment 4. Presentations given during each of the platform review meetings, as well as other background information, are posted on the registration website: www.obpreview2009.govtools.us.

The remainder of this section provides a brief description of the implementation process for the platform review meetings, identifies the IBR review panel, and describes the role of the steering committee.

A. Biomass Program Peer Review Process

The 2009 Biomass program peer review process consisted first of a series of six platform peer review meetings followed by the overall program review meeting. The six platforms that were peer reviewed matched the manner in which the Biomass program organizes its research and analysis activities. The platforms are Integrated Biorefinery, Infrastructure, Analysis, Feedstocks and Sustainability, Biochemical Conversion, and Thermochemical Conversion. The platform review meetings were held during the February–April timeframe.

The six platform review meetings consisted of technical project-level reviews of the research projects funded in each of the six Biomass technology platform areas. The overall structure and direction of the platform was also reviewed. A separate review panel, and review panel chair,

was formed 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 in July 2009 following each of the six platform reviews. During 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 each of the platform review chairs as input. The panel for the Biomass program review consisted of a steering committee formed to provide overall oversight of the program peer review process. The program review panel also will include the chair from each platform review panel.

This report represents the results of the IBR platform review and evaluation of the platform and the individual projects in its research portfolio. A separate program review report has been prepared for each platform review and the program review meeting. The program review report may also include additional comments related to the IBR platform.

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 review process is provided in Exhibit 4.

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 Field Office, National Renewable Energy Laboratory (NREL) Systems Integrator, and contractor support. BCS, Incorporated was the lead contractor responsible for the organizing of each peer review. 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.

B. IBR 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. One member from each review panel also served as the panel chairperson and 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 July.

In forming its review panel, the IBR 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 lack of a

conflict of interest (COI) as represented by receipt of their COI form. 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 5 lists review panel members for the IBR platform. Per steering committee guidance, at least three of the IBR platform reviewers were assigned to review each project. Reviewer assignments were based on reviewer expertise and to avoid conflict of interest.

Exhibit 4 - Basic Steps in Implementing the Biomass Program Peer Review

1. The program's RD&D and analysis project portfolio was organized by the six 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 principal investigators, and overall planning for the platform review.
3. Each platform identified projects for review. Target: review at least 80 percent of program budget.
4. 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.
5. Draft project-level, platform-level and program-level evaluation forms were developed for the 2009 platform review meetings. Similarly, a draft presentation template 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 forms were reviewed and modified by the steering committee before being finalized.
6. 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. Committee provided *Yes/No* recommendations on candidates and recommended other candidates for the platforms to consider. Results were provided to platform leads for consideration in final selection of review panels.
7. Upon confirmation, each review panel member was provided background information on the review, instructions, evaluation forms, presentation templates and other information needed to perform his or her duties. Project lists and COI forms were provided to each reviewer in advance of the review meeting and COI forms were collected. At least one conference call was held for each review panel to provide instructions, discuss panel member responsibilities and to address any questions. To the extent possible, steering committee members participated in those calls.
8. The Biomass program performed outreach to encourage participation in each of its platform review meetings by sending announcements to over 3,000 program stakeholders, principal investigators, and attendees at previous program events. The program reviews were also announced on the Biomass program Web site.
9. Platforms invited PIs to present their projects at the platform review. PIs were provided with presentation templates and instructions, reviewer evaluation forms, and background information on the review process. Follow-up calls were held with PIs to address questions. If PIs chose not to present they were requested to submit a form stating such.
10. Platform review meetings were held according to guidelines developed by the peer review lead and planning team, platform lead, and steering committee. Members of the steering committee participated in each review to ensure consistency and adherence to guidelines.
11. Review panel evaluations were collected during each platform review meeting using an automated tool. These evaluations were posted to a password-protected Web site following each review and review panelists were provided approximately 10 working days to update and edit their comments. PIs were then provided approximately 10 working days to go to the same password-protected Web site and see comments on their projects. PIs were given the opportunity to respond to review panel evaluations.
12. 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.

Exhibit 5 – IBR Review Panel

Name	Affiliation/ Title	Expertise
Bill Cruikshank	Retired - CANMET Energy Technology Centre/Consultant	Biochemical Conversion R&D
Kent M. Sproat	Jupiter Biotech/Consultant	Biochemical Processing, Industrial Management and Technology Transfer.
Dr. Michael Tumbleson*	University of Illinois- Urbana-Champaign/Professor Emeritus	Agricultural Systems and Biological Engineering
Dr. Robert Miller	Air Products and Chemicals/Director Advanced Research	Industrial Energy Science and Technology.
George W. Huber	University of Massachusetts Amherst/Armstrong Professor of Chemical Engineering	Biomass Conversion, Heterogeneous Catalysis and Kinetics
Doug Marshall	Retired - Hartford Steam Boiler	Industrial Facility Design and Construction Management; Risk Assessment for Technology and Project Management Efficacy
David Webster	Ark Resources, LLC/Consultant	Biofuel Industry Consultant
George Parks	FuelScience, LLC/Retired from ConocoPhillips	Chemical Processing, R&D
Bryna Berendzen	Department of Energy – Golden, CO/ Engineer - Renewable Energy Projects Division (for Verenium and Mascoma projects only)	DOE – Golden Engineer

**Review Chair*

C. 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 Feedstock platform
- Results of review panel comments on projects evaluated during the platform review and PI responses to reviewer evaluations for their projects
- The Biomass Program Feedstock platform Technology Manager response to review panel comments and discussion of next steps for each project.

II. Platform Overview and Evaluation Results

A. Platform Overview

i. Platform Goals and Objectives

DOE has set a goal in its strategic plan to promote energy security through a diverse energy supply that is reliable, clean, and affordable. As a key strategy for attaining both presidential and departmental goals, the DOE EERE's Biomass program is focused on developing biofuels, bioproducts, and biopower technologies in partnership with other government agencies, industry, and academia.

The Biomass program supports four key priorities of the EERE strategic plan:

- Dramatically reduce dependence on foreign oil
- Promote the use of diverse, domestic, and sustainable energy resources
- Reduce carbon emissions from energy production and consumption
- Establish a domestic bioindustry

The 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.

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 Fig 3-21 from MYPP, February 2009. 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 (FOA) funded by the American Recovery and Reinvestment Act (ARRA) 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.

Key Deliverables

- Operational commercial, demonstration, and pilot scale biorefineries gathering data in order to validate process economics, technical performance, sustainability, etc.
- Ultimately, these facilities will reduce risk to encourage private sector investments

Key Milestones (quantitative, quarterly, yearly, out-years, detailed milestones)

- Program level milestones are the quarterly and annual joule targets (included in budget requests, projected two years out).
- Project level milestones are linked to quarterly and annual joule targets. Project management plans (PMPs) capture the project level milestones that are managed out of the Golden Field Office (along with more detailed information that establishes the project baseline in order to track approved scope, timeline, and budgets changes). Weekly updates are held by the Golden Field Office for HQ and quarterly reports are received at HQ. The independent engineer also provides oversight and reporting, specifically for risk assessments and on a monthly basis to ensure invoices submitted by the PIs are tied to actual progress made.

Platform Strategy and Pathways

The IBR platform's work breakdown structure addresses and supports all pathways. The WBS under each pathway is comprised of three major elements:

1. Demonstration and deployment includes all the major integrated biorefinery projects, collectively representing the largest portion of the overall platform budget.
2. Technical assistance covers smaller R&D projects that are identified by industry partners and stakeholders as critical to improving existing biorefinery operations.
3. Analysis covers a broad range of technical, economic and environmental topics, and is used to assess the individual progress of the integrated biorefinery projects as well as the collective status and progress of the bioindustry.

Cost Targets and Major Milestones Cost Targets:

The 2012 performance goal of the IBR platform is to demonstrate the successful operation of three integrated biorefineries across various pathways.

By 2017, a mature technology plant model will be validated for cost of ethanol production based on pioneer plant performance and compared to the "path plant" target of \$1.76/gallon.

- Support the validation of the programmatic cost goals for “most competitive” cellulosic ethanol, originally set from Advanced Energy Initiative in 2006
 - \$1.76/gallon by 2012.
 - Platform developing a way to link R&D cost targets to actual plant data and market conditions, and broader biofuels.
- Bridge IBR deployment activities with R&D platforms
 - Utilize and implement the latest R&D breakthroughs in an integrated biorefinery
 - Feedback barriers experienced in integrated biorefineries to develop R&D solutions.
- Leverage national lab experience and facility capabilities to address barriers identified during deployment.

Milestones

The platform level milestones are generally based on:

- Downselect: Based on bench scale evaluation of viable processes/technologies, select the process design configuration that will move forward for demonstration in an integrated pilot plant.
- Demonstrate: At pilot scale and beyond, verify that the unit operations operate as designed and meet the complete set of performance metrics (individually and as an integrated system).
- Validate: At pilot scale and beyond, ensure the process/system meet the desired expectations/original intent. Validation goes beyond just meeting all of the performance metrics; it is an assessment of whether the system actually fulfills/completes a portion of the program effort so that the program can move on to the next priority.

FY 2007 Joule [MET]

- Complete a preliminary engineering design package, market analysis, and financial projection for at least one industrial-scale project for near term agricultural pathways (corn wet mill, corn dry mill, oilseed) to produce a minimum of 15 million gallons of biofuels per year (as mandated by the Energy Policy Act).

FY 2008 Joule [MET]

- Approve a final engineering design package of at least one commercial scale biorefinery capable of processing up to 700 metric tones per day of lignocellulosic feedstocks. The approved design package must address any findings from an independent engineering review to validate contractor costs and scheduled timeline. Validation of biorefinery concepts will reduce technological risk and attract additional sources of capital to accelerate deployment and oil displacement.

FY 2009 Joules

- Initiate construction of at least one commercial-scale biorefinery project (designed to process 700 tons per day of feedstock) including orders for long lead items, vendor packages, and

structural steel. Validation of biorefinery concepts will reduce technological risk and attract additional sources of capital to accelerate deployment and oil displacement.

- Approve engineering design of one additional commercial scale biorefineries (two in total) including orders for long lead items, vendor packages, and structural steel. The result of this will ultimately be to complete construction by 2011.
- Approve preliminary engineering design package, market analysis and financial projections for at least four demonstration scale biorefineries (designed to 70 ton per day feedstock) selected in FY 2008. These efforts work toward validating the programmatic \$2.01–2.87 per gallon estimated cost competitive target range in integrated biorefineries by 2017 (in 2007\$).

FY 2010 Joules

- Initiate construction of two additional commercial-scale biorefinery projects selected in FY 2007 (three in total).
- Complete sufficient engineering design to allow initiating construction (after financial and other requirements, i.e. NEPA, are met) for two demonstration projects selected in FY 2008.
- Complete at least one trial run of an innovative integrated biorefinery process to demonstrate the integrated operation of processing biomass into a biofuel. This will support validating the programmatic \$1.76 per gallon estimated cost competitive target range in integrated biorefineries by 2017 (in 2007 dollars).

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ii. FY 2008 and FY 2009 Budget by Technology Area

The IBR platform directed \$102.7 million and \$131.4 million of federal funding toward its research, development, demonstration, and deployment activities in FY 2008 and FY 2009, respectively. The IBR platform oversees a number of congressionally directed projects that relate to the platform objectives and goals. Additionally, the platform also funds transportation fuels infrastructure efforts for testing intermediate ethanol blends on legacy vehicles, distribution systems, small engines, and materials and related analysis. The funding for these activities is included in the FY 2008 and FY 2009 budgets. The portion of the IBR budget for the projects that attended the peer review was estimated at more than 87% of the platform portfolio.

The Utilization of Platform Outputs (INT) budget item was phased out starting with the FY06 budget, leaving the Integration of Biorefinery Technologies (EWD) item.

- FY08: EWD: \$102,769 million
- FY09: EWD: \$131.428 million
- FY10: EWD: \$132.977 million

iii. Platform Direction for FY 2010

Fiscal year 2010 funding is planned at \$132.98 million for continuing to support the mortgages of commercial and demonstration scale biorefineries competitively selected in FY 2007 and FY

2008, respectively. Funds are also planned for crosscutting integrated biorefinery activities, such as analysis, NEPA review, and other oversight.

There are additional ARRA funds for IBR activities that were not included in budget request which include up to \$480 million on the new IBR FOA for pilot and demonstration scale integrated biorefineries and \$166 million for increased funding to existing commercial scale integrated biorefineries, under section 932 of the Energy Policy Act of 2005.

B. Results of 2009 IBR Platform Evaluation

The review panel evaluated the platform on criteria such as goals, approach, RD&D portfolio, and progress, and also provided comments on the strengths and weaknesses of each. The following are questions posed to each of the reviewers followed by average scores, reviewer comments, and the IBR platform Technology Manager responses to those comments. The 10 independent evaluations of the Feedstock platform as a whole are summarized numerically in Exhibit 7. In addition to the numerical scores, each reviewer provided written comments, which have been reproduced below. Additionally, the section provides verbatim results of the review panel evaluation of the Feedstock platform.

Exhibit 7 – Average of Reviewer Platform Evaluation Scores

Evaluation Criteria	Average Score	Standard Deviation
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?	3.57	0.98
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?	3.14	0.90
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)	2.86	0.38
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.	2.57	0.79

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

The following sections provide the full written comments of the review panelists for each of the five evaluation criteria.

i. Platform 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?

Exhibit 8 – Platform Goals: Strengths and Weaknesses

Strengths	Weaknesses
The platform goals, tech. targets & barriers are very clearly articulated, and logical.	The platform goal as stated in section 3.3.2 of the platform MYPP is considered to be over optimistic, particularly in the current economic downturn that will likely extend well in to 2010.
Without this program none of these projects would go forward. This program is critical to make biofuels happen and to reduce our dependence on foreign oil. There is too much large risk of capital investment to make investments happen.	If all these projects were funded I do not think that would meet Congress goals of reducing our dependence on foreign oil There is way too much smoke and mirrors with the projects in this program. Most of these projects should be at the pilot plant stage. Before they go to demonstration or full scale commercial plants they better show and demonstrate 12-24 months of data at the pilot plant. Perhaps they should even show 5 years of pilot plant data. Most of these companies were not honest with the reviewers and DOE. They need to be more open and honest.
N/A	Program appears to be leap frogging development and committing to demonstration and betting the bank that the contractors will have successfully all the technical, economic and commercial hurdles necessary for deployment of a commercial demonstration plant. Given that and fact, the state of development of most of the projects that we reviewed and the fact that the US financial situation is in a shambles, I would seriously doubt if any of these projects will be able to move into the construction stage. If few or no projects move forward and if the ones that are built fail because the technology was not quite ready for the full-scale plant, the public will view the IBR as a failure.
Goals are well articulated. Emphasis is being placed on	\$1.33 goal for cellulosic ethanol is probably not attainable. Need to look at better process models and reevaluate.

biofuels. For production of biofuels, Program is well-balanced and it is addressing a diversity of feedstocks, processes such as gasification, fermentation, and various fuel product scenarios that may have realistic markets if proven. The wrong set of goals would have been to have all projects designed to produce only ethanol.	Need goals for non-ethanol fuels, gasoline and diesel range hydrocarbons. Should add carbon footprint goals as well. Most fuels should meet with no problem, but should be part of platform goals. Maybe need to allow some trade-off between carbon footprint and cost. Not clear how lessons learned from individual projects will be shared across program and disseminated to public.
Clear cost target.	The real platform goals appear to be a moving target, which makes evaluation of the projects presented in this Peer Review extremely difficult. True definition of the platforms goals is urgently needed. If the Program priority is "focused on enabling biorefineries to efficiently convert cellulosic biomass into ethanol and other biofuels", this needs to be stressed to presenters and in the evaluation of project selection.
N/A	OBP has taken an aggressive position to select and fund projects at demo- and commercial scale. This path no doubt is open to criticism by its very nature and my comments are intended not to detract from this aggressive track but to facilitate assessment and possibly adjustment to the program to achieve its goals. According to the MYPP timeline and the presenters characterization of their progress indicates that OBP is one year behind its MYPP timeline. This delay is understandable due to the maturity of the technologies in its portfolio. The MYPP timeline should be reviewed in light of detail project timelines that unfortunately were not generally provided during this peer review. Presenters of more mature projects (e.g., Abengoa "2", Flambeau, RangeFuels, POET) all indicated that loan guarantees would be essential to move to the post-FEL / deployment stage. It is unclear whether or not the Loan Guarantee Program is sufficiently funded or staffed to accommodate these essential requests that are now being submitted.
OBP has identified the multiple, critical barriers to development	The platform goal as stated in section 3.3.2 of the platform MYPP is considered to be over optimistic, particularly in the

and deployment of large-scale facilities to support the “20 by 20” policy goals. OBP has initiated well-funded programs to deploy demo-scale and large-scale facilities into the market.

current economic downturn that will likely extend well in to 2010.

Technology Manager Response

The Technology Manager (TM) appreciates the reviewer’s comments concerning the IBR platform goals being very clearly articulated and logical. Efforts have been made to ensure that the goals are clear and in support of the overall Biomass Program. The cost goals are based on the Advanced Energy Initiative target to make cellulosic ethanol cost competitive by 2012, which is defined in —ntplant—terms using an NREL design modeled cost for the minimum ethanol selling price (MESP) on a BTU equivalent basis with gasoline. Once these demonstration facilities are operational, the data will be used to benchmark the current production cost of cellulosic ethanol and other —advanced biofuels” and assess forecasts using the NREL nth plant modeled costs. The program will continue to assess and refine its goals since the long term impact on developing the advanced biofuels industry is unknown, due to economic conditions and the volatility of crude oil prices.

These four commercial demonstrations and the eight smaller 10% demonstrations are not meant to single handedly reduce our dependence on foreign oil. These demonstrations are the first step to validating the commercial viability of developing future generations of biofuel production technologies and feedstocks. The intent of these demonstrations is to assist the nascent industry in reducing the technical and financial risk associated with new technology deployment. If successful, these projects will attract private investment for future commercial scale replications and, eventually, replace the need for continued government funding to enable commercial scale-up. Those commercial scale replications could make an impact on reducing dependence on foreign oil.

The Energy Policy Act of 2005, Section 932 provided the guidance for the program to issue a solicitation for commercial scale biorefinery demonstrations. The program agrees that pilot and small demonstration scale biorefineries are more valuable to foster technology development based on the current state of technology and economic environment. These demonstrations will provide information on the progress toward reaching the cost goals. The IBR platform is working closely with its partners to ensure they conduct the necessary scale up validations at pilot or demonstration scale, so as not to leap frog key risk reduction steps. The Program intends to work closely with the other R&D platforms to assess technology level of readiness and will continue to develop new solicitations for pilot and demonstration scale to support technology deployment.

The TM agrees with the reviewers opinions regarding the disclosure of information. It was unfortunate the Principal Investigators did not disclose more information on their progress towards overcoming their technical or economic barriers. We encourage the PIs on these projects to share as much data as they can (without violating business sensitive or proprietary information) at conferences, etc. and a final report from the project will be made publically available at the completion of the project. Peer reviews like these also serve to share lessons learned from individual project with the public.

For the next peer review, the program will request longer presentations with required, meaningful information for the reviewers. This information will also be provided to the reviewers ahead of the peer review to allow enough time to prepare questions. We are confident that our Project Management Center (PMC) at the Golden Field Office with support from the Independent Engineer and the Independent Project Analysis group can provide risk assessment, project management, and oversight for these projects. The information referred to by the reviewer has been made available to other independent reviewer, but it wasn't communicated to the review panel.

The program is collecting sustainability metrics from the demonstration projects and will continue to work toward reducing the carbon footprint and other sustainability issues, such as water utilization, in biorefineries. The cost target expressed in the nth plant modeled cost using the NREL design will be reported to OMB in the budget document in addition to being published in the Program's MYPP. These documents are available to the public. The EPA is still in the process of defining the LCA's for biofuels to meet the EISA RFS. Any biofuels producer who wants credit for their fuel to meet the RFS must conduct this LCA. The EISA RFS also established a volumetric goal for "advanced biofuels" that is more than just cellulosic ethanol, basically all biofuels other than corn starch. The program is still focused on making cellulosic ethanol cost competitive, with a longer term goal to support the EISA volumetric goal.

Most of the projects have had schedule slippage due to NEPA compliance, their inability to get cost-share funds, or technical problems which have delayed detailed engineering. As part of the PMC management, a performance baseline with resource loaded schedule is a deliverable that must be provided by the companies. These deliverables are required for funding, but some of the companies have been slow to develop them. In addition, a few of the projects have "go/no go" decisions based on either USDA or DOE Loan Guarantees. The new administration has expressed concerns over the DOE's loan guarantee's slow progress and is committed to improving that schedule. Recently the Loan Guarantee program rejected all biomass projects from the second round solicitation. The Program is committed to working with the DOE Loan Guarantee program to understand how this developing industry can meet their requirements.

The program is focused on driving down the cost of advanced biofuels, particularly cellulosic ethanol by 2012. By 2017, mature technology plant model will be validated for cost of ethanol production based on pioneer plant performance and compared to the target of \$1.33/gallon. The

program is working with its partners to determine what additional support it can provide, if needed, in the current economic downturn.

ii. Platform 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?

Exhibit 9 – Platform Approach: Strengths and Weaknesses

Strengths	Weaknesses
The IBR platform approach strongly supports achievement of the goals of the feedstock core R&D and conversion core R&D platforms.	The IBR platform approach contributes little to the biofuels infrastructure platform goal. The link between the IBR and feedstock platforms is essential. Unfortunately, it does not appear to be as strong as that with the conversion platform. It's probably time to focus less on the conversion aspects of the IBR platform and increase emphasis on feedstock supply.
I think the milestones are good, but the people receiving DOE money were not honest with reviewers.	I am not sure what the uncertainties around each project are. Most of these projects were not open with reviewers. They did not identify what are the uncertainties and risks.
The approach to design with its rigorous PMP and RPP milestones and methodology and pilot to demonstration to commercial scale plant build up is excellent.	Unfortunately, many projects do not appear to be adhering to the DOE approach. Many projects do not demonstrate the use of rigorous RPP and PMP practices. Projects with pilot plants often do not demonstrate the proper use of the pilot plant to develop data for scale-up. Many demo plants are being built on scant or no pilot data. Even some commercial scale plants are being built without first building a pilot or a demo facility.
Program has tried their best to select a diversity of projects that represent stand-alone greenfield plants as well as retrofits with existing Forest Products industries with built in GO-NO-GO decision points prior to making significant investments in demo plant construction. If the technical and commercial milestones are not made both the DOE or the investor will be able to opt out and redirect work scope until the technology is ready.	Emphasis of projects appears to be closely aligned with the Forest Products Industry and there are other industries not represented in the program that would benefit as well, such as integration with the food processing industry, agricultural processing industries, etc.
Projects span multiple approaches with cellulosic biomass	Some weak projects in portfolio.

	Difficult to assess with no detail given in project presentations. Need more pilot-scale work and less commercial and precommercial.
N/A	With those projects that have real focus on the objectives of producing biofuels, the platform seems to provide direction, evaluation and control. But that said, some of the projects that have been presented have questionable relevance to the objectives of the platform. Better screening of projects or better focusing of projects which have been selected would increase the efficiency of the program.
OBP demonstrates in the MYPP a detailed understanding of the barriers to RD&D for biofuels.	This reviewer is unclear on how OBP intends to foster collaboration across platforms so that “lessons-learned” from their various projects can advance individual projects or the OBP portfolio in general.

Technology Manager Response

The TM welcomes the reviewers’ positive comments on the integrated biorefinery platform. It should be noted that all IBR projects in our portfolio were selected through a competitive solicitation process that involves an independent merit review committee, and are authorized under legislative authority EPACT 932. OBP will continue to manage these projects with support from IE and IPA to provide risk assessment and oversight. The IBR platform has developed a resource loaded planning document that address future project funding and platform interfaces across the Biomass program R&D platforms. This information was not presented at the IBR platform review due to time limitations; however, we can include this in future reviews.

The IBR platform has been increasing its feedstock interface efforts. In particular it funded a pre-competitive effort with industry on corn cob harvest and collection. One of the early findings of the IBR projects are feedstock availability and supply chain-delivery issues which need to be addressed to meet our programmatic goals. The platform is working in coordination with the Feedstocks platform on these issues and has collaborated on a logistics solicitation (\$16 million). The IBR platform has also increased support to commercial scale projects to address some of the feedstock availability and supply chain issues (example: POET). Since the forest products industry is more developed to deliver a lower cost feedstock, we assumed there would be a greater emphasis in the early solicitations to use wood. However, our new solicitation will broaden DOE’s investments into other biofuels technologies and feedstocks.

The IBR platform will continue to interface with the conversion platforms on the remaining barriers, the timing of budget requests (two years out) and funding availability (planned mortgages) makes it difficult for the platforms to run solicitations quickly to address barriers uncovered in the IBR platform. New solicitation for pilot and demonstration scale integrated biorefineries producing biofuels, bioproducts, and biopower will be forthcoming.

The program will improve the peer review process so that the amount of information given to the reviewers by the projects is increased so that they may be properly reviewed. The program had organized a “closed session” for discussion of business sensitive or proprietary information/data, however, not many projects actually discussed the detailed information requested for the review. The program, in future peer reviews, will require more detailed information and longer presentation from the projects and review this information up front in order to ensure its adequately detailed for the reviewers.

The platform believes it is unfortunate the PIs of some projects did not present all of their data or background supporting the scale-up to their biorefinery designs, such as pilot data. A project would not have been selected for negotiation unless they had pilot data supporting their designs. Some have run them more than others, thus driving down the technical risks associated with scale up to commercial or 10% of commercial scale.

iii. 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)

Exhibit 10 – Platform R&D Portfolio: Strengths and Weaknesses

Strengths	Weaknesses
The platform R&D strongly supports the transformation of existing corn dry mill plants to biorefineries using feedstocks that are readily available to them.	The platform is underweighted on projects that use non-corn based feedstocks i.e. grasses and forest residues. It's logical and appropriate to initially base the creation of the new biorefining sector on the existing corn ethanol industry i.e. hybrid starch/cellulose plants; however, it's now time to begin to move to greenfield projects that will utilize non-corn derived feedstocks.
They are funding gasification and fermentation technologies. They are funding projects using wood, agricultural wastes and MSW. They should stay focused on cellulosic biomass. I think clearly the first feedstock they will use will be wood. After that will be agricultural waste and then energy crops. I think MSW and waste materials will have a small impact (and	They are not funding other more innovative technologies like pyrolysis. They need to focus more on pilot plant work and process improvements. It is not always clear what they learn from scale up. Each company should list the top 3-4 things they will learn from scale up.

be very economically attractive), but they will never be [a high impact solution].	
Platform is balanced - gasification and fermentation. Different gasifiers and different approaches to generating the biofuels. Wood, ag residues and sorted MSW represent a diversity of feedstocks.	Need more energy crops and food processing wastes. Need to consider biogas to biofuels demonstrations, such as anaerobic digester gas and more MSW to biofuels. Too much emphasis on PP industry.
N/A	Weak presentations made it impossible to tell anything about progress toward goals.
An example of targeting R&D to benefit all of platform is the enzyme work. If properly conducted, this should provide a benefit to all of the platform and not just to one of the project leads.	There are cases where the R&D efforts are left to the overall project lead. This can lead to tunnel vision in looking at solutions to various technical issues. If Critical Success Factors's in the various projects are commonly identified, it might be recommended that the platform look at funding R&D to investigate multiple alternatives.
No comment	This reviewer is sympathetic to the role pulp-and-paper companies can play in the evolution to full-scale biorefineries. The benefits of utilizing this industrial sector to achieve the Program's goals are well understood. A key impediment to leveraging this sector, however, is the decade-plus decline of the industry and their overall weak balance sheets and re-investment ratios. OBP's selection of three mills in its portfolio is laudable and these firms appear to be pro-actively communicating. However, there is a distinct overlap of technologies that should be prioritized in the overlapping projects. Also, OBP should ensure collaboration among these projects so that each project partner benefits from the lessons-learned by others.

Technology Manager Response

The TM was grateful to have the reviewers recognize the platform's efforts to transform the existing industry from the existing corn dry-mill plants to biorefineries using readily available feedstocks. The platform understands the interest to move to greenfield sites, but also recognizes that these sites are typically more expensive than hybrid or add-ons to existing industry infrastructure. The new FOA for pilot and more demonstration scale biorefineries will broaden the IBR portfolio and may satisfy this interest.

The program aims to broaden its technology and feedstock investment portfolio with selections from the new FOA. The new FOA will include pyrolysis technologies. It should also be noted that the thermochemical conversion platform is also ramping up pyrolysis efforts. Anaerobic digestion is considered a commercial technology and thus is not considered innovative for investment. MSW has been included as a feedstock (as long as its sorted) and is the feedstock for one of the commercial IBR projects (i.e. BlueFire). Some demonstration projects had listed switchgrass as a feedstock but had to refocus on more near term feedstock due to changes in project partners or availability issues. The new FOA for pilot and demonstration scale projects requires applicants to develop a detailed plan for scale up and define the unknowns which will be learned from the pilot or demonstration scale facility.

The platform agrees with the review panel on the need for PIs to present detailed information in their presentations. In future peer reviews, will require more detailed information and longer presentation from 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 TM agrees that the Flambeau and New Page projects have been very proactive about collaboration. For example, they are sharing pilot plant costs and data at the TRI facility in North Carolina.

iv. Platform 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 – Platform Progress: Strengths and Weaknesses

Strengths	Weaknesses
The IBR platform is making a significant contribution to the achievement of the conversion core R&D platform with respect to enzyme hydrolysis and fermentation.	The projects within IBR platform are not sufficiently coordinated and synergistic to achieve the 2012 platform goal stated in the IBR platform MYPP.

To make biofuels happens will be difficult. This requires a long term sustained research efforts. To make fuels cheaply is also very [difficult].	N/A
Progress across a number of IBR pathways is underway at a pace that appears to be near a pace to date that might still achieve DOE 2012 platform goals.	Progress to date, however, appears to be at serious risk due to financial stress on a great number of the program participants. This theme ran through many of the presentations. DOE should undertake a review of this to estimate the risks to each project and the overall portfolio to assess the potential risk to the overall program and develop contingency/mitigation plans. Progress on some projects appears to be good until one realizes it is being made at the expense of skipping pilot/demo scale work thus putting the probability of success at risk. The current economic climate is stressing many of the projects commercially.
Some of the projects are making good progress and a few of the projects appear to have the team structure, management plan, technology readiness and support to proceed ahead with construction of demo plants.	The Program has funded a lot of projects, but based upon the content of the reviews, I am not sure that most projects will never pass the GO gate for a number of reasons. That may be a matter of financing difficulty and risk adversity and not the fault of the OBP.
N/A	No way to judge given weak presentations with no details Some PIs are using program as a tool to save their failing industries. They may come up with useful solutions, but if something else comes along that gives them hope, they will likely drop biofuels.
For the projects that seem to be focused on meeting the platform goals, the projects seem to be moving forward and seemingly on track toward achieving the platform goals.	Some projects are very questionable in meeting the platform objectives. These need to be weeded out. The other presentations need to be more substantive in data presented, CSF's need to be separated between technical, financial, and regulatory with information why they are risks and what is planned to overcome the barriers. Financial should indicate where they are presently in relation to the target costs including a breakdown. It have been suggested that a cost template be provided such that various competing projects could be compared on a common basis.
The OBP team (including RW	See earlier comments regarding this reviewer's opinion

Beck/Harris Group and IPA) has the qualifications to oversee the platform's portfolio. However, since these groups were excluded from providing their independent assessment of factual measures of each project's progress (e.g., timeline vs. goals; expenditures vs. milestones, etc.) and project-specific barrier it was difficult for this reviewer to gain insight into the effectiveness of their oversight findings or to benefit from what appears to be OBP's routine review and evaluation of these items.

on the platform's progress.

Loan guarantees will be essential to overcome the current crisis in credit markets. This reviewer suggests the OBP consider advocating 100% guarantees if projects must begin construction in 2Q or 3Q 2009 (calendar year).

OBP should consistently assess its exposure to external economic conditions affecting private sector partners. These conditions may include (i) the ability of a company to retain and utilize sufficient working capital to execute the project deliverables, (ii) the robustness of corn ethanol producers to continue their OBP work in light of the well known difficulties in the corn ethanol industry, (iii) the continued paucity of commercial credit, or (iv) the effect of a de-listing for small-cap public companies to continue their work. For public companies, assessment of cash resources is readily available through SEC filings. For privately held companies, such assessments are more opaque. There seems to be a heavy weighting of about three projects in the portfolio that an external market event(s) could negatively influence and thus compromise OBP's achievement of goals.

This reviewer suggests that the emphasis on I.P. protection will hobble the deployment of the portfolio and technology transfer. This reviewer well appreciates the private sector's demand in this area. But, insistence on I.P. protection presents a large hurdle that must be overcome to foster collaboration within the portfolio and across platforms and also for technology transfer. One can envision that the second round of projects will be repeats of the first, successful projects since new entrants will simply not have enough capital to overcome the first-to-market projects. This is a tough issue with no easy solution.

OBP should develop an approach to guide the selection and evaluation of projects in its portfolio. Unlike some peer reviewers this one does not wish to saddle project selection and evaluation of pioneer plants with unachievable high metrics for IRR or cellulose-sugar-fuel yield. One can understand that as pioneer plants these standard measures do not apply to new technology deployments and, indeed, improving financial and technical performance of these portfolio projects is at the heart of the federal OBP initiative. OBP might consider asking project to divide their projects into ISBL / OSBL

portions where the technology risk largely lies “ISBL”. The private sector can be invested in the OSBL / BOP areas and OBP can invest (up to 100%) in the ISBL technology portion. This approach may also allow more power to allow OBP to promote technology transfer and to invest RD&D funds with promising, targeted technology vendors who often lack the capital to qualify directly for OBP funding.

Technology Manager Response

The TM appreciates the comments concerning the platform’s progress across a number of IBR pathways is underway at a pace that appears to be near a pace to date that could achieve DOE 2012 platform goals. We also acknowledge that there is overall concern that other projects appears to be at serious risk due to financial stress due to current economic conditions. The program management has taken such concerns under review and held one-on-one meetings with each of the projects during the Peer Review to address these and other such issues. Each project does have a risk mitigation plan in place. The Project Management Center (aka Golden Field Office, PMC) will continue to work with the projects to ensure these plans are followed.

The program is working closely with the PMC and the project teams to identify financial and technical issues not originally anticipated in the risk mitigation plan. The program plans on conducting a comprehensive annual project review for a more rigorous assessment of project’s progress and address financial or technical issues. This information would be used to prioritize projects and potentially cut weaker projects out of the portfolio.

The TM appreciates the comments concerning the project designs and pilot data. Projects would not have been selected for negotiation and funding unless they had pilot data to support their designs. DOE funds the independent engineer to review the project designs at different stages to ensure readiness for scale up and reduced technical risks. The PMC and the independent engineers will continue to work with recipients to reduce the risk to the extent practicable and provide the oversight to identify unresolved technical risks that should be resolved. RW Beck/Harris Group (i.e. the independent engineer) and IPA will present an overview of their work at the program peer review in July.

Based on this feedback received, we recognize that it would have been informative to have the Independent engineer and IPA present on each project as part of the peer review process in the IBR platform. The IBR platform will work with the steering committee and organizers to incorporate this into the next peer review along with longer, more informative presentations for the projects that require technical and financial data. In the future, the Program will aim to conducting a comprehensive annual project review to ensure a more rigorous assessment of

project's progress and address financial or technical issues. This information would be used to prioritize projects and potentially cut weaker projects out of the portfolio.

v. Portfolio Gaps

Are there any gaps in the Platform RD&D Portfolio? Do you agree with the RD&D gaps presented by the Platform Manager?

Exhibit 12 – Platform Gaps: Reviewer Comments

Reviewer Comment
Probably the biggest gap in the IBR platform portfolio is lack of support for projects that will use grasses as a feedstock. This is particularly relevant in light of Abengoa's comment that corn stover is proving to be a more difficult feedstock to handle than was originally anticipated.
Fund more pyrolysis work and new technology that is coming on line. There are no pyrolysis projects in this platform (probably because these projects are not quite ready yet).
Work is focused on production of biofuels with the disposal of lignin/coproducts being given "one off" consideration on a project by project basis. Each project appears to be confident of finding a way to handle the issue of coproducts at this point. In the future, however, when DOE full commercialization goal volumes are achieved, the volumes of coproducts will overwhelm the existing uses for these products. The two relatively small FT processes presented stated that the wax they will produce will constitute 3% of the US candle usage. They thought this was small but this was actually an eye opening figure for these two small facilities. DOE should look into a separate effort to begin characterizing the types and volumes of coproducts that are to be expected and how they will be utilized as feedstock for industry or power. If, as I believe, power will be the predominant use, people from the appropriate companies in the energy industry should begin looking at these fuels now rather than later. This is a major looming platform barrier and should not be left to each individual project to develop.
1) I am not that familiar with the content of the RDD portfolio. 2) I feel that the platform as reviewed today is missing co-gen applications where power and/or fuel can be generated by the same processing step. For example, a gasifier producing syngas from a biomass feedstock and the ability to demonstrate the economics by co-generating power or steam and fuel production from the same gasifier stream. 3) Platform is not covering innovative separation approaches for the gases or the liquids. For example, innovative development for reducing the energy required in separating alcohol/water. 4) Platform is focused only on different approaches to make liquid fuels but there is no emphasis on using new technology to increase the energy efficiency or reduce the fossil carbon imprint of each or all steps in the IBR projects.
Although not mature yet, in the future, DOE may want to consider some pilot-scale projects with direct conversion a la Dumesic, Virent, Huber. These paths produce hydrocarbons that can be blended directly into transportation fuel. Technology is probably not ready for demo plant, but is

getting close.
I agree with the gaps as discussed in the joint meeting of the peer review panel.
See earlier comments on I.P. protections hindering technology transfer.

Technology Manager Response

The TM very much appreciates the feedback received on the perceived platform gaps. The IBR platform recognizes the gap of grasses, such as switchgrass in its portfolio. Some projects had initially stated that switchgrass would be included as a feedstock, but then changed their focus due to other issues in the project (i.e. Mascoma). The new IBR FOA seeks to broaden the program's portfolio of technologies, feedstocks, geographically, etc at smaller scales (pilot and demo) that may be more appropriate for emerging feedstock.

The platform agrees with the gap that exists in biopower or co-generation of biopower and biofuels. In fact many of these projects have incorporated a power island to utilize the lignin or other waste streams to use onsite and in some cases, exporting to the grid (e.g. Abengoa). These power islands provide both economic and GHG benefits. Some IBR projects are also getting support for waste water treatment (i.e. Verenium), which was not discussed. The IBR platform will continue to work with its partners to discuss issues with co-products and waste streams and work closely with the R&D platforms to support those needs of the developing industry. The program is in process of developing an R&D strategy for bioproducts. The new IBR FOA includes bioproducts as the main output and the FOA requires a market assessment to justify there is enough market share for the bioproduct.

OBP is also concerned with the strain on the feedstock supply necessary to produce fuel, power, and products and is working on assessing those feedstock demands through its analysis efforts. While biopower is not the main focus, many of these projects do have a heat and power component (POET, Abengoa, for example). For the next peer review, the program will require that power components be presented in going over the project's IBR design. The program can require that all unit operations for the project's biorefinery design be reviewed and those that are innovative, such as separations technologies, be highlighted so that the peer reviewers can assess the RD&D developments unique to each project (as discussed earlier with the milestones by pathway by project).

As stated previously, the new IBR FOA seeks to broaden the technology/feedstock portfolio (including pyrolysis), and the Thermochemical Conversion platform is also ramping up its pyrolysis efforts.

The IBR platform's resources loaded plan, which was not discussed, includes an out year strategy for reducing energy efficiency and carbon footprint of these IBR technologies. The next peer review should incorporate this information being briefed to the peer reviewers. Also, the current and new IBR projects are reporting sustainability metrics, which the program should also discuss at the next peer review.

vi. Additional Recommendations, Comments, and Observations

Exhibit 13 – Other Reviewer Comments

Reviewer Comment
The IBR platform and achievement of its goals is essential to the Biomass Program reaching its goals as stated in the program MYPP. The platform is considered to be making a valiant effort; however, it is severely compromised by major factors beyond its control. These are: 1) the current economic environment; and 2) congressional and/or lobbyist/3rd party decisions/activities that "whip saw" and frustrate effective platform management. That notwithstanding, it is considered that the platform is being well managed under difficult circumstances. In terms of managing individual projects, it seems that DOE would benefit from having language in the individual contracts/agreements that gave the Department the authority to terminate specific work packages and/or projects that were not meeting pre-defined performance targets. The platform should also make efforts to assure that it is not blind-sided by sustainability/indirect land use change issues that could negatively impact achievement of platform goals. This will require strong coordination with the feedstock platform, as well as relevant USDA feedstock-related activities.
We jumped ahead with this program. We need more pilot plant information and process improvements. Before most of these projects go forward I would recommend that they have at least 6-18 months of pilot plant data. More of DOE's efforts should focus on the pilot plant work. They should not fund demonstration projects until the companies can clearly justify why they want to move forward with the project and demonstrate good pilot plant data. For all these projects they should calculate the minimum selling price of the biofuel with an IRR of 10% (with and without DOE cost share). They should state where they are with pilot plant data and where they should be. They should also clearly specify the project investment, material balances and go through a material flow chart for each presentation. There are currently lots of uncertainties around the economics. DOE might also consider doing economic analysis with and without carbon taxes. For the review you need to spend at least 1-2 hours on each company. Reviewers need to go into technical and economic data as well as pilot plant data. DOE needs to be treated like a true stake holder in this project rather than a handout of government money. For biofuels to happen DOE clearly needs to focus on more R&D and not just scale up.
As discussed, the information presented by the projects at the peer review closed session was terribly inadequate for the purposes stated by DOE. We proceeded to issue reviews based on "it is what it is" but in all honesty as we discussed with DOE the quality of the information and reviews produced is nowhere close to the standards we individually or collectively desired or would have held out for in our business practices. The peer review process and DOE's ability to ensure/enforce full and open

participation and disclosure by each process should be evaluated and strengthened. Presenters were unable or unwilling to present in sufficient detail or at times to even answer appropriate technical questions. There has to be greater accountability on the part of those who receive funding from DOE to provide sufficient information for review.

Where are the measured or projected impacts of energy savings, energy efficiency, reduced carbon footprint, and a quantifiable reduction in oil? That is the basis of the program goals, but in no presentation did anyone give us projected quantifiable data. Since DOE does not require this, then how sure is the Program that the projects in the Platform will provide meaningful efficiency savings, CO2 reduction and oil reduction impacts.

Platform review MUST not distinguish between earmark, DNFA or competitive projects. DOE should treat all projects on the same basis - that is, they are part of the overall IBR platform. Knowing the procurement mechanism I believe taints the reviewers.

It was obvious that the organizations did not take the peer review seriously. Need to make PIs give meaningful information to peer reviewers.

The DOE representatives were very knowledgeable and ran the meetings and review sessions in a very professional manner. They promoted open discussions and facilitated good input from the panel members. In general, it is extremely difficult to make in depth comments about most of the presentations, if we are to only comment on what was presented.

There was insufficient time to ask detailed questions of the presenters. The peer review should consider whether more time could be given to this. More background information would be beneficial.

It is not clear that an inter-agency approach is in place to address likely public concerns (factual or perceived) regarding the use of GRAS GEMS (*e.g.*, recombinant *e-coli*) in enzymatic hydrolysis-based platforms. EPA and NIH should be encouraged to work with DOE / OBP to provide recommendations, clear guidelines, or regulations to assure the public that risk from these microorganisms is minimized or eliminated. The issue is not scientific. Indeed, it may largely be perception but pro-active consideration of the public reaction to this matter may save many months of delay in these types of projects.

OBP should consider funding pre-development work that results in detailed project proposals that then may qualify for future funds for implementation. This reviewer is concerned that the current portfolio is heavily weighted towards well-capitalized companies that will benefit almost exclusively from the federal investment in commercializing their protected technologies. (In some cases, one can discern little market motivation of some companies to “share” their technology so that other firms can “use” the processes developed under the OBP funding.) By providing funds to smaller firms qualified (by talent and experience, as opposed to balance sheet) to pull a bioenergy / new technology project proposal together, OBP may then have a much wider range of opportunities for future funding to mature and implement the plans. Commercial firms and OBP can work together to select these pre-development proposals using part private and part public monies.

Technology Manager Response

The IBR platform agrees it would be beneficial to manage its project portfolio with true “stage gate” go/no go decisions centered around technology performance targets that are linked to cost

reduction goals. These have not been incorporated since most of the projects use engineering and construction cost as the go/no go decision points. Technology performance at the pilot scale or demonstration scale will in fact be go/no go decisions for many of the projects before construction is authorized. Results of IPA report, external independent review by Beck, and review by DOE will be used to make go/no go decisions. This includes performance, economics, design, etc. If a project does not show adequate performance at the smaller scale to justify scale-up, a no go decision can result. Note that no or very little operational budget is included in these projects. Most of the funding/risk is in the upfront R&D and subsequent construction.

The IBR team is coordinating on the sustainability issues with the Feedstock team.

The new IBR FOA seeks pilot plant applications that have integrated bench or lab scale data to justify scale up, along with an R&D plan to resolve remaining technical barriers in the pilot plant as well as contingency plans. The new IBR FOA also seeks demonstration scale biorefineries that have the required pilot plant data to justify scaling up to demonstration along with their R&D plan to resolve any remaining technical barriers and contingency plans.

An IRR of 10% for these types of facilities is unrealistic. These are meant to be research or first of a kind facilities and a profit is not expected. Proformas are required for all of these projects and the new IBR FOA requires more data to justify the readiness for scale up and the facility economics. Business plans are required to show the project partners ability to commercialize.

The IBR platform will increase the time spent reviewing each project in the next peer review along with requiring more detailed information.

The core R&D platforms are focused on the R&D needed before scale up. The IBR platform coordinated information sharing (aka “feedback loops”) into its resource planning in order to assess technology readiness and remaining technical issues with the core R&D platforms. The next peer review may include this resource loaded plan in order for the reviewers to understand how IBR coordinates this knowledge sharing internally and its longer term strategy.

The IBR platform greatly appreciates this feedback and will increase the time spent reviewing each project in the next peer review along with requiring more detailed information.

C. Overall Technology Manager Response

The Platform thanks the Peer Reviewers for their valuable comments, time, and expertise. We hope to address their concerns in the near term through a Comprehensive Annual Project Review in the new calendar year, and through more thorough information exchanges at future Peer Reviews. Although the Peer Reviewers weren’t able, with the information presented, to give a complete assessment, their comments and concerns were very much on point. We hope that the PI’s take the Peer Reviewers comments seriously and will be committed to working with the PI’s to ensure their projects are successfully managed and implemented to make progress towards the Program’s goals.

III. Project Review

The IBR Platform supports research, development, and deployment projects with the National Labs, University and Industry partners, non-governmental organizations, and other entities. Projects funded through the IBR Platform align their activities with the Biomass Program Multi-Year Program Plan (MYPP) goals. At the February 18-19, 2009 Review, 17 projects gave 20-30 minute presentations that focused presenting how project results would help achieve the Biomass Program objectives. Projects were evaluated by a subset of the Feedstock Platform Review Panel, in accordance with the reviewers' areas of expertise.

A. Evaluation Criteria

Each project was evaluated systematically by set of criteria developed in conjunction with the Biomass Program peer review steering committee. The evaluation criteria were provided to the project PIs ahead of time. The five criteria are provided below:

Relevance - *The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.*

Approach - *The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.*

Technical Progress - *The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.*

Success Factors - *The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.*

Future Research - *The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.*

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

B. Project Scoring

Exhibit 14 – Project Scoring Summary Table

WBS	Title and Project Information	Relevance	Approach	Technical Progress	Success Factor	Future Research	Overall
5.1.2.1	Making Industrial Bio-refining Happen! (GW); Natureworks, LLC; Dr. Suominen Pirkko	2.8	3.75	3.5	2.5	3.25	3.2
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	4.5	4.5	4	3.75	4.25	4.2
5.4.4.1	Integrated Biorefinery for Conversion of Biomass to Ethanol, Synthesis Gas, and Heat; Abengoa Bioenergy Corporation (GW); Gerson Santos Leon	5	5	4.33	3.67	4.33	4.5
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	4	4	3	4	2.75	3.6
5.5.5.1	West Coast Biorefinery (WCB) Demonstration Project; Pacific Ethanol, Inc.; Harrison Pettit	3.5	3	3	2.67	2.25	2.9
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					
5.5.7.1	MAS10BIO5; Mascoma; Dr. Mike Ladisch	4.4	4.2	4.2	3.8	4.2	4.2
5.5.8.1	Jennings Demonstration Plant; Verenium Corporation; Russ Heissner	4.33	3.8	3.6	3	3.4	3.6
5.5.3.1	Mecca Ethanol Facility: A Landfill Waste Feedstock to Cellulosic Ethanol Facility; BlueFire Ethanol; William	3.33	2	2	2.33	1.67	2.3

WBS	Title and Project Information	Relevance	Approach	Technical Progress	Success Factors	Future Research	Overall
	Davis & Necy Sumait						
5.5.6.1	Lignol Biorefinery Demonstration Plant; Lignol Innovations, Inc.; Michael Rushton	3.25	2.75	2.5	2.5	2.25	2.7
5.6.2.1	Demonstration of an Integrated Biorefinery at Old Town, Maine; RSE Pulp & Chemical; Dick Arnold & Jim St. Pierre	2.5	2.75	2.75	2.75	2	2.6
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	3.33	3	3.33	3.67	3.3
5.6.3.1	Demonstration Plant - Biomass Fuels to Liquids; Flambeau River Biofuels, LLC; Robert Byrne	3.67	3.33	3.67	3	3.67	3.5
5.6.1.2	Cellulosic Based Black Liquor Gasification and Fuels Plant; Escabana Paper Company; Michael Fornetti	3	3	3	2	3	2.8
5.5.1.1	Commercial Demonstration of a Thermochemical Process to Produce Fuels and Chemical from Lignocellulosic Biomass; Range Fuels, Inc. ; William Schafer III	3	2.75	3	2.25	3.25	2.9
7.5.4.1	City of Gridley Biofuels Project; City of Gridley; Dennis Schuetzle	3	2.5	2.25	3	2.33	2.6
7.5.4.5	Louisiana State University Alternative Energy Research (LA); LSU : Agriculture Center; Donal F. Day	1.33	2.67	2	1.67	2	1.9
7.5.7.2	Biomass Energy Resource Center (BERC) - Core and Program Support; BERC; Chris Recchia	2.33	2.67	3.33	2.67	2.67	2.7

C. Integrated Biorefinery Individual Project Reviews

The following 17 projects were evaluated by three to ten reviewers. The number of reviewers for each project is listed for each project. Each evaluation provides a summary table of the evaluation scores provided by the review panel followed by a verbatim reproduction of the full written comments provided by the review panel. The written comments do not in any way reflect an official opinion of the U.S. Department of Energy. Following the review, each project Principal Investigator was given an opportunity to review and respond to the written evaluation provided by the review panel. These responses are provided in full below. The Principal Investigator responses do not reflect an official opinion of the U.S. Department of Energy.

Individual Project Reviews by Sub-Platform

This section will provide review results for each project in the sub-platform and PI response.

Project Number:	5.1.2.1
Project Title:	Making Industrial Bio-refining Happen! (GW)
Performing Organization:	Natureworks, LLC
Number of Reviewers:	Dr. Suominen Pirkko

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	3.0	0.82	2
Approach	3.75	0.50	1
Progress & Accomplishments	4.0	0.58	1
Success Factors	2.5	0.58	1
Future Plans	3.25	0.96	2
Average Score: All Criteria	3.2		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Investigator Response

Thanks for your comments. There appears to be a misunderstanding that lactic has been the main topic of the work. Since re-starting the funding and work in summer 2006 all of Task 1 (hydrolysis development by Abengoa) and most of Task 2 (biocatalyst development by NatureWorks/Cargill) has been focused on ethanologen, although there has been lactic strain development work as well.

Abengoa will be the first company using this ethanologen commercially. They have made great progress in the hydrolysis part of the process both in Task 1 and in their other projects. Although Abengoa doesn't disclose their cost modeling numbers publically, the fact that they are going ahead with their plans to build a full scale plant in Kansas, should be strong enough indication that the economics based on their hydrolysis process and Cargill's biocatalyst are good enough for a commercial operation. Ethanol production from hydrolysate from Abengoa's pilot has been demonstrated in collaboration between Abengoa and Cargill. We have addressed specific process relevant questions to give as realistic data to the cost models as possible from bench scale.

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Excellent progress on lactic acid fermentation. Excellent progress on pentose fermentation - particularly with respect to co-fermentation of xylose and glucose	Work on lignin valorization appears to be lagging. Need more work on increasing solids loading.
PI Response: N/A	
They have developed some nice organisms.	I do not think this program fits into the program. The project just focuses on developing micro-organisms for lactic acid production.
PI Response: Although lactic has been commercialized the main focus and spending of Task 2 (organism development) has been on pentose to ethanol organism development. This has been very successful, ethanol fermentation results were presented not only in pure sugars but also in real hydrolysate produced in Task 1 (by Abengoa in their pilot plant). Task 1 (done by Abengoa) completely focuses on hydrolysis process. This is part of a bigger program at Abengoa and since they were giving a presentation on the bigger picture in the same review I was short on describing advancements of Task 1. Collaboration between Task 1 and 2 has been very good. The developed organism has been tested at Abengoa's site and Cargill has	

received hydrolysate for organism development and testing at our site.	
N/A	While this project addresses the creation of "bioproducts" contained within the MYPP Mission, it does not address the further defined goals of biofuels contained within the MYPP Strategic Goal and Performance Goals. Thus it is of value but does not address the highest most immediate goals of the MYPP.
PI Response: Although lactic has been commercialized the main focus and spending of Task 2 (organism development) has been on pentose to ETHANOL organism development. This has been very successful, ethanol fermentation results were presented not only in pure sugars but also in real hydrolysate produced in Task 1 (by Abengoa in their pilot plant). Task 1 (done by Abengoa) completely focuses on hydrolysis process. This is part of a bigger program at Abengoa and since they were giving a presentation on the bigger picture in the same review I was short on describing advancements of Task 1. Collaboration between Task 1 and 2 has been very good. The developed organism has been tested at Abengoa's site and Cargill has received hydrolysate for organism development and testing at our site.	
Xylose to ethanol organism is important to cellulosic ethanol.	Seemingly more targeted to PLA than ethanol Although PLA replaces some oil related products, it is not directly related to the production of biofuels. Presently, PLA is not being produced using cellulosic fermentable sugars.
PI Response: Although lactic has been commercialized the main focus and spending of Task 2 (organism development) has been on PENTOSE TO ETHANOL organism development. This has been very successful, ethanol fermentation results were presented not only in pure sugars but also in real hydrolysate produced in Task 1 (by Abengoa in their pilot plant). More ethanol results were presented than lactic results to reflect the focus of the work. Task 1 (done by Abengoa) completely focuses on hydrolysis process. This is part of a bigger program at Abengoa and since they were giving a presentation on the bigger picture in the same review I was short on describing advancements of Task 1. Collaboration between Task 1 and 2 has been very good. The developed organism has been tested at Abengoa's site and Cargill has received hydrolysate for organism development and testing at our site.	
Conversion of 5 carbon sugars was good.	Objective re recovery of value added lignin was not referenced. Questions about lignin work were not answered. Challenges were not listed. Not clear how toxin levels will be decreased the longer feedstock will be stored at ambient temperature.
PI Response: I believe the next speaker from Abengoa answered the lignin related questions. It is hard to give out other company's information beyond what they cleared for the presentation. In	

this unique situation where Abengoa speaker was next, this shouldn't have been a problem.

Toxin levels are reported in literature to be highest when the hydrolyzate is fresh. We have wanted to test the organism in the harshest conditions and thus the hydrolysate has been shipped fresh in cold, and stored in cold. In our hands we have not observed changes in bug performance due to age of hydrolysate (tests span over six months using same lot). Thus this hasn't been a concern for us. If toxin levels would decrease faster at room temperature that would be a good thing and just make the bug performance better.

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The work plan for the fermentation work is well designed with logical and well defined milestones	The work plan for the valorization of lignin is not well defined. No milestones or other performance targets.
PI Response: N/A	
Xylose organism advantage. It appears that Natureworks uses many genetic tools in the development of this type of organism.	N/A
PI Response: N/A	
Work accomplished, for those items not listed in objectives, was well done and important for the development of commercial lactic acid production. Long term milestones were met. Effort to identify biocatalyst route was defined.	N/A
PI Response: Also biomass hydrolysate sugars to ethanol milestones were presented in the same well defined form as lactic related milestones. All ethanol milestones were achieved on or ahead of schedule, which was also presented.	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
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Excellent progress on the lactate fermentation and fermentative organism now being utilized at commercial scale. Very good progress on pentose fermentation but further work needed on productivity at low pH.	No reported progress on lignin valorization.
PI Response: N/A	
They have made good progress toward commercialization.	N/A
PI Response: N/A	
Presentation indicated that project goals were met on the xylose organism; but it is not clear who set those goals and how those goals work to meet the overall goal for low cost ethanol.	Ethanol production seems far behind the lactic acid platform. There is no guarantee that ethanol producing organism will perform the same at scale up as is suggested by the example of the lactic acid success.
PI Response: Project goals were set using cost models and together with Abengoa to make sure the bug performance fits in their economical targets. Lactic development started in 1999, long before this program, while ethanol development started in this program to leverage the lactic learnings and developed technology. Since the ethanol organism is the same as lactic organism it is a clear benefit that there is large scale experience with this novel organism. We realize there can be process specific issues with scale up, but many of the larger issues have already been solved with the lactic producing organism, e.g. seed production & nutritional needs.	
N/A	OBP goals and objectives were not reviewed.
PI Response: N/A	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Good identification of technical critical success factors re hydrolysis and lactate and ethanol	Poor identification of business and market factors for all aspects of the project. Poor identification of technical critical success factors for

fermentation.	lignin work.
PI Response: N/A	
N/A	"Critical Success Factors and Potential Challenges" were identified in the presentation but when questioned, the presenter was unable to elaborate on any of the "Potential Challenges".
PI Response: All potential challenges that were questioned related to Abengoa's part of the project. I was not authorized to talk about their strategies. I thought this was OK, because the next speaker was from Abengoa and could answer these questions.	
N/A	There were no critical success factors presented regarding the development of the xylose organism. The assumption is that things are on track.
PI Response: The key success factors regarding the xylose organism are 1) use of the xylose isomerase pathway 2) robust microorganism tolerant to hydrolysate toxins. Both were mentioned in the presentation but not clearly pointed out as the key success factors.	
N/A	Success factors, as outlined in DOE presentation guidelines, were not identified. Basic information for meeting OBP objectives was not available.
PI Response: N/A	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Future work plan for hydrolysis and fermentation is logical and builds on success to date. Recognition that hydrolysis and fermentation are synergistic is very important.	No work plan for lignin valorization. Failure to recognize that high value co-products from lignin can positively impact biorefinery economic viability.
PI Response: N/A	
N/A	No detailed plans were revealed. It appears Natureworks has essentially completed their portion of the work and no definitive goals were set for future work. Bullet points

	were given without details of what needs to be completed.
PI Response: The project has only 2 months left, so, the plan is to wrap up and report the work.	
N/A	No future work plans provided.
PI Response: The project has only 2 months left, so, the plan is to wrap up and report the work.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
Partnerships with Abengoa and NatureWorks are excellent. These companies have the capability to immediately incorporate the advanced fermentative organisms for ethanol and lactate respectively.	N/A
Presentation indicates potential to displace 40MM bbls of petroleum usage through this technology. What collaboration is going to be required to make this happen and when will this begin. There is no collaboration with other Mfgs indicated on this work to date. Is collaboration with others required to capture this oil savings? What is the plan to achieve this?	The 40MM bbls of petroleum displacement is projected to come from PLA replacing petrochemical based plastics like PET. This has already began. NatureWorks currently has one plant in Blair. More than this one plant is required for the projected displacement. NatureWorks will grow its capacity as the PLA demand grows. Outlicensing is also a possibility.
Implementation of this technology is dependent on the Abengoa collaboration at this time. Presenter did not indicate any outside collaborations were being used for the development of the ethanol producing organism.	Abengoa is the first licensee of this ethanologen. Other licensing negotiations are in progress with 4 other companies, whose names cannot be revealed due to confidentiality agreements. Ethanol producing organism development in this project has been done by NatureWorks/Cargill since 2005. The platform organism and technology has been licensed to Gevo for butanol production.
Apparently all findings, as a result	Findings are currently shared with potential licensees.

of meeting milestones, will be retained within organization.	Cargill is also presenting at the SIM Fuels and chemicals meeting early May.
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g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
Drop lignin from the work plan for this project since it already appears to be low priority and no significant advances have been reported.	N/A
None. Appears this project in very near completion assuming scale up is successful. No economics were presented to indicate whether this will be good enough for the Abengoa project.	N/A

Project Number:	5.2.2.1
Project Title:	Advanced Biorefining of Distiller's Grain and Corn Stover Blends: Pre-Commercialization of a Biomass-Derived Process Technology (GW)
Performing Organization:	Abengoa Bioenergy Corporation (GW)
Number of Reviewers:	Gerson Santos Leon

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	4.5	0.58	1
Approach	4.5	1.00	2

Progress & Accomplishments	4.0	0.82	2
Success Factors	3.75	1.50	3
Future Plans	4.25	0.96	2
Average Score: All Criteria	4.2		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
N/A

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The objective of integrating cellulosic biomass conversion technology into a dry mill starch plant and developing process improvements for each is a significant. Achievement of this objective is very important to the economic viability of commercial-scale biorefineries.	Business decisions necessary to maintain the economic viability of the existing dry mill plant operation curtailed important aspects of the project.
PI Response: Agree, but such is the nature of the business.	
Project has been aligned with the MYPP objectives throughout. Focuses on solving technical issues. Some successful, some not.	N/A
PI Response: OK	
Strong management understanding of the ethanol industry has focused the research and development on	N/A

critical goals and experience in the production of ethanol from starch has developed a strong project oriented management team. If successful, the project could be related to various locations throughout the nation.	
PI Response: OK	
There were data available and reports of work conducted based upon outlined objectives. For those areas where attempts were made to develop technologies but economic viabilities were not present, decisions to go to other areas was excellent. Justification to discontinue work on improving co-product quality was based upon actual investigations with economic considerations.	Lack of information on material balances
PI Response: Due to time limitations these were not presented. They are available in our offices.	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Very well designed project management plan which is being rigorously followed. Key decisions are based on solid data/results.	No significant weaknesses
PI Response: OK	
There were many task being performed and I never heard or saw a PMP for project execution and it was unclear how every task tied together or how and when resources	The presenter did not follow the presentation template. He presented in a format that was somewhat different than the criteria for evaluation and it was difficult to assess the project. There were a number of independent tasks and it was not clear how much was accomplished

were redirected when issues with unsuccessful economic results were encountered,	and how everything tied together.
PI Response: Next time we will try to be more transparent on the organization of the presentation. This is a very large project and we did not have enough time to go into the details.	
Company has been open and aggressively attempted to partner with many different potential partners increasing their chance of success.	N/A
PI Response: OK	
Use of interdisciplinary communications with regularly scheduled meetings appeared to be critical for assessing short and long term objectives. As a result of the outlined jobs, data were available for making logical decisions on which fork in the road to use for continuing the overall project.	N/A
PI Response: OK	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Improved ethanol yield from starch was achieved; however, further improvements were limited by enzyme cost. Nonetheless, Abengoa indicated it would restart the work should technology developed by others appear to be applicable to achieving project objectives.	Valorization of animal feed co-product(s) was not achieved.

PI Response: Agreed	
Satisfactory progress on biomass pilot plant tasks. C5 sugar fermentation successfully developed.	And the results showed that some of the barriers will not be overcome by completion of the program, given the refocus of effort on the BMPP. No Gantt?
PI Response: This work will have to continue after the completion of this grant.	
N/A	Very little data presented in order to truly evaluate the progress which has been achieved although it appears that the project is on track. Barriers were presented, but no plans were presented to overcome those barriers.
PI Response: Did not have sufficient time to present data.	
Stated milestones and achievements of said milestones were defined and elaborated upon. Considerations for meeting and conquering barriers were presented as possibilities to be assessed.	N/A
PI Response: OK	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The key technical, business and market success factors and showstoppers have been identified and rational strategies to overcome them are in place.	No significant weaknesses
PI Response: OK	
N/A	Critical factors were identified but not enough information was presented to understand what the development strategies will be.

PI Response: The critical success factors for each one of the unit operations are defined and tracked. We chose not to present this information.	
Strong project and engineering orientation if followed as presented should address the CSF's and internal project review should address inability to overcome the CSF's	Use of GMO's could have a significant approval time if spent organisms are to be used any feed applications or depending upon disposal requirements. Option on a long term basis was to burn the material. Critical success factors were presented but no strategies were presented to define the approach to solve these problems.
PI Response: Agree, this will not be a problem during deployment.	
Numerous success factors were identified and categorized.	N/A
PI Response: N/A	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The future work plan builds on past progress and is based on both sound business principals and in-house technical expertise, supplemented by external consultants as needed. The objectives of Abengoa re building biorefining capacity directly address several technical barriers identified in the OBP MYPP.	No significant weaknesses.
PI Response: N/A	
The PI stated that they are going to spend the remaining funds for the project on testing of the BMPP which will build upon or conclude the previous work.	Why restart the dry-grind co-products piece when the economics showed no viability?
PI Response: There are opportunities to improve the viability of the concept.	

Strong project emphasis on economic evaluation of each step would appear to be in place.	N/A
PI Response: N/A	
As per project successes to date, outlines were provided to make relevant decisions based upon data to be elucidated.	N/A
PI Response: N/A	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
A key interface is with enzyme developers. Abengoa has been very diligent and successful in establishing good working relationships with three such companies. They also recognize the need for farmer participation and are working diligently to establish a good working relationship with the farm community.	N/A
Lots of subcontractors who have provided a lot of critical R&D support for the project.	N/A
There appears to be an open minded approach to evaluate all opportunities and technologies. Level of results presented made it difficult to determine if the DOE goals were being met.	The program objectives have been met and we are moving into the commercialization phase in Hugoton.
Excellent example of biorefinery type program.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
There are no recommended additions/deletions.	N/A
Focus all resources on the testing in the BMPP as it can be used to improve or optimize the Commercial Plant project 5.4.4.1.	Agree.

Project Number:	5.4.4.1
Project Title:	Integrated Biorefinery for Conversion of Biomass to Ethanol, Synthesis Gas, and Heat
Performing Organization:	Abengoa Bioenergy Corporation (GW)
Number of Reviewers:	Gerson Santos Leon

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	5.0	0.0	0
Approach	5.0	0.0	0
Progress & Accomplishments	4.33	0.58	1
Success Factors	3.67	0.58	1
Future Plans	4.33	0.58	1
Average Score: All Criteria	4.47		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
N/A

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The project fully supports the MYPP objectives with respect to	None with regard to support of MYPP objectives.

the agricultural residue processing pathway.	
PI Response: OK	
Fits extremely well with DOE program. Choice of pilot proven technologies ready for demonstration. Commercial and market drivers drive the project objectives. Looking ahead at commercial and business arrangements (e.g., Contracting ahead with feedstock suppliers) to establish long-term perpetuity of the plant once commissioned.	Lignin market uncertainties Gasifier has issues and the issues have not been resolved by testing.
PI Response: As I explained during the presentation, lignin is an option if we secured the contracts if not it will be fed to the boiler or the gasification for energy.	
Successful operation of this project can be duplicated in many other locations.	N/A
PI Response: Agree.	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The approach is sound and rigorous project management tools are in place, particularly with regard to change management and minimizing financial risk. The importance of guaranteeing adequate feedstock supply has been correctly prioritized as high.	None with regard to approach.
PI Response: Thanks.	

PMP is for a logical Project WBS and Execution structure approach. Awareness of project delays such as NEPA, long lead items, etc. is recognized within the scheduling. Though summary paper speaks about using multiple feedstocks, project execution will initially focus on one feedstock - corn stover since it is the commercial objectives that are driving the project. Other feedstocks may be tried later.	Public summary should be updated to show the project's focus on corn stover as feedstock. PI is convinced that all technologies are ready but given the state of development of some of them, there may be some surprises and there was no alternative plan presented. For example, what if the stover feed handling system doesn't work or what if there is a problem feeding stover into the gasifier?
PI Response: The contingency are pellets to gasifier, it will increase cost.	
Use of many outside people increases chance of implementation the best technology. A strong project management system appears to be in place. High level approval of management should provide additional project control.	N/A
PI Response: Thanks.	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Key partnerships have been established and the approach to working with enzyme suppliers is a key to making good progress towards both project and MYPP goals. Good progress with the NEPA process.	Progress on enzyme hydrolysis and lignin utilization for process heat and/or value-added co-products is lagging.
PI Response: Lignin co-products are third party technology, only deploy if we secured contracts.	
Project is in early first stage but	N/A

appears to be on schedule and the focus is on commercial objectives, including for example, developing feedstock supply contracts now. As a credit to AB, some of the data from the Spain plant will leverage the DOE project.	
PI Response: N/A	
N/A	Concern that high reliance on Aspen modeling with a new process having many input variables not always well defined may lead to some difficulties. Must use some conservative design approach.
PI Response: We validate Aspen with excel spreadsheets and engineering reviews. We are fully aware of the shortcomings of Aspen as it relates to continuous versus semi-continuous batch processes.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
For the most part, the critical success factors and show stoppers have been correctly identified.	The gasification technology does not have a strong track record and more emphasis should have been given to this as a possible show stopper.
PI Response: Agree, this is a concern with most gasification systems.	
Speaker pointed out importance of getting the permits and making the contracts with the suppliers.	No barriers or CSF's were shown, except for importance of the feedstock supply.
PI Response: There are multiple barriers, however the most important is the supply system and financing, the other barriers have risk mitigation plans.	
N/A	Some KCSS factors may be outside the Company's influence. Such as financing.
PI Response: Agree.	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The project is well planned and Abengoa has demonstrated the business and technical skills necessary to address overcoming barriers associated with feedstock supply.	Abengoa has no experience in gasification and the project relies solely on Silvagas expertise. The approach to managing/recovering from a failure of that technology has not been well addressed.
PI Response: In addition to the gasification, we have a boiler capable of processing 100 % of the biomass input.	
AB knows how to design, build, operate and manage this big project. Their experience with the plant in Spain will greatly facilitate this project's execution.	Where are the contingencies?
PI Response: We rather not release our budget contingency. If the budgeted contingency is not sufficient, we can secure additional funding from corporate but it will affect the project financials.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
There are not considered to be any significant issues around transfer of technology and/or collaborations. Abengoa has presented the status of the project in the open session of the IBR platform on 19 March 09.	All the licensing agreements are in place.
Not really relevant here.	N/A
Company appears to be open to outside cooperation and consultation. Project appears to be	Thanks.

on track.	
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g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
The project would benefit from improved contingency planning re failure of the Silvagas gasification technology.	This was addressed above with the addition of the boiler system.
Stay the course!	N/A

Project Number:	5.4.4.1, 5.4.3.2, & 5.4.3.3
Project Title:	LIBERTY - Launch of an Integrated Bio-refinery with Eco-sustainable and Renewable Technologies in Y2009
Performing Organization:	POET Project Liberty, LLC
Number of Reviewers:	James Sturdevant

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	4.0	1.41	3
Approach	4.0	1.41	3
Progress & Accomplishments	3.0	0.82	2
Success Factors	4.0	0.0	0
Future Plans	2.75	0.96	2
Average Score: All Criteria	3.55		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
Thank you to the panel for your preliminary feedback. I have responded to some of your individual comments. I hope you find my responses to be helpful.

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The four stated project objectives fully support MYPP objectives and are directly relevant to the needs of target customers, feedstock suppliers and ethanol blenders.	None with respect to Program objectives and market need.
PI Response: N/A	
Expertise in the starch to ethanol arena gives them an insight to the business.	If long term approach is to only bolt on to existing starch based plants it will limit the applicability to other regions in the US.
PI Response: N/A	
Development of logistics for collection of corn cobs. Apparent collection of pilot plant data to be used for designing the commercial cellulose to ethanol facility.	Considerable agricultural extension types of efforts (producer meetings to describe US needs to develop bioenergy technologies) were reviewed. This would appear to be peripheral to the objective of developing an integrated biorefinery. The video of general energy security issues was a bit off the central focus. Answers to questions concerning storage effects on cob composition and fungal and bacterial growth were not forthcoming.
PI Response: Securing a sustainable biomass feedstock is a critical and primary objective of Project LIBERTY. A DOE requirement is the conversion of 770 BDT/day of biomass to ethanol. As stated in the closed session presentation, the key success factors are farmer adoption rate and available cob harvest systems at levels required to achieve this biomass	

requirement. The purpose of the referenced video, which was shown only in the open session, is to hit this head on -- energize the farmers and accelerate equipment development. Cob compositional work with NREL and others have shown that fungal and/or bacterial growths do not inhibit our processes.	
Integration with & leverage to dry mill industry; POET's vertical integration (feedstock - processing - sales);	Control of IP with a near-dominant corn ethanol producer will limit market penetration if licensing price is too high, or terms of use are too restrictive.
PI Response: POET plans to support the nation's goal of proliferating Project LIBERTY technologies across the country. Since the first feedstock is corn crop residue (cobs/corn fiber) the focus will be throughout the U.S. Corn Belt. Once we perfect the use of corn cobs as the feedstock, POET plans to move to other forms of biomass.	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
A well defined management plan is in place with key milestones appropriately identified. Very high emphasis has been placed on sustainable acquisition of feedstock which is absolutely key to the ultimate success of the project.	The management of technical risk concerning the conversion of corn cobs to fermentable sugars was not well addressed.
PI Response: The technical risk of converting corn cobs to fermentable sugars is not part of Project LIBERTY. POET is addressing this within an exclusively POET-funded project called Project Bell. Within this project, POET constructed a demonstration-scale cellulosic ethanol plant in Scotland, SD. It has been making ethanol from corn cobs since November 2008. POET has been testing, learning, and adjusting processes; the plant is operating well. Validation is scheduled for summer 2009. POET will scale up Bell technologies for Project LIBERTY.	
Strong project management	High degree of using only in house expertise might restrict new ideas.
PI Response: N/A	
N/A	Essentially no data presented on conversion technologies. Even with considerable discussion about corn cob

	sourcing; compositional data was not available.
PI Response: The technical risk of converting corn cobs to fermentable sugars is not part of Project LIBERTY. POET is addressing this within an exclusively POET-funded project called Project Bell. Within this project, POET constructed a demonstration-scale cellulosic ethanol plant in Scotland, SD. It has been making ethanol from corn cobs since November 2008. POET has been testing, learning, and adjusting processes; the plant is operating well. Validation is scheduled for summer 2009. POET will scale up Bell technologies for Project LIBERTY.	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The project has made very good progress towards achieving OBP goals re feedstock acquisition, as well managing the NEPA process.	Lack of quantification of the progress that has been made on the conversion technology.
PI Response: The technical risk of converting corn cobs to fermentable sugars is not part of Project LIBERTY. POET is addressing this within an exclusively POET-funded project called Project Bell. Within this project, POET constructed a demonstration-scale cellulosic ethanol plant in Scotland, SD. It has been making ethanol from corn cobs since November 2008. POET has been testing, learning, and adjusting processes; the plant is operating well. Validation is scheduled for summer 2009. POET will scale up Bell technologies for Project LIBERTY.	
N/A	No real data was presented, but project appears on track.
PI Response: N/A	
N/A	There was an indication of a number of possible types of corn cob harvest equipment available or to be available; however, only one example was presented. Answers were not available with respect to dry matter tons/acre; also, what percentage of dry matter will be cellulose.
PI Response: As shown in the closed session presentation, Project LIBERTY and equipment companies have demonstrated three example methods of corn cob harvesting in both public field days and farmer use: 1) towable systems (3 manufacturers had systems in the fields), 2) corn cob mix (3 manufacturers also had systems in the fields), and 3) flex-harvester (1 consortium had this system in the fields). As stated in the Q and A in the closed session, between 0.6 and 0.7 tons of biomass (cellulose) per acre has been achieved, and there is significant potential for	

this to increase.	
NEPA / FONSI completion; cob harvest work. Excellent project planning steps for Phase I.	POET will need a series of additional financial support including loan guarantees. There is insufficient information from the briefing material, presentation, or Q&A session to make a meaningful judgment. How dependent is their implementation step (Phase II - construction) to "profit"? For this add-on unit? Can they halt the project if this one pioneer project is not profitable based on their analysis?
PI Response: The first LIBERTY/DOE agreement (pre-construction) and the conditions required before commencement of work under the second agreement (construction) have several go/no go decisions built in. A DOE loan guarantee, commercial lender financing, and an overall financial plan approved by DOE are required before a spade goes into the ground. Also keep in mind -- Project LIBERTY is the construction of one cellulosic ethanol biorefinery, plus three years of operational monitoring and reporting. Moving to "LIBERTY number 2" is not required if profitability cannot be achieved. However, POET's 21 years of experience in this industry and recent/rapid technological advances give us a great degree of confidence that profitability will be achieved and the technology will be replicated across the country.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Ensuring sustainable feedstock supply (corn cobs) is a critical technical success factor and has been clearly identified as such. Environmental permitting and financing issues have also been correctly identified as critical. The approach to managing the risk associated with those factors has been well addressed.	Critical success factors with regard to performance of the conversion process for producing sugars from corn cobs was not well addressed.
PI Response: N/A	
Strong technical and engineering	Presentation dealt mainly with the collection problem.

background in company.	Other difficulties in the process were not detailed with associated suggested solutions. Technical challenges were not detailed and stated to be in the Company's control.
PI Response: N/A	
The primary requirement of success will be 100% loan guarantees from DOE and/or UDSA.	N/A
PI Response: N/A	
Strong farmer / equipment vendor outreach, as expected from POET's long standing relationships with these communities.	Cobb harvest equipment manufacturing is outside the control of POET and can delay Phase II construction. Later in pricing phase, will POET really "make up the difference" between today's projected total cap-ex and the final installed capital cost?
PI Response: N/A	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The six areas presented for future work build on past work on feedstock procurement and on the conversion process at pilot scale (but with no detail) and as such directly address several technical barriers in the OBP MYPP.	Optional paths/off ramps were not well defined.
PI Response: N/A	
Strong project management orientation.	No discussion of future technical issues and plans to address those issues.
PI Response: I admittedly was rushing during this part of the closed session in order to end on time. As you recall, the primary technical issues related to biomass-to-ethanol conversion are being addressed by Project Bell. Under Project LIBERTY, the future work to overcome barriers is in the areas of engineering and feedstock. As the slides showed, future work includes	

1) state air and water permitting, 2) preparation of commercial-scale enzymes, 3) complete preliminary and final engineering, 4) complete the financing package, and 5) work to accelerate farmer cob harvesting adoption rates and cob harvest equipment manufacturing. The final slide in the closed session showed a timeline for when these future activities will occur.	
N/A	Without available background information, we were unable to project relevance of planned program.
PI Response: I admittedly was rushing during this part of the closed session in order to end on time. As you recall, the primary technical issues related to biomass-to-ethanol conversion are being addressed by Project Bell. Under Project LIBERTY, the future work to overcome barriers is in the areas of engineering and feedstock. As the slides showed, future work includes 1) state air and water permitting, 2) preparation of commercial-scale enzymes, 3) complete preliminary and final engineering, 4) complete the financing package, and 5) work to accelerate farmer cob harvesting adoption rates and cob harvest equipment manufacturing. The final slide in the closed session showed a timeline for when these future activities will occur.	
N/A	Timeline risk is multi-variable and difficult to manage. However, there is insufficient information from the briefing material, presentation, or Q&A session to make a meaningful judgment on this item.
PI Response: I admittedly was rushing during this part of the closed session in order to end on time. As you recall, the primary technical issues related to biomass-to-ethanol conversion are being addressed by Project Bell. Under Project LIBERTY, the future work to overcome barriers is in the areas of engineering and feedstock. As the slides showed, future work includes 1) state air and water permitting, 2) preparation of commercial-scale enzymes, 3) complete preliminary and final engineering, 4) complete the financing package, and 5) work to accelerate farmer cob harvesting adoption rates and cob harvest equipment manufacturing. The final slide in the closed session showed a timeline for when these future activities will occur.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
The project demonstrates very good interaction and coordination with appropriate institutions and sources of technical expertise. The project status was presented in the open session of the IBR platform review	N/A

on 19 March 09.	
Yes, to a reasonably high degree for the collection issue. Other areas of the process were not covered as well.	N/A
Good team - Iowa State, Iowa power company, NREL, etc. Unclear on the eventual ability of licensing to non-POET entities - POET owns so many plants now, they potentially can be the lost cost ethanol producer using the processes developed here without relying on near- or medium term licensing opportunities and fees.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
No recommended additions or deletions.	N/A

Project Number:	5.5.5.1
Project Title:	West Coast Biorefinery (WCB) Demonstration Project
Performing Organization:	Pacific Ethanol, Inc.
Number of Reviewers:	Harrison Pettit

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
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Relevance	3.67	1.16	2
Approach	3.0	1.0	2
Progress & Accomplishments	4.0	1.0	2
Success Factors	2.67	1.16	2
Future Plans	2.33	0.58	1
Average Score: All Criteria	2.93		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
Given the early stage of the project, this seems like a fair appraisal of the WCB project and provides some clear areas for improvement.

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Right on target with MYPP strategy. Multiple feedstocks capable.	N/A
PI Response: N/A	
N/A	Present project would appear to have potential limitations in application to other regional areas. No water recycle planned within the operation of this demonstration plant. Without detail of the process it is difficult to evaluate whether is repeatable.
PI Response: The original WCB project scope and pilot plant work maximized use of waste water for energy self-sufficiency. The WCB project scope change eliminated this feature to refine the project focus on the higher priority validation of the biomass feedstock conversion process. Given the design and pilot work that included this feature, it can be added to the WCB at a later stage and will be a part of a future commercial scale plant.	

Complete recycling of water.	As project just began, no awareness if this project will support MYPP. Use of poplar because of high lignin content was not explained. During Q&A, comment that water will be completely recycled was retracted but unexplained.
PI Response: Part 1. -- Use of Poplar. As stated, one of the goals of the project is to demonstrate multi-lignocellulosic feedstock conversion. Poplar is a higher lignin content feedstock than either wheat straw or corn stover and the conversion process optimization with its inclusion as a feedstock will validate pilot plant work demonstrating the feedstock flexibility of the technology. Part 2. -- Recycling of Water -- The original WCB project scope and pilot plant work maximized use of waste water for energy self-sufficiency. The WCB project scope change eliminated this feature to refine the project focus on the higher priority validation of the biomass feedstock conversion process. Given the design and pilot work that included this feature, it can be added to the WCB at a later stage and will be a part of a future commercial scale plant.	
N/A	Beware of too much overlap of the feedstock - pretreatment linkages among this project and other 932s and 1/10th scale.
PI Response: N/A	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	Very little presented that would allow a solid assessment of the RDD and project management practices.
PI Response: Given the stage of our project, this is a fair review.	
Theoretically, this project is based upon a previous pilot plant (which is understood not to exist anymore).	No data was presented which would indicate how advanced the technology is compared to published information.
PI Response: This is a fair review given the stage of the project.	
N/A	Presentation was a sales pitch for possible

	investors; whereas, little information was available about plans for success.
PI Response: N/A	
Initial plan is good. Scale of facility is suitable to achieve 2012 goal for 1/10th scale	Initial plan is good; difficult to evaluate its validity especially since the 3rd party IE has not yet been chosen to review the project management plan.
PI Response: N/A	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Based on lab and pilot plant work moving to 1/10 scale demo. Appears to have addressed significant number of pathway milestones and barriers.	N/A
PI Response: N/A	
Project has just begun.	N/A
PI Response: N/A	
Apparently good pilot data is available.	Unable to determine because this is a brand new project, no 3rd party endorsement (see above)
PI Response: N/A	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Construction at existing facility utilizing existing human operating expertise and infrastructure maximizes chances of success.	Standard/generic items presented. Little shown or discussed that provided any significant insight or analysis of this particular project's

	potential risks.
PI Response: N/A	
N/A	Project seems well behind other projects. Presentation did not indicate how this project differs from other projects in progress or how they would feel they have a greater chance of success.
PI Response: We do not have the knowledge of other project in order to provide a realistic comparison of progress. We do feel there are strong fundamentals that provide significant strengths.	
Co-location with dry mill is a big plus. Scale - up seems reasonable (5x - pretreat; 100x fermentation).	Too optimistic on feedstock contracts, even though the amount is relatively small. This aspect needs attention. Variability of feedstock seems to be commercial goal for the Company, but this complication can slow down the feedstock supply contacts and the design of the pretreatment system - can feedstock choice be simplified and still overcome DOE technology barriers? Pacific has defaulted on loan covenants - will their financial troubles upset the project timeline?
PI Response: These are very helpful comments. The feedstock supply issues do require significant attention and plans are in place to provide the necessary resources.	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	Pilot plant dismantled. This demonstrates an apparent significant reduction in their future commitment and capability to perform future development.
PI Response: BioGasol needed more space and so that Pilot Plant was dismantled for the move and is being re-constructed to provide on-going support to the project.	

N/A	There was no clear research plans presented indicating what is the difference in this project is from others.
PI Response: There is a very strong commitment to R&D and plans are in place. Part of the tasks outlined for Budget Period 1 is to solidify these plans.	
N/A	Barriers referenced were those commonly listed, in general, e.g., biomass recalcitrance, pretreatment costs and end to end process integration; however, elaboration on specifics was not forthcoming.
PI Response: N/A	
Using Pacific Ethanol staff is a good idea, but does this team have sufficient in-house experience?	Unable to comment - they've just started. No implementation steps yet. However, project write-up said they would get permits using a conceptual design - I don't think that sufficient information will be available at that stage to get permits.
PI Response: Pacific Ethanol staff has experience in developing over 200 million gallons of ethanol production in four separate facilities. Given the co-location with an existing, fully permitted corn ethanol plant, the permit process (excluding NEPA) will be simplified.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
No indication that they were going to work with other technology companies; seemingly only engineering companies. Company did not present any information on the basic technology or actual results from the referenced pilot plant.	This is a helpful reminder of the helpful role of technology specialists for aspects of the project.
No academic component.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
Reduce feedstock choices so project can be more focused.	Reducing feedstock choices would simplify the project and we will take this advice into consideration.

Project Number:	5.4.6.1
Project Title:	A Rural Community Integrated Biorefinery Using Novel Solid State Enzymatic Complexes to Convert Lignocellulosic Feedstocks to Ethanol & Vendible Products
Performing Organization:	Alltech Envirofine
Number of Reviewers:	Mark Coffman

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	Did not present		
Approach			
Progress & Accomplishments			
Success Factors			
Future Plans			
Average Score: All Criteria			

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

Project Number:	5.5.7.1
Project Title:	MAS10BIO5
Performing Organization:	Mascoma
Number of Reviewers:	Dr. Mike Ladisch

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	4.4	0.56	1
Approach	4.2	0.84	2
Progress & Accomplishments	4.2	0.84	2
Success Factors	3.8	0.45	1
Future Plans	4.2	0.84	2
Average Score: All Criteria	4.16		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
We appreciate the helpful comments and useful observations of the review team and the program managers, as well as the insights gained from review process itself, which was well organized. The rapid feedback is helpful in planning our work and addressing key issues more efficiently as this project moves forward.

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths		Reviewer Commented Weaknesses	
Addresses the progression toward validated cellulosic ethanol production in 2012.		N/A	
PI Response: N/A			
CBP is the type of process breakthrough that industry is constantly looking for.		N/A	
PI Response: N/A			
Focus on wood unique for northern US Well thought out scale-up plan		N/A	
PI Response: N/A			
Assuming the technology can be performed effectively, it appears that this technology could be implemented in many locations throughout the nation. It would seem this is an important aspect of the IBR program. Substrate should be available year round and storage should be less of a problem.		N/A	
PI Response: The work with switchgrass has been initiated. Compositions are being obtained and pretreatment and hydrolysis is being carried out. The project initially is addressing hard wood, and switchgrass data will be provided in the next quarterly report.			
Project outline, progress, future direction and some barriers were reviewed. As per most investigators, capital costs and operation costs were listed as primary barriers. Knowledge of hardwood composition was provided. Preliminary successes in operation at high solids and ethanol titers of 5%. Apparent awareness of information needed as each step is encountered and assessed.		Both hardwoods and switchgrass were identified as feedstocks; however, no data were provided with respect to composition and source of switchgrass.	
PI Response: N/A			

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Well defined for the stage of award, with clear milestones.	The project management for the construction phase of the project has not yet been addressed.
PI Response: The work is currently in budget period in the initial phases of budget period one. It is focused on preliminary design, and obtaining environmental assessment for the Kinross site. Project management for the construction phase will be developed later in this budget period.	
Indications of strong use of RDD plans and project management with milestones.	N/A
PI Response: N/A	
CBP approach has potential for major reduction in process complexity and cost. Simplified pretreatment could be very good Use of lignin for process heat to make plant self-sustaining.	Continuation of all three pilot plants (1,000, 5,000, and 25,000 gallon) may be inefficient. Ideally once scale-up issues are resolved, one pilot plant could be used to generate data and other two decommissioned.
PI Response: The reviewer is correct. The development of three pilot plants would be inefficient. In fact there is one pilot plant, but three different sizes of fermentation vessels (1000, 5000, and 25000 gallons) in order to provide needed scale-up data. Data will be obtained at as small of a scale as possible as long as it meets the criteria in mitigating risk of scale-up, and the independent engineers agree that the risk has been suitably mitigated in order to enable design to be completed (once environmental review has been satisfied).	
Implementing IPA guidelines. Presenter gave clear company focus for what appeared to be major current concern which was the scale up of the fermentation.	N/A
PI Response: N/A	
Approach and early implementations were defined and approached methodically. Use of milestones and accomplishments were accompanied with logic in directions for continuations.	N/A
PI Response: N/A	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Project is still in initial stages, therefore on target thus far.	Schedule for the CBP organism is aggressive. Project is still in the early stages.
PI Response: The schedule for the CBP is being revisited based on this comment. As noted by the reviewer the project is still in the early stages. The benefit of the pilot facility is the ability to quickly test laboratory developments, once they are ready, in order to validate laboratory results at a larger scale using steel fermentors and large-scale equipment. The timeline will be adjusted as needed in consultation with the DOE, as the need should arise.	
Existence and use of the Rome facility is a strong asset for further development.	N/A
PI Response: N/A	
Good presentation of key results.	Would like to have seen economic data
PI Response: Economic data will be reported as the designs are developed and the project proceeds. As noted by the reviewer we have presented key results, but this is early in the project.	
Appears to be on track.	N/A
PI Response: N/A	
Operation at high solids, ethanol titers of 5% and validation of laboratory data were outlined and reviewed.	N/A
PI Response: N/A	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The project is able to utilize research and data obtained through simultaneously DOE funded	N/A

work. Appear well aware of the potential show stoppers and have interacted with our Independent Engineer along with the DOE IE.	
PI Response: N/A	
N/A	With the exception of the fermenter, those presented are very standard/generic.
PI Response: This reviewer notes that equipment is standard/generic except for the fermenter. The initial designs are following this philosophy, based on inputs from IPA and the independent engineers. While improvements will be made in the future, currently resources are being focused on a high solids cellulose fermentation, for which there is limited data, and which has been identified as a key gating item by our analysis, and that of independent engineers. We agree that scale-up of the fermentation is a critical success factor, and significant effort in planning is being directed toward this scale-up step.	
Appears to have met most critical success factors so far Factors well-defined.	Some of the success factors (GHG regulations and costs, financing availability) lie outside the control of the project. Uncertainty of lignin markets and prices.
PI Response: The reviewer's comments are perceptive and consistent with our analysis. The use of the co-product lignin is important and the impacts of markets for it are being studied as part of this work.	
Scale up of the fermentation appears to be the major CSF identified at this time. The scale up program indicated hopefully will provide the data necessary to allow design of a successful production scale fermentation	N/A
PI Response: N/A	
With limited time to date, realistic findings were presented.	N/A
PI Response: N/A	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Clear go/no go decision point prior to construction phase of project.	May not have enough schedule contingency built into the current schedule for potential environmental and R&D setbacks.
PI Response: The schedule contingency relative to the current schedule is being reviewed based on comments of this reviewer, and suggestions and critiques offered during the review process. Further assessment of the environmental and R and D status will inform future adjustments and schedule, and will be discussed with the DOE program managers as this information becomes available during the course of this project.	
Use of the Rome facility to scale-up to the next phase is a strong indicator of a successful approach. This project as presented gave the appearance of understanding its success factors and show stoppers, sound planning to approach solutions and realistic timelines.	N/A
PI Response: N/A	
Larger pilot plant is logical extension of technology	N/A
PI Response: N/A	
Scale up of the fermentation appears to be key and their approach is to scale up in stages.	N/A
PI Response: N/A	
Challenges, success factors and window for opportunity were identified and suggestions were presented for meeting and accessing same.	N/A
PI Response: N/A	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
The project will utilize R&D from the current DOE funded ethanologen project. Otherwise project has had little interaction with other institutions in relation to this project.	N/A
ORNL, Michigan good partners. External, independent engineering review good step to lend credence.	N/A
Appears to be open to input from contractors to improve the project.	N/A
Excellent example of outline for establishing a cost competitive integrated biorefinery to convert cellulosic biomass into ethanol and other fuels. Timelines were indicated to meet DOE anticipated accomplishments.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
Have there been any surprises in initial scale-up? Present economics!!	The project is utilizing R and D and microorganisms developed by the ethnologic project, as well as results of technology from both international and other university partners. In addition, Mascoma is obtaining industrial input from two independent engineers, and analysis through IPA. Surprises for initial scale-up, when they occur, will be reviewed in the context of both technology scale-up and impacts on economics. Both positive and negative surprises will be reported as they occur. A positive surprise has been the better operation of the process at a large-scale. As expected there is a clear need for

	systematically and analytically addressing issues related to solids handling, pretreatment, and scaling up the fermentation. Economics are being developed based on designs and work on this project, and will be reported as they become available and completed as part of this project.
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Project Number:	5.5.8.1
Project Title:	Jennings Demonstration Plant
Performing Organization:	Verenium Corporation
Number of Reviewers:	Russ Heissner

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	4.3	1.21	3
Approach	3.8	0.45	1
Progress & Accomplishments	3.0	0.55	1
Success Factors	3.0	1.23	3
Future Plans	3.4	0.55	1
Average Score: All Criteria	3.7		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
Seems to me that reviewer #17587 did not actually perform a review, and stated so in the final section. However,

the scores associated with reviewer 17587 are being used in compiling the aggregate score. Can we please adjust the aggregate score neglecting reviewer 17587's scoring?

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
All aspects of this project fully support MYPP objectives and directly address the needs of relevant customers and markets.	No weaknesses with respect to support of overall program objectives and market need.
PI Response: N/A	
Builds on well-established technology Partners with established fuel provider	Sugar cane bagasse/energy cane is limited feedstock in US
PI Response: N/A	
Feed stock may have regional relevance, if the energy cane can be utilized in other regions this will broaden the application.	Feed stock being utilized at this time has limited applicability to many other locations throughout the US.
PI Response: N/A	
KPI milestones. Excellent project management.	N/A
PI Response: N/A	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Verenium's use of a Key Performance Indicator milestone approach for project management, for both technical and financial importance, is considered realistic and acceptable.	No significant weaknesses re design of work plan. However, no specific information was provided as to how KPI milestones will actually be used to manage the project.
PI Response: N/A	
WRT to demonstrating the preparation and adherence to a managed scheduled plan, this project was one of the stronger. A very clear	N/A

and detailed monthly plan was presented. This was the only project to present in such detail that reviewers actually were able to question what was being done to drive specific anticipated accomplishments shown from month to month.	
PI Response: N/A	
Robust milestone/KPI approach incorporates good metric if set properly. Campaigns planned for gradual continuous improvement of each unit operation.	Would like to see switchgrass included asap.
PI Response: N/A	
It would seem the Diversa portion of the company would provide a strong research asset.	It was not clear how the use of presented KPI's would foster a go/no go decision process. Although it was mentioned that economic evaluation of each step was being made.
PI Response: N/A	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Good to excellent progress on overcoming technical barriers, particularly with respect to feedstock hydrolysis and fermentation of hexose and pentose sugars.	Progress on assessing and mitigating public concern re the use and disposal of genetically modified, enteric bacteria for industrial scale biorefining has not been addressed. This could be a major, non-technical issue.
PI Response: Verenum has in fact already applied and received approval from the EPA for a Microbial Commercial Activity Notice which goes in great detail on how the demonstration facility treats the containment of GMO's in its operations. I apologize for not making more of a detailed presentation on this subject.	
Pilot plant commissioned last month. The fact that a pilot plant has been built and "commissioned" is a plus.	Would have liked to have had more time to delve into what exactly "commissioned" meant and what has been accomplished to date.
PI Response: "Commissioned" means that each unit operation has been tested for safe use, mechanical, electrical, automation sequencing, and all Standard Operating Procedures, and is	

"operationally ready" to begin trials for validation of process conditions that have been modeled for commercial design.	
Initial results from pilot plant look good. Hard to evaluate long-term since unit has just come on line.	N/A
PI Response: N/A	
A timeline was presented and it would appear the project is on target for the mechanical portion of the project.	Little detailed technical information was presented to be able to determine where the presenter is in meeting the technical goals.
PI Response: Given that the optimization phase of the project had just commenced, there was very little data to report with respect to progress against plan.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
No real strengths with respect to this evaluation criterion.	Weak definition of critical success factors with respect to the business and market elements of the project. Lack of "work around plan(s)".
PI Response: N/A	
N/A	Pretty standard stuff presented. Really nothing shown that provided for in-depth discussion, significant insight or analysis of this particular project.
PI Response: N/A	
KPI's have defined success criteria.	Needed to know how critical robust milestones/ KPI's are to commercial success. Wasn't clear which were "make or break" issues.
PI Response: N/A	
N/A	Most of the CSF's were financial with no real discussion of what technical parameters could

	be improved to meet the financial targets.
PI Response: N/A	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Areas for future work are directly relevant to ultimate viability of the biorefinery operation	Specific performance targets for future work topics are not well defined.
PI Response: N/A	
Presented a very detailed plan that can be followed and managed going forward.	N/A
PI Response: N/A	
Future work areas listed, but little strategy as to how they will be addressed.	N/A
PI Response: N/A	
N/A	Very little information was presented on the future R&D plans.
PI Response: N/A	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
These were not well addressed e.g. no specific information re interaction with Diversa re cellulase enzyme development or U.of Florida re fermentation organism development. Project status was presented at open session of IBR platform review 19 March 09.	The research you refer to are on-going programs within Verenium. Further, improvements to our enzyme and ethanologen technologies are on-going and are not relevant to the commercial success of Verenium's first commercial plants. The existing validated performance of our enzyme and ethanologen technologies served as the basis of design for the demonstration facility, and once validated at demonstration scale, will serve as the design basis for our first

	commercial facility. Those on-going improvements will serve to continue to drive down operating costs for existing facilities, and will serve for the optimized design basis of future generation commercial facilities.
BP Biofuels collaboration provides excellent potential partner for future commercialization.	N/A
BP Biofuels is excellent partner.	N/A
Progress was well presented, but very few results were presented. The facility was just commissioned.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
No additions/deletions are recommended.	N/A
(#17587) Please ignore this review.	N/A
Need to see economics.	The current set of economics is based upon pilot unit performance data, and we feel is only indicative of the scale-up process. Performance validation at demonstration scale will allow us to refine our commercial scale modeling. We have indicative economic modeling in place already that has allowed us to progress to this stage of development. Once this stage of development is complete, the data gathered will allow us to further refine our modeling, and provide for further "de-risking" of the associated process economics. The implicit "go/no-go" decision comes after successful completion of the validation of performance KPI's and modeling of that data into our commercial Aspen and financial models.

Project Number:	5.5.3.1
Project Title:	Mecca Ethanol Facility: A Landfill Waste Feedstock to Cellulosic Ethanol Facility
Performing Organization:	BlueFire Ethanol
Number of Reviewers:	William Davis & Necy Sumait

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	3.33	1.53	3
Approach	2.0	1.0	2
Progress & Accomplishments	2.0	0.0	0
Success Factors	2.33	1.16	2
Future Plans	1.67	0.58	1
Average Score: All Criteria	2.27		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
N/A

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Alignment with objectives is quite good; however, its support for the needs of its ultimate customers and markets is less well defined.	Current status of project makes it very site specific and there's no strong indication of attention to a broader range of customer and market needs.

PI Response: N/A	
This project aligns well with an important pathway. Beyond the DOE ethanol objectives it potentially addresses MSW disposal issues as well.	N/A
PI Response: N/A	
Southern California need for alternative to landfill. California requirement for separation of recyclables; therefore, much of the initial separation effort will be done prior to BlueFire access of material. Addresses a societal issue.	Possible sites were discussed; until site is selected, much of planning will be on hold. Meeting site requirements for Cabazon tribal location may be much less than those required for other areas in California. Pretreatment is a show stopper.
PI Response: N/A	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Milestones are not well defined and no clear path/plan is apparent for the progression from the Japanese pilot plant operation, to the Lancaster pilot plant and finally to the Mecca plant. Some parts of the overall approach are based on virtual modeling while others are apparently based on real data; however, it's difficult to make the distinction as to which is which.	No strong, detailed management plan.
PI Response: N/A	
N/A	Performed unit process operation testing at vendor sites creating a "virtual demonstration of integrated process". No integrated facility of any scale has ever been run utilizing the proposed feedstock. MSW by definition is a variable feedstock. Regardless of what the project states that CA law requires, there will be non-compliance and the incoming MSW will contain unexpected/unwanted material. Even material that is within legal specifications

	will present unexpected/unpredicted handling and production issues. The only way to adequately predict proper handling and production is an extended pilot run. Batch runs at various vendors' sites provide an inadequate design basis. This is a very major shortcoming in a project proposing to move directly to commercial scale.
PI Response: N/A	
N/A	Based upon limited available information with respect to biomass composition and availability, project personnel suggested possible direction; however, once the site is selected new directions may be required.
PI Response: N/A	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Some pilot plant operation experience in Japan.	Lack of detail with regard to the specific advances that were achieved from operation of pilot plant in Japan. This is the case for both unit operations and process integration.
PI Response: N/A	
N/A	Very little technical information presented.
PI Response: N/A	
Lancaster site is shovel ready to construct a pilot facility.	Projections based upon theoretical possibilities.
PI Response: N/A	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Critical success factors re feedstock and permitting have been satisfactorily identified.	Critical success factors around several key process areas i.e. sugar separation and acid recycle have not been identified. These are seen to be two areas with a very high degree of technical risk. The issue of gypsum disposal (from over-liming to neutralize the acidic sugar stream from the SMB separation) was not addressed.
PI Response: N/A	
N/A	When questioned regarding the potential problems on the front end feedstock handling, the presenter stated he shared these concerns. Yet no such showstopper was in the presentation and when discussed no mitigation plans were brought up. There are success factors, barriers and showstoppers that were not presented and discussed.
PI Response: N/A	
If suggestion there would be less than 5% acid makeup is achieved, it will be an advantage to the chemical process. Lignin could be used for thermal requirements of the plant. No solids discharge.	Lack of preliminary data. Composition of feedstock is unknown.
PI Response: N/A	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
The future work plan is generally defined and is generally relevant to removing barriers identified in the MYPP.	The future research approach is poorly defined, if at all. There is no clear, logical plan based on actual work completed how that supports a future research plan.
PI Response: N/A	
N/A	No research into barriers and showstoppers was discussed. Contingencies were not presented for very major problems that the industry has experienced. Cost estimates

	appear low. This is not the first such project to be proposed and many MSW to power plants have been built. There is a great deal of knowledge out there on prior success and failure that should be drawn on. This project deserves a lot more review and questioning that it does not appear to be getting.
PI Response: N/A	
N/A	Plans not identified.
PI Response: N/A	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
Good collaboration re feedstock procurement but no detail re collaboration on conversion process issues. Project status was presented at the open session of the IBR platform review on 19 March 09.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
DOE has an excellent approach of using 1/10 scale demonstration projects prior to commercial scale. Why deviate from this well thought out approach in this instance. Biofuel from waste (MSW) is an important national goal/pathway. I have well founded sincere concerns about this project's probability of success. Decades of waste to energy projects have proven that the front end dealing with handling the waste has consistently presented problems not anticipated by the developers and engineers. Izumi is not sufficient..... it uses woodchips. Reliance on CA waste laws is not	N/A

sufficient; they are not adhered to 100%. "Virtual modeling" is not sufficient. This project, I very much fear, will fail due to problems in the front end handling of the waste and integrating it with the conversion process. Acid conversion of cellulose to sugars has been well demonstrated. Getting at, handling and converting the cellulose at a commercial scale when it is contained within MSW has not. Failure of this commercial scale project would be very visible and would severely damage the ability to commercialize this pathway for many years to come. (To say nothing about the risk to DOE's reputation as well.) The risks associated with this project and potentially to its hosts do not appear to have been adequately assessed and planned for. A complete risk assessment and mitigation plan should be developed. This should include not committing to a commercial facility until the complete system has been properly demonstrated at the pilot scale.	
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Project Number:	5.5.6.1
Project Title:	Lignol Biorefinery Demonstration Plant
Performing Organization:	Lignol Innovations, Inc.
Number of Reviewers:	Michael Rushton

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	3.25	1.5	3

Approach	2.75	0.96	2
Progress & Accomplishments	2.5	1.29	3
Success Factors	2.5	0.58	1
Future Plans	2.25	0.5	1
Average Score: All Criteria	2.65		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
N/A

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They make other products besides a fuel.	This is not a cost-competitive project and has a negative IRR. This project will never make a large impact on reducing our dependence on fossil fuels. They have a very low yield of fuel per ton of biomass. They have already run most of this technology on a large scale already. It is unclear what they will learn from the demonstration plant at this scale. They need to more clearly specify where the uncertainties around process equipment is and what they will learn by scaling up each process equipment. Very low yields of ethanol per ton of biomass. They are only making 10 gallons of ethanol per ton of biomass. This will never be able to make a large impact on ending our dependence on petroleum oil. You really have a lignin refinery with a biofuel as a side product. They have a high capital cost \$80 million per 100 tonnes/day plant. I don't want to ask what the capital cost for the full scale commercial plant will be. If they want to make

	biofuels they should focus more on biofuels...
PI Response: This is a demonstration scale project. The program defines this as 10% of the capacity of an economic commercial plant, therefore a positive return is not expected - admittedly, this may have to change in the restructuring of the project if it is to be successfully financed. The project will not have the economies of scale that a commercial project would. Our pilot plant has a capacity of 1 tpd, 1% scale of the proposed demonstration plant and 0.1 % scale of a commercial plant. The original "Alcell" pretreatment process was run in a demonstration plant in the pulp and paper industry in the 90's, but the rest of the process and the fully integrated process still needs to be demonstrated. The demonstration plant will verify design and provide extensive experience with continuous operations providing pertinent data on internal stream cycling and waste stream requirements. The Lignol demonstration plant is designed to produce 265 liter of ethanol per metric tonne of dry wood or 64 gallons per ton, <u>NOT</u> 10 gallons per ton.	
Potential significant contributor to pathway.	N/A
PI Response: N/A	
N/A	Project seems to be more interested in the lignin production than ethanol. If economics driven by lignin, one might question the ability to justify multiple plants
PI Response: The Lignol project is to build a demonstration biorefinery in which three products are to be produced. The products other than ethanol are used in applications where they displace products that are today produced from petroleum derivatives. This substantially increases the oil displacement beyond what is displaced by the ethanol production alone. It is more accurate to say that economics are "enhanced" by co-product sales which enable economic biorefineries to be build at smaller scale. Lignol has done a lot of applications development and marketing on its lignin product and found demand to be very strong - enough for many commercial biorefineries.	
Co-production of "clean" lignin and etOH. Possible future use of hemis (instead of combustion)	Does DOE see this as primarily a cross-cutting technology for value-added lignin processing?
PI Response: N/A	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
I really had limited time to access this and did not see a lot of their data. I imagine they have some good pilot plant data and economic analysis.	They need to specify in great detail what they are doing.
PI Response: The DOE award to Lignol is for the construction and operation of a demonstration scale biorefinery. Pilot plant and research activities are not part of the DOE funded project scope and therefore were not reported on. Pilot plant data will be used to verify and refine the design of the demonstration plant.	
Progress appeared to be moving along well until dissolution of partnership with Suncor. Given a strong financial partner, I believe this project would get back on a good track for progress. Pre-meeting information received from Lignol included a detailed Project Milestone Table. While all projects said they had good project mgt, this was one of the few that actually demonstrated a schedule.	There was insufficient presentation to assess approach to RDD.
PI Response: N/A	
Up front separation of the lignin may make other technologies in the production of ethanol more effective.	Does not seem that there is strong technical expertise in the ethanol production. Not sure the University cited has a sufficiently experienced background in development of organisms needed in a reasonable time frame.
PI Response: This comment is unjustified. The scope of the peer review was to look at progress on the DOE funded project which does not include technology development at the lab and pilot plant scale, where Lignol has developed significant capability and proprietary technology on all aspects of bioconversion of cellulose to ethanol. Lignol is working with leading enzyme and ethanologen developers to incorporate their materials into our process; certain proprietary solutions are also being developed. Don't understand the comment with respect to University - we did not mention any.	
Lignol is to be commended on their plan and also on their immediate follow-up after losing SunCor support.	Unfortunate weakness is their loss of a funding and project partner.
PI Response: The withdrawal of our commercial partner is a setback and will cause some delay in	

continuing with the project. We believe the Lignol process is viable and is an important piece of the DOE Biomass program and its initiatives. Furthermore, Lignol is confident other partner(s) will be secured in the near future and a restructured project will be defined.

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
I think they have a good process design (although this wasn't shown to us).	N/A
PI Response: N/A	
Existence of a pilot plant upon which to base further development and scale-up.	There was little to no discussion or presentation regarding technical accomplishments. Statement was made that pilot work would continue but no objectives or accomplishments were presented.
PI Response: The DOE award to Lignol is for the construction and operation of a demonstration scale biorefinery. Pilot plant and research activities are funded independent of the DOE, therefore, they were not presented.	
N/A	Due to loss of funding partner it appears that very little progress has been made. Company seems to have very little expertise in the conversion of the substrate to fermentable sugars and subsequent production of ethanol.
PI Response: This comment about expertise is unjustified. The scope of the peer review was to look at progress on the DOE funded project which does not include technology development at the lab and pilot plant scale, where Lignol has developed significant capability and proprietary technology on all aspects of bioconversion of cellulose to ethanol. Lignol is working with leading enzyme and ethanologen developers to incorporate their materials into our process, as well as on their own proprietary bioconversion technologies.	
existing 100K gpy integrated pilot	Too early to tell - brand new project (Oct08).
PI Response: N/A	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	The real showstopper to this project is the economics. They should demonstrate how much money they need from DOE (or what price oil needs to be) to make the project have an IRR of 10%. I think they need to do two things: 1) do more R&D and pilot plant studies to improve the process or 2) build a larger scale demonstration unit which will hopefully have a better IRR. I am unsure about what the critical risks of scaling this technology are.
PI Response: Research, development, and pilot plant activities are continuing under independent funding structures. A higher capacity demonstration plant is being considered to improve the economics of the demonstration plant. There are no particular scaling issues apparent for the process.	
N/A	Most showstoppers right now deal with the commercial aspects of the project and the dissolution of the Suncor partnership. This is new within the last month, critical and immediate and strategies to overcome are not yet developed.
PI Response: N/A	
N/A	Other than indicating financial shortcomings, little identification of technical shortcomings or plans to obtain the information needed was presented.
PI Response: The DOE award to Lignol is for the construction and operation of a demonstration scale biorefinery. Pilot plant and research activities are funded independent of the DOE, therefore, they were not presented. The information needed to complete the demonstration plant design is being generated in Lignol's pilot plant.	
They understand the precarious nature of their award and were very open about the challenges	Need a new partner. DOE should help do this.

in front of them to restructure their project following the loss of their key partner.	No detail on lignin off-take market.
PI Response: Lignol has invested significantly in lignin applications and market development and has formed a number of partnerships with major companies to exploit lignin as a replacement for petrochemicals. This work demonstrates a robust market for lignin which will support the construction of multiple plants. Unfortunately, presenting this kind of information was outside the remit of the peer reviews which was prescribed and very focused on the DOE funded project scope.	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	They should focus on improving the process rather than just scaling it up. They don't gain much by just building a larger pilot plant.
PI Response: Lignol's R&D program is focused on process improvement and co-product (lignin) applications development. This is proceeding in parallel with the demonstration plant project but is not part of the DOE project scope, so was not reported on. Building a demonstration plant is a critical step in de-risking the technology on the way to commercial deployment, so there is everything to gain from successfully implementing the project.	
N/A	Nothing was shown or discussed that provided any insight or analysis of the particular technical risks that this project faces or specific future research. Mgt is focused on the immediate commercial challenges faced due to Suncor's dropping out of the project but certainly the ongoing pilot plant work is being done for some reason and has some objectives that should have been presented. Despite the other issues, the project must remain focused on these.
PI Response: The DOE award to Lignol is for the construction and operation of a demonstration scale biorefinery and does not include pilot plant and research activities. These are funded independent of the DOE, therefore, they were not presented, but ongoing work is focused on generating data to validate and improve the design of the demonstration plant.	
N/A	Expertise is in the lignin extraction. Company does not have a technology partner for the

	ethanol production.
PI Response: Lignol has developed a complete integrated cellulosic ethanol process that includes co-production of lignin and other bio-products. The process for converting Lignol's clean cellulose substrate to ethanol has been developed by Lignol working with partners from the enzyme industry. Lignol also has significant proprietary technology in this area, but it was not reported because this development work does not fall within the scope of the DOE funded project.	
They understand the precarious nature of their award and were very open about the challenges in front of them to restructure their project following the loss of their key partner.	There is insufficient information from the briefing material, presentation, or Q&A session to make a meaningful judgment.
PI Response: N/A	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
Most of this information is just kept internally in the company. I do not think that they will want to share this information with other institutions. They should publish some of their results and help DOE evaluate where DOE should focus future R&D. If they are not economical they should state what should be done to improve future economics.	The issue of being economic is about scale. At 100 tpd of feedstock (2.5 million gpy ethanol) the demonstration project will not be economic, but because of the multi-product revenue model of the Lignol process, biorefineries can be economic well below 1000 tpd of feedstock (25 million gpy ethanol). Lignol's R&D efforts are not funded by DOE and public disclosure will be very limited, though ultimately the operating data from the demonstration plant will be published as required by DOE.
Company does not seem to have developed the necessary cooperations to efficiently produce ethanol from the lignin extracted material.	This comment is unjustified. The scope of the peer review was to look at progress on the DOE funded project which does not include technology development at the lab and pilot plant scale, where Lignol has developed significant capability and proprietary technology for bioconversion of its clean cellulose substrates to ethanol using both commercial and non-commercial enzymes and yeasts.
This area indeed needs work. They did not identify non-principal team members.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
I think this project will not continue right now because it has a negative IRR. They should instead focus on improving the process at the pilot plant level and then build a larger demonstration plant which will hopefully have more favorable IRR. This technology also will never make a large impact on reducing our dependence on crude oil. I think it does have the potential to be economical if they can improve their technology. I hope DOE will give them permission to redirect some of this money to their pilot plant where they can focus on technology improvements. They should also focus on how they could convert more of their streams to fuels (rather than just chemicals). The goal of this program is to make fuels not chemicals. Right now lignol is a chemical company focusing on fuels as a byproduct. For this project they should discuss how they can become a fuels company with chemicals as a byproduct rather than a chemicals company with fuel as a byproduct. I feel a little bad for this company as they seem to have a good technology, but are in turmoil. Lignol needs to be more open with the reviewers. They need to view DOE as a stock holder in this project rather than just free money. There was a lot of smoke and mirrors in this presentation. Lignol needs to demonstrate more pilot plant data before they go forward with this project. Lignol needs to provide to reviewers a process flow chart, a basic economic analysis and pilot plant data. I don't understand why lignol wants to go forward with this project if they don't have the pilot plant data. I think this is a very honest company. I think it is a good think that they are so honest and DOE should continue to work with them. I wish lignol luck in this difficult economic time.	There are many points to address in this comment: Pilot plant work is ongoing and is providing a good design basis for plant design - IRR can be improved by increasing plant capacity as well as by process enhancements. Ethanol yields from the process are in-line with other processes - lignin could be used as fuel, or to make fuels, but there is higher added value from chemical uses; high added value means better economics and more biorefineries being built - markets for high purity lignin are large enough that many plants will be needed to satisfy demand. HP-L lignin will be used to replace petrochemicals, thereby reducing crude oil demand. Lignol has been open with the reviewers with respect to the scope of the DOE funded project - it was not the forum for an in-depth review of Lignol's entire operations, including R&D focus and activities which are not funded by DOE. Process flow sheets, process economics, energy and mass balances were all provided when Lignol applied for funding - all of these will be updated during the design phase of the project and verified by pilot plant data which is presently being collected.
This was a very inopportune time to have a review of this project due to the collapse of	Technology development, including lab and pilot plant work, is continuing in parallel with

their commercial partnership last month. This appears to be a well managed project, with promising technology addressing an important pathway. The immediate focus of Lignol mgt on trying to pull their project back together commercially, however, has pulled their attention away from the technical and longer term vision and mgt issues we are attempting to asses. I suggest that this assessment not weigh too heavily but that DOE work with Lignol as they work to put their project back on a sound commercial footing and then reassess once a new partner and project have been established.	the restructuring of the demonstration plant project - there is no loss of focus on technical issues but since this was not part of the DOE project scope, they were not reported. The structure of the Peer Review presentation was heavily prescribed and with limited time it was necessary to stick to the structure and project issues.
No comment: they have not started any real work and they need to restructure their project. No additions or deletions are recommended at this time.	N/A

Project Number:	5.6.2.1
Project Title:	Demonstration of an Integrated Biorefinery at Old Town, Maine
Performing Organization:	RSE Pulp & Chemical
Number of Reviewers:	Dick Arnold & Jim St. Pierre

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	2.5	1.29	3
Approach	2.75	0.96	2
Progress & Accomplishments	2.75	0.5	1
Success Factors	2.75	0.96	2
Future Plans	2	0.82	2
Average Score: All Criteria	2.55		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
Thank you for the comments to our peer presentation in March. This was our first presentation in this format and we were unsure of what to expect or, in some cases, how far to go with the presentation. We have attempted to respond to areas of weakness in hopes of demonstrating the extent to which this project has progressed.

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They are integrating biofuels into an existing refinery. This leads to lower capital costs and a technology that can be scaled up.	They will never make any impact on fuels with this technology. They weren't clear on their yields. They need to clearly define how many gallons of ethanol they make per ton of biomass and show there overall material balances. There IRR is negative and I am not sure why they want to go forward with negative IRRs.
PI Response: Summary of inputs/outputs/economics for demonstration plant: Feedstock = 108 BDmt/day Output = 1.5 mgpy fuel and 2.3 mgpy chemicals Proforma EBITDA = \$4.3 million	
N/A	This project application is very narrowly focused on pulp mill applications. With this limited base of application coupled with the very small yield of ethanol stated for the process it is difficult to see how this will be a major contributor to "dramatically" reducing dependence on foreign oil. (1.5MM GPY ethanol from a 550 dry ton per day pulp mill) As presented, this is actually a process more dependent on a revenue stream from acetic acid. It was stated that only two other mills in North America (perhaps it was the US) have the dual continuous digester set up that Old Town has. Other large pulp mills with a single continuous digester will have a difficult if not impossible time cost justifying the capital to install a second digester stated as a need to incorporate this new process. Smaller batch digester mills will apparently require less capital but will also produce even less ethanol (due to their smaller size) and are generally the mills even more stretched for capital, The commercial applicability of this

	appears to be extremely small and coupled with the small ethanol yield appears to accomplish very little toward the MYPP goals of dramatically reducing dependence on foreign oil.		
PI Response: Replication, scale-up and deployment			
Planned schedule for deployment: The United States has 295 pulp mills. Hardwood mills will be the early technology adopters. Once the proposed facility has reached stable operations, RSA plans to disseminate the results and allow other companies to visit the facility and review its operations and results.			
It is expected that within five years, 10 mills will have adopted the pre-extraction technology presented herein, while it will take 12 years for the Nth plant to be operational and 20 years for the Nth plant technology to be adopted by 50% of both softwood and hardwood Kraft mills.			
Year	Activity	No of plants	Fuel produced Million gallons/yr
2010	Old Town Demonstration biorefinery plant at full capacity	1/2	1.5
2011	Old Town Demonstration biorefinery at full scale	1	3.0
2013	Technology adopted in 10 mills	10	30
2013	Old Town demonstrates Nth plant chemistry and process	11	63
2017	Technology of Nth plant adopted in 70 plants	70	2,000+
Table 10 – Planned Schedule for Deployment			
U of Maine technology and knowhow to be used in this project. The status of pilot-scale testing of U Maine technology is sufficient to begin the integration with the plant. Engineering firm on board to design and build.		UMaine is doing the pilot scale testing and design for the fermenter. Isn't this something that is best done by industry using industry practices and standards?	
PI Response: UMaine has completed and continues with lab scale research and is the developer in collaboration with us of the extraction technology employed at the Old Town mill. For this project we will be discussing and highly likely be employing a pilot scale extract conditioning process designed and built by IPT, a company with design/build experience in pilot and commercial scale biopharmaceutical and biotechnology areas.			

N/A	Market acceptance for pulp was not demonstrated. Limited application. Applicability is miniscule. Presenter was interested in promoting keeping mill open for community jobs. Need discussion of economic viability. Lack of collaboration within the industry.
PI Response: N/A	
Involvement of pulp mill - a critical program strategic partner.	Project appears to be targeted primarily to be a part of a rescue plan for the mill.
PI Response: Biofuels have the potential to significantly reduce global –greenhouse gas” emissions associated with transportation. GHG emissions will decrease dramatically as biofuels of the future are increasingly made from cellulosic feedstocks and as the associated manufacturing processes increasingly use clean, renewable energy sources. Patriarch is committed to building a "Bioenergy Platform" based on the success in Old Town. There are three key steps in that framework: Step 1 ~ with the restart of the facility, we will operate one of the few existing pulp operations with the technology and ability to produce energy and biofuels in conjunction with its core business of pulp for the paper industry. Step 2 ~ a primary focus of our overall business development strategy revolves around this project for building the region’s first bio-refinery, based on extraction technology developed with the University of Maine. The extraction of hemicelluloses from wood chips and the process to convert the resultant extract to biofuels and other chemicals provide fungible replacements for currently used transportation fuels. Step 3 ~ the conversion of cellulose fiber to chemicals and fuels. This step in our commercialization efforts will increase the extract rate and produce a purer brown cellulose product that for further conversion to ethyl levulinate of appropriate carbon-chain length and processing as a biodiesel and/or other fuel additives.	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They seem to have some pilot plant data.	They need to show a better plan to improve their economics. They admit it is uneconomical in a very large plant. Then why are we doing this project. How will funding this project reduce the cost in the future? What are the key process variables? I need more information to make a better

	evaluation. They need pilot plant data for the fermentation reactions.
PI Response: There are three significant technical milestones that must be overcome in order to demonstrate a commercially viable process that converts hemicelluloses digester extract into a transportation fuel. These are: Milestone 1 - Convert hemicelluloses extract in fermentable C5 sugars Milestone 2 - Identify an organism, or organisms operating in tandem, capable of metabolizing C5 sugars into <i>n</i>-butanol at concentrations that are economical viable. Milestone 3 - Develop and demonstrate a purification strategy that economically purifies “<i>n</i>-butanol beer” into a transportation grade fuel. Integrated Process Technologies, Inc. (IPT) has core competencies needed to maximize the likelihood for success in each technical milestone. Specifically, IPT has the process expertise, equipment design, process automation, fabrication, start up and commissioning knowhow to deliver process modules at both the pilot and demonstration scale on a turnkey basis. Their experience in the design, construction, and operation of pilot plant and demonstration scale biofuels plants, leads us to make the following recommendations and action plan. Of the three technical milestones noted above, we recognize the greatest technical and commercial risk lies in identifying suitable microbe(s) capable of converting C5 sugars into <i>n</i>-butanol. To accelerate the search for <i>the best microbe</i>, we propose a pilot scale module capable of conditioning 30 gallon batches hemicelluloses digester extract. The product of this pilot module will be a solution containing between 10 and 30% C5 sugar. This pilot scale module has the following advantages: <i>It can be quickly and economically implemented.</i> <i>It will quickly get large amounts of concentrated C5 sugars out to the industry for microbial testing and evaluation. This feed stock is the only commercial scale C5 sugar source available from a pulp digester source in North America. It represents a large, untapped renewable natural resource for local economies distributed throughout the United States.</i> The plan for the pilot module will be to adapt the batch process according to specific needs of promising microbes. For example, if a promising microbe shows inhibition from acetic acid or high levels of sodium, a diafiltration step may be added at this scale and the efficacy of the inhibitor removal step can be verified. This scale will provide excellent insight into the appropriate membrane chemistry, material, and flow channel geometry for the ultrafiltration step used in hemicellulose digester extract concentration.	

The plan is to utilize process scale ultrafiltration membranes and provide accurate scale up and equipment cost data for the hemicellulose digester extract concentration step.

This pilot scale module will provide useful reactor kinetics data for the acid hydrolysis step. This data can be easily transferred from batch into a continuous plug flow reactor design.

An intermediate product stream contains lignin precipitate. Processing at this scale will provide insight into the particle size distribution of lignin precipitate and thereby allow the team to select the most cost effective separation method at the demonstration scale.

After the best microbe for the application is determined, IPT has the experience and capabilities to deliver a demonstration scale process on a turnkey basis. In the northeastern United States, IPT knows of no other company with the demonstration scale biofuels experience capable of delivering a bio process on a turnkey basis. This scope of supply requires experience skills spanning conceptual design through final process qualification and derived through following industries:

OEM equipment suppliers and membrane manufacturers

Process engineering and construction management services

High purity process modules fabricators

High purity process piping contracting and construction

Process automation system integration

Biotechnology operating companies

UMaine Fermentation Data

organism	bacteria/ fungus	temp	GMO?	mono/ oligo	anaerob- icity	product	by- product	demon- strated product yield (% theoret)	demon- strated GL tolerance	te w
E coli KO11	bacteria	meso	GMO	mono	facultative	EtOH	80-90%	3x	mature	no
Pichia stipitis CBS-6054	fungus	meso	isolated	mono	micro aerobic	EtOH	40%	0.5X	moderate	no
Clostridium phytofermentans	bacteria	thermo	isolated	oligo	obligate	EtOH	HAc	---	0.5X	pr

T. thermosaccharolyticum HG-8	bacteria	thermo	isolated	oligo	obligate	EtOH	HAc	---	0.5X	prelim.	no
Moorella thermoacetica	bacteria	thermo	isolated	oligo	obligate	HAc	---	0.5X	prelim.	no	?
Bacillus coagulans MXL-9	bacteria	meso	isolated	mono	facultative	HLa	72-95%	1X	moderate	yes	?
other possibilities											
Z. mobilis	bacteria	meso	GMO	mono	facultative	EtOH	n/a	yes	NREL		
S. cerevisiae	fungus	meso	GMO	mono	facultative	EtOH	n/a	yes	Nancy Ho		
S. cerevisiae	fungus	meso	GMO	mono	facultative	EtOH	n/a	yes	R. Nedalco		
Zymetis	bacteria	meso	GMO	mono	obligate?	EtOH	n/a	yes	Zymetis		
Clostridium Acetobutylicum	bacteria	thermo	GMO	oligo	obligate	BuOH	n/a	yes	Cobalt		
Clostridium beijerinckii	bacteria	thermo	GMO	mono	obligate	BuOH	n/a	yes	Tetravitae		
N/A			Nothing in the presentation allows me to asses if a project management plan or well designed RDD approach is being used. No project schedule or milestones were presented other than major points such as equipment selection and construction. This project seems to have gone through a great deal of turmoil during the recent bankruptcy and may still be suffering from a lack of continuous management planning and oversight.								
PI Response: Milestones ~ see previous response.											
Project Schedule & Management Plan ~ we do have a complete Project Schedule with milestones and a Work Breakdown Structure that incorporates DOE nomenclature and stage gates. This material has been provided to the Golden Field Office.											
Unique integration approach to extracting an ethanol-producing fraction from the wood and delivering the extracted wood to the mill. Using outside engineering resources. VTT process is unique.			Might want to consider bringing in other industrial partners for the fermentation technology, and marketing the products.								

PI Response: Fermentation technology providers have been identified as we prepare for our "commercial level" extract trials. Once these trials have been completed, we will create a partnership with the most suitable technology provider(s).	
I think complications with Mill integration will be reasonably well understood since the second digester is in-place and a full Mill operating team is available. I like their acknowledgement that another Go/No Go gate exists at the end of Phase 1.	Shifting of focus from VPP to etOH production places Old Town into a new area. Will all risks be shifted to the fermentation technology provider? I doubt they will have the balance sheet to cover such a risk, so it will fall back to Old Town & project investors.
PI Response: We are well positioned financially to move forward, with or without partnerships. Patriarch has it clear with regards to their commitment to the development of biofuels. The risks associated with this path will be fully understood and mitigated as part of the development process.	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They have shown that they can produce an aqueous hemicellulose stream.	They did not show any information about how they can convert that hemicellulose stream into ethanol. What are their material and energy balances? What is the cost of each unit?
PI Response: We have the material and energy balances for fermentation to butanol and ethanol. Butanol is the higher valued product. This material has been provided to the Golden Field Office.	
N/A	Very difficult to assess the rate of progress given the recent bankruptcy. Without that event I suspect the progress would have been better. Pre-meeting handout states "There are no Barriers associated with this project". Barriers not addressed. Meeting handout does not identify proper stage of development consistent with DOE nomenclature. I believe that recent turmoil in this project and turnover probably has created situation where team members do not understand DOE objectives and methodologies.

PI Response: Three barriers to success were identified at the presentation although not tied to DOE MYPP: 1. biorefinery integration: Referenced to Sec 3.3.3 of MYPP, subsection It-A "End-to-End Process Integration". 2. Quantity and quality of extract: Referenced to Sec. 3.1.3 of MYPP, subsection Ft-G, "Feedstock Quality and Monitoring". 3. Fermentation Process Yield: Referenced to 3.2.1.3 of MYPP, subsection Bt-J, "Fuels Organism Development".	
10 % complete. The VPP extraction process, upon which this proposed IBR will be based, has been tested at full scale and shows no adverse effects on the pulp product feed to the mill.	No Gant schedule provided to judge progress versus time. It is questionable whether the U Maine can conduct all the testing at a scale sufficient to prove the fermentation piece of the IBR.
PI Response: We do have a detailed Gant schedule and milestones for UMaine work. This material has been provided to the Golden Field Office.	
Limited due to financial restructuring of mill.	No engineering firm selection yet (maybe due to restructuring of the Mill; not sure).
PI Response: We have built a relationship with Integrated Process Technologies (IPT) for their expertise in providing process engineering, piloting, validation and start up & commissioning services for the demonstration plant. They have extensive experience and background in biotechnology companies at both pilot and commercial scales.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	The show stopper is the economics. IF they don't have favorable economics with DOE paying part of the capital then why continue with this project. Instead they should focus on future R&D and get more pilot plant data. They should continue to improve this money rather than pay for all the capital to just build steel.
PI Response: A crucial part of our business strategy lies in the development of technologies in the area of bio-energy; we believe that with assistance from DOE on the biorefinery, we can be at the leading edge of commercializing processes that convert cellulose to biofuels and that are economically viable.	
N/A	See comments in #5. Very little recognition or discussion of potential barriers.

PI Response: Our barriers are identified in response above under category 3.	
Patriarch is strong partner.	Not having the expertise on the project team to address Project Objective 3: To identify & secure separation/fermentation technology to produce economically viable yields. The selection of the fermentation part of the IBR will be critical to success.
PI Response: Selection of the fermentation technology provider is critical to success of this project and all involved recognize this. We believe our success will be the result of implementing a unique technology that creates value from our feedstock prior to pulping. Also, UMaine's pre-extraction technology is best suited for our situation and we have already proven that we can produce that extract on a commercial basis. We are confident that we can convert the extract to a liquid fuel and that the various steps in the process use technologies that we are familiar with today. Our challenge revolves around the integration of those processes in order to create a resulting fuel that is economically viable. We have outlined a plan that will accelerate the identification of the best microbe(s) capable of converting C5 sugars. That fermentation partner will become an integral part of the team as we design, build and operate the demonstration plant.	
VPP process is fully to scale and abundant "hemi-liquor" can be obtained when needed. Apparently strong new parent company, committed to biofuels.	Finanacibility when fermentation vendor is secured: who will cover the monetized process risk? Make sure pulp purchasers are satisfied with the pulp quality, post-VPP (during the pre-construction stage). If ethanol is seen as a path to stabilize Mill revenue, will DOE be left without a project if the Mill's sensitivity / volatility projections and analysis do not support this goal? Unclear about the success of adding the hemi-cellulose hydrolysis and fermentation step - no data, no information on piloting.
PI Response: See previous responses.	
In terms of risk and pulp quality, the pre-extraction of hemicellulose is fully integrated with our pulping operation. The "extract trials" are being conducted to optimize the process for extraction of hemicellulose in order to obtain the most favorable mixture for subsequent conversion to acetic acid and ethanol/butanol. We will conduct these trials at the 1200 BDT/day pulping feedstock (woodchips) rate with a resulting extraction rate of about 400 gpm, producing 72 to 120 BDT/day of dissolved biomass as a feedstock to our biorefinery. These trials will be "controlled experiments" that allow us to study and document the effects of extraction operating parameters on the composition and dissolved solids content of extracts at the 10% demonstration scale. In terms of market volatility, our longevity in Old Town will depend on our success in bioenergy, not pulping.	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	They need to get more pilot plant data before they go large scale. They need to explore different options for process improvements. They seem too early to me to build a demonstration plant.
PI Response: Pilot data and run time are crucial in improving chances of success with advanced technology projects. The bankruptcy and idled plant situation over the last year has precluded that from substantially progressing. Our plan during the initial budget period (BP-1) is a detailed approach to producing a commercially viable extract for pilot fermentation testing by various technology provides thus identifying risks and a mitigation plan prior to detailed design.	
N/A	This project is strictly focused on Old Town. There is no recognition of DOE barriers (technical, commercial....) or mention of any plans to commercialize beyond Old Town.
PI Response: Refer to prior response under criteria #1 for deployment of technology. DOE Barriers: Funding approval for this fiscal year & beyond; DOE acceptance of scope change "fermentation to butanol"; DOE's acceptance of cost share strategy, our in-kind match, the Risk Mitigation Plan, etc.	
N/A	Not enough information to access.
PI Response: N/A	
Focus on monomer fermentation is good - oligomer fermentation can come later.	80% engineering in 10months seems unachievable - they must mean 80% of typical front-end engineering work (typically 8-10% of total engineering).
PI Response: We have our infrastructure in-place (building, steam, power, water, treatment, site permitting, etc); we are specifically referring to process design and detailed engineering for the pre-fermentation, acetic acid recovery and fermentation stages. The pre-extraction is complete. The pre-fermentation pilot is scalable; the acetic acid recovery is current technology used in other pulp mills; and the fermentation pilot plant (reactors) are scalable.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
They are working with UMaine which is a plus as they will publish and share this	We have completed a "due diligence review" with the Golden Field Office and have shared with them

information with others. They should be more open with their material and energy balances. They should define where the bottle necks are and help to tell DOE where to focus future research efforts. If government is providing money for this project then they should make sure that they share some of the information they learn. At the very least they should identify where the bottlenecks are and where R&D should be focused.	all information pertinent to this project including our economic analysis, mass and energy balances, flow sheets, schedules, pilot plant data, etc. Numerous publications have come out of UMaine with regards to the pre-extraction of hemicellulose and integrated biorefineries in pulp mills. We have identified bottlenecks and future research needs as we collaborate with UMaine, IPT and various other groups such as Biofine, Shell, Dupont, etc.
There appears to be no collaboration within industry which is very surprising given this industry and the connection with U Maine. This is a surprising shortcoming for a project such as this in the P&P industry which has a history of collaboration through organizations such as TAPPI and AF&PA.	Collaboration within the industry is on-going including AF&PA, The Atlantica Bioenergy Task Force, the Maine Pulp & Paper Association, and numerous others through UMaine relationships.
U Maine appears to be the only collaborator and though they have invented the proposed approach, industry partners beyond the mill should be brought into the project.	Others are being considered and discussions on-going.
U Maine - good. No separation/fermentation vendor-partner has been identified: maybe DOE can play a role here.	See prior response.

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
I think they should focus on pilot plant studies and process improvements. If the economics don't work out with government money providing a loan guarantee then they should focus on process improvements. If they go to the larger plant too early then they risk shutting down the entire project. I hope that DOE could	We believe that the extract and pilot trial phase of our project (producing a commercially viable extract for pilot fermentation) is consistent with our initial proposal, although more thorough and does satisfies DOE concerns by front end loading efforts in the potential high risk areas, mitigating the risks, and implementing design revisions to make the

move some of this money from a large scale demonstration plant to more pilot plant. This technology is clearly at the pilot plant stage.	demonstration scale project successful. We are confident that the results obtained from our pilot program are sufficiently scalable for design of the demonstration plant.
Nothing was presented however to demonstrate that this process has been explored with respect to its economical applicability to other mills that would allow it to become part of a national solution. The project should include an immediate study of the economic viability of this technology in other mills. This would not be a major undertaking.	This was done with the initial FOA and discussed under criteria #1 ~ replication and deployment.
DOE should advise on separation / fermentation systems that apply to this process. Pulp purchasers should be canvassed to assure the main revenue for the plant is not affected by the removal of some of the hemis.	Discussions are on-going with DOE and our pulp customers with regards to these issues.

Project Number:	5.6.1.1
Project Title:	Project Independence: Construction of an Integrated Biorefinery for Production of Renewable Biofuels at an Existing Pulp and Paper Mill
Performing Organization:	NewPage
Number of Reviewers:	Douglas Freeman

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	3	2.0	4
Approach	3.33	1.53	3
Progress & Accomplishments	3	2.0	4
Success Factors	3.33	0.58	1

Future Plans	3.67	1.53	3
Average Score: All Criteria	3.27		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
We look forward to proceeding with the DOE on this demonstration plant. I feel that the Feasibility Study will answer many of the questions that are presented in the review. Project Independence is a good project and can make a difference in the knowledge of this technology and in the use of biomass for fuels. The next peer review will contain the results of the Feasibility Study.

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They have some pilot plant data. They seem to have some economic analysis. New Page is a very well respected company. They have experience with managing capital and collecting the biomass.	I have no idea about their pilot plant data because they didn't report any of this. What are the overall gallons per ton? What are their overall capital costs? How long did they run the catalysts for? I had no idea how to judge this presentation. Very little information was given to us during this presentation. IT was just a bunch of smoke and mirrors. The company does not have any experience with making fuels, FTS, or using catalysts.
PI Response: We appreciate the positive comments of this reviewer and the good impression that NewPage Corporation as a company has made on him. A number of questions and comments are contained here. I will address each of them. <i>I have no idea about their pilot plant data because they didn't report any of this.</i> Pilot plant data was not reported due to the short presentation time. A complete mass and energy balance has been generated from the small scale pilot plant work done by TRI and EFT. The large scale pilot plant work which will be the key to the design will be generated in May/June, 2009. The large scale pilot plant work will be covered next report.	

What is the overall gallons per ton?

36 gal/dry ton biomass.

We are not pushing the Fischer-Tropsch reactor so this is relatively low. If we pushed the reactor, a yield of 56 gal/dry ton would be expected. We are not pushing the reactor to keep the capital cost down in this demonstration facility and we have a use for the tail gas where we derive natural gas value.

What is their overall capital costs?

\$77 MM

How long did they run the catalysts for?

Catalyst runs have been made for extended periods of time on laboratory gas mixtures. Experience with long term catalyst runs using actual synthesis gas from woody biomass has not been made. This will be part of the large scale pilot plant work. Catalyst decay will be plotted and modeled

I had no idea how to judge this presentation. Very little information was given to us during this presentation. It was just a bunch of smoke and mirrors.

I am sorry my presentation was not informative to the reviewer.

The company does not have any experience with making fuels, FTS, or using catalysts.

The products that we are going to make are new to NewPage Corporation. However, we internally produce and burn 450 gpm of black liquor at Wisconsin Rapids Mill along. Black liquor has similar properties as #6 fuel oil. We handle combustible gas stream in our vent systems which we then burn.

When looking at Project Independence and operations at Wisconsin Rapids Mill there are a number of similarities:

Biomass Handling, Sizing and Drying: Already handle 350 dry ton of biomass fuel and 2,500 dry ton of biomass for pulp production.

Biomass Feeding: Have several biomass feed systems up to 150 psi pressure. This includes our boiler, digesters, ozone bleaching and chlorine dioxide bleaching.

Fluidized Bed Combustion: We have fluidized bed combustors in the NewPage Corporation organization. These are boilers that combust hog fuel.

Scrubbing: Operate seven scrubbing systems using three different technologies, including

<i>the ones proposed in this project.</i> <i>Compression: Operate a variety of compressors and turbines.</i> <i>Fixed Bed Catalyst: Operate several reactor system including chlorine dioxide generator, lime slacking and digesters. Operate a large number of heat exchangers and steam generation units.</i> <i>Distillation: Operating a variety of evaporation system and distillation systems. These include black liquor evaporation systems and methanol stripping.</i>	
Project supports the program and will demonstrate a biofuel different from ethanol; that is, F/T bio diesel via biomass gasification. Project team is solid and the project leader has assembled knowledgeable industrial concerns well-versed in each of the technology areas within the project, thereby assuring success. Much of the fuel could be used for internal consumption.	Not much real integration of the biorefinery with the mill. Project could stand alone.
PI Response: The support of the overall goals is important to NewPage Corporation. We want this project to succeed and give the DOE value as well as value to NewPage Corporation. There are several areas to address: <i>Not much real integration of the biorefinery with the mill.</i> The integration with the mill is at the utilities and fuel for the lime kiln. There are 50,000 lbs/hour steam and 100 MMBTU/hr of tail gas being incorporated into the existing operation from Project Independence. This allows Project Independence to have a positive impact to the mill economics, utilize the available energy at Wisconsin Rapids Mill and minimize the capital cost without risking the core business at Wisconsin Rapids Mill of producing pulp and paper. This was done due to the lessons learned from trying to integrate black liquor gasification systems into operating pulp mills. The risk to the main business is just too great. <i>Project could stand alone.</i> That is one of the goals of this effort. Demonstration of a stand alone capability would expand the usefulness of this technology.	
Supports goals.	Addresses only wood.

PI Response: The support of the overall goals is important to NewPage Corporation. In looking at the limited raw material type reference by the comment; <i>Addresses only wood.</i> Project Independence focused on woody biomass since it is a raw material that we have in abundance in this area and 100 years of experience working with it. However, this technology could also be used with agricultural waste, purpose grown crops, old tires, and municipally derived wastes. TRI is looking at all of these types of applications.	
Presentation of management plan. Partners are committed to the project. Collaborating with others in the industry.	Need several years on catalyst testing. Techniques are not mature technologies. Underestimation of complexity of technologies.
PI Response: N/A	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They claim to have pilot plant data and detailed engineering analysis.	I wasn't able to learn much from the presentation. This reflects poorly on the company.
PI Response: We do have small scale pilot plant data and will be gathering additional data with the larger scale pilot plant. Pilot plant data was not reported due to the short presentation time. A complete mass and energy balance has been generated from the small scale pilot plant work done by TRI and EFT. The large scale pilot plant work which will be the key to the design will be generated in May/June, 2009. The large scale pilot plant work will be covered next report. To the comment; <i>I wasn't able to learn much from the presentation. This reflects poorly on the company.</i> I am sorry my presentation was not informative to the reviewer.	
Project approach is using technologies that are known and proven and pilot plant is in	Perhaps there is a bit of over confidence that everything will work I am concerned about the

progress. Obtained good knowledge of local biomass supply and logistics.	gasifier and the FT system. DOE should carefully review the economics that show \$3.00 per gallon biodiesel produced. When adding the cost of delivery, I would suspect that no one will buy the product, and so far there are no supply contracts in place.
PI Response: We have focused on the raw material aspects of this project as there is no project if we can not source the material. We have done three studies to demonstrate that the feedstock is available. We have done several trial runs of feedstock gathering to determine technique and cost. We also wanted to stay with as much proven technology as possible and I am glad that he review acknowledged this. There are some comments that we should address further: <i>Perhaps there is a bit of over confidence that everything will work</i> There is a lot of technical review that must be done yet. In these reviews we will work on mitigating risk and determining alternatives to the main technology. The pilot plant work will go a long way to fill in the gaps of what works or not. <i>I am concerned about the gasifier and the FT system.</i> So are we. That is why we plan to have use a pilot plant operation and have been careful to put in fall back positions to handle upsets and problems. <i>DOE should carefully review the economics that show \$3.00 per gallon biodiesel produced.</i> Hydrocarbon economics will determine the viability of all alternative fuels projects. If the economic projections for hydrocarbons are not favorable, I would expect that DOE and NewPage Corporation will not proceed with the project. This part of our stage-gate process. At this point, we want to proceed with the Feasibility Study so that we have enough engineering and investigative work done to proceed if the economic picture is right. <i>When adding the cost of delivery, I would suspect that no one will buy the product, and so far there are no supply contracts in place.</i> I am not sure is if this statement refers to the cost or the quality of the product. Our efforts during the Feasibility Study is to firm up the economic and quality picture so that we know which markets we can sell into and will it be profitable. Supply contracts are going to be difficult as no entity is willing to write a long term contract, especially for a facility that is 3 years from steady production. However, we are looking for active partners interested in the product and have gotten more responses than	

we have product. The next step is to firm up this interest as part of proceeding to construction. We also have an internal need for diesel fuel and consume this fuel within the Wisconsin Rapids Mill. We have 800 trucks a day coming to our mill.	
Pulling relatively mature technologies together rather than developing new technologies. Fluidized reforming gasifier may help cut capital costs	Project involves complex technologies (materials handling, gasification, FT synthesis) that may be difficult to integrate. It is not clear that the team has the expertise to deal with these complexities.
PI Response: We wanted to stay with as much proven technology as possible and I am glad that he review acknowledged this. There are some comments that we should address further: <i>Project involves complex technologies (materials handling, gasification, Fischer-Tropsch synthesis) that may be difficult to integrate. It is not clear that the team has the expertise to deal with these complexities.</i> Integration of these technologies can be difficult. Material handling is one of our core competencies at Wisconsin Rapids Mill and NewPage Corporation. We will need to learn more about gasification and Fischer-Tropsch synthesis as we move ahead with this project. However, similar gasification systems are operated in our industry and a fixed bed catalyst system is one of the easier catalyst technologies to operate. This point is well taken and we will be looking to increase our knowledge of these processes. The products that we are going to make are new to NewPage Corporation. However, we internally produce and burn 450 gpm of black liquor at Wisconsin Rapids Mill along. Black liquor has similar properties as #6 fuel oil. We handle combustible gas stream in our vent systems which we then burn. When looking at Project Independence and operations at Wisconsin Rapids Mill there are a number of similarities: Biomass Handling, Sizing and Drying: Already handle 350 dry ton of biomass fuel and 2,500 dry ton of biomass for pulp production. Biomass Feeding: Have several biomass feed systems up to 150 psi pressure. This includes our boiler, digesters, ozone bleaching and chlorine dioxide bleaching. Fluidized Bed Combustion : We have fluidized bed combustors in the NewPage Corporation organization. These are boilers that combust hog fuel.	

Scrubbing: Operate seven scrubbing systems using three different technologies, including the ones proposed in this project. Compression: Operate a variety of compressors and turbines. Fixed Bed Catalyst : Operate several reactor system including chlorine dioxide generator, lime slacking and digesters. Operate a large number of heat exchangers and steam generation units. Distillation: Operating a variety of evaporation system and distillation systems. These include black liquor evaporation systems and methanol stripping.

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They claim to have some pilot plant data and economic analysis. I am unsure about this data and these weren't discussed in any detail.	I have no idea how to judge these people. Robert talked for 30 minutes and told us zero. They need to disclose to DOE what they are doing with DOE's money. I would give them a better score if they disclosed more.
PI Response: We do have small scale pilot plant data and will be gathering additional data with the larger scale pilot plant. We have done an economic analysis that looks favorable. Addressing the other comments: <i>I have no idea how to judge these people. Robert talked for 30 minutes and told us zero.</i> I am not sure who the Robert is that is being referred to. Is this meant to be Doug Freeman or Robert Byrne from Flambeau River? In either case, we will be more informative in future presentations. <i>They need to disclose to DOE what they are doing with DOE's money. I would give them a better score if they disclosed more.</i> So far we have not used any DOE money. There has been full disclosure by NewPage Corporation to DOE on our plans and details of the project including mass and energy balance, schedule, pilot plant plans, project management, general procurement strategy and off-take strategies.	
Project is proceeding as planned. Prefeasibility study has been completed and project is in progress doing detailed feasibility study. Good	N/A

attention to economics, M& E balances and costs and the project is addressing biomass procurement and product off-loading concepts which were identified in the pre-feasibility.	
PI Response: We have a lot of work yet to do to answer all of the questions but we appreciate the comments.	
FEL-3 stage should have costs well defined.	Fluidization is a difficult science/art. Fluidized beds are a solution of last resort in the chemical process industry. May need to plan for more time to pilot. PMP shows minimal time for fluidization & catalyst testing
PI Response: Defining costs and economics are a major part of the Feasibility Study. This is the main effort to determine if the technology is worth pursuing. Addressing the fluidization questions; Fluidization is a difficult science/art. Fluidized beds are a solution of last resort in the chemical process industry. May need to plan for more time to pilot. PMP shows minimal time for fluidization & catalyst testing This is a good comment and will be incorporated in our planning. Fortunately, the pilot plant work is from the gasifier vendor which is guaranteeing the operation of the gasifier. The result is that all of the pilot plant work and experience gained on the gasifier and Fischer-Tropsch synthesis system will be rolled into the supplier delivery to meet the performance guarantee.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Not enough information is given. I guess they have some pilot plant data, but I am not sure. They showed us the product they are making.	This process is not economical. I doubt it will go forward unless the economics improve... Need to provide more data in terms of economics, process flow diagram, and process risks. I think they need more pilot plant data.
PI Response: We do have small scale pilot plant data and will be gathering additional data with the larger scale pilot plant. Addressing the other comments: <i>This process is not economical.</i> We feel that the economics of this process are good enough to warrant a Feasibility Study. These results firm up the economics and allow us to make a more informed	

decision. We will report on these economics in the next peer review.

I doubt it will go forward unless the economics improve.

The project will not go forward if the economics do not support it. This is part of the DOE and NewPage Corporation stage gate process. We will report on these economics in the next peer review.

Need to provide more data in terms of economics, process flow diagram, and process risks.

This is a much larger presentation and we would be glad to provide it. We have provided the mass and energy balances, process flowsheets, risk mitigation plans which address both process risks and other risk area. The economics and process flowsheet will be further developed in the Feasibility Study and will be reported on in the next peer review.

I think they need more pilot plant data

This is a good comment and will be incorporated in our planning. Fortunately, the pilot plant work is from the gasifier vendor which is guaranteeing the operation of the gasifier. The result is that all of the pilot plant work and experience gained on the gasifier and Fischer-Tropsch synthesis system will be rolled into the supplier delivery to meet the performance guarantee.

The additional pilot plant data will be report in the next peer review.

Recognition that supply and product agreements will be critical to success.

Project team is overly optimistic that all will work technically. I applaud their enthusiasm, and they may be right. Good luck.

PI Response: We have focused on the raw material aspects of this project as there is no project if we cannot source the material. We also have taken a hard look at the products and need to spend additional time narrowing down the options and coming up with a best set of scenarios to negotiate and sell the products. In response to the following: Project team is overly optimistic that all will work technically. I applaud their enthusiasm, and they may be right. Good luck.

We are optimistic and we have selected technologies that have a proven track record. There is a lot of work to be done in putting it all together successfully. We can use all the luck we can get.

Good EE & ME expertise. But what's needed is Chemical Engineering!

Fluidized bed combustor should be added to critical issues lists. TRI gasifier deployment--1 success and 1 failure so far in commercial operations. This is a significant risk. No mention of chemical engineering expertise. Challenges described, but no strategies for

	dealing with them were presented.
PI Response: We do have a lot of Electrical Engineer and Mechanical Engineer experience at Wisconsin Rapids Mill and NewPage Corporation and appreciate the acknowledgement of this. There are several issues to address in the other comments: <i>Fluidized bed combustor should be added to critical issues lists. TRI gasifier deployment--1 success and 1 failure so far in commercial operations. This is a significant risk.</i> This has been a major discussion point with TRI. The reasons for success and failure have been reviewed and discussed. This is part of our risk analysis and we are looking to use commercial experience, cold flow modeling, computer modeling and pilot plant results to help understand the design problems and operating issues to minimize this risk. <i>No mention of chemical engineering expertise.</i> About a third of our engineering staff are chemical engineers. Along with pulp and paper science engineers, which have a very similar curriculum as chemical engineers, the process engineer discipline is the largest group of professional people in our mills. These engineers have experience in the design, installation and operation of the material handling, combustion, distillation, evaporation, pumping, gas scrubbing, compressor, slurry reactor, and other technologies that are in the pulp and paper industry. We are a process heavy industry and as have developed a strong expertise in chemical engineer disciplines. <i>Challenges described, but no strategies for dealing with them were presented.</i> In this short presentation I only presented the challenges. We have a risk mitigation plan and a review process to address these challenges as we move forward with Project Independence. The risk mitigation plan is a dynamic document that is always being added to. I would be happy to give a presentation on how we plan to address the challenges.	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They are building a large scale demonstration project. It seems like they have done a lot of preliminary work, but we did not review these.	N/A
PI Response: The review timing was very short and we would have like to gone into more detail on many subjects.	

Uses stage gate.	N/A
PI Response: We have used a stage gate process for many projects and find it very useful.	
N/A	Need independent verification of economics Presentation says that FEL-2 is done and later states that capital costs need to be known better. What is accuracy of FEL-2 costing?
PI Response: Addressing the questions; <i>Need independent verification of economics. Presentation says that FEL-2 is done and later states that capital costs need to be known better. What is accuracy of FEL-2 costing?</i> The purpose of the Feasibility Study is to further develop the economics for this project. The current accuracy is +/- 20%. Looking to get to +/-10% in the Feasibility Study as well as further explore any lingering questions that impact the decision to proceed with the project.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
It is beneficial that New Page is open to working with other companies in this space. They need to provide reviewers what they are doing. If they are this closed to DOE reviewers then I don't think they will be open to most people.	<i>It is beneficial that New Page is open to working with other companies in this space. They need to provide reviewers what they are doing. If they are this closed to DOE reviewers then I don't think they will be open to most people.</i> With a limited time to present we were not able to go into a lot of detail. Hopefully we can change this perception in the future.
Yes Well planned and developed technology and business team. No publication list presented.	We think that we have a good team and look forward to working with them and the DOE.
IP with ExxonMobil is good. Good set of collaborators.	We think that we have a good team and look forward to working with them and the DOE.

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
I would recommend that they increase the	I tried to address the comments as they are

size of their plant. They are proposing a 500 ton/day plant. I am not sure what they learn by this size of a plant. I think their economics would look a lot better if they build a larger plant. The capital cost at that small size of plant is very large. I also think they should focus on process improvement. They claim \$3.00/gallon as a cost and I think they will not make money at those costs. I don't think that DOE or New Page should go forward with this project unless it becomes more economically attractive. This still seems like a very early stage project and I do not think it will be funded. In future reviews please provide pilot plant data, material and energy balances, process flow chart and economic analysis.	presented below: <i>I would recommend that they increase the size of their plant. They are proposing a 500 ton/day plant. I am not sure what they learn by this size of a plant. I think their economics would look a lot better if they build a larger plant. The capital cost at that small size of plant is very large. I also think they should focus on process improvement. They claim \$3.00/gallon as a cost and I think they will not make money at those costs. I don't think that DOE or New Page should go forward with this project unless it becomes more economically attractive. This still seems like a very early stage project and I do not think it will be funded.</i> The 500 dry ton/day plant size was picked to match the biomass resource, lime kiln fuel need and the total capital cost. This formed a project package that met the resources of the company and the desire for a demonstration plant. The Feasibility Study will determine the overall economics and whether we should move forward. We will report on the detailed economic analysis in the next peer review. <i>In future reviews please provide pilot plant data, material and energy balances, process flow chart and economic analysis.</i> We will be glad to provide this information.
Move forward to complete the feasibility stage.	We look forward to completing the Feasibility Study and moving forward with this project.

Project Number:	5.6.3.1
Project Title:	Demonstration Plant - Biomass Fuels to Liquids
Performing Organization:	Flambeau River Biofuels, LLC
Number of Reviewers:	Robert Byrne

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	3.67	1.15	2
Approach	3.33	0.58	1
Progress & Accomplishments	3.67	1.53	3
Success Factors	3.0	0.0	0
Future Plans	3.67	1.15	2
Average Score: All Criteria	3.47		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
N/A

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
This is a project that they claim is close to being ready for commercialization. Flambeau has expertise in collecting	I am unsure about their pilot plant data. They need significantly more pilot plant before they proceed. They seem way too early for this project!!! How long

the feedstocks to a centralized refinery. They also have expertise in managing capital and in operations of large scale equipment.	will there catalysts be stable for? How often will they replace catalysts? What type of reactors are they using for each step? For a 20 minute presentation we probably don't have time to evaluate this. They should discuss more about the key process steps that they need to understand once scaled up. I have no idea what they will learn from this project.
PI Response: Pilot data will be covered next report. Catalyst development specifically for this project has been ongoing at laboratory scale for more than a year at EFT's lab in Broken Bow, OK, building on the experience of the EFT scientists. Based on the catalyst chosen we expect a 3 year catalyst life with annual regeneration.	
Aligns well with DOE plan. Same technology as NP but bigger plant. Company, not DOE is taking the biggest risk.	Significant project financing requirements by the private sector could prevent deployment. Market for the product is uncertain. Off take contracts for the biodiesel may be a problem.
PI Response: This reviewer is correct. We currently have an off-take letter of intent for the F-T wax, which is the largest revenue stream. We have had meetings with fuel blenders in Wisconsin that have expressed some interest. We are in discussions with a Honeywell (UOP) blending specialist for assistance with diesel blending. The product will sell as a diesel replacement. Marketing of the green diesel to get a premium to diesel is the current challenge.	
N/A	High capital cost makes project unlikely to produce cost-competitive fuel. FT needs large scale to be economic. This is a fundamental mismatch with highly dispersed, low energy biomass resource
PI Response: This weakness comment is correct. This project attempts to build a project that is of large enough size to be economical to run, without ruining the economic cost of the woody-biomass inputs due to transportation costs. Plant sizing for these kinds of projects is critical. They cannot be too big or too small, or they lose their opportunity to be feasible.	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They have detailed economic analysis and some pilot plant data. I didn't see the pilot plant data, which they probably didn't have too much time for in this presentation.	Need more pilot plant data. They claim to have carbon credits which I do not know if they will have. Also a lot of the project depends on the cost they can sell the wax and biodiesel. There

	is only a limited supply of wax.
PI Response: Additional runs are scheduled. Catalyst delay will be plotted and modeled.	
Same technical approach as presented by New Page. Project can leverage off of the other project. Pilot operations of TRI and EFI processes demonstrated and should provide the design data for scale-up to a commercial plant demo. PMP with Gantt	N/A
PI Response: We realize the value each project will receive from the other as New Page and Flambeau work together. We will be able to learn from each others' pilot run, share pilot data, and speed up our respective learning curves. DOE ought to encourage other projects using similar technologies to do the same.	
Utilizes technologies that appear to be off the shelf.	Success depends on high wax prices. While this may work for plant #1, many large plants would saturate wax market and drop value--much like biodiesel and glycerin. Project involves complex technologies (materials handling, gasification, and FT synthesis) that may be difficult to integrate. It is not clear that the team has the expertise to deal with these complexities. TFI gasifier deployment--1 success and 1 failure so far. This is a significant risk. Determine maximum concentrations of product in diesel with cold flow properties. Need economics with hydrocracker to crack waxes since this will be required for "nth plant."
PI Response: Both these strength and weakness comments are correct. TRI gasifier operation has been identified in our risk matrix as the highest technology risk. The integrated pilot run this summer is our plan to mitigate that risk. Further, as we produce real quantities of green diesel from wood during our pilot work, we have a number of potential off-takers, including Chevron, which want larger samples for blending studies.	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They have pilot plant data and a detailed economic analysis. Great project timeline.	They need to more clearly specify the key process risks. I have no idea about this because they didn't show their pilot plant data. The only thing they did was show us some liquids that they made.
PI Response: This will be covered next report. Up until now, pilot work has done by unit operation. The integrated pilot run starting in July is key to this project's success.	
Project is very early. Making excellent progress addressing areas of concern Feedstock analysis, wood supply study and sample products to end use customers tested are important accomplishments. Class 30 engineering completed ahead of schedule.	N/A
PI Response: Correct.	
Design and costing appear complete	N/A
PI Response: Correct, although design may change some with integrated pilot plant learnings. Our +/- 30% engineering has identified several value engineering opportunities that must be explored. These opportunities may allow us to reduce this project's capital cost.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	They do not talk about the technology risks. They need to clearly define the technology risks. Just scaling up should not be defined as a risk.. Need to focus on catalyst stability. You can focus on catalyst stability at bench top and pilot plant facilities. It would be a poor idea to study catalyst stability on your full scale commercial plant. They need to discuss how they will improve their process. If there process is not economically then they should not build it right now. Instead they should focus on improving it until it becomes economical.

PI Response: We have a complete risk matrix as part of the +/-30% engineering effort that was recently completed. Catalyst stability has been studied specifically for our project for over a year at EFT's laboratory. We are looking forward to learning how the catalyst works in the pilot with a range of Wisconsin woods. Project economics are a function of the carbon conversion efficiency, the plant's thermal conversion efficiency, and the relative costs of capital, woody-biomass and the cost of diesel. If the project does not produce an acceptable return, it will not be built.	
Project recognizes the showstoppers and limitations and is working on these.	Biomass gasifier feed and material handling have plagued many other gasifiers. No solution was presented here, but speaker recognized that feed issues remain to be proven. F/T catalyst stability and life is being tested but could be a showstopper.
PI Response: Comments are correct. We are currently doing feeder testing, but look forward to a longer test. Comments on catalyst are correct.	
N/A	Difficult to assess without good economics. Need to do economics with hydrocracking of waxes since this will need to be done if deployed on a large scale. 20 year take-off contracts are unreasonable in fuels business.
PI Response: We have an off-take for all the wax to be produced by plant #1. We have done an order of magnitude engineering study of cost and scope to hydrocrack wax if it becomes necessary for the nth plant. Off-taker with hydrocracking (Chevron) might buy wax as is as a blending fuel and crack at their existing refineries.	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
I think overall they have made some good progress.	I think the project should focus more on process improvement and design. How are they going to improve the process? What will they do to reduce the capital costs and improve the yields? How much further can they improve the yields?
PI Response: We have been doing catalyst development for over a year to increase activity and	

optimize the hydrocarbon output curve by chain length (alpha), to increase diesel cut and wax cut and minimize the naptha cut. We have a list of identified value engineering activities to complete with our +/-10% engineering work after the integrated pilot work is completed. A guaranteed yield will be a key commercial guarantee from the technology suppliers TRI and EFT.	
Project plan deployment will depend on securing the financing.	N/A
PI Response: This will be the biggest challenge in today's financial markets. The upcoming pilot work, when successful, will help this some by mitigating the perceived technology risk.	
Plans look good.	Need to consider EPA fuel registration including Tier 1 health effects testing.
PI Response: We will add this comment to our work list and our risk matrix, as an activity to be completed.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
They are very open about this project and working with others. I would like to commend them with sharing their information and working with others. They should work more clearly with DOE to help specify what they think are the critical needs and how DOE should focus its R&D efforts in the future. I think the money spent on this project will be beneficial for everybody involved in biofuels as they share their information with others.	We plan to do this and have a meeting scheduled with DOE to start this dialog.
Yes, lots of qualified technology vendors as partners. No publications presented.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
This is a full scale commercial plant to produce biofuels. I think that this is the type of project that DOE should fund. Although this is not a demonstration project this is a commercial	N/A

project. Perhaps DOE should divide this program into two parts: one to build pilot plants to demonstrate the technology and one to provide cost share to build commercial plants. Before this project is funded they need 2-3 more years of pilot plant data. This company is not ready to build the commercial project and is overly optimistic in its statement that it could build a commercial plant in 2 years. They have no expertise in the fuels market. It is clear that this project would not be happening unless DOE provides cost-share and loan guarantees. I do think though that a large portion of this money should come from the private market as this is a commercial project. The company may have to wait until private markets improve before they start this project and I hope DOE will be flexible with them. The company should also continue more pilot plant runs. I do not think they are focusing at all on process improvements. Instead they just want to scale up. Before they spend this large amount of money on capital they should focus on process improvements. They need more data at the pilot plant before they can go forward with demonstration plant. They should not use their full scale demonstration plant to do catalyst stability. They should do catalyst stability at the bench top and pilot plant level. This project also clearly shows how expensive gasification and syngas technology is. DOE should focus on other technologies which are still in development before they decide that this is the technology they want to support. It is likely that these newer technologies will have lower capital costs. However, this project demonstrates the technology that is most ready to be commercialized. I appreciate that Flambeau is open with sharing information, and working with other companies. This is a huge advantage of this project.	
No changes recommended	N/A
Need detailed economics.	N/A

Project Number	5.6.1.2
Project Title:	Cellulosic Based Black Liquor Gasification and Fuels Plant
Performing Organization:	Escabana Paper Company
Number of Reviewers:	Michael Fornetti

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	3.0	1.0	2
Approach	3.0	1.0	2
Progress & Accomplishments	3.0	1.0	2
Success Factors	2.0	0.0	0
Future Plans	3.0	0	0
Average Score: All Criteria	2.8		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
N/A

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
If this proves economic then other paper mills will follow. There is a lot of black liquor available in the US that could make a very	Only marginally economic. If the project is not economic then they need to focus on technology improvement or develop a better

small dent in our fuel supply.	technology. It is unclear if they will improve the technology. They are mainly focused on scale up. It is really hard to judge this project and the presenter did not do a good job conveying what they are doing. They need to treat DOE as a share holder in this and not a place for free money.
PI Response: Investigator 17587 is correct in that this demonstration project is not economic at this mill at a scale to handle only 30% of the black liquor produced at this pulp mill. The economics are better at 100% substitution because: 1. Capex/unit of production will go down with a fuels plant over 3 times as large. 2. Pulping yield will increase by about 3% with 100% gasification. 3. Energy efficiency increases. The IRR for a full sized plant is estimated at 12%. If all pulp mills in the United States were converted to this process, the fuel equivalent would provide for 3% of our transportation needs. Since Escanaba has a very reliable recovery boiler, it is a good location to prove the technology without serious impact on the traditional business line. It is true that our main focus is on scale up because that is where the risk is.	
Validation of a new BLG concept is valuable.	As configured, the project is producing methanol. There is no market for methanol as a fuel. DME could be a unique fuel but there is also a limited market for DME as a transportation fuel. Mill retrofits by themselves to increase energy efficiency should be outside of the IPR scope.
PI Response: Agreed, DME would need recognition as a viable fuel substitute for diesels or as a home heating fuel. It is also stable, up to 3%, in existing diesel fuel. Mill retrofits to improve energy efficiency were included because we are extracting a fuel stream from the mills energy supply and those BTU's need to be replaced by either burning more biomass fuel or by using less energy for manufacturing by greater efficiency. In this project work scope we are doing both.	
DME/methanol may be good alternative to FT.	Black liquor probably easier to gasify than solid biomass if corrosion problems can be

	adequately addressed.
PI Response: We would monitor the corrosion in the existing development plant which has over 6000 hours of operation a high pressure.	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Have partnered with a well respected partner. They have pilot plant data.	I can't really judge this because they were not open in disclosing their bottlenecks. That is the companies fault.
PI Response: The mill bottlenecks are: 1. Additional kiln capacity is required because of increased carbonate load in green liquor. 2. An additional 600T/day of bark needs to be burned to replace BTU's in the fuel stream. 3. Bark fuel preparation and delivery needs capacity increases. 4. Bark boilers need modifications in the convection passes, grate area and air systems. Since we will be producing green liquor from two sources, one conventional and one developmental, we will need a green liquor stabilization tank and green liquor clarifier modifications.	
Proven fuel process - thus only need is to demo one unproven technology (the BLG) rather than two. Redesigned Chemrec with the right metallurgy - 7006 hours on stream running well.	new BLG Gasifier concept is new unproven technology that needs to be tested at scale.
PI Response: N/A	
Consideration of alternate products (DME, methanol) give alternative to Fischer Tropsch.	N/A
PI Response: N/A	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They have some pilot plant and economic analysis. Cost estimate to a 15-20% level.	Economics doesn't work at 20% cost share. If the economics don't work then you shouldn't continue this project. They need to be more open about 1 what they want to accomplish and what they have accomplished so far.
PI Response: For this demonstration project we are in agreement. But for the full scale plant, as previously stated, the economics will look much better.	
Basic plant engineering data completed. BLG pilot operating. Lots of progress made with the BLG.	No accomplishment lists were provided.
PI Response: This phase of this project was an engineering study to develop the cost estimate. At the same time we monitored the progress of the development plant which was shown on my presentation. Technical objectives accomplished by Chemrec include: 1. Nozzle design for good carbon conversion. 2. Extensive lining development and life extensions, expectations is for up to 3 years lining life. 3. Quench area design and development. 4. Green liquor quality. Syngas quality and uniformity and low tars.	
Good work on gasifier for black liquor.	N/A
PI Response: N/A	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	The economics drive this project. If it is not economic with DOE providing 30% of the cost share they shouldn't continue it. Instead they should focus on improving the technology.

	This project is too expensive.
PI Response: Agreed, it is expensive at this size. It will be less costly at 100% recovery boiler replacement but no one will do that until the scale-up is proven. It would also be less costly at a kraft pulp mill with reserve bark boiler capacity and a lime kiln with extra capacity. In our operation, this equipment is fully developed and already at maximum continuous throughput.	
N/A	PI did not address marketability of the product Past experience with BLG was not discussed relative to proposed new gasifier.
PI Response: N/A	
N/A	No show stoppers listed. Critical success factors not listed.
PI Response: N/A	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	Unclear about how they are going to improve the technology or if they can improve the technology. If economics don't work out then I wonder why they should continue this project.
PI Response: N/A	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
I think they are open with their data and willing to share. I think that this is beneficial and I hope they will publish their results so that other paper mills can learn.	N/A

Yes. Project is aligning with technology partners and two industrial partners (Volvo and an oil company) who would provide a market for the DME product, but not the methanol.	N/A
Major energy partner will be good addition.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
I am confused why DOE is funding two New Page projects. They should just fund one project per company. Very good economic analysis. They need to have a process flow diagram, economic analysis, and what are process uncertainties and bottlenecks. This project is too expensive \$300 million for a 500 ton/day unit. DOE needs to be viewed as a share holder in this project. New Page needs to clearly communicate to DOE where they are and what needs to happen for this project to work. They should communicate back to DOE future research direction. This is a full scale commercial plant not a demonstration unit. This can be an advantage or disadvantage.	NewPage purchased Stora Enso, North America, who already had a project going at Wisconsin Rapids at the same time we were involved at Escanaba with Chemrec. When the companies merged, we had two projects. I completely disagree on the comment of two projects at one company, especially if they are utilizing different technology and different resources. This is not about "spreading the money around". It is about picking projects with merit and if one Company has two, then so be it. Also, my fault on the demonstration VS commercial plant. This is a demonstration plant. The commercial plant would have 4 gasifiers feeding one fuels plant.
Drive the project toward DME and make the DME island a part of the project from the get-go.	I agree but DOE has not recognized DME
Need to see economics	We have very detailed economics with market correlations and sensitivities. I will see if I can get this model to the reviewers.

Project Number:	5.5.1.1
Project Title:	Commercial Demonstration of a Thermochemical Process to Produce Fuels and Chemical from Lignocellulosic Biomass
Performing Organization:	Range Fuels, Inc.
Number of Reviewers:	William Schafer III

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	3.0	0.82	2
Approach	2.75	0.96	2
Progress & Accomplishments	3.0	1.83	4
Success Factors	2.25	1.26	3
Future Plans	3.25	1.71	4
Average Score: All Criteria	2.85		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
N/A

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Range fuels claims to have a lot of pilot plant data (which they never showed to us). It seems like they have done a lot of engineering.	They "claim" to be building a full scale commercial unit not a demonstration unit. They need to more specifically lay out the key risks for scale up. I need to see their pilot plant

	data and economic analysis to better evaluate this project. Nobody has made ethanol efficiently and I imagine catalyst R&D is a key variable. They probably need significantly more catalyst development work before they scale up. I think this is a pilot scale project and not a demonstration project. There is a lot of smoke and mirrors with range fuels which became apparent in this presentation. They are not ready to build the demonstration plant. They need a lot more work.
PI Response: Range Fuels is building a full scale commercial unit, not a demonstration unit. This is not a claim, it is a fact defensible by detailed review of pilot plant test data, detailed design Basis of Design, design PFDs, P&IDs, fabrication schedules, detailed construction schedules. This reviewer seems to have had, in my opinion, an unrealistic idea of what information is conveyable, and the level of detail that can be communicated within the format of the peer review process. The reviewers request to "see there (sic) pilot plant and economic analysis..." is at odds with our understanding of the goals and format of the session. There is clearly not only skepticism, but active animosity demonstrated by this reviewer's statements. We complied strictly with the format and requested information supplied to us by the DOE. The conclusions drawn by this reviewer appear to be based on little other than predisposition. Lots of speculation with little basis.	
Plant is actually under construction and permits in place!	Product mix is ill defined, but the methanol fraction will not be suitable for a transportation fuel in the US
PI Response: Product mix is variable, as was stated in the presentation, and can be pushed toward greater methanol or greater ethanol production, proportionately. Methanol fraction has myriad fuel applications, outside standard transportation fuel, and legislation currently proposed legislation, the Open Fuel Standard Act, actually adds methanol to ethanol as a requirement for flex-fuel vehicle design, refuting the statement that methanol will not be a suitable transportation fuel in the U.S. It is difficult to respond to whatever other factors resulted in a Fair ranking, as this is the only weakness cited.	
Well planned and thought out.	Gasification capital costs
PI Response: Gasification capital costs are, indeed, a weakness of these early stage technologies, but history has demonstrated the significant reduction in capital possible in the evolution of the technologies and we expect to be very competitive as economies of scale and design refinements are achieved.	

N/A	This is a significant portion of the 932 program budget and scale-up is monumental. This is a big risk for all involved.
PI Response: This is a significant portion of the 932 program, but the major risks are borne by equity investors under the 60:40 match. In fact, much less than 40% of even the early phase costs will be paid out under the 932 program.	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They seem to have a very good project team and have done a good job of outlining the process. They have a pilot plant and "claim" to have some pilot plant data.	I have too little information to access their R&D efforts. I have no idea about material and energy balance, yields or economics. The only idea is the overall material balance (around 60-70 gallon per metric ton) and capital investment \$550 million for a 2500 ton/day unit. DOE needs to be viewed as a shareholder in this effort. If Range is unwilling to provide this data to DOE reviewers then DOE should not fund this project.
PI Response: All of the data cited as not being presented has been provided to the DOE as well as a detailed evaluation under a DOE-funded Independent Engineer's Report and a thorough project evaluation by IPA. An incredible amount of due diligence has been performed and information has been freely shared and timely provided to the DOE. Either the reviewer or Range Fuels seem to have misunderstood the reviewer's role under the Peer Review. No 35 minute presentation could possibly have provided even a cursory examination of this reviewer's requests and provided the other information requested. Range Fuels stuck very closely to the format and information requested and, in fact, received several complimentary comments following the presentation for sticking closely to the format, rather than digressing.	
Well managed structure with multiple vendors and suppliers Project has developed critical path schedule to manage. On schedule and on budget	N/A
PI Response: N/A	
Good project planning Mixed alcohol synthesis FEL system in place. Not just integrating 3rd	No technical information given. No economic information given.

party technology. Significant novel technology internally developed.	
PI Response: All of the requested information was provided. DOE has performed significant additional due diligence including multiple evaluations by Independent Engineers, IPA, and others. We presented information requested to judge the progress of the project, not to evaluate the fundamental technical and economic merits of the project. This has been repeatedly addressed outside this process.	
No doubt their planning is first class and well reasoned, however...	... I hope someone is watching the scale-up issues and I am not clear or convinced about the three phase project roll-out. They essentially are getting DOE to pay for a very large demo project, and then a commercial scale project. Can OBP place a hold on the project if inadequate process performance is shown at the end of Phase I?
PI Response: DOE is actually paying for a fairly small portion of the total cost of the project under the 932 program. Major risk is being carried by Range Fuels' equity investors. The entire purpose of the phased roll-out is to provide stage gates where project goals and facility performance are evaluated prior to any decision to proceed further. Scale-up issues are a major focus and largely account for the decision to proceed under a phased structure. The least proven portion of the technology, the biomass to syngas conversion, is implemented at full commercial scale in Phase 1. Other process blocks present much less scale-up risk as scale-up issues are well understood through experience gained with similar or identical industry-standard processes, as has been demonstrated and discussed in detail with project personnel from DOE.	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They seem to have a well laid out work plan (although I am unsure what this work plan is).	We really have too little information to assess this. They need to be clearer in providing us data as to where they are in terms of development. They only have some pilot plant data. Why are they going forward with the commercial plant so quickly if they don't have more pilot plant data?

PI Response: This reviewer's comments consistently demonstrate what appears to be a misunderstanding of the goals and approach of the Peer Review sessions. All of the information cited is available and can be provided, and has been provided, but cannot be provided during a 35 minute presentation without slighting other areas we were requested to address. Perhaps a review of the Independent Engineer's Report provided to DOE by R.W. Beck would satisfy all of the requests of this reviewer, but this also would entail a large commitment of time, and no doubt money, to repeat work already performed. Range Fuels may have, in fact, more pilot plant data than any other group in this industry space. As was state during the presentation, we have several runs of nearly 1,000 hours for the fully integrated pilot plant and tens of thousands of hours of pilot plant data for catalyst runs. We believe any experience, objective, well-informed, reviewer would find a more than sufficient volume of test data from fully instrumented pilot plant operations, run for extended periods.	
Different approach - catalytic conversion of syngas to alcohols. NEPA done on schedule. May offer fuel product flexibility for optimizing product sale to changing market demand. Pilot plant for gasifier is outside project and was successful.	N/A
PI Response: N/A	
Good experience on gasifier and alcohol synthesis	N/A
PI Response: N/A	
N/A	Simply not clear. Presenter was very guarded. There is insufficient information from the briefing material, presentation, or Q&A session to make a meaningful judgment. Pilot seems very small but no data was presented. I am not clear or convinced about the three phase project roll-out. They essentially are getting DOE to pay for a very large demo project, and then a commercial scale project.
PI Response: See previous section's response to this reviewer's same comment.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	They aren't very clear with any of this. I imagine the show stoppers all evolve around catalyst performance. They don't need a commercial plant to show catalyst performance.
PI Response: We clearly listed factors considered to be critical success factor and showstoppers, as was cited by another reviewer. Catalyst performance is not a show stopper. As was stated during the presentation, significant advances in catalyst performance have been demonstrated, but must be placed in context against other commercial options for syngas conversion in harmony with the goals of the 932 program and Range Fuels' own commercial interests. A detailed risk registry has been provided to DOE with specific mitigation strategies. Full presentation of this information was beyond the provided scope and available time allotment under the Peer Review.	
identified success factors and barriers and is addressing them as part of the forward project execution.	No strategies presented- only identification of the issues.
PI Response: Mitigation strategies were provided verbally during the presentation and further discussion time was provided under the Q&A section.	
Good listing of factors	No values given for critical values of any of "challenges"
PI Response: Critical values for challenges are dictated under the terms of both the original 932 FOA, and the testing and validation described in Range Fuels' Technology Investment Agreement with DOE.	
N/A	Unable to give a comment - they only mentioned Phase 2 funding as an issue. Explanation of risk mitigation and contingencies was minimal or non-existent. Frankly, the presenter was in "sales pitch" mode and his manner was not forthright.
PI Response: The presenter had no "sales pitch" to make as Phase 1 of the project is fully funded and it was not understood that the peer group reviewers had responsibilities beyond judging the progress and approach taken for the projects. I am not aware of any questions posed that weren't	

provided a reasoned response within the confines of the available format. Perhaps reviewers were unaware of the due diligence evaluations and submittals regularly provided to the DOE. Reviewer perception of their role seems incommensurate with the opportunity provided to provide information. Certainly, a very large amount of additional material is available to respond to reviewers' perceptions of deficiencies, but Range Fuels made a point of sticking very closely to the requested format for presentations and the time available

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	They need to specify what they hope to learn at each step. What are the key uncertainty. All they claim is they don't know what the process uncertainties are. How are they evaluating different process options?
PI Response: In fact, we have detailed experiments performed at the pilot plant level to address process uncertainties, as was mentioned during the presentation. Although we will have opportunities to perform research, the 932 program is not targeted at pilot or demo plant support, there is a separate program for those stages of development. The Range Fuels Soperton Project is designed to progress in a structured way to full commercial operations, as specified under the FOA. There are uncertainties resulting from every significant departure from the pilot plant, which has provided multiple long-term test runs, but testing at the pilot plant level has targeted increasing understanding of these uncertainties and reducing them to an acceptable level for support of a commercial design.	
Focus on primary goal to make sure the plant operates well.	N/A
PI Response: N/A	
Well defined construction schedule.	N/A
PI Response: N/A	
N/A	Unable to give a comment - they only mentioned Phase 2 funding as an issue. Explanation of details related to Phase 2 was not clear to me. DOE must have seen some extremely convincing information to accept this level of scale-up on two major reaction

	trains. It flies in the face of the other projects, in my opinion.
PI Response: Range Fuels believes our project is far more advanced than the other projects and has provided DOE data, evaluations, etc. to substantiate that statement. DOE has often volunteered that such is the case. This reviewer has repeated the same statement with little variation for the last three areas considered. Perhaps this is a reflection of the presentation being given late in the day, accounting for some inattention or lack of questioning during the provided Q&A period that might have provided a more meaningful review.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
They probably won't share any of their information. Probably any information they learn will be kept for internal usage. The other gasification projects are all a lot more open than Range.	We are focused entirely on providing a replicable, commercially viable project, as is, we believe, a major aim of the 932 program. It is true that we will resist sharing information publicly that could compromise our ability to reach commercial viability. The 932 program was not designed to provide public domain information to potential competitors; it was designed to support the transition to commerciality for biorefineries. The other gasification projects are looking for investors.
Lots of partners and collaborators.	N/A
Extensive group of capable collaborators	N/A
Excellent mix of partners, except for academic institution.	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
Not clear about how demonstration is going to reduce the risk of scale up. They claim that the next plant will have 50% lower capital cost. I doubt this is true and it is probably smoke and mirrors. They have not laid out a clear plan about how they will reduce the cost in the future. This presentation was just a sales pitch of Range technology. I don't think they are ready to scale up and build this facility. They are way too overly optimistic about scale up. They need to present their pilot plant data. Range needs to view DOE as a stock holder in this project rather than as free money to make their real stock holders rich. What is there costs with their catalysts making ethanol vs. methanol? I get the feeling that Range is not being honest with DOE and if DOE is going to be providing so much money they better be more honest and open. This is the only gasification project that is stand alone. Therefore there capital costs will be 2 times higher than the other gasification projects which are not "grass roots". They all use essentially the same type of gasifier which is an indirect gasifier. In their presentation they claimed that everybody should be building grass roots plants for biofuels. This is not true. The first cellulosic plants will be co-located with other facilities. There is a set of economics for grass roots plants and a different set of economics for plant expansion (which Range seems unaware of). In future project reviews Range needs to provide DOE reviewers with the economics, process flow diagrams, key uncertainties and risks, and pilot plant data. Without providing reviewers this information then I would not recommend funding this project. Range also needs to be as honest as possible with DOE reviewers. Some of these problems may be because this is the first time DOE reviewed this project. Hopefully Range	This reviewer's comments have consistently assumed a tremendous amount of information that was not presented, and then drawn conclusions based on these assumptions. A specific instance is the contention that all of the gasifier projects are essentially the same. Range Fuels' gasifier performs the same conversions, but it is a proprietary design. To say they are all indirect gasifiers and, therefore, all the same shows remarkable lack of insight. What was stated during the presentation was that the economies of scale attainable with a larger stand-alone project like the Soperton Project demarcate a critical point for validating a technology at commercial scale. The much smaller, add-ons to existing corn ethanol plants have two significant drawbacks: first, they are dependent upon the commercial viability of the primary, corn-based plant, which is a significant source of risk given the current state of that industry and controversies associated with food vs. fuel issues; second, these add-ons will always be significantly limited in scale and capacity. How they can possibly meet the goals articulated by the RFS as provided in the EISA without a significant contribution by stand-alone plants is a matter for some conjecture.

will be better prepared next time.	
None.	N/A
Need to see economics, process flow etc.	N/A
Reduce DOE exposure to failure or inadequate performance of Phase 1.	The entire reason for the phased approach described during the Peer Review is to limit DOE's exposure to failure or inadequate performance by building as small and inexpensive a project as will reasonably demonstrate the viability of the full commercial scale plant. This is detailed in the TIA between Range Fuels and DOE. Moreover, DOE is provided detailed reporting on at least a monthly basis showing progress on both budget and schedule for the project and any variations are addressed at that time. All payments from DOE follow payment of original invoices by Range Fuels and are subject to review by DOE's Independent Engineer and validated against the approved schedule, budget, and scope prior to approval and payment. This information may not have been available to this reviewer, but it is certainly relevant to the comments submitted.

Project Number:	7.5.4.1
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Project Title:	City of Gridley Biofuels Project
Performing Organization:	City of Gridley
Number of Reviewers:	Dennis Schuetzle

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	2.67	0.58	1
Approach	2.33	0.58	1
Progress & Accomplishments	2.0	0.0	0
Success Factors	3.0	1.0	2
Future Plans	2.33	1.53	3
Average Score: All Criteria	2.47		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
Receiving an objective third party critique of the project is useful to ensure the project maintains the correct approach. The project team appreciates DOE and the peer reviewer's efforts in putting this event together. Further, having this review come after the Biomass 2009 conference allowed for good knowledge sharing and networking that will help to advance of the industry as a whole. From some of the questions and comments from reviewers, it appears that some of the reviewers did not understand the different funding mechanisms/levels used for each project. Unlike the recent grant awardees, the Gridley Biofuels Project is funded at a much lower level than recent awards and will not construct a 1/10 scale biorefinery. Just to clarify scope, the project will conclude with the integration of two key unit processes - a ~15 ton per day biomass-to-syngas platform and a ~1 ton per day syngas-to-fuels Process Development Unit (PDU). Further work on pilot demonstration efforts will be required.

It appears that the project did not get comments back from all reviewers and only partial comments from some reviewers. The review committee should include all comments from the reviewers and encourage reviewers to provide comments on all areas of the presentation. Also some reviewer comments were incomplete, which may have been due to the time that reviewers had to enter comments.

Some comments request additional information or clarification on items that were out of scope of the discussion, could not be reviewed in a public forum due to confidentiality (ex. catalyst specifications), or we simply did not have sufficient time to discuss during the presentation. The project team would be happy to provide this information and/or facilitate a conference call to discuss and solicit further feedback from reviewers.

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Generally the project meets the objectives of the MYPP.	The presentation did not address the specific MYPP objectives which the project addressed.
PI Response: This project leads to MYPP objectives by demonstrating and validating integrated technologies to achieve commercially acceptable performance and cost proforma targets for an integrated biorefinery. Completion of the validation studies and deployment of this technology is planned for 2012 in support of the DOE Integrated Bio-Refineries program. The commercial plant is to be deployed at a 26-acre site in Gridley, CA and will be used to convert rice harvest, wood, and other agriculture residues to diesel fuel, electricity and steam (for a co-located food processing plant).	
Seeks to do process integration.	Need to show more data for us to evaluate. Once they prove this technology at this scale they should discuss more there plans to scale it up from there.
PI Response: Data related to syngas quality, fuel specifications, and other data, that was generated from test runs during 2008 and 2009, was summarized in the Appendices and mentioned during the presentation.	
The plan for scale-up involves completing the current DOE funded program (integration of the 15 ton-per-day TCC system and the 1 ton-per-day liquid fuels system). The next step is to complete extensive testing on a fully integrated 25 ton-per-day system (not part of scope of this project) and following completion of this fully integrated system deploy the first round of	

commercial plants. Red Lion Bio-energy and Pacific Renewable Fuels have developed a comprehensive commercialization plan that outlines the steps needed to achieve wide-spread commercialization, that is available for DOE review upon request.	
N/A	General overview was nonspecific. Specific MYPP objectives were not related to overall OBP objectives.
PI Response: This project directly meets the OBP objectives by working to achieve the following goals: - Demonstrating and validating integrated technologies to achieve commercially acceptable performance and cost proforma targets for an integrated biorefinery. - Demonstration of a pilot system and deployment of the DOE integrated bio-refineries agricultural residue processing pathway - Demonstration of a pilot integrated bio-refinery by DOE's target timeframe in 2012.	
The focus on pyrolysis-syngas train is good. Involvement of City / local government is also good.	Scope is too large - abandon the electrical production.
PI Response: The City of Gridley is a member of NCPA (Northern California Power Agency) and co-production of renewable electricity (along with the diesel fuel) is a key interest of the City. Further, the renewable electricity prices in Northern California help project economics. For the Gridley plant, renewable power production needs to remain part of the plan. However, the technical team has two plant configurations. One that allows for maximum fuel production (by recycling tail gas) and the other that uses this tail gas for power production. Other plants will be configured to maximize fuel production by recycling the tail gas, which has been proven at the unit process scale to improve yields and is a more economical in some situations (especially outside of California).	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Potentially addresses conversion of a difficult	No project management plan, which is a major

feedstock i.e. rice straw.	weakness.
PI Response: While a PMP was not required initially for this project (and therefore budget was not allocated for a PMP), REII has recently developed a PMP to govern the remainder of the project and future scale-up efforts. This PMP can be provided upon request.	
N/A	I have too little information to efficiently evaluate their technology. I think their claimed yields of 50 gallons per dry ton of biomass is probably too high. There have been billions of dollars spent on FTS and I doubt that this group with their limited research can obtain yields better than the other companies who have spent millions of dollars on catalyst research. They have not costed out the compressor cost yet. They are in for a surprise when they do the compressor cost.
PI Response: Our team brings over 200 years of collective advanced catalyst and Fischer-Tropsch catalyst development expertise. This history allows us to leverage prior work in this area and we have developed a catalyst that is specifically designed to work in small biomass-to-liquids plants by directly producing a usable diesel fraction at high conversion rates. Typical FT processes produce a wax that requires hydroprocessing and this approach does not work for biomass-to-liquids and while this works for large refineries, it does not for biomass-to-liquids plants. While the compressor costs were not included in the presentation since detailed costing was not a requirement, our team has spent considerable time costing out compressors (and other components of the system). Approximately 6-9% of total project capital goes to compressors. Our operating pressures are significantly lower than other biomass-to-liquids plants and run at a maximum of 400 psi. Exit pressure of the syngas from the thermochemical conversion system (TCC system) is 50 psi, so our compressors require a 350 psi boost. Our compression requirements are significantly lower than that required for typical mixed-alcohol catalysts (1,000-2,500 psi). Below are some key innovations that intensify this process and bring economical production of biomass-to-liquid fuels within reach: Direct Production of Cleaner Syngas: Extensive characterization of the syngas produced from the TCC system has been conducted on wood, rice harvest waste, and other feedstocks. The syngas that is produced from the gasifier is at least 10x (and in some cases 1000x) cleaner than any previously published syngas data. Reduction of tars, particulate matter, sulfur, and other catalyst poisons dramatically reduce the capital and operating cost associated with syngas clean	

up systems that are required of other systems. While this system operates at a 15 ton per day range, the process will be adapted for smaller scales to meet the needs of this proposal.

Ideal Syngas Ratio: Typical gasifiers produce syngas ratios between 0.5 – 1.0 H₂/CO due to the use of air/oxygen in their systems. As a result they require costly water gas shift (WGS) processes or alternative hydrogen production to increase H₂/CO levels to the correct ratio for fuel production. The TCC system (a pyrolysis, steam reforming design that functions under reducing conditions) produces H₂/CO ratios of 1.8 – 2.5 without process augmentation. Further this TCC system produces < 1% Nitrogen (compared to an average of > 25% from typical gasifiers). This superior gas mix dramatically reduces both capital and operating expense and allows for a considerably more efficient catalytic conversion system.

Directly usable superior diesel fuel: The fuel produced from the catalytic conversion process is a directly usable, clean fuel which will exceed ASTM and SAE specifications. Typical fischer-tropsch catalysts produce a high molecular weight hydrocarbon product that requires hydroprocessing. This is appropriate for large refineries that can justify the capital expense, but not for biomass-to-liquids plants at small scales. PRF has cut this step out of the production process by going direct to fuel, thus eliminating a major process step.

High catalytic conversion efficiencies at lower operating conditions: The catalysts provide high catalytic conversion efficiencies and operate at lower operating pressures than traditional catalysts. These process intensifications reduce capital and operating costs and allow these catalysts to work in PRF's unique, low cost catalytic reactor.

More efficient operation through the use of a patent-pending adaptive control system platform: Control system platforms have been developed which are able to change operating conditions based on feedstock inputs (water content and composition) and catalyst behavior. These control systems monitor hundreds of system parameters in order to optimize fuel output, extend catalyst life, and maximize plant revenue. This control systems approach increases plant efficiencies and allows for better economics for small plants in the 300 – 2000 DTPD range.

N/A

Specifics of development at Ohio site were not apparent.

PI Response: The Ohio site was highlighted in the presentation as the pilot test site that will generate necessary data for the design and development of the next plant.

They selected less-well known technology providers as well, which does not necessarily mean they are less qualified. Indeed, they may be more flexible in developing the pilot and demo work needed.

Four years to reach selection of technology seems excessive, but I will soften this objection knowing that the wheels of City Hall and NGOs often move slowly. Technical due diligence of the process technology providers should include a financial component if the project financing depends in part on guarantees

	from the vendors.
PI Response: The project team agrees that our team can move faster and be more flexible in design, construction, and testing of the pilot system. For example, the gasifier/TCC system was disassembled in Denver, moved to Toledo, Ohio and was then back up in a short period of time. In addition, efforts related to catalyst development, Process Development Unit (PDU) design and construction, and other related activities have moved very quickly. When our team discovers that something is not working toward the end goal (the economical conversion of biomass to liquid fuels at 300-2000 ton per day plant sizes), we act quickly to find solutions. Related to the second comment, the team agrees that there has been a lot of history related to the Gridley Biofuels project but believes that the ultimate technology platform selected was the correct path forward and that once the pilot demonstration phase started (the current Phase II effort started in 2008), pilot demonstration efforts have moved quickly. Technical due diligence of the process technology providers do include a financial component as this is part of the project plan.	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Good quality syngas.	Specific results/data in the appendices should have been summarized in the presentation.
PI Response: Good quality syngas is a key to success for this technology platform. Significant data was summarized in the Appendices and was briefly reviewed in the 15-minute presentation. Fifteen minutes is not a lot of time to review all the data that has been generated; however any data can be provided upon request. Please let the project team know if you are interested as we are happy to send along for review.	
They supposedly have a syngas production facility.	We probably
PI Response: Not clear on this comment. Yes, we have a pilot plant in Toledo, Ohio. We showed several photos of this pilot plant during the presentation.	
N/A	For utilization of agricultural residue in California, present discussion was disconnected.
PI Response: Just for clarification, the pilot plant is running in Toledo, Ohio but the ultimate	

goal is to build a commercial plant in Gridley, CA utilizing agricultural and wood wastes.	
N/A	They have an overconfidence in the pricing model to predict future returns. There is insufficient information from the briefing material, presentation, or Q&A session to make a meaningful judgment.
PI Response: Again, fifteen minutes to present all the data that has been generated on this project is not enough. High level costing was given, but a detailed discussion around the project economic pro-forma was out of scope for this presentation. The team recognizes that costs / pricing may change as we move toward commercialization but we update the pro-forma based on actual vendor quotes/estimates on a regular basis and include recent wholesale pricing for the revenue model that is provided from partners in the region.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
Success factors and show stoppers were well identified.	N/A
PI Response: N/A	
N/A	Success factors were not related to overall objectives.
PI Response: N/A	
Focus on modularization is beneficial if it proves to be workable.	I don't believe their economics - CapEx and ROI need to be examined. Since they don't have pilot data yet, I doubt the precision of the capital cost estimate, even if one assumes the scale-up to the modules installed in Gridley is manageable.
PI Response: The model is updated with actual pilot plant test data when this data is generated. The team recognizes that costs / pricing may change as we move toward commercialization but we update the pro-forma based on actual vendor quotes/estimates on a regular basis and include recent wholesale pricing for the revenue model.	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
No real strengths.	Very poor definition of future research approach.
PI Response: Although we have identified several future research needs from the validation work to date, there was not enough time in our presentation to discuss these research needs. Slide # 24 did discuss the future need for a fully integrated 25-ton per day pilot facility.	
N/A	No information for identifying future work.
PI Response: Next steps on the project were discussed (i.e. integration of the TCC system with the 1 ton-per-day PDU system).	
Focus on Ohio demo plant is good.	Catalyst life will always be an issue and needs to be monetized as a sparing reserve or opEx. Maybe single-pass of syngas during full scale start-up should be considered as a risk mitigation approach? They are underestimating the pressurized air-lock feed system development, esp. with the emphasis on the requirement of "No O2" leaks to the syngas.
PI Response: Great comments. We agree that the focus on the demonstration plant in Ohio is extremely important. Catalyst life will be validated later this year when the plant is integrated. We have established very stringent syngas purity requirements that will help insure a long catalyst lifetime. Assumptions for catalyst costs have been used in the pro-forma model and will be updated after testing is completed. Single pass tests will be done before tests involving full recycle to validate catalyst data. We have had problems with the pressurized air-lock feed system (rips have occurred in the bladder system) but we learned a lot from these failures and this system has been re-engineered.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
One strong point in favor of this project is the number of collaborators it has and their ability	All of our project participants have provided great value to the project and are the best in the

to add value to the project.	industry for their area of focus. We believe this bringing together of a broad based team will also help to facilitate technology transfer and further development of the industry as a whole.
extensive team, esp. with non-profits and governments. Almost too much - how can they coordinate all these folks? They say it's based on good project management. Not clear about technology transfer approach.	All of our project participants have provided great value to the project and are the best in the industry for their area of focus. We believe this bringing together of a broad based team will also help to facilitate technology transfer and further development of the industry as a whole.

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
This has the potential to be a good project and does not need scope addition or deletions. It is desperately in need of a good project management plan and a well defined approach that demonstrates how the project meets MYPP objectives.	We agree. While a PMP was not required initially for this project (therefore budget was not allocated for a PMP), REII has recently developed a PMP to govern the remainder of the project and future scale up efforts. This PMP can be provided upon request. This project leads to MYPP objectives by demonstrating and validating integrated technologies to achieve commercially acceptable performance and cost proforma targets for an integrated biorefinery. Completion of the validation studies and deployment of this technology is planned for 2012 in support of the DOE Integrated Bio-Refineries program. The commercial plant is to be deployed at a 26-acre site in Gridley, CA and will be used to convert rice harvest, wood, and other agriculture residues to diesel fuel, electricity and steam (for a co-located food

	processing plant)
Consider a way to eliminate the turbine system in first phase / full-scale project. Instead, can you install a Jennbacher engine or modified CNG engine in the first phase?	During the pilot phase of the project, the project team is running tail gas to a boiler which introduces no technology risk. However, for the commercial plant (which is not in the scope of this DOE funded effort), the City of Gridley requires co-production of renewable electricity (along with the diesel fuel). For plants other than Gridley, the technical team has two plant configurations, one that allows for maximum fuel production (by recycling tail gas) and the other that uses this tail gas for power production. So, other plants can be configured to maximize fuel production by recycling the tail gas, which has been proven at the unit process scale.

Project Number:	7.5.4.5
Project Title:	Louisiana State University Alternative Energy Research (LA)
Performing Organization:	LSU: Agriculture Center
Number of Reviewers:	Donal F. Day

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
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Relevance	1.33	0.58	1
Approach	2.67	0.58	1
Progress & Accomplishments	2.0	1.0	2
Success Factors	1.67	1.16	2
Future Plans	2.0	1.0	2
Average Score: All Criteria	1.93		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
N/A

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	This project should not be in this program. It has nothing to do with the objective of this program, which is to build demonstration scale projects. This project should be in the feedstock program.
PI Response: As to the relevance to the program, this selection was done by DOE, not us. It is relevant to this program when taken in context of the previous support for the program, which has led to a pretreatment technology applicable to sugarcane bagasse. It became obvious during the research that bagasse does not respond in the same manner as corn stover. As has been noted, all biomass is local and the collary is it is all not the same.	
Marginal relative to the overall platform objectives. This would best be placed in an R&D program area.	This did not fit the IBR platform objectives. Rather it was a research program that surveyed the various biomass sources used in sugar refining and assessed their relative value for different product, energy and conversion

	applications in a sugar refinery.
PI Response: I agree that this component should be placed in an R and D program, however, it is necessary in order to answer the questions and criticisms of the prospective users (the sugar industry-framers and processors)	
Has potential to increase utilization of cellulosic biomass in Louisiana. Low capital required to provide incremental ethanol.	Sugar mills represent very small-scale resource. Unlikely to contribute significantly to petroleum reduction. Would have greater contribution if extended to other facilities.
PI Response: Our data shows that successful implementation by the existing sugar industry could produce adequate ethanol to convert completely the gasoline utilization in Louisiana to E85.	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They obviously know how to characterize biomass and this will be important to future biorefinery.	There is no research plan about how they will convert this. They are too early stage.
PI Response: This was addressed in previous support.	
As a research project, the survey has done a cursory study of the potential applications for the various fractions of sugar refinery biomass - product, energy, waste energy, etc. which when could provide some guidance for creating an integrated biorefinery model for this industry.	It was not clear what data was developed under the project or abstracted from the literature. I am surprised that a lot of the facts presented were not readily available in the literature.
PI Response: There is little or no information in the literature on these specific points, particularly as it relates to the sugar industry. Because of its relatively small size in the US the Cane processing industry is generally overlooked as a resource. The major effort has been in Brazil with the focus on sugar conversion to ethanol. There are only 3 locations worldwide that deal with cane sugar processing in any form.	
Reasonable approach. Will determine fundamental info for potential new feedstocks.	This research appears to provide information to a limited industry that perhaps the industry should do as a reasonable cost of doing

	business. Investigators should look at Near-IR methods being developed at NREL. Would like to see literature review. Have others studied this same issue. If so, how do their results differ?
PI Response: The local industry is well aware of this research. We have a complete technology transfer program for them. In fact there is an informatory meeting with all the processors this Month. NIR is used routinely in Australia to monitor sugar crops. We are aware of NRELS work which is why this particular approach was selected.	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	Need to conduct an economic analysis while during this project.
PI Response: The processing aspect is underway. The agronomic aspects are still in the data collection stage.	
Made progress and has some useful results that could pertain to the specific sugar refinery plant.	I saw nothing about integration - just an investigation of many separate elements from several feedstocks for sugar refining.
PI Response: The integration issue is still a problem. It requires a test case where all stakeholders agree to try the process. We are moving to convince them to go for the low hanging fruit first, i.e. sugar juices from sorghum. that will force the mills to make the investments for fermentation, distillation operations, and the farmers to see the time and labor requirements necessary for a second crop on fallow land.	
Reasonable approach.	Accomplishments seem minimal for \$800K spent.
PI Response: Work in progress, timing dictated by crop growing cycles.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	If this project works it won't help the program.
PI Response: N/A	
N/A	None identified and no content of presentation addressed what was or was not considered a successful project. I struggled to understand what the clear goals of the project were and whether the PI would achieve them by the end of the project.
PI Response: N/A	
Didn't see anything in this area.	Mentioned that communication to farmers and millers critical, but no plan given to communicate.
PI Response: Both directly and through extension service we are in constant communication with stakeholders. There is an informational meeting this month on the subject of mill operators.	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	This doesn't have anything to do with the project goals.
PI Response: N/A	
Project will end this but PI stated that an economic analysis must be done after the project is finished. When questioned about that, Pi said that economic analyses were being done now and that is worthwhile to do before this project end, so as to gain some value for the DOE program.	N/A
PI Response: N/A	
Appears that this work will complete what's	N/A

been proposed.	
PI Response: N/A	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
This is done at a university. I think they will share their data and publish it. This will provide some good information for sugar mills, but it is too early stage for this program.	N/A
I was presented with none to review.	N/A
Limited collaboration. Anyone beyond sugar mills?	N/A

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
This project doesn't belong in this program. They need to do an economic analysis at first. They need a pilot scale facility to be in this project. Before they are ready for this program they need more data. This project is why the government should not do earmarks.	N/A
Based upon the results to state, I would suggest that the PI create a document that best describes his integrated biosugar refinery vision, and use the best results that he has obtained to date and attempt to conduct and finish a preliminary economic analysis. This might extract value for the program for future applications to sugar refineries. To the extent, there are any funds left, it might steer final work to fill in gaps in data that might be integrated in creating the "vision of an integrated sugar refinery model".	N/A

Project Number:	7.5.7.2
Project Title:	Biomass Energy Resource Center (BERC) - Core and Program Support
Performing Organization:	BERC
Number of Reviewers:	Chris Recchia

1. Summary of Project Scores

Evaluation Criteria	Average of Reviewer Scores*	Standard Deviation	Range
Relevance	2.33	2.31	4
Approach	2.67	2.08	4
Progress & Accomplishments	3.33	1.53	3
Success Factors	2.67	2.08	4
Future Plans	2.67	1.53	3
Average Score: All Criteria	2.73		

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

2. Compilation of Reviewer Comments and Principal Investigator Feedback

Overall Principal Investigator Response
N/A

a. Relevance - The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	This project has nothing to do with the project.
PI Response: We agree that the IBR category is not the proper category for our work, but also	

that, as explained elsewhere, liquid fuels as an exclusive focus of DOE is not in the best interest of our long-term energy policy and is too restrictive. In fact, the project directly, and cost-effectively, meets the predominant goals of the MYPP by displacing fossil fuel and increasing our energy security.	
120 feasibility studies appears to be a good result	Combined heat and power not relevant to IBR. No way for reviewers to assess how good the feasibility studies are. Need detail on what feasibility studies entail or how useful they are to end users.
PI Response: The feasibility studies and subsequent implementation of Thermal and CHP projects performed through this project have displaced well over 1M Gallons of heating oil per year and save several million dollars per year. We appreciate that the reviewers did not get to see the results in detail - the presentation time of 10 minutes was much too short to do so. We would be happy to provide additional detail on the work and results at any time.	
BERC's work is critical to advancing the need for public information and	It needs to be coordinated with other regional centers if they exist.
PI Response: Thank you. BERC is National in scope, but we are relatively young and got our start in the Northeast, so while much of our work continues to be in the Northeast (Vermont is the national leader in Schools heated with modern wood-chip systems, for example) we have many regional partners and national partners - including: Pacific Northwest, MACED, Forest Guild, Pinchot Institute, BIA, NREL among many others. We will continue to look for ways to collaborate and coordinate with other regional and national partners, but to our knowledge, we are unique in the work we do and the service we provide.	

b. Approach - The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	N/A
PI Response: We do directly advance the goals of the Multi-year Project Plan (MYPP) though we agree the IBR category is both too restrictive in its focus and we are in the wrong category for this Peer Review.	
N/A	No real connect to IBR program Impossible to assess with no information of what was done

	other than the fact that it was done.
PI Response: We believe we gave adequate information about what was done within the 10 minutes allotted. Again, we'd be pleased to give greater detail and discuss benchmarks and performance measures at any time.	
For a small staff they seem to leverage these resources well by accomplishing 120 feasibility studies.	N/A
PI Response: Thank you. We are particularly proud of the fact that we are able to accomplish this work with expenditures that are orders of magnitude less than other projects in the category.	

c. Progress and Accomplishments - The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
They have some idea about harvest and production of biomass.	This won't help us meet our goal of demonstrating a biorefinery.
PI Response: Strength Response: We have done much work to build off and refine the Billion Ton work of DOE to ensure projects are sustainable, both in terms of net growth of forests and agricultural land, but also in terms of documenting carbon sequestration under such management practices, and maintenance of other ecosystem values. Weakness Response: We disagree. The sustainable fuel supply work is critical to ALL uses of biomass, and the refinery will have a tougher job of demonstrating long-term efficiency and sustainability. While we are doing this work primarily in support of thermal and CHP applications, it is equally relevant to biorefinery efforts to overcome the supply barriers. The reviewer is correct that our work does not address technical barriers in the biorefinery itself.	
Progress toward educational goals Biomass cost curve appears to be good, but need to know something about methodology for producing it.	Hard to identify clear measurable deliverables.
PI Response: The I&E Component is critical to advance the public understanding and acceptability of biomass - particularly with respect to sustainability of fuel supply. We would be happy to discuss our methodology and goals, and how we measure deliverables. There was inadequate time to describe these in the presentation in detail, but we have completed many issue papers, fact sheets, and case studies - all of which are on our website at www.biomasscenter.org and quantify our presentations at conferences, meetings etc., in our quarterly reports. We are	

also working to develop survey tools that enable us to go beyond quantitative measures of "how many" materials and presentations are delivered, to also address measures of success in increasing people's understanding of the use of biomass for these type of energy applications.	
Strong track record - big return on investment, it seems.	Measurements or metrics should be developed to report on outreach success.
PI Response: Thank you. We do believe communities and DOE get a big return on a relatively modest investment through this project. See previous comment regarding measures and metrics.	

d. Success Factors - The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
N/A	This project will solve no technical barriers to liquid biofuels.
PI Response: See above response. We disagree, particularly with regard to sustainable fuel supply issues.	
Appears to not be applicable to this project.	No real measurable deliverables that can be used to measure success.
PI Response: There are no showstoppers for this project. There are certainly challenges, most of which are related to financing the capital of these projects. There are many measurable deliverables - in terms of both services and educational products. We agree that we need to continue to refine measures to transcend quantitative measures toward qualitative measures of success.	
N/A	None.
PI Response: N/A	

e. Future Plans - The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

Reviewer Commented Strengths	Reviewer Commented Weaknesses
None.	N/A

PI Response: N/A	
Interesting set of objectives.	Not aligned with IBR program.
PI Response: N/A	
Need more on district heating projects, esp. if it can be combined with industrial plants using wood. (the heat sink with hot water is an excellent use and large increase in efficiency.)	Can institutional work be done in the SE and NW regions for hot water purposes?
PI Response: District Energy is a relatively new focus of our project, but it has tremendous potential for communities, college campuses, industrial parks, etc. This can be used not only for heat, process heat, and heat-lead CHP, but also for cooling as well, so we believe there is significant potential in the SE. We are working on programs in the Pacific NW as well as in the SW to increase biomass use in these regions.	

f. Technology Transfer/Collaborations

Reviewer Comments	PI Feedback
They are definitely sharing their information. This is probably a good thing about this project.	Thank you.
Extensive list of collaborators.	Thank you.
They are doing great considering they have only 12 members.	Thank you.

g. Recommendations for Additions/Deletions to Project Scope

Reviewer Comments	PI Feedback
This project has nothing to do with the program of integrated biorefinery. They should be in another program. This is a typical earmark project which unfairly takes taxpayer money away from good programs and gives it to programs which are outside the scope of the	We agree that this project is not directly relevant to biorefineries and that we are in the wrong platform. But more to the point, and to specifically address the "earmark" statement, the fact of the matter is that, in spite of DOE's overarching policy goals of increased energy security and displacement of significant portions of oil, it is telling that there is not currently a single relevant platform for this or any other thermal project. This is a casualty of DOE's singular focus on liquid fuels over the recent past. One third of our oil

program. I do think this is a decent project for biomass for heat production, but it is completely outside the scope of the program.	use - equivalent to 100% of our domestic production - is used for thermal purposes, and DOE has neglected this area entirely. This is all the more significant since it is the area in which people are most vulnerable in their reliance on oil - staying warm - and disappointing, because with a little help and direction, these thermal options are very feasible, extremely economic and have wide-ranging benefits for using biomass sustainably, locally and immediately. The fact that BERC started as the only organization of its kind providing communities and public institutions with the where-with-all to make this transition speaks not to lack of relevance, but to the need to overcome an entrenched, misplaced, singular belief that there is one solution to solve our energy problems - a utopic solution that, when found, will enable us to continue "business as usual." We are thankful for the vision of Senatorial discretion in realizing what a powerful difference this program could, and is, making through real applications, with real results. We are proud of the value to the public and the field gained with this taxpayer assistance. This, at a fraction of the cost of the theoretical technology being advocated by the Department to the unfortunate exclusion of all else. We do not begrudge investment in large advancing technologies, but we use energy and grow biomass in a decentralized way, so some modest investment in advancing technologies that address the problem at the scale in which it is created is appropriate. I do not know if this is a "typical earmark project" as the reviewer states, but BERC is certainly willing to - dollar for dollar - compare its results and achievements for directly and permanently reducing oil use in a sustainable way to anything else funded by DOE and presented in the IBF platform during this "Peer" review. We are grateful there are "earmarks" to make such investments. In the end, we appreciate the reviewer's acknowledgement that this is a "decent project". But for the Congressional direction, we think it would likely not exist.
Project should be removed from IBR program and placed in a more appropriate area.	We agree.

Attachment One: Project Review Form

Project Evaluation Form

Session:

Reviewer Name:

Title of Project:

Presenter Name:

Reviewer Self Assessment of Subject Knowledge (Circle One): **None** **Novice** **Intermediate**
Expert

1. Project Stage of Development as Identified by PI _____

2. Project Stage of Development as Recommended by Reviewer _____

3. Relevance to overall Program objectives and market need.

The degree to which the project continues to be relevant to the goals and objectives of the Biomass Program Multi-Year Program Plan. Market application of the expected project outputs have been considered.

Project Relevance to OBP Objectives and Market		
5-Excellent. The project is critical to and fully supports Multi-Year Program Plan objectives. The project is critical to and fully supports the needs of target customer(s) and market(s); customers and markets are fully identified.		Specific Comments:
4-Good. Most aspects of the project align with the plan objectives. Most aspects of the project align with the needs of customers and markets; customers/markets are identified and important.		

3- Satisfactory. Many aspects of the project align with plan objectives. Many aspects of the project align with the needs of customers and markets; customers/markets are identified.		
2-Fair. The project partially supports the plan objectives. The project partially supports the needs of customers and markets identified.		
1-Poor. The project provides little support to the plan objectives. The project does not meet the needs of customers and markets; customers/markets not identified.		

4. Approach to performing the Research, Development and Demonstration (RD&D).

The degree to which the project uses a sound, well-designed RD&D approach and clear project management plan, which incorporates well-defined milestones for monitoring the progress of the project and methods for addressing potential risks.

5-Excellent. The project has a sound, well-designed approach and has developed and implemented effective project management practices. Difficult for the approach to be improved significantly.		Specific Comments:
4-Good. The approach is generally well thought out and effective but could be improved in a few areas. The project has developed adequate milestones and potential risks have been identified but management approaches may not be fully developed.		
3-Satisfactory. The approach is satisfactory to meet project objectives and some milestones are developed. Improvements in approach would improve project quality.		
2-Fair. Some aspects of the project may lead to progress, but the approach has significant weaknesses.		
1-Poor. The approach is not responsive to project objectives and unlikely to make significant contributions progress.		

5. Technical Progress and Accomplishments

The degree to which the project has made progress in its stated objectives, achieving milestones as planned and contributing to OBP goals and objectives as outlined in the OBP MYPP and overcoming technical barriers outlined in the MYPP.

5-Excellent. The project has made excellent progress towards project objectives, OBP goals and objectives and overcoming one or more key technical barriers. Progress to date suggests that the barrier(s) will be overcome.		Specific Comments:
4-Good. The project has shown significant progress toward project objectives, OBP goals and objectives and to overcoming one or more technical barriers.		
3-Satisfactory. The project has shown satisfactory progress toward project objectives, OBP goals and objectives and contributes to overcoming technical barriers.		
2-Fair. The project has shown modest progress towards stated project goals and OBP objectives and may contribute to overcoming technical barriers.		
1-Poor. The project has demonstrated little or no progress towards stated project goals, or OBP objectives and technical barriers.		

6. Critical Success Factors and Showstoppers

The degree to which the project has identified critical success factors (technical, business, and market factors) which will impact technical and commercial viability of the project; and the degree to which the project has identified potential show stoppers (technical, market, regulatory, legal) which will impact technical and commercial viability.

5-Excellent. A comprehensive list of critical success factors and showstoppers are identified and strong strategies to overcome possible showstoppers are identified.		Specific Comments:
4-Good. Key critical success factors and showstoppers are identified and there are clear strategies developed to overcome showstoppers.		
3-Satisfactory. Many critical success factors and showstoppers are identified and strategies to overcome showstoppers have been proposed.		

2-Fair. Some critical success factors and showstoppers are identified. Strategies to overcome showstoppers are not well developed.		
1-Poor. Little to no identification of critical success factors or showstoppers. Little to no recognition of relative importance or prioritization of activities.		

7. Proposed Future Research approach and relevance (as defined in the project).

The degree to which the project has effectively planned its future, considered contingencies, understands resource or schedule requirements, built in optional paths or off ramps, or identified other opportunities to build upon current research to further meet OBP goals and objectives.

5-Excellent. The future work plan clearly builds on past progress and is sharply focused to address one or more key technical barriers in the OBP MYPP in a timely manner.		Specific Comments:
4-Good. Future work plans build on past progress and generally address removing or diminishing OBP MYPP barriers in a reasonable period.		
3-Satisfactory. Future work plans are loosely built on past progress and could address OBP MYPP barriers in a reasonable period.		
2-Fair. The future work plan may lead to improvements, but should be better focused on removing/diminishing key OBP MYPP barriers in a reasonable timeframe.		
1-Poor. Future work plans have little relevance or benefit toward eliminating OBP MYPP barriers or advancing the program.		

8. Technology Transfer/Collaborations

Does the project adequately interact, interface, or coordinate with other institutions and projects, providing additional benefits to the Program? Have Project Performers Presented or Published on the Progress or Results of the Project?

9. Recommendations for Additions/Deletions to Project Scope

Attachment Two: Platform Review Form

Platform Review Form

Reviewer Name: _____

Platform: _____

Reviewer Self Assessment of Subject Knowledge (Circle One): None Novice Intermediate Expert

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?

Platform Goals		
5-Excellent. The platform goals are critical and fully support achieving OBP goals. The platform goals are clear, realistic and logical.		Specific Comments:
4-Good. The platform goals are important and support achieving almost all OBP goals. The platform goals are clear and logical.		
3-Satisfactory. The platform goals support achieving the majority of OBP goals. The platform goals are defined, but could be improved.		
2-Fair. The platform goals support achieving some OBP goals. The platform goals need better definition.		
1-Poor. The platform goals support achieving few OBP goals. The platform goals are not well defined.		

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?

Platform Approach		
5-Excellent. The quality of this platform approach is exceptional and fully supports achieving Program Performance Goals.		Specific Comments:
4-Good. The quality of this platform approach is above average and supports achieving almost all Program Performance Goals		
3-Satisfactory. The quality of this platform approach is sufficient to support achieving the majority of Program Performance Goals		
2-Fair. The quality of this platform approach supports achieving some Program Performance Goals		
1-Poor. The quality of this platform approach supports achieving few Program Performance Goals		

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)

Platform R&D Portfolio		
5-Excellent. The platform R&D is focused and balanced and fully supports achieving OBP and Platform goals.		Specific Comments:
4-Good. The platform R&D is focused and balanced and supports achieving almost all OBP and Platform goals.		
3-Satisfactory. The platform R&D is balanced and supports achieving the majority of OBP and Platform goals.		
2-Fair. The platform R&D supports achieving some OBP and Platform goals.		
1-Poor. The platform R&D supports achieving few OBP and Platform goals.		

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.

Platform Progress		
5-Excellent. The platform is making exceptional progress towards achieving OBP and Platform goals.		Specific Comments:
4-Good. The platform is making above average progress towards achieving almost all OBP and platform goals.		
3-Satisfactory. The platform is making sufficient progress towards achieving the majority of OBP and platform goals.		
2-Fair. The platform is making progress towards achieving some OBP and platform goals.		
1-Poor. The platform is making little progress towards achieving OBP and platform goals.		

5) Please note any specific platform strengths.

6) Please note any specific platform weaknesses.

7) Are there any gaps in the Platform RD&D Portfolio? Do you agree with the RD&D gaps presented by the Platform Manager?

8) Additional Recommendations, Comments and Observations

Attachment Three: Platform Review Agenda

Office of the Biomass Program
Integrated Biorefineries Platform Peer Review
Closed Session
March 18, 2009

7:00-7:45 AM	Continental Breakfast				
8:00-8:25 AM			Welcome and OBP IBR Platform Overview	DOE	OBP IBR Team Leader
	Presentation /Q&A	WBS #	Project Title	Performing Organization	Presenter/Recipient
8:25 – 8:55 AM	20/10	5.1.2.1	Making Industrial Bio-refining Happen! (GW)	Natureworks, LLC	Dr. Suominen Pirkko
8:55 – 9:25 AM	20/10	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
9:25 – 10:10 AM	30/15	5.4.4.1	Integrated Biorefinery for Conversion of Biomass to Ethanol, Synthesis Gas, and	Abengoa Bioenergy Corporation	Gerson Santos Leon

			Heat	(GW)	
10 Minute Break					
<i>10:20 – 11:05 AM</i>	<i>301/5</i>	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
<i>11:05 – 11:35 AM</i>	<i>20/10</i>	5.5.5.1	West Coast Biorefinery (WCB) Demonstration Project	Pacific Ethanol, Inc.	Harrison Pettit
<i>11:35 – 12:05 PM</i>	<i>20/10</i>	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
Lunch					
<i>1:00 – 1:30 PM</i>	<i>20/10</i>	5.5.7.1	MAS10BIO5	Mascoma	Dr. Mike Ladisch
<i>1:30 – 2:00 PM</i>	<i>15/5</i>	5.5.8.1	Jennings Demonstration Plant	Verenium Corporation	Russ Heissner
<i>2:00 – 2:45 PM</i>	<i>30/15</i>	5.5.3.1	Mecca Ethanol Facility: A Landfill Waste Feedstock to Cellulosic Ethanol Facility	BlueFire Ethanol	William Davis & Necy Sumait
<i>2:45 – 3:15 PM</i>	<i>20/10</i>	5.5.6.1	Lignol Biorefinery Demonstration Plant	Lignol Innovations,	Michael Rushton

**Office of the Biomass Program
Integrated Biorefineries Platform Peer Review
March 19, 2009**

7:00-7:45 AM					
Continental Breakfast					
8:00-8:20 AM			Welcome and OBP IBR Platform Overview	DOE	OBP IBR Team Leader
	Presentation /Q&A	WBS #	Project Title	Performing Organization	Presenter/Recipient
8:20 – 8:40 AM	15/5	5.1.2.1	Making Industrial Bio-refining Happen! (GW)	Natureworks, LLC	Dr. Suominen Pirkko
8:40 – 9:00 AM	15/5	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
9:00 – 9:25 AM	20/5	5.4.4.1	Integrated Biorefinery for Conversion of Biomass to Ethanol, Synthesis Gas, and Heat	Abengoa Bioenergy Corporation (GW)	Tom Elgin
9:25 – 9:50 AM	20/5	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
9:50 – 10:10 AM	15/5	5.5.5.1	West Coast Biorefinery (WCB) Demonstration Project	Pacific Ethanol, Inc.	Harrison Pettit
10:10 – 10:30 AM	15/5	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
10 Minute Break					
10:40 – 11:00 AM	15/5	5.5.7.1	MAS10BIO5	Mascoma	Dr. Mike Ladisch

11:00 – 11:20 AM	15/5	5.5.8.1	Jennings Demonstration Plant	Verenium Corporation	Russ Heissner
11:20 – 11:45 AM	20/5	5.5.3.1	Mecca Ethanol Facility: A Landfill Waste Feedstock to Cellulosic Ethanol Facility	BlueFire Ethanol	William Davis & Nedy Sumait
Lunch *					
1:00 – 1:20 PM	15/5	5.5.6.1	Lignol Biorefinery Demonstration Plant	Lignol Innovations, Inc.	Michael Rushton
1:20 – 1:40 PM	15/5	5.6.2.1	Demonstration of an Integrated Biorefinery at Old Town, Maine	RSE Pulp & Chemical	Dick Arnold & Jim St. Pierre
1:40 – 2:00 PM	15/5	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
2:00 – 2:20 PM	15/5	5.6.3.1	Demonstration Plant - Biomass Fuels to Liquids	Flambeau River Biofuels, LLC	Robert Byrne
2:20 – 2:40 PM	15/5	5.6.1.2	Cellulosic Based Black Liquor Gasification and Fuels Plant	Escanaba Paper Company	Michael Fornetti
2:40 – 3:05 PM	20/5	5.5.1.1	Commercial Demonstration of a Thermochemical Process to Produce Fuels and Chemical from Lignocellulosic Biomass	Range Fuels, Inc.	William Schafer III
15 Minute Break					
3:20 – 3:50 PM	20/10	7.5.4.1	City of Gridley Biofuels Project	City of Gridley	Dennis Schuetzle
3:50 – 4:20 PM	20/10	7.5.4.5	Louisiana State University Alternative Energy Research (LA)	LSU : Agriculture Center	Donal F. Day
4:20 – 4:50 PM	20/10	7.5.7.2	Biomass Energy Resource Center (BERC) - Core and Program Support	Vermont BERC	Chris Recchia
4:50 – 5:00 PM	Wrap Up/Path Forward/Closing Remarks				OBP Integrated Biorefinery Technology Manager

* Lunch will not be provided for this meeting. A list of local eateries will be included in your registration materials.

Attachment Four: Feedstock Platform Review Attendees

IBR Platform Review Attendees

First Name	Last Name	Organization
Yonatan	Alemu	EEA North America
Richard	Arnold	Red Shield Acquisition LLC
Daniel	Barry	Chemrec
Bryna	Berendzen	U.S. DOE- Golden Field Office
Catalino	Blanche	USDA CSREES
Michael	Blaylock	Edenspace Systems Corporation
Peter	Bluford	Consultant to the Life Science Industry
Wes	Bolsen	Coskata
Christopher	Bordeaux	Bordeaux International Energy Consulting, LLC.
Dan	Burciaga	TRI
Thomas	Burns	U.S. Department of State
James	Cash	U.S. DOE
Chris	Cassidy	USDA
Shulin	Chen	Washington State University
Larry	Christner	LGC Consultant LLC
Helena	Chum	National Renewable Energy Laboratory
Eric	Connor	TRI
John	Cowie	Agenda 2020 Technology Alliance - AF&PA
Anthony	Crooks	USDA Rural Development
William	Cruickshank	Cruickshank Consulting
Donal	Day	Audubon sugar Inst, LSU AgCenter
Roxanne	Dempsey	U.S. DOE

Chris	Doherty	TRI
Nicholas	Frasier	Navarro Engineering and Research Inc.
Stephen	Gatto	BioEnergy International, LLC
Molly	Hames	Navarro Research and Engineering
Jill	Hamilton	National Biodiesel Board
John	Houghton	U.S. DOE, Office of Science
Thomas	Hsiung	Pacific Renewable Fuels
George	Huber	University of Massachusetts-MA
Joanne	Ivancic	Advanced Biofuels USA
Terry	Jaffoni	Clean Transportation Fuels
Alex	Johnson	Red Lion Bio Energy
Jay	Keller	Sandia National Laboratories
Ellyn	Kerr	Industrial Biotechnology / Mary Ann Liebert
George	Kervitsky	BCS, Incorporated
Courtney	Kirk	BCS, Incorporated
Melissa	Klembara	Department of Energy, Biomass Program
Michael	Knotek	Knotek Scientific Consulting
Robert	Kozak	Atlantic Biomass Conversions, Inc.
David	Lax	API
Michael	Manella	Archer Daniels Midland Company
Philip	Marrone	SAIC
Doug	Marshall	Retired from Mfg/Ins
Andras	Marton	Independent Project Analysis, INC
Josh	Messner	Navarro Research and Engineering

Babu	Metgud	Innovation Technology Enterprise Development Center
Jeffrey	Miano	Syngenta
Robert N.	Miller	Air Products
Liz	Moore	Navarro - DOE Golden Field Office
George	Parks	FuelScience LLC
Hemant	Pendse	University of Maine
Leslie	Pezzullo	U.S. DOE, Office of the Biomass Program
Debbie	Sandor	National Renewable Energy Laboratory
Tom	Sanford	City of Gridley
Moinuddin	Sarker	Natural State Research, Inc.
Bhima	Sastri	U.S. DOE
Susan	Schoenung	Longitude 122 West, Inc.
Robert	Schuetzle	Pacific Renewable Fuels, Inc.
Dr. Dennis	Schuetzle	Renewable Energy Institute International
Amy	Schwab	National Renewable Energy Laboratory
Hratch	Semerjian	Council for Chemical Research
Scott	Sklar	The Stella Group, Ltd.
Seth	Snyder	Argonnne National Laboratory
Glenn	Sonntag	U.S. DOE, Office of the Biomass Program
Kent	Sproat	Jupiter Biotech, LLC
James	St. Pierre	Red Shield Acquisition LLC
Christy	Sterner	U.S. DOE
Don	Stevens	Pacific Northwest National Laboratory
Jake	Stewart	Austin Energy/ City of Austin

Bryce	Stokes	Navarro Research and Engineering
Douglas	Struble	Red Lion Bio-Energy
Melati	Tessier	LSU AgCenter, Audubon Sugar Institute
Valentino	Tiangco	California Energy Commission
M	Tumbleson	University of Illinois
David	Webster	Ark Resources, LLC
Gary	Welch	Aventine Renewable Energy Inc.
Candace	Wheeler	General Motors
Kelly	White	Bell Bioenergy, Inc.
Robert	Wimmer	Toyota
Carl	Wolf	BCS, Incorporated
May	Wu	Argonne National Laboratory
Joyce	Yang	U.S. DOE, Office of the Biomass Program
Corinne	Young	BioEnergy International, LLC

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