U.S. Department of Energy
Office of the Biomass Program
Feedstock Platform
Summary of Results

Dear Colleagues:

This document discloses the comments provided by a review panel at the:

- U.S. Department of Energy Office of the Biomass Program Peer Review held on November 15-16, 2007 in Baltimore, MD.
- Feedstock Platform Portfolio Peer Review held on August 21st through 23rd in Washington D.C.

The work evaluated in this document supports DOE, and the results of the review are major inputs used by the Department in making future funding decisions.

The projects were presented to the reviewers organized by the type of Feedstock R&D activity they supported (i.e. supply and sustainability; logistics; and systems integration). The platform review agenda is included in Appendix A.

At the end of both meetings, a collection of summary comments was presented by the reviewer chairperson to the attendees at the end of the meeting. At the Platform Review, each PI was invited to provide responses to the initial reviewer feedback at and after the meeting. These summary comments and PI responses are included in the main body of this document.

The table below lists the projects in a ranked order based on the average score received from the Reviewer Panel. The average scores are based on a four-point scale, with four being the highest. A full listing of all the reviewers' scores and comments (taken directly from their evaluation forms) is included in the main body of this report. The name of the reviewer who provided the individual comments will remain anonymous.

We would like to express our sincere appreciation to the members of the Review Panels. Your diligence and hard work during the review process resulted in many insightful comments that will help us improve our Programs.

Regards,

Sam Tagore
Technology Manager – Feedstocks R&D
DOE/EERE, Office of the Biomass Program

Project Title	Relevance	Approach	Progress	Success Factors	Future Plans	Average
Feedstock Supply System Design Report	4.00	4.00	4.00	3.67	3.25	3.78
Feedstock Logistics - Storage & Queuing	4.00	3.33	3.50	3.50	3.75	3.62
University of TN Switchgrass Demonstration Project	3.75	3.67	3.75	3.67	3.25	3.62
Feedstock Logistics - Harvest & Collection	3.75	3.75	3.75	3.25	3.50	3.60
Feedstock Logistics - Preprocessing	3.75	3.75	3.50	3.50	3.50	3.60
Biomass Resource Supply Analysis	3.75	3.75	3.50	3.33	3.33	3.53
GIS-Based Biomass Resource Sustainability	4.00	3.75	3.25	3.00	3.50	3.50
Feedstock Logistics - Handling & Transport	3.50	3.75	3.25	3.25	3.25	3.40
Alternative Fuel Source Study	3.00	3.33	3.67	3.67	3.33	3.40
Regional Biomass Energy Feedstock Partnerships	3.50	3.50	3.00	3.50	3.00	3.30
Supply System Logistics	3.00	2.67	2.67	2.67	2.67	2.73
MSU Sustainable Energy Center	2.75	2.25	2.50	2.25	2.50	2.45

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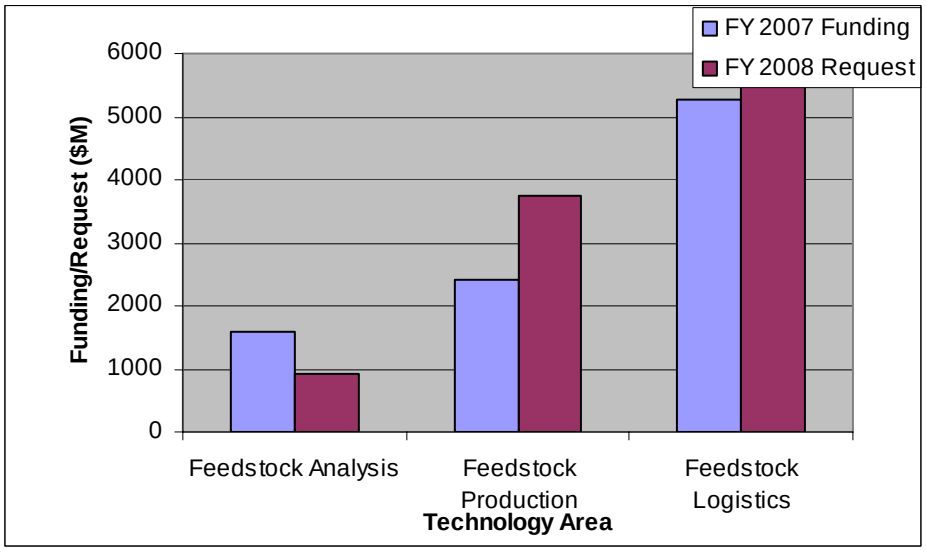
Program Peer Review Platform Results

Platform Direction

In FY2008, the Feedstock Platform will continue work through the Regional Feedstock Partnerships and/or by leveraging OBP biorefinery demonstration projects to conduct large crop demonstration trials in order to collect more realistic feedstock production data, ultimately leading to more informed decision-making regarding specific energy feedstocks on which to focus programmatic efforts. By the end of FY2008, the platform will have also completed the first phase of the GIS-based resource assessment tool, which will also better inform platform and programmatic decision-making. Finally, in FY2008, the platform will release a solicitation for industrial-scale feedstock logistics projects, which will help lower feedstock costs.

Platform Funding (in $M)



Specific Responses to Select Comments

Program Peer Review		
Reviewer Comment		**Technology Manager Response**
• Well directed and well focused. Strong teams working on gathering this important information. • As explained, the parts of the platform are working together well and are logically derived. • The program is making progress on complex issues. The realization that a diversity of feedstocks is needed to fulfill program goals is positive. This will be important in regions outside the Midwest. • Good organization using good science. Work at INL on storage and queuing as well as harvest and collection appears to be on target.		The TM appreciates the reviewer's comments regarding the overall strength of the Feedstock Platform in terms of being well directed, organized, and focused. The TM further acknowledges the good work at INL. Further, the TM recognizes the challenges that lie ahead, particularly outside of the Midwest.

Work at INL on storage and queuing as well as harvest and collection appears to be on target.		Same comment for INL as above.
• Not enough switch grass has been collected to get a handle on real cost. The fertilizer the biomass removed does not appear to be factored into the cost of the biomass. Current phosphate, nitrogen and potassium costs are significant. • The real cost of biomass has not been convincingly determined. • Scaling up to handle corn stover will create new challenges. Need to lay out a plan now.		Only under the Charitan Valley project was switchgrass collected in sufficient quantities to provide meaningful costs. Fertilizer costs are figured into feedstock production estimates, but are not included under the feedstock logistics element. The TM agrees that corn stover represents some new challenges. It is planned that corn stover logistic costs and operations will be developed in conjunction with appropriate 932 or 10% validation integrated biorefinery projects, and their industrial partners.
• I appreciate the Program's (and platforms) growing consideration of sustainability issues. I think that many of the issues which may emerge have readily available answers, but the Program and Department need to be prepared to respond when questions are raised. An example is the realm of nitrogen and phosphorus contamination of water. In the short realm, there are concerns about the expansion of corn production for biofuels. However, there are long-established production practices and agronomic research which can be implemented in production to mitigate these concerns (if implemented). Also, a sustainable harvesting technique to protect soil carbon levels may assist (but will not completely mitigate) this effort. Additionally, a long-term shift to perennial crops may involve dramatically lower nitrogen and phosphorus needs, depending on the crop species selected and the production practices which emerge. Some research on these emerging species is needed, but likely would not take much effort. • The gaps identified by the review team are OK, but they do not go far enough. The yield productivity anticipated by the Billion Ton Study requires sustained funding of genetics and breeding programs across most production areas. Likewise, there is an urgent need for longer term sustainable production research.		The TM appreciates the reviewers' comments pertaining to sustainability issues. Under the feedstock umbrella, sustainability practices will be developed and supported. As the reviewers suggest, some long-established practices should be implemented to mitigate concerns. Under the regional feedstock partnership effort (launched in 2007-2008), the Program will foster the development and adoption of more advanced sustainable agronomic and silvicultural practices. While the platform supports perennial energy crops, in part because of their intrinsic sustainable root profile, the program will encourage the sustainable production of feedstocks among all of the different feedstock pathways. The DOE feedstock platform acknowledges that it will probably not have the fiscal resources for sustained funding of breeding and genetics across most production areas, but believes that USDA, land grants, and private companies will engage in this area to help meet the Billion Ton vision.
Critical concern for separation of biomass components must be reviewed with appropriate scientists and engineers. Perhaps this area is for early treatment studies; however, some separation may be accomplished in the field.		This concern calls for synergy between the feedstock platform and conversion platforms, as well as integrated biorefineries. The feedstock platform will pursue this avenue.
• Lack of industry partnership/involvement. Lack of clarity as to how DOE and DOA activities are complimentary/synergistic. • It screams for DOE and USDA involvement that don't appear to be happening sufficiently		FY 2008 is the first year that the Feedstock Platform will have sufficient funds to procure funds for industrial partnerships. The Biomass R&D Board has established a feedstock interagency working group between USDA and DOE (and other agencies) to enhance interagency coordination.

The need for life cycle analyses likewise is an important area for attention. Increasingly, the science of environmental analysis is focused on this methodology, as are international corporate social reporting standards. I don't have the resources/information to analyze the recommendation to resolve different cost targets; however, it was reported that this effort has already progressed. Similarly, I don't feel prepared to comment on the econometric recommendation. The comment that the platform should conduct statistic analysis on yield trials is worthy of attention from the Program. Yield variability is a fact of life and is well document for grain crops.		Life cycle analyses are now required as part of the implementation of the recently signed Energy Independence and Security Act of 2007. The comment of statistical validity of crop trials is well taken; and an individual with a strong statistical base will help design the crop trials that will be planted during the 2008 growing season. The "Uniform-Format Feedstock Supply System Design for Lignocellulosic Biomass" (November 2007) by INL provides a better basis for developing cost targets.
If giant biorefineries are needed in order to obtain low operating costs, logistics is crucial. That critical weakness in the Program justifies research to identify conversion technologies that can operate at acceptable cost at smaller scale (thermochemical processing is one option). Pyrolysis oil is much more energy-dense than wheat straw. A number of feedstocks were identified (MSW, forest residues) were identified that are quite different from wheat straw, and will have quite different handling, storage, and pretreatment needs. They will broaden the research challenges even more than corn stover will.		There are many potential alternative biorefineries at different scales. The 932 and 10% validation solicitations should provide different scenarios with a broad range of feedstocks. Where possible, the feedstock platform will interact with these industrial partners to develop acceptable feedstock logistics.
A critical area of interest for accomplishing the overall goals with respect to conversion of cellulose (and perhaps hemicellulose at a later date) is procurement of feedstocks. Considerable discussion has occurred about source of material as well as delivering functional, microorganism free fiber. However, minimal data are available for ascertaining realistic economic numbers with respect to possible tons to be delivered during the next five years. Also, conflicting information has been presented with respect to cost/ton delivered. A specific area of need is for appropriate interagency personnel involvement for convincing growers (farmers) to select change with little enticement for: • Sale of present planting, tilling and harvesting equipment and purchase of needed equipment; however, necessary modifications to possible equipment have not been achieved. • Ability to collect straw, stover, corncobs etc without contact with the soil (which will result in hydration as well as bacterial and fungal contamination • Storage sites and equipment • Equipment to transport chips, straw, stover etc, which often is ¼ the density of cereal grains and debarked trees.		The TM agrees with the reviewers that appropriate interagency personnel are needed to interact with the growers. The regional feedstock partnership will develop extension opportunities to help address this need. The feedstock platform will also explore various feedstock scale-up projects that already receive State and private financing for leverage opportunities to help convince growers. In addition, it is anticipated that the upcoming Farm Bill may provide enticements for growing energy crops.

A major need is to identify opportunity costs of fiber production. Tons/acre often do not encompass duration from planting to harvesting, altering soil quality, need for nutrient replacement or productivity of land utilized. Duress to plants grown without pesticide protection, adequate nutrients and concern of harvesting time is paramount; this may result in plant chemical production and/or cohabitation with fungi to produce appropriate chemical compounds to repel predators. Cooperation with machinery manufacturers should proceed early in the overall game plan, rather than after arbitrary decisions on source materials have been made. Subsequent to elucidating enhanced value of current products or value of to be identified fractionated products, contact can be initiated with possible agricultural and forest producers. Questions about drying of material in the field or forest need to be identified and answered. Harvesting dates and methods will be site specific, e.g., dry air in KS is a bit different than wet air in SD; also, ability to harvest without deleterious effects on soil quality must be delineated		The reviewer comments point to a need for a greater understanding of plant requirements during its life cycle, the importance of machinery manufacturers to improve the source materials and appropriate fractionation of the products, the importance of drying in the field and forest, and the potential to cause deleterious effects on the soil through the harvesting cycle. These are all important considerations for the feedstock platform.
I would have appreciated hearing about the Regional Biomass efforts in conjunction with this platform. I understand that this is a new endeavor, but the presentation on Thursday afternoon about the NW regional study seemed to indicate that there are opportunities in this realm.		Sorry the Regional Biomass efforts were not better explained in the full program review, but this is a relatively new effort and will be much more fully covered in the next peer review meeting.

Program Review Comments

Strengths

- Well directed and well focused. Strong teams working on gathering this important information.
- As explained, the parts of the platform are working together well and are logically derived.
- The program is making progress on complex issues. The realization that a diversity of feedstocks is needed to fulfill program goals is positive. This will be important in regions outside the Midwest.
- Good organization using good science. Work at INL on storage and queuing as well as harvest and collection appears to be on target.
- Work at INL on storage and queuing as well as harvest and collection appears to be on target.
- The platform has identified the key areas necessary to achieve program goals.

Weaknesses

- Not enough switch grass has been collected to get a handle on real cost. The fertilizer the biomass removed does not appear to be factored into the cost of the biomass. Current phosphate, nitrogen and potassium costs are significant.
- It screams for DOE and USDA involvement that don't appear to be happening sufficiently.
- I appreciate the Program's (and platforms) growing consideration of sustainability issues. I think that many of the issues which may emerge have readily available answers, but the Program and Department need to be prepared to respond when questions are raised. An example is the realm of nitrogen and phosphorus contamination of water. In the short realm, there are concerns about the expansion of corn production for biofuels. However, there are long-established production practices and agronomic research which can be implemented in production to mitigate these concerns (if implemented). Also, a sustainable harvesting technique to protect soil carbon levels may assist (but will not completely mitigate) this effort. Additionally, a long-term shift to perennial crops may involve dramatically lower nitrogen and phosphorus needs, depending on the crop species selected and the production practices which emerge. Some research on these emerging species is needed, but likely would not take much effort.
- Scaling up to handle corn stover will create new challenges. Need to lay out a plan now.
- Critical concern for separation of biomass components must be reviewed with appropriate scientists and engineers. Perhaps this area is for early treatment studies; however, some separation may be accomplished in the field
- Lack of industry partnership/involvement. Lack of clarity as to how DOE and DOA activities are complimentary/synergistic.

R&D Portfolio Gaps

- I agree with the gaps assessment which was identified.
- The gaps identified by the review team are OK, but they do not go far enough. The yield productivity anticipated by the Billion Ton Study requires sustained funding of genetics and breeding programs across most production areas. Likewise, there is an urgent need for longer term sustainable production research.
- The real cost of biomass has not been convincingly determined.
- As noted above, I agree with the need for sustainability attention. The need for life cycle analyses likewise is an important area for attention. Increasingly, the science of environmental analysis is focused on this methodology, as are international corporate social

reporting standards. I don't have the resources/information to analyze the recommendation to resolve different cost targets; however, it was reported that this effort has already progressed. Similarly, I don't feel prepared to comment on the econometric recommendation. The comment that the platform should conduct statistic analysis on yield trials is worthy of attention from the Program. Yield variability is a fact of life and is well document for grain crops. It will surely be an issue in future feedstocks.

- If giant biorefineries are needed in order to obtain low operating costs, logistics is crucial. That critical weakness in the Program justifies research to identify conversion technologies that can operate at acceptable cost at smaller scale (thermochemical processing is one option). Pyrolysis oil is much more energy-dense than wheat straw. A number of feedstocks were identified (MSW, forest residues) were identified that are quite different from wheat straw, and will have quite different handling, storage, and pretreatment needs. They will broaden the research challenges even more than corn stover will.
- A critical area of interest for accomplishing the overall goals with respect to conversion of cellulose (and perhaps hemicellulose at a later date) is procurement of feedstocks. Considerable discussion has occurred about source of material as well as delivering functional, microorganism free fiber. However, minimal data are available for ascertaining realistic economic numbers with respect to possible tons to be delivered during the next five years. Also, conflicting information has been presented with respect to cost/ton delivered. A specific area of need is for appropriate interagency personnel involvement for convincing growers (farmers) to select change with little enticement for:
  - Sale of present planting, tilling and harvesting equipment and purchase of needed equipment; however, necessary modifications to possible equipment have not been achieved.
  - Ability to collect straw, stover, corncobs etc without contact with the soil (which will result in hydration as well as bacterial and fungal contamination
  - Storage sites and equipment
  - Equipment to transport chips, straw, stover etc, which often is ¼ the density of cereal grains and debarked trees.
- A major need is to identify opportunity costs of fiber production. Tons/acre often do not encompass duration from planting to harvesting, altering soil quality, need for nutrient replacement or productivity of land utilized. Duress to plants grown without pesticide protection, adequate nutrients and concern of harvesting time is paramount; this may result in plant chemical production and/or cohabitation with fungi to produce appropriate chemical compounds to repel predators. Cooperation with machinery manufacturers should proceed early in the overall game plan, rather than after arbitrary decisions on source materials have been made. Subsequent to elucidating enhanced value of current products or value of to be identified fractionated products, contact can be initiated with possible agricultural and forest producers. Questions about drying of material in the field or forest need to be identified and answered. Harvesting dates and methods will be site specific, e.g., dry air in KS is a bit different than wet air in SD; also, ability to harvest without deleterious effects on soil quality must be delineated.

Additional Recommendations, Comments and Observations

- I would have appreciated hearing about the Regional Biomass efforts in conjunction with this platform. I understand that this is a new endeavor, but the presentation on Thursday afternoon about the NW regional study seemed to indicate that there are opportunities in this realm.

Specific Responses to Select Comments

Platform Peer Review		
Reviewer Comment		**Technology Manager Response**
The Feedstock Platform has developed a sound plan to address the Administration's current goals.		The TM, on behalf of the Feedstock Platform, greatly appreciates the reviewer comment.
• Coordination between multiple agencies/stakeholders is improving. Cooperation with Extension is identified as a need to be addressed and can be strengthened by consistent funding. • Progress is being made across a variety of complex issues. The tools being developed by platform R&D have the potential to be widely applicable to existing and future industry. • There is a need for enhanced coordination with USDA, the Sun Grant Initiative, etc. on breeding timelines.		The TM appreciates all of these comments from the reviewers. The TM is also cognizant that there is an enhanced need for coordination among DOE, USDA, the Sun Grant Initiative, etc. on breeding timelines as well as other crop development activities.
• The means to address issues of sustainability (such as soil carbon) have begun to be identified, but not yet to the full extent necessary. • Life cycle analysis in the feedstock platform is encouraged. • There is an ongoing need to understand competing food, feed, and fuel interactions while maintaining global economic and environmental sustainability. • The largest portfolio gap is in looking at opportunity costs of increasing the use of agricultural products for fuel and the impact on soil quality and productivity, as well as pest and disease pressure, by shifting agricultural practices.		The Feedstock Platform agrees with regard to the increasing importance of sustainability, life cycle analysis, and macro economic issues such as the food versus fuel. The Billion Ton vision was produced with the consideration that biofuels would be produced in a sustainable way and not have a major negative impact on food markets. However, there may always be some tradeoffs. Public policy will sort these out to some degree and it is important for the program to scientifically-based information to help address these important issues.
The diversity of the feedstock pathways that have been funded is positive.		The program appreciates this comment. Portfolio management has been a challenge.

• There is a need to resolve cost targets and estimates between the design report (as reported by Richard Hess) and the IBSAL model (as reported by Shahab Sokhansanj). • Many of the cost models used by the Platform have econometric implications, and therefore need to reflect market implications and include an estimate of accuracy.		Reported cost discrepancies between IBSAL and the Uniform Format Design (UFD) are the result of differences in assumed cost and performance parameters (e.g., machine lifetime, annual hours, travel speed, field efficiency, etc.). IBSAL uses standard ASABE/ANSI costing methodology and data as the source for these cost and performance parameters, whereas the UFD analysis used the best available data including field/lab data, manufacturer/dealer estimates, operator estimates, and ASABE/ANSI methods and data. To resolve these differences, the costing methodology will be updated to include the use of nonstandard (i.e., "best available) data for assessing unique feedstock designs. This provides a common method for insuring that all modeling efforts are using the same cost estimating methods regardless of the data source, and that the UFD, as well as other innovative supply system designs, will interface seamlessly with the IBSAL computational engine.
The Platform needs to accumulate and conduct statistical analysis of yield trials		The Program agrees and has insisted that someone with statistical expertise be added to the energy crop team.

General Platform Comments

- The Feedstock Platform has developed a sound plan to address the Administration's current goals.
- Progress is being made across a variety of complex issues. The tools being developed by platform R&D have the potential to be widely applicable to existing and future industry.
- Coordination between multiple agencies/stakeholders is improving. Cooperation with Extension is identified as a need to be addressed and can be strengthened by consistent funding.
- The means to address issues of sustainability (such as soil carbon) have begun to be identified, but not yet to the full extent necessary.
- Life cycle analysis in the feedstock platform is encouraged.
- The diversity of the feedstock pathways that have been funded is positive.
- There is a need to resolve cost targets and estimates between the design report (as reported by Richard Hess) and the IBSAL model (as reported by Shahab Sokhansanj).
- Many of the cost models used by the Platform have econometric implications, and therefore need to reflect market implications and include an estimate of accuracy.
- The Platform needs to accumulate and conduct statistical analysis of yield trials.

General Comments (applicable to all presentations)

- Overall it is apparent that the stage gate review methodology is still being learned by Program collaborators.

General Comments (on multi-agency issues)

- There is an ongoing need to understand competing food, feed, and fuel interactions while maintaining global economic and environmental sustainability.
- The largest portfolio gap is in looking at opportunity costs of increasing the use of agricultural products for fuel and the impact on soil quality and productivity, as well as pest and disease pressure, by shifting agricultural practices.
- There is a need for enhanced coordination with USDA, the Sun Grant Initiative, etc. on breeding timelines.

Feedstock Supply & Sustainability Projects

Project Title: Biomass Resource Supply & Sustainability Analysis

Project Investigator: Bob Perlack, Oak Ridge National Laboratory and Tris West, Oak Ridge National Laboratory

Strengths

- This project is critical to future feedstock efforts.
- There is depth of thought around linkages and a commitment to good data.
- The tool is flexible and able to integrate data from multiple sources.
- There is a strong link between this project and other programs (i.e. IBSAL, ORIBAS, POLYSYS).
- Project performers have a good understanding of the data available and computational requirements.
- This is a good communication tool as well as an analysis tool.

Weaknesses

- Project performers need to verify the benefits of using 30m resolution.
- The year to year variability of the data being used could become an issue.
- The tool is not yet open source.
- Project performers need to increase attention to soil erosion data set.
- The Platform needs to ensure quality control of the model through continued funding.
- This project will require several years of data to reduce the uncertainty of estimates being used.

Comments

- The tool should be designed to capture year to year (or seasonal) variability.
- Soil carbon and denitrification data should be added to the project.
- There needs to be confirmation that there are enough local people to supply data to the project.
- Potential production vs. farmer acceptance is a concern.

Project Title: Regional Biomass Energy Feedstock Partnerships

Principal Investigator: Jim Doolittle, SDSU (with Terry Nipp, National Sun Grant and Kevin Kephart, SDSU)

Strengths

- The project brings local involvement and ground-truthing into the portfolio.
- Land Grant universities have a high amount of credibility, are an unbiased source of information for farmers, and have a proven record of introducing new technologies.

Weaknesses

- Sun Grant universities may not be as equipped to address forest residue issues as other organizations.

- The Sun Grant initiative is broader than the Feedstock Platform's and may at time conflict. However, there are also many synergies and alignment of objectives.

Comments

- Progress within the Sun Grants has been slow, potentially due to lack of consistent funding.
- Project performers need to ensure communication between all Sun Grant centers and/or other portfolio initiatives.
- There needs to be continuous monitoring of the link between local Extension and Land Grants.

Project Title: Mississippi State University Sustainable Energy Center

Principal Investigator: Michael Collins, MSU

Strengths

- An initial screening trial of potential feedstocks has been completed.

Weaknesses

- Geographic coverage is narrow; the results are not applicable to a larger region and are in some cases below economic size.
- Longer term studies are needed to address the sustainability of double-cropping oil seeds.
- Project results would be improved if research design considered factors relevant to the use of biomass in subsequent processes.
- The research design, as reported, lacked measurable outcomes.
- Increased communication with other Feedstock Platform elements is needed.
- A more rigorous agronomic design would improve the quality of project results.

Comments

- The project would benefit from an independent review from ORNL/INL experts to ensure the funded work has broad applicability (possibly should be incorporated with the RFP).

Project Title: Switchgrass Demonstration Project

Principal Investigator: Burt English, University of Tennessee

Strengths

- The project incorporates a good agronomic design.
- The project will be able to affect change at the grassroots level.
- The project uses a rational approach to introducing an entirely new crop to the region.
- This is a high-risk project that has gotten good results.

Weaknesses

- The selection of pyrolysis as a downstream processing area of research is questionable.
- The addition of a chemical processing expertise would benefit the project.

Comments

- Some of the lessons learned on this project should be shared with other Sun Grant regions.

Project Title: Alternative Fuel Source Study
Principal Investigator: Ralph Zee, Auburn University

Strengths
- The project includes a cooperative and committed industrial partner.
- A wide variety of alternative fuels are tested (though this may not address the Platform focus).
- Project performers recognize the need for a bench-scale burn simulator.
- Quantification of the limits of fuel substitution has been addressed (phosphorus and chlorine).

Weaknesses
- Generic economic data and/or project drivers/context would have been useful.
- Some of the feedstocks used may not be available for free beyond this project.
- More explanation of the significance of emission results would be helpful.

Comments
- Project performers have infectious enthusiasm.

Feedstock Logistics Core R&D Projects

Project Title: Harvest and Collection
Principal Investigator: Kevin Kenney, Idaho National Laboratory

Strengths
- Good fundamental study.
- Detailed, high-quality engineering and cost analysis associated with the project.

Weaknesses
- Project needs more inclusion of existing technologies for densification.

Comments
- Should assess the nutrient impact of fractionation, including denitrification.
- Further development of the single pass approach to fractionation is needed.

PI Response
- Reviewer Item: “Need more inclusion of existing technologies for densification”
  - Response: There are indeed many existing technologies and processes for densifying biomass, primarily for the feed industry. The results of a literature review were briefly discussed in the presentation, but since the technology to densify crop residues within the engineering limits posed by a harvesting machine does not exist today, the presentation focused more on the deficiencies of current technologies rather than the opportunities to learn from existing technologies. Successful development of densification process suitable for integration with single-pass harvest

technology will certainly require inclusion of existing technologies, and as we progress with this task considerable attention and effort will be devoted to this issue.

- Reviewer Item: “Nutrient impact of fractionation including denitrification”
  - Response: The nutrient impact of fractionation is a major focus of a current stover removal project involving the INL, Iowa State University and the National Soil Tilth Lab. A paper discussing this issue has been published per the following reference:
  - Hoskinson RL, Karlen DL, Birrell SJ, Radtke CW, and Wilhelm WW. Engineering, nutrient removal, and feedstock conversion evaluations of four corn stover harvest scenarios. Biomass and Bioenergy 2007;31:126-136.
  - This publication represents data and findings from the first year of the project, and the project is currently approaching the third harvest season of the study.

- Reviewer Item: “Further development of single pass approach to fractionation needed”
  - Response: Since the single-pass fractionation material presented focused on small grain crop residues, I assume this comment is referring to the single pass fractionation of corn stover. Single-pass fractionation of corn stover would certainly require a different approach than that presented for small grain residues, since unlike cereal residues, not all of the corn stover passes through the harvester during grain harvest. This issue is being addressed on two separate fronts. First, the INL is involved with a stover removal project involving Stuart Birrell at Iowa State University and Doug Karlen at the National Soil Tilth Laboratory. This project is evaluating different stover harvest scenarios, and evaluating the impacts on machine performance as well as agronomic impacts. Secondly, plans for another project to evaluate yield potential, moisture and complete stover mass balance for material other than grain (MOG) collection with typical grain combine configurations is being planned, and these plans were presented in one of the slides titles “Path Forward.” This project will establish baseline data that will help drive the engineering systems for single pass approach to corn stover harvest, including fractionation based on either compositional differences or moisture differences of the stover fractions.

Project Title: Preprocessing

Principal Investigator: Chris Wright, Idaho National Laboratory

Strengths

- Good framework for investigation.
- Detailed, high-quality engineering and cost analysis associated with the project.

Weaknesses

- There is a need for further investigation of existing engineering aspects of grinding technologies.
- The project performers should investigate shear shredding as a grinding option.

Comments

- Grinding is a size preparation step that may be specific to bioconversion. For thermochemical conversion, other methods of densification and size modification may be appropriate.

PI Response

- Reviewer Item: “Need further investigation of existing engineering aspects of grinding technologies”
  - Response: This is a very relevant comment based on the general maturity of the grinding industry. As the INL preprocessing task moves forward, particularly in conjunction with grinding industry partners, a more focused effort to identify current grinding technologies that may impact the size reduction and densification of a wide variety of biomass feedstocks will occur. This effort will primarily rely on the expertise of INL partners and other research organizations, which have tested preprocessing equipment, because of their intimate knowledge of grinding processes. The preprocessing task will document these technologies and their implementation into a grinding system as part of the FY08 preprocessing hardware development and fundamental bulk biomass characterization subtasks.

- Reviewer Item: “Should investigate shear shredding as a grinding option.”
  - Response: This identified weakness is very perceptive on the part of the reviewers, since INL/ORNL researchers and their industrial partners have identified shear forces as key parameters in the development of herbaceous biomass grinder designs. The INL full-scale grinding test plan (delivered as an E-level milestone in May 2007) identifies research scope that will evaluate shear grinding designs as they apply to current industrial machines. As the INL preprocessing task continues in FY08 with different industrial partners, the scope of the work will include using grinding designs that incorporate significant shear force characteristics.

- Reviewer Item 1, investigation of existing grinding technologies, and Reviewer Item 2, investigation of shear shredding options, will be two of the basic guidelines for FY08 and FY09 biomass feedstock preprocessing validation and prototype development scope.

Project Title: Storage and Queuing

Principal Investigator: Corey Radtke, Idaho National Laboratory

Strengths

- Project considers qualities that are not normally considered in this type of analysis (i.e. fundamental biochemistry and biophysics; water activity for example).
- Detailed, high-quality engineering and cost analysis associated with the project.

Weaknesses

- There is a need to identify the health risks associated with storage activities.
- There is a need for better definition of the current state of dry storage.

Comments

- The “revolution not evolution” approach is interesting.

Project Title: Handling and Transport

Principal Investigator: Judy Partin, Idaho National Laboratory

Strengths

- Impressive instrumentation.
- Project assesses state of the art science.

- Important characterization of data is not readily available.

Weaknesses

- Would like to have heard abrasiveness data in the presentation.
- Characterization should be developed with equipment manufacturers.
- Problems need to be defined more clearly (i.e. designing trucks for unloading).

Comments

- The most suitable application may be in the hoppers and loading/unloading aspects of transportation.
- Rheological data for biomass slurries is lacking and needed in processing, and could be supplied by this project.

PI Response

- Reviewer Item: “would like to have heard abrasiveness data”
  - Response: The PI does recognize the need for this type of data and has included it in recent status reports as a parameter of significant interest in the design of pipeline conveying systems. Since the design and testing of these advanced systems is not scheduled to begin until FY-08, this work has not yet been initiated. We have, as part of our fundamental rheology task, looked into various types of wear testers. In particular, we have looked at some rotational shear testing systems that could be used to evaluate abrasion. We are also familiar with the wear tester used by Jenike and Johanson, Inc. Again, as with our other property characterization techniques, we are looking at adapting these measurement systems so that they can be used over a range of compaction pressures, particle sizes, and size distributions. In light of the reviewer comments, we will expedite completing the design and fabrication of our measurement system so we can initiate this data collection.

- Reviewer Item: “should develop characterization with equipment manufacturers”
  - Response: The PI agrees that collaborating with industry is very important to the success of the project and should be pursued at every opportunity. Prior to initiating the rheological experiments, the project personnel had multiple interactions with Mike Belingheri of Johanson Innovations, Inc. and Lee Dudley and Kristin O’Quest of Diamondback Technology, Inc. These interactions included the exchange of sample materials for testing and helped shape the testing protocols and approaches used in our work. In particular, in view of their independent test results, we decided to not purchase a commercial hang-up indicizer, but rather build our own system adapting concepts used in the commercial device and reported in the literature.

    The project work which supports aspects of harvesting and collection, preprocessing, and storage is leveraged by a number of industrial partnerships that are associated with these efforts. In particular, a consulting contract with Diamondback Technology is providing specific input to the harvesting and collection task and feedback on the use, and limitations, of rheological property attributes for the design of various handling and conveying systems. And, while we do not yet have formal relationships, we have interacted with a number of equipment consultants and vendors in the areas of material compaction and pumping to collect valuable data and insight for use in the design and evaluation of advanced systems.

- Reviewer Item: “Need to define problems more clearly (i.e. designing trucks for unloading)”
  - Response: The PI admits that in presenting the overview emphasizing the rheological property testing some of the project scope described in the work plan may not have been conveyed to the reviewers very effectively. The initial focus of the work is to obtain physical and rheological property data that will allow us to understand how these properties impact the capacity, efficiency, and in some cases, the quality of the various feedstock assembly operations, including loading and unloading trucks. This data will then be used to help us develop material formats and modify assembly processes to optimize these operations.

    For example, in the case of transporting materials via truck, we know the material bulk density we need to achieve the maximum load limits for different handling scenarios. We also know from our testing the pressure required to produce that bulk density for a particular biomass material and screen size. Consequently, one of our project tasks is looking at the efficiency, capacity, and cost of compacting auger and tamping systems that could compress feedstock materials of a particular grind fraction to the desired density as part of the truck loading operation. In addition, we have measured the material consolidation strength as a function of particle size and compaction force, and from this data we can determine the properties of the feeder systems used in the operation. In some cases, we know the hang-up potential due to material strength will require us to use live-bottom, or other active, means of unloading the material from the truck once it is compacted. Any losses in handling efficiency, or added equipment cost, will be assessed and used to determine if the compaction of feedstocks using these types of techniques has the potential to reduce the cost of truck transportation systems.

    We envision that as we continue to collect property data as function of the various assembly operations, and investigate scenarios for manipulating those properties to increase handling capacities and efficiencies, we will be able to define the material properties, or format, that will lead to both optimizing the feedstock assembly operation and standardizing the feedstock commodity delivered to the plant.

Feedstock Systems Integration Projects

Project Title: Development of Engineering Data for Feedstock Supply Operations/Supply System Logistics

Principal Investigator: Shahab Sokhansanj, Oak Ridge National Laboratory

Strengths

- Good attack on a challenging problem.
- Integration of INL work.
- Useful tool for normalizing and sharing information.

Weaknesses

- Complexity of the model may end up masking potential inaccuracies.

Comments

- Model validation and verification are essential to the project and should be a focus in later presentations.
- Linking the model with GIS could be challenging.
- The model needs to include a range of accuracy or error bars.

Project Title: Feedstock Supply System Design Report

Principal Investigator: Richard Hess, Idaho National Laboratory

Strengths

- Depth & breadth of the analysis provided.
- Organization & clarity of the project are positive.
- Some cost targets have been met (i.e. Idaho straw).

Weaknesses

- There is a need more flexibility of separating biomass for thermo- or biochemical conversion.
- There is a need to tap further into existing outside expertise.

Comments

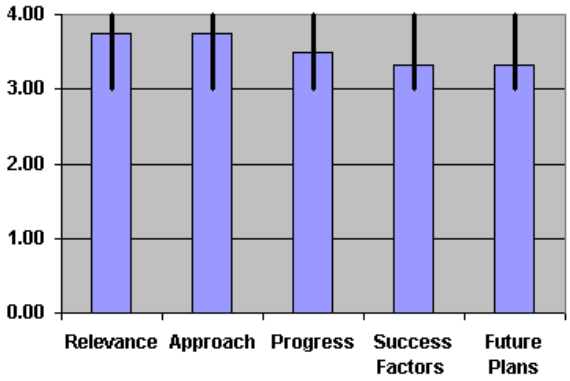
- The portion of DDGs considered cellulosic should be clarified.
- It is difficult to evaluate multi-year project when only one year of project milestones is presented (timeline would be helpful).
- Wet storage may be the mostly costly logistics element & therefore may require additional resources – other parts of the program should work to assist this portion (i.e. selection strategy, address downstream costs, depot concept).

Feedstock Supply & Sustainability Projects

Project Title: Biomass Resource Supply Analysis

Principal Investigator: Bob Perlack, Oak Ridge National Laboratory

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	3.75	0.75	0.25
Approach	3.75	0.75	0.25
Progress	3.50	0.50	0.50
Success Factors	3.33	0.33	0.67
Future Plans	3.33	0.33	0.67
Average	**3.53**		



Question 1: Relevance to Overall Objectives

- This project is critical to all future biomass program projects.
- GIS Analyses are CRITICAL, as distances=dollars, and are critical for overall sustainability (long-term). This is a positive aspect of the modeling.
- This project covers some projects that are clearly needed area of analysis.
- Sustainability has not been addressed, as yet. This cannot be added as an afterthought. You've got to build it in from the beginning.
- Good approach and pretesting.
- Good tool for managing resource data and issues.
- This is highly useful work, in that knowing the feedstock
- Potential is key to forecasting bioenergy success.

Question 2: Approach to Performing the R&D

- Well thought out, but a big job. Is 30 meter scale really needed? Even if the data are free, there is a cost to utilize such a vastly larger amount of information.
- Using NASS data has problems. I have hit this myself. Yet, it is critical.
- Resource availability and costs of production are crucial elements to model. This seemed to be a real strength of the program.
- The County level scale is not a bad way to go.
- The amount of data and use of the database presented shows thorough pretesting has been done.
- The real challenge is getting and verifying low level data from the field. 30 m may be too ambitious.
- Nutrient replacement cost work should be expanded to look at how much of the nitrogen in the stover/straw actually gets into next year's crop, vs. being lost in denitrification. This will vary by region. A model was developed, I think by Michigan State, to model denitrification. Bruce Dale would be one contact regarding this model.
- Store multiyear data so stochastic modeling can eventually be related to actual historical data.
- I assume that the model can be expanded to include specific properties for biomass, e.g. alkali content of straw.

Question 3: Technical Accomplishments and Progress

- The conclusion of 1.3 billion tons of resources is a bit optimistic. I am not against biofeedstock use and development. However, I am concerned that there was not more attention.
- The assumption of 25-50% yield increases is a bit optimistic vs. declining fertilizer availability due to energy (natural gas) constraints. 99% of all nitrogenous fertilizers come from natural gas. We've seen what even a "little" blip (Katrina) can do to that supply. You have to have the fossil fuels to even approach the yield estimates given here. HAS A CALORIE IN VS. CALORIE OUT ANALYSIS BEEN DONE?
- I am less able to judge the assumptions of forest lands. However, Western forest resources (slow growth forests) are much more constrained that Southern forests (fast growth forests). Hence, I am disagreeing in the rather optimistic.
- I agree that tillage practices may affect the residue availability. I was glad to see that you addressed that.
- Good developing effort.
- Very high level of database development.
- Problem will be to maintain focus on feedstock objectives and continual verification of results.
- Quantifying sustainability issues will be the major contribution of this work.
- This and the billion ton study are good working platform for discussion at the state and local level.
- The level of detail in the model today is impressive, as is the ability to manipulate the model and test cases with it.

Question 4: Success Factors and Showstoppers

- I appreciated your note regarding private vs. public lands. This is a critical factor in the Western forests. Obviously, there are more constraints there. Is someone representing these, primarily public forests, on your team?
- I really think a GIS modeling approach has REAL potential!!
- I applaud your efforts there.
- Don't you need some significant ECONOMIST input? It may be there, but I missed it.
- Budget may be the biggest limitation.
- Can the data show risk of ability to harvest the resources identified?
- Grower cost data is always a challenge and will be for this project.
- Can the data show the shifts in production e.g. CRP to corn acres?
- Linking the model to work in siting and also in logistics (IBSAL) is a positive factor, as well as its ability to model future scenarios (POLYSIS).
- Knowing the collection density (tons per total square miles in the collection area) is key for forestry data. The key problem with forest harvest residues is that they are highly scattered in any given year due to long rotation times.

Question 5: Proposed Future Research Approach and Relevance

- Can the move to 30m scale be justified? Do the benefits justify the costs? I assume you have answered this, but it wasn't made really clear.
- The presentation reflects good planning. Obviously a number of issues have already been confronted and addressed.
- It's not clear what state-level tools and personnel are available to provide the information for this effort.
- Apparently good integration or links with other models.

Additional Comments

Strengths

- I really feel that the GIS approach is a great idea. The existing elements of arcGIS, etc. to analyze the effects of transportation and distances needs to be tapped.
- I agree that modeling efforts are the ONLY way to do the projects. I applaud your use of remotely-sensed NDVI (greenness index) data. Yet, there are some assumptions that must be admitted.
- The multiplicative model of yield is a good approach.
- I, very much, appreciated the reference to Agronomy Journal, January 2007 (Graham, et al.) which showed depth of research into the CONSEQUENCES of the use of corn stover.
- Appropriate tool for a "moving target."
- Good integration to other tools.
- A flexible tool that embeds known data and allows simulation and modeling of future scenarios. This is good work.

Weaknesses

- The Billion Ton follow-on study looks like a huge undertaking, increasing both the fineness of resolution and the breadth of topics covered. The results will be important, but it will require a large amount of resources to meet the goals you have set.
- Opportunity costs (alternative, competing uses and net returns) must be considered in the resource supply models. Things are changing rapidly in the agricultural commodity pricing area, due to existing effects from biofuel production. This is a difficult area to model. I have empathy for you!!
- Show trends ad historical data. Can Stanford Research Institute biomass inventory (nationwide county level) from the 1970s be used for comparison?
- Need to organize data acquisition from local level.
- Need to further develop sustainability criteria.
- None that are not already acknowledged as part of the research program.

Technology Transfer/Collaborations

- Define explicit rules for sustainability with NRCS, Extension etc.
- Add risk analysis to harvestable resources (timber, residues).
- Extremely high: answers the question "what's out there?"

Recommendations for Additions/Deletions to Project Scope

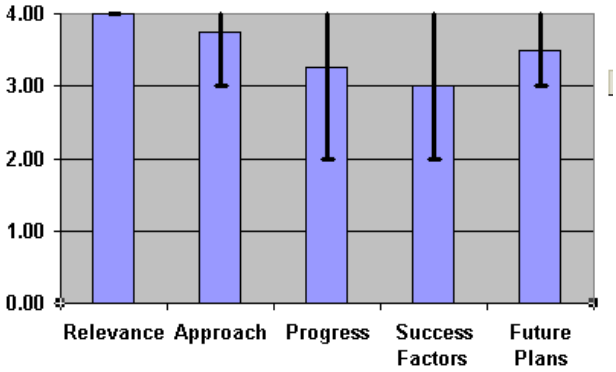
- Somehow, we need to build some links to existing USDA-CSREES Sustainable Ag. Efforts. Yah, I am biased, but I think there are some synergies there that could add real credibility to your efforts in this area. I am not against biofuels, in fact I'm very much "for" them – but I think the overall "system" (on-site effects, off-site effects, and longer term effects) must be considered. Surely there must be a way that we can work together on this, beyond simply the USDA-ARS efforts.
- Need to account for year to year environmental changes.
- Reassess yield projections. These have been most criticized area of billion ton study.
- Is urbanization and land use accounted for? This is a major impact on farm and forest (4% per year?)
- As noted above, two items that I think should be added over time are a geographically specific model of denitrification (and soil carbon impact, if possible), and the storage of

multiyear data so that it can be ultimately recovered and perhaps used for stochastic modeling.

Project Title: GIS-Based Biomass Resource Sustainability

Principal Investigators: Tris West, Oak Ridge National Laboratory

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	4.00	0.00	0.00
Approach	3.75	0.75	0.25
Progress	3.25	1.25	0.75
Success Factors	3.00	1.00	1.00
Future Plans	3.50	0.50	0.50
Average	**3.50**		



Question 1: Relevance to Overall Objectives

- If all this can be accomplished, it will increase the certainty with which investments in bio-based industries are made.
- There is no question that these data are needed.
- Clearly focused on goal of refining information.
- Highly relevant to all subsequent work: it answers the question "what resources do we have to work with". It will only stay relevant if it is rigorously updated. Storing the history in a recoverable manner, i.e. letting a model user see the actual history of yields and crops for a given area, will add to the relevance of the model.

Question 2: Approach to Performing the R&D

- SURGO/STATSGO efforts are laudable. NASS-CDL link is also laudable. However, the references of "hope that regional partnerships will help" shows that much of these links have not been made, as yet.
- Feedstocks at 30m resolution is going away (LANDSAT is going away) – what are your options??
- NLCD vs. NASS-CDL is a difficult data "mesh" to achieve. What are your plans for this? THIS IS DATA INTENSIVE. Wow! Do you have the capabilities? I have worked with NASS on their CDL…you have a big tiger by the tail here!
- CO2 emissions from POLYSYS? Hmmm….
- Barriers clearly identified and alternate systems have been identified or tested to resolve data issues.
- Recognition of, and attempts to address conflicts between data sets is a good component of the planned research.

Question 3: Technical Accomplishments and Progress

- Plan of attack has been developed.
- It seems that more was given as "will do" than any "have done."
- I am not convinced that CO2 sequestration vs. feedstock production has been addressed adequately.
- There are HUGE assumptions in both EPIC and SWAT.
- This is obviously an overview study at the START GATE -- with many things that still need to be filled in.
- Good base established for further development. Main advantage is ability to following changing data quality and changing results.
- This is a work in progress; progress to date is excellent, specifically the ability of the model to interact with other systems such as IBSAL, stochastic modeling.

Question 4: Success Factors and Showstoppers

- Can the Regional Partnerships do all the work expected of them?
- This seemed to have all the right buzzwords and models…but the findings seem to be rather limited and narrow at this point.
- Models have provided for development of technical and business related factors with coefficients.
- Business data apparently has placeholders.
- Competing uses of resource not clearly identified. Water identified as an area for development.
- The key success factor is the quality of the data and its updating.

Question 5: Proposed Future Research Approach and Relevance

- Sustainability issues and the stability of supply over time need to be included. The late frost in Tennessee wasn't expected, but brings supply stability into question, for example.
- Certainly most of this still REMAINS to be done. The GIS computational needs will be ominous.
- I agree much of the data is still becoming available.
- Well developed plan for highly complex project.
- Decisions will have to be made to focus analyses and use of data.
- Outstanding.

Additional Comments

Strengths

- WELL aware of the current models and buzzwords.
- This fellow is extremely bright and his breadth of knowledge is impressive.
- I am concerned about the depth of the approach and real research, as displayed here.
- Flexible tool. Apparently good talent and equipment to realize objectives.
- Ability to integrate different data sources greatest strength.
- This is a very versatile model, and the key strength of the research is the determination of the research team to improve the usefulness of the model. The team is looking at conflicts in data from different sources, and at extending the usefulness of the model. One example of this is linking it to DOE work on carbon sequestration and linking it to water quality. This is a very valuable research program, in my opinion.

Weaknesses

- Not a darn thing done, except a word in last slide, regarding sustainability….but it seemed, primarily lip service.
- Where is a link to the USDA-ARS Wind Erosion Lab at Manhattan, KS? You say that it is difficult to get at for a national level. I am not convinced that you are looking deep enough.
- Problem of getting and validating local data. Factors are site specific.
- Budget? For 30 m resolution at local level? State level tools and personnel may be a problem.
- Can risk analysis be added to feedstock availability (e.g. farmer willingness to provide feedstock, agency ability to make wood resource available, etc.)?
- How can this tool be made useable by Sun Grant and energy people at local level? What interfaces are planned?
- How will data be accessed or integrated into general economic modeling?

- I am aware of no weaknesses that have not been identified by the research team.

Technology Transfer/Collaborations

- Seemed to have a good links with NASS – which is an outstanding source.
- Clear list of data and interface needs. Major problem may be ability of local information sources to handle and enter data. Do local entities have the budget and personnel to accomplish this? How much support is needed from regional program budget?
- This model is critical for all subsequent analysis of biomass energy projects.

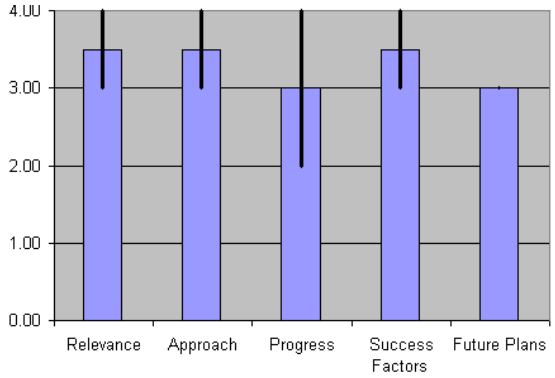
Recommendations for Additions/Deletions to Project Scope

- You have to have been links with the opportunity costs of carbon sequestration and both on-site and off-site effects (such as soil erosion). The on-site effects (such as groundwater pollution) seemed to be addressed much better than any other off-site effects.
- Series of local validations will be very useful.

Project Title: Regional Biomass Energy Feedstock Partnerships

Project Investigator: Jim Doolittle, SDSU; Kevin Kephart, SDSU; Terry Nipp, SGI

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	3.50	0.50	0.50
Approach	3.50	0.50	0.50
Progress	3.00	1.00	1.00
Success Factors	3.50	0.50	0.50
Future Plans	3.00	0.00	0.00
Average	**3.30**		



Question 1: Relevance to Overall Objectives

- Regional Partnerships will provide local "ground truth" on all aspects of local biomass production.
- Good overall approach identifying local sources of data.
- Feeding data up to a national data base / GIS system is very relevant; this activity should not be devolved into five regional data bases.
- The bioweb activity is a national activity; it can be done by the structure outlined, but in a year or two it is worth checking whether this method of implementation is effective.
- The cited goals in Kevin's part of the presentation are disturbing: agricultural diversity and rural economic development as interpreted by 50 land grand universities through five regional associations is not relevant if the objective is bioenergy.
- Certainly, this is relevant.
- Key partnerships with Land-grants are critical for many for the accomplishment of important objectives.
- The Land-grant partnership has elements in each COUNTY -- MAKE THIS A PRIORITY…don't let it die at the Ag. Exp. Station level! This should be an integrated effort between extension and Ag. Exp. Stations. I don't see reference to this. Utilize the key clientele that Extension can bring to the table.

Question 2: Approach to Performing the R&D

- Uniform procedures will enhance the value of the test results. The list of agronomic factors covers a lot of important issues.
- Regional focus for local issue.
- Local partners identified.
- GI Compatible goals. Market oriented, coordinating role.
- Builds on Land grant capabilities.
- Need to incorporate former USDOE regional partners that are now supported by the states. There is a wealth of information that the Sun Grant link needs to take advantage of. Where are the reports? You have a new team that needs to understand what has been done since 1979.
- Sun grant folks are mostly agriculturists and need an education in Energy as demonstrated in the western region meeting after the review.
- Is there room for universities other than land grant universities to make a contribution?
- Using universities to be educational outreach is a good idea: there is a need for better knowledge about bioenergy, and there is a need to challenge standard but erroneous assumptions.

- The merit of a bioweb run by a regionally oriented entity isn't clear; hence check if it is effective.
- I am a true cheerleader for the COMPLETE Land-grant mission. Hence, I'd like to see more extension and farmer/rancher involvement at the grass-roots level. Too often, the Ag. Exp. Stations neglect the grass-roots level. To date, what I have seen in the Sun Grants has been limited to the "academic elite," who, understandably aren't really elite.
- Have you considered ways to involve farmers/ranchers on key Sun Grant advisory councils? Of course, a key is to ensure that these farmers/ranchers are truly involved and not merely names listed on a proposal or report.

Question 3: Technical Accomplishments and Progress

- Regional meetings could have been accomplished sooner. Goals are well-formed and deal with important issues.
- Regional workshops have limitations. The Regional workshop at SD was more productive than at Portland. The latter was asking groups to come up with a wish list for grant money.
- Bioweb should include interactive forums moderated by local experts in soils, crops and energy.
- Need to identify existing local expertise in all institutions not just Land Grants.
- Should develop functional teams in regions of technical people.
- It is too early to rate this higher than fair, as only two regional meetings have been held. A key question in my mind is whether this structure will provide true help and efficiency or a cumbersome layer of bureaucracy; let's hope for the former.
- The grass roots elements (farmers/ranchers/county agents/etc.) are a key to getting reliable data and "ground truth" in into the proposed GIS Atlas. Pretty pictures are nice, but REAL ground truth is ESSENTIAL.
- The climatic data that is available at Land-grants is also a big "PLUS" for the Sun Grant partnership. How are you going to integrate this across the regions? Many states are very protective of these data.
- Some of the details in your tables RUSLE2 vs. RUSLE showed "attention to detail" in your efforts. Some investigators would have overlooked this.

Question 4: Success Factors and Showstoppers

- Are there sufficient incentives to induce participation by qualified scientists at these institutions? Promotion and tenure policies and committees really influence research plans.
- Problems clearly identified.
- Big diversity in needs and understanding between forest resources and agricultural resources. This program could provide a valuable link between energy, agricultural extension and NRCS.
- Resource issues are very site specific especially in mountain forest and dry land agricultural areas.
- Bioweb could be a useful tool but needs to be managed (that's from 12 years of running bioenergy discussions a websites).
- My sense is that this is in the early stage, so the ability to assess whether "showstoppers" are identified and resolved isn't clear. Coordinating cross state research will be daunting.
- Certainly, a success factor is the Land-grant system.
- The POWER is in the SYSTEM. However, it is "easier said than done" to integrate the total system into your program.
- It is so very easy to have farmers/ranchers involved in only a "token" way. How are you going to ensure (and measure for OMB) the real impacts on the farms/ranches?

- I'm not sure how the alternative crops (oilseeds, such as camolina, etc.) fit with the cellulosic model of this program. I understood, from the review instructions that "cellulosic" was the model here.

Question 5: Proposed Future Research Approach and Relevance

- The plans presented here address the issues that seem most pertinent to the supply issue.
- Well-organized programs, good organization.
- Good balance of budget.
- Main problem is integrating interests and organizations. There is a lot of good information and activity out there but it needs to be managed. The regional biomass program (1980-2002?) was an outreach program. Sun Grant looks like a research program.
- This is an early stage project but there are plans in place for future activity.
- This seemed a little "fuzzy" at this point. Perhaps, it is due to the late arrival of the funds?

Additional Comments

Strengths

- Local involvement.
- Building on existing infrastructure good concept.
- Regional level of information.
- Built in educational components.
- Local field trials experience will be essential.
- Communication with stakeholder good focus.
- Enthusiastic use of 50 universities, including their outreach educational capabilities.
- The "strength is in the SYSTEM" (Land-grant system)…Therefore, this program has many, many built-in advantages. There is no way to overstate this. It is a powerful feature to enable outreach to the grass roots sector.

Weaknesses

- Delay in implementation. It has been 12 months since the second regional meeting.
- Balancing efforts of other crops.
- Problem identified quality of information – recognized.
- Keeping economic relevance.
- The only way the GIS data base contribution will be effective is if it is very capably integrated into ORNL's national work.
- However, that same strength (of the Land-grant system), is often overlooked or underutilized by the "academic elitists" of those same Universities. Don't let this happen!! Make sure that Extension [especially the County adult educators (a.k.a. County Agents)] are involved at the get go. How many, for example, are coming to the regional workshops? I've yet to see any county educators who even knew about Sun Grant, much less know of the regional workshops. Nonetheless, some will find it on their own (via Google) via BioWeb. However, I have used BioWeb and VERY LITTLE IS THERE. A search for Camolina brings up ZERO. Why aren't you using eXtension's community of practice as an option? This is cheap, easy and effective – but not used.
- There is an assumption here that Coop. Extension is "connected" to Sun Grant. IT HASN'T HAPPENED!!!

Technology Transfer/Collaborations

- Full interaction with existing programs like regional biomass program (now funded individually be states.) Organized and disseminate information from prior programs.
- If successful, the degree of collaboration will be high.
- Somehow, we need to build some links to existing USDA-CSREES-SARE Sustainable Ag. Efforts. Yah, I am biased, but I think there are some synergies there that could add real credibility to your efforts in this area. I am not against biofuels, in fact I'm very much "for" them – but I think the overall "system" (on-site effects, off-site effects, and longer term effects) must be considered. Surely there must be a way that we can work together on this, beyond simply the USDA-CSREES-AES and USDA-ARS efforts.

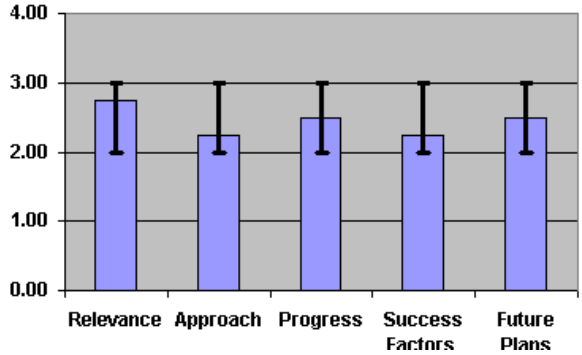
Recommendations for Additions/Deletions to Project Scope

- Add local expert forums to Bioweb.
- Assess in one to three years whether the bioweb is better run through this entity vs. a separate national contract issued by the Department of Energy.
- How do you really get "force" interstate research when you can't even get interdisciplinary work? Terry is a terrific person – and an effective lobbyist. However, I worry that he cannot see the forest for the trees here. If you are letting the Sun Grants be lead by the Agricultural Experiment Stations, you have not really involved Extension. They have a whole different set of leaders, ECOP for Extension vs. ESCOP for Ag. Exp. Stations. At many institutions, they don't even talk to each other. Ask Mike Harrington (WAAESD), Extension Dirs. in the West cut him totally out of their loop (a mistake, I admit – but they did).

Project Title: Mississippi State University Sustainable Energy Center

Principal Investigator: Michael Collins, Mississippi State University

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	2.75	0.75	0.25
Approach	2.25	0.25	0.75
Progress	2.50	0.50	0.50
Success Factors	2.25	0.25	0.75
Future Plans	2.50	0.50	0.50
Average	**2.45**		



Question 1: Relevance to Overall Objectives

- Certainly relevant in several areas.
- Field plots across soil types are a strength. Most PI's in this area ignore the critical element of the plethora of soil types.
- I just have to admit that I like the emphases that come to mind in the name: Sustainable Energy Research Center.
- Local screening study good exercise developed local data.
- This is a first step project that identifies opportunities for further work.
- The highly focused small area analysis limits the applicability of the work, which is compounded by what appears to be limited research design. For example analysis of pine residue usage should extend past the state boundary, and the work on switchgrass does not appear to systematically study establishment issues such as seeding rate, nutrient supply and weed control.

Question 2: Approach to Performing the R&D

- This seems to be totally focused on Mississippi vs. a regional or national approach. Wouldn't there be economies of scale if it were not simply a state-based approach?
- Are three years of data sufficient for a perennial crop?
- Extremely broad coverage makes success very uncertain.
- Market orientation?
- Not as thorough a market and application study as the Tennessee work.
- Need to integrate with other activities in the state.
- This is really just a scoping study.
- I have some reservations about the concepts embedded in the approach to this research. Two examples: thinking that energy crops would be used for forage or energy at the whim of the producer (what does the bioenergy plant do for feedstock if much of the normal supply goes to forage). Second example: limiting transportation distance for forest thinnings from pine to 50 miles: is there enough wood within this diameter to make ethanol at a meaningful scale? Is wood envisioned as being converted to ethanol in the same plant as other biomass? My sense is that the research focuses on all biomass in one state but with a low level of focus on ultimate processing. Switchgrass trials would benefit from a systematic agronomic design.

Question 3: Technical Accomplishments and Progress

- Measurable outputs seemed to be looking in this project.
- Just getting started. Estimates of woody biomass availability and production costs estimates for lignocellulosics are useful if they are reliable. Data on the performance of

so many new crops are not very reliable, since there are no established management practices for many of these crops.
- Discussion in 06.
- Example of what can be done by regional approach.
- Field trials.
- 300k t rice straw.
- Management recommendations for producers.
- Good oilseed results.
- Economics screening results good for Switchgrass and miscanthus shows potential.
- There is some interesting data of a very site specific nature generated from this study, but there is no evident agronomic design, which limits the usefulness of the data. There is the comment about the difficulty of establishing switchgrass, but as noted above no data was presented on seeding rate, weed treatment. The linkage of the results from this study to other work isn't clear. As well, I am not aware that concepts of scale of end usage have entered into the research design or analysis of results.

Question 4: Success Factors and Showstoppers

- Poultry litter biofeedstocks research appears to be the only work in this area. Although, I should have looked in the other big poultry area (DelMarVa peninsula).
- Uncertainty of funding hasn't been overcome.
- Good local demonstration of suitability.
- Identify comparison of Switchgrass with cotton.
- Good data to feed into regional program.
- As noted above, I am concerned that some business factors have not been adequately identified, especially the scale of usage of bioenergy crops. The ultimate goal of a bioenergy program isn't biomass; it is the conversion of biomass to useful energy.

Question 5: Proposed Future Research Approach and Relevance

- There seemed to be limited thought given to this – perhaps, because this funding is ending?
- Too many tasks to do them well.
- Project complete.
- Good plans, future funding?
- 3 year data collection.
- Low cost SWG potential with risks identified.
- To what extent were agronomic issues systematically investigated; to what extent will they be if extended?

Additional Comments

Strengths

- This project has some links to the farm level.
- The integration of economists into the project seemed to be implemented at the very first…but it was unclear.
- Addresses risk of grower familiar with new crops.
- Can fold into regional efforts.
- Identification of multiple uses (e.g. range Switchgrass field).
- Detailed data at a local level. Thoughtful observations re the difficulty of establishing a perennial crop.

Weaknesses

- This seemed to be a final report, rather than a “get up and go” interim report.
- Could be best with multi year program.
- 3 year data insufficient for perennial crop.
- Need additional funding.
- Insufficient thought about the ultimate use of biomass, including scale; based on the presentation, limited systematic exploration of agronomic factors.

Technology Transfer/Collaborations

- Co-funding with plant breeders.
- Data is very locally focused.

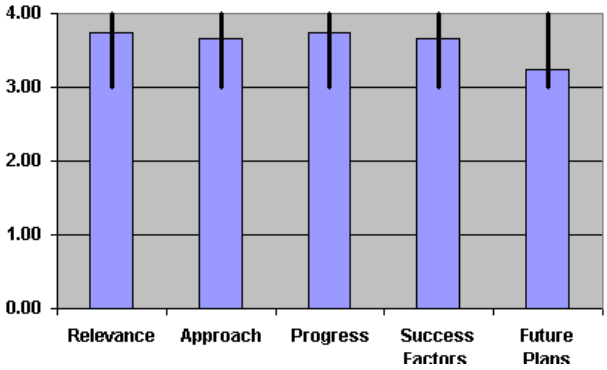
Recommendations for Additions/Deletions to Project Scope

- Align with regional program.
- Address scale of biomass, e.g. is there enough thinnings from pine to make ethanol in a real plant? Systematize the exploration of agronomic variables.

Project Title: Switchgrass Demonstration Project

Principal Investigator: Burton English, University of Tennessee

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	3.75	0.75	0.25
Approach	3.67	0.67	0.33
Progress	3.75	0.75	0.25
Success Factors	3.67	0.67	0.33
Future Plans	3.25	0.25	0.75
Average	**3.62**		



Question 1: Relevance to Overall Objectives

- The three questions are pertinent to the future of a biomass industry. Identifying the needed inducements will be important to encourage private industry to invest.
- Certainly this is relevant, based on the President's State of the Union. However, part of what makes this VERY relevant was that this was one of the few that clearly showed a farmer/rancher link from the beginning. Clearly, this immediately brings it to a low "publishable research" level – but, it always gives it credibility with the folks who MUST BE CONVINCED TO GROW THE FEEDSTOCKS. I basically dislike "earmarks" – but this one may give everyone some MEASURABLE IMPACTS which are difficult to identify and measure.
- Testing and developing basic variety tests data.
- The rating of this project is based on the agronomic component only. I consider the upgrading component to be very weak, but I accept that the results weren't presented to this session. The feedstock component includes and interesting agronomic study of the factors affecting switchgrass establishment and productivity. I have concerns about pyrolysis: light off oil for a coal fired power plant doesn't seem to be a large enough end use to be relevant to a national bioenergy program, and pyrolysis product is bad stuff (acidic, toxic, prone to polymerization, and inefficient unless the char is used). If DOE has interests in pyrolysis then consider discussing a program at the German Federal research entity, Forschung Zentrum in Karlsruhe, Germany. Their processing concept recovers the char, vastly improving the overall process efficiency.

Question 2: Approach to Performing the R&D

- Good plan to identify missing information on switchgrass culture and go get it.
- Objectives gleaned from the presentation:
  - Alamo is assumed to be the standard variety.
  - Estimate RN farmers' willingness to plant an energy crop.
  - Also looked at bio-oil from switchgrass
  - Wanted low-input
  - This is an earmark…
- Enough funding to keep research for 5 years & farmers for 4.
- 4 farmers participating.
- Tyler is both soil scientist & general agriculturalist.
- BID PROGRAM TEST IS A GOOD IDEA…
- Field trials with applications.
- Good awareness of needs of early adopters.

- Good approach re agronomic component; the systematic exploration of weed control in response to an unexpected result (weeds not being out competed by switchgrass) is well done.
- In future I suggest clarifying that pyrolysis results are presented elsewhere so that reviewers don't think it should be included in their evaluation.

Question 3: Technical Accomplishments and Progress

- Information on stand establishment, labeled weed control, combustion properties.
- Yes, I realize that this research is VERY applied vs. much of the sophisticated engineering that has been shown in the review. However, this is one that can yield some real "OMB-mandated" results:
  - # of acres impacted
  - # of farmers who have changed attitudes/actions
  - # of growers who will PRODUCE measurable amounts of biofeedstocks
  - # of weed control agents tested and eliminated or labels could be acquired.
- You just have to give them credit for this.
- This is "no brainer stuff" – BUT, IT MUST BE DONE BEFORE THE FEEDSTOCKS WILL BE AVAILABLE.
- Field trials.
- Management practices – weed control needed- not learned from other sites.
- Tested transportation.
- Bio-oil at BECON.
- Gadsen tests.
- Before frost and after frost tests.
- Recognize equipment needs.
- Identification of the agronomic issues regarding switchgrass is a valuable contribution, e.g. seeding rate, weed control, nutrient response.

Question 4: Success Factors and Showstoppers

- No unidentified risks, but the identified ones are bad enough.
- Clearly, the strengths of this project are the link to the grass (no pun intended) roots level.
- 29% who will, 45% need info, 25% will not follows EXACTLY the Don Dillman (Rural Sociologist, WSU) model for adoption of technology (ANY) by farmers/ranchers.
- Example of "early adopter" farmer who contacted extension having zero weeds, vs. the "early adopter" who did not, should be documented and measured.
- Field trials.
- Management practices – weed control needed- not learned from other sites.
- Tested transportation.
- Bio-oil at BECON.
- Gadsen tests.
- Before frost and after frost tests.
- Recognize equipment needs.
- As noted above, the agronomic component seems well founded, the processing component is not.

Question 5: Proposed Future Research Approach and Relevance

- Yield measurements are crucial to this project and to all other switchgrass projects.

- As much as I love the grass roots approach of this project, I didn't see the rationale for further applied research.
- Putting in 5 million gallon ethanol plant need 8,000 acres.
- Carryover to 2009 good.
- Finding funding from variety of sources.
- The agronomic work is likely to succeed and lead to a very valuable contribution.

Additional Comments

Strengths

- Local involvement with some real people.
- Clearly, the strengths of this project are the link to the grass (no pun intended) roots level. You are NOT going to get growers to grow the feedstocks (in any significant "billion ton" way) unless SOME HOW, SOME WAY, you find funds to fund THIS TYPE of outreach to farmers/ranchers. Yet, the only way this received funding was through an earmark. A sad commentary on the Land-Grant system…
- Both field and experiment station data.
- Good data developing and interactions.
- Good systematic agronomic work.

Weaknesses

- Can you justify the estimated yields? This is the most critical piece of information in the whole program.
- This is not flashy or publishable…just needed…
- Need market assurance to grow SWG from state.
- Seed production critical issue.
- Equipment needs identified.
- The choice of pyrolysis isn't clearly explained or justified; it is almost as if "we had to do something with the biomass, so we chose pyrolysis.

Technology Transfer/Collaborations

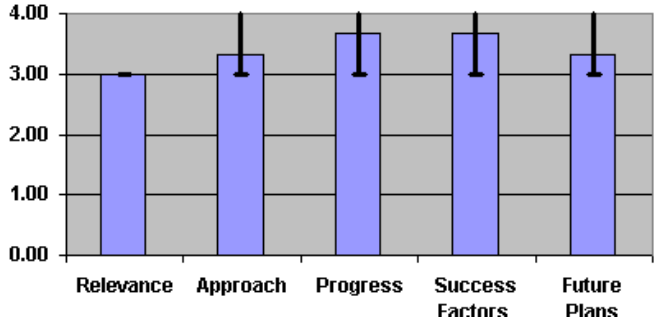
- Survey and bids.
- Discovered role of Extension for seed planting at right depth and weed control.
- Farm Field Day.
- Let farmers resolve harvesting problems on their own good solution.
- The switchgrass work will, I think, make a significant contribution.

Recommendations for Additions/Deletions to Project Scope

- Find a way to fund this type of applied research and outreach in the "system."
- You need to get a rural sociologist involved to look at "if" growers will shift and "when" (see Dr. Don Dillman's "early adopter" research).
- Continue support for this project. It has generated good information in area where switchgrass is an unfamiliar crop.
- Include a survey of other work in the area of pyrolysis.

Project Title: Alternative Fuel Source Study
Principal Investigator: Ralph Zee, Auburn University

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	3.00	0.00	0.00
Approach	3.33	0.33	0.67
Progress	3.67	0.67	0.33
Success Factors	3.67	0.67	0.33
Future Plans	3.33	0.33	0.67
Average	**3.40**		



Question 1: Relevance to Overall Objectives

- Seems to be less relevant due to lack of direct "agricultural link." However, I started to see the link later on.
- Lafarge is largest cement maker in the world.
- Lafarge is using switchgrass, wood waste, broiler litter, scrap—tires, recycled plastics instead of coal. They can burn these low quality fuels because of very high temperatures. Interesting that this is one of the ONLY users who can use landfill wastes, etc. because of high temperature kilns.
- Some fuels are relevant.
- Does not demonstrate advanced technologies for fuels but it does demonstrate feedstock issues for handling and feeding while using an existing market.
- OBP should find a good way to integrate these congressionally directed programs in the overall program plan to show relevance. It demonstrates delivery system and co-production.
- Cement manufacture is a wonderful outlet for biomass, reducing carbon emissions.
- The gasification component is of high relevance to other projects.
- The results of this research will have a high relevance to cement manufacturers around the world.
- Cement production was identified as a high energy consuming industry, so this is relevant to overall energy consumption, but not to liquid fuel replacement goals.

Question 2: Approach to Performing the R&D

- VERY WELL DESIGNED STUDY…(or, very well EXPLAINED).
- They are going into a lab study AFTERWARD, which is sort of backward – but totally understandable in this situation.
- Goal is replacing 50% of coal with waste, which Europe has done already.
- Poultry litter is at least 40-50% energy content of coal.
- A VERY detailed and intense sampling procedure was observed.
- A VERY GOOD "systems approach dealing with on-site and off-site (pollution, safety, health) effects…"
- Biomass handling not germane to large scale production but appropriate to specific application. Pilot testing at full scale is useful.
- The research design is thoughtful and rigorous.
- The presentation of data for concrete properties should include error bars (standard deviation of testing) so that one can judge whether the variance between runs is significant.
- The work seems very well thought out and executed.
- Well planned.

Question 3: Technical Accomplishments and Progress

- I was very impressed with the sampling procedures and experimental design. The detail of the presentation was immense.
- I am not sure that I am convinced that hydrocarbon emissions are zero…but I am not competent to judge!
- Testing – broiler litter and plastic.
- Good industrial testing.
- Good screening trial.
- I don't believe the model or simulator will have as much general value as proposed but it should be developed and tested.
- Test burns are half completed: this is a major accomplishment.
- Work seems well underway.
- The industrial partner is particularly well committed.
- This project has contributed to two goals: saving energy and cleaning up the environment. I hope LaFarge and its industry will implement this to the maximum extent possible. Burn simulator is a very useful idea.

Question 4: Success Factors and Showstoppers

- It seems to me that you have discovered an industry that can use complex and hazardous (high hydrocarbon) wastes, without a problem. Any residuals go into the cement – but are probably "bound" in the environment – so it is a smaller consequence. FASCINATING! The Phosphorous pollution problems are solved, because: who cares about high-P cement!
- What a great way to use poultry waste!
- Established some burn rates.
- Successful burn rates.
- Simple feed system.
- No showstoppers evident; success factor is the commitment of the industrial partner.
- You identified a number of potential showstoppers, including some social issues, and got the information needed to address them.

Question 5: Proposed Future Research Approach and Relevance

- Interesting…but funding may be difficult to obtain…
- Gasification technologies – thee are well known. This could be a minor part of effort. (Look at California energy commission PIER program projects by GEEER for kiln scale gasification).
- Burn simulator – to be developed.
- The decision to include a burn simulator is a good addition. The decision about gasification by oxygen vs. air needs to be critically based on an economic and technical analysis; oxygen separation is expensive and the merit, if burning the resulting gas, isn't clear.
- Completed project, but provides useful information for others to use in future applications.

Additional Comments

Strengths

- Again, it seems to me that you have discovered an industry that can use complex and hazardous (high hydrocarbon) wastes, without a problem. Any residuals go into the cement – but are probably "bound" in the environment – so it is a smaller consequence. FASCINATING! The Phosphorous pollution problems are reduced.

- What a great way to use poultry waste!
- Test burns and emission results good.
- Variety of fuels tested well.
- Good research design and an outstanding industrial partner.

Weaknesses

- High Phosphorus cement can be a problem.
- Need economics in results.
- Not evident that cement chemistry has been included in proportions of fuels co-fired. Alkali in cement is critical and should be highlighted or tested as the potential limiting factor in alternative fuel such as Poultry Litter.
- Large scale storage and handling should be addressed.
- None evident.

Technology Transfer/Collaborations

- Coordinate with RAM – Rubber Manufacturers Association – which handles tire co-firing for assessment of general application of this model to other kilns around the US.
- Cement is an “everywhere” industry, so the results of this work will have a very high relevance to that industry. The gasification work will be of interest beyond the cement industry.

Recommendations for Additions/Deletions to Project Scope

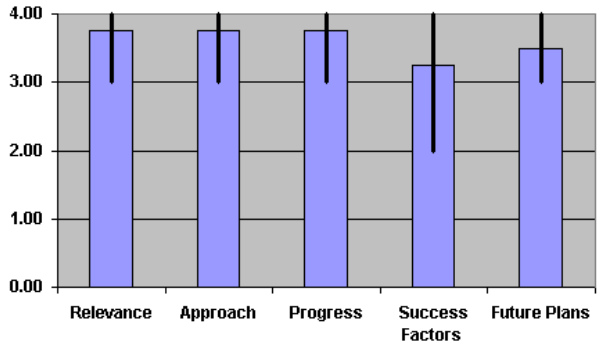
- I am unsure as to whether I am qualified to address this. However, the project is fascinating!
- Continue this work and find ways to bridge work to goals off feedstocks program. This represents a potential “front end” to providing energy or feedstock for conversion.
- The analysis to support the selection of a gasification process should be included in the project report.

Feedstock Logistics Core R&D Projects

Project Title: Harvest & Collection

Principal Investigator: Kevin Kenney, Idaho National Laboratory

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	3.75	0.75	0.25
Approach	3.75	0.75	0.25
Progress	3.75	0.75	0.25
Success Factors	3.25	1.25	0.75
Future Plans	3.50	0.50	0.50
Average	**3.60**		



Question 1: Relevance to Overall Objectives

- Key issues have been identified.
- Well-organized approach with clearly specified target toward large scale harvesting of feedstocks for conversion.
- Given that all biomass processing plants will need material transport, the high quality of this work will ensure its relevance.
- "Only link to sustainability" according to presenter.
- This is another essential link – so it is assumed to be critical to the systems analysis.

Question 2: Approach to Performing the R&D

- Good fundamental study, similar to the process used to develop the cuber many years ago. Good plan to gain fundamental understanding.
- Account for significant factors.
- Better integration with engineering and accomplishments of existing industry needed.
- Thoughtful analysis of the work of others, e.g. cob and chaff harvesters. Very good fluid dynamic modeling.
- I have a bias against pelletizing that reflects my understanding of its relatively high cost. I don't want to impose any bias on this work, so I simply caution that the program should not commit to pelletizing without a thorough analysis of other options and an analysis of the cost of pelletizing. The program has recognition of costs and a focus on it, i.e. a good approach.
- The analysis of fractionation is of very high quality.
- The key need is a better understanding of how much biomass needs to be left on the field for sustainability. Part of this needs to be consideration of denitrification, including whether fractions denitrify at the same rate.
- The depth and breadth of the analyses seemed well-planned and comprehensive….well done!

Question 3: Technical Accomplishments and Progress

- Good application of the CFD research.
- First steps given the state of the program. Project should continue to maintain cost and energy efficiency criteria in harvesting technologies.
- Excellent results to date. For example, the work on fractionation has excellent results of major impact.
- The presenter seemed to understand the complexities of the total system, as well as the various harvester systems.

- Obviously, you have some real constraints here, including horsepower, etc. However, the presenter was not afraid to admit the problems and then go on to identify a probable solution.
- I like the first principles approach -- to identify the bulk properties that are critical – then, to go from there to develop analytical techniques.
- Interesting “reverse engineering” approach.
- The use of Johanson indices is applauded!!! I had not heard of them – however, I found them on the web and the description is a vindication of your approach and knowledge of the subject!!!

Question 4: Success Factors and Showstoppers

- A critical issue is maintaining harvest capacity of current crop harvesting systems. Producer participation will hinge on not reducing current capacity.
- GMO,MC, pellet
- Depends on single pass system which has had many problems in the past 30 years. Single pass depends on identifying and quantifying enhanced value of fractionated products. Good approach but needs to be developed further.
- Need better definition of what a “pioneer Plus” system with existing technology can do. It is not accurately characterized.
- Too much emphasis on ¼ minus particle size and densification. This needs to be thoroughly reviewed by those of us in industry who have years of experience working on this. Cost and energy are critical showstoppers unless added value can be clearly identified.
- Potential of single pass to produce higher value co-products should also be identified.
- The key success factor is the high quality of both research design and execution. I see no showstoppers to the research and engineering, although the targets themselves are daunting.
- “To take what we should take and leave what we should leave” is an exemplary mantra. KEEP THIS! YOU ARE ON-TARGET!

Question 5: Proposed Future Research Approach and Relevance

- Baseline data will be invaluable. Needs to include corn harvest in central Corn Belt where field drying may be slower than in Kansas and Nebraska.
- Field test – good idea but not large enough. Need 25,000 bales per feedstock with different technologies used for baling (hydraulic vs. mechanical balers).
- Realign work plan to spend more time on aspects with good potential such as single pass and fractionation.
- Excellent plans to proceed.
- Looking at socio-economic factors is essential.
- Your Sustainability Index flowchart is terrific. Keep at it. This is, admittedly, VERY difficult. However, I APPLAUD YOUR EFFORTS. “Hang in there,” as this will take both time and money. However, THIS IS ESSENTIAL TO THE SUCCESS OF THE OVERALL EFFORT.

Additional Comments

Strengths

- Systems approach is good. Good basic information gathered as first step.
- Excellent engineering and cost analysis and a broad ranging focus.
- The depth of breadth of the PROPOSED analyses (this project is just getting under way) is startling. However, the discussion by the presenter showed an unusually broad knowledge of the subject. This is a winner! Keep this effort going!

Weaknesses

- Densification characterization is very weak. There is more to science and technology that realized. Major changes have been made to the engineering and process of densification in the last 10 years. Many field trial shave been made for using densification as an intermediate product.
- Pioneer systems are not adequately characterized. Actual densities and capabilities are higher 14 lb/ft3 and reliability. Apply to harvesters and balers. Specific energy consumption 50 kWh/ton.
- Relate fractionation to specifications from platforms. Some platforms (thermochemical) do not need ¼ minus from the field.
- Need to move further in understanding and experience from existing industry. There are hundreds of mechanical and agricultural engineers who could contribute to this topic in both private and public organizations. Need to engage existing industry more.
- None evident.
- The emphasis on a "sustainability index" could be superficial. I'd like to reserved judgment until another year.

Technology Transfer/Collaborations

- This will be high because of the high quality of the work and its impact on all residue biomass projects.
- Industry collaboration is ABSOLUTELY ESSENTIAL to this projects success. However, to this point…it seems fairly low.

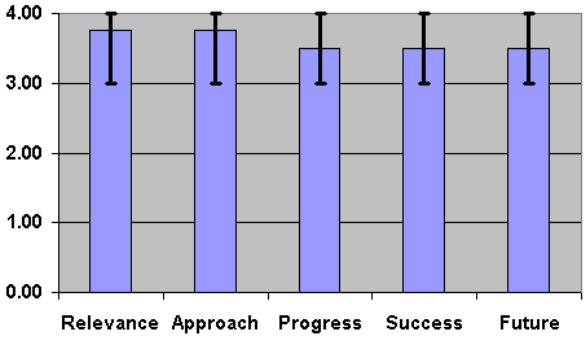
Recommendations for Additions/Deletions to Project Scope

- Get together with existing engineering and industrial experience.
- Feedstock needs to be reliable and of good quality. Feedstock quality starts at harvest with harvest decisions made by harvester. Develop systems that take need for decisions away from harvester/baler etc.
- Ensure that denitrification is included at some point in analyzing nutrient and sustainability issues: this will affect the grower payment.

Project Title: Preprocessing

Principal Investigator: Chris Wright, Idaho National Laboratory

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	3.75	0.75	0.25
Approach	3.75	0.75	0.25
Progress	3.50	0.50	0.50
Success Factors	3.50	0.50	0.50
Future Plans	3.50	0.50	0.50
Average	**3.60**		



Question 1: Relevance to Overall Objectives

- Seems tightly tied to dry straw process. Need to make it as broadly applicable as possible. Is there a possible collaborator like Diamond Z somewhere in the corn belt?
- Well-prepared and focused project plan.
- The high quality of the work and the fact that cellulosic ethanol plants will require processed biomass ensures the relevance of this work. Note that if combustion or gasification applications become of interest in the future the size requirements for biomass will be different. Given the current focus on ethanol, the work is well designed.
- Admittedly, preprocessing is another essential element in the "system" of feedstock and conversion processes.

Question 2: Approach to Performing the R&D

- Good that you are working with Al Womack. The $6 per ton goal needs to have a good definition of what is being done in the process (input size, output size, etc.) or you may not be making valid comparisons.
- Good overall organization. Thoughtful consideration of problems and aspects of preprocessing. This step should identify critical costs and alternatives of preprocessing.
- Good broad thinking. One caution I have is to recognize that storage may occur more than once in a chain, e.g. a farmer, might store bales on farm and take them to a depot at a flexible time; the depot might then process it and store the biomass in a different form. The general concept that packaging and then undoing to repackage is uneconomic is a good observation, but one needs to be careful not to over apply this.

Question 3: Technical Accomplishments and Progress

- Grinding and compression studies have added to a better understanding of these processes. The test plan will expand this to other materials.
- Overall aspects of problem have been identified and some preliminary work has been done. Much more work should be done on alternative methods of sizing, densification and fractionation.
- Very good results to date based on good thorough research.
- Excellent analysis in terms of both depth and breadth.
- The detail in looking at particle size, etc. is excellent.

Question 4: Success Factors and Showstoppers

- Cost targets, both in money and energy, are important.
- Good basics to move forward. Need better integration with existing industry. Too dependent on mobile tub grinder as processing unit. Need to consider that preprocessing will probably be in stationary setting connected to storage.

- Results to date are outstanding and are the basis of future work.
- No showstoppers are evident in the research, although the targets themselves are daunting.
- Again, this is not “showy” stuff – but the analyses are essential to the success of the overall program.
- Looking at density, particle size, etc. – as related to compression and etc. – are key factors.
- The radiography studies were intriguing.
- The varietal difference data from the laser ultrasonic analyses are extremely interesting.

Question 5: Proposed Future Research Approach and Relevance

- Good plan.
- Not clear what resources will be used to move forward or how project will integrate and benefit from experience in wood and fiber technology, grinder manufacturers and engineering, etc. Need clear definition of the range of specifications of conversion platforms.
- Plans for future research are appropriate and build on past work.
- It appears that the radiography, spectroscopy (UV), laser, and other particle analyses are proposed, rather than complete. The explanation is a little fuzzy. I am assuming this is because this research is proposed rather than done.

Additional Comments

Strengths

- Good approach.
- Good basic background work.
- Excellent engineering and cost analysis supporting a broad approach to a key problem.
- The 3 analytical techniques may not be all inclusive – but they are intriguing and logical extensions of the technology.

Weaknesses

- Need further development of grinding. Include shear shredding (SSI) as a process. Consider and contact existing grinder manufacturers. Send them materials and pay for them to grind to your specifications. (E.g. Chariton valley Biomass Project). Many engineering decisions used in grinder design have not been considered in this study.
- Too much reliance on ”deployable uniform feedstock”. Feedstock for our fuel and fiber industries takes on many characteristics and specifications. Objective should be the most economic and energy efficient form on just a uniform form.
- Design and testing of mobile or field equipment has many challenges that are not identified in these studies.

Technology Transfer/Collaborations

- The high quality of the work and the fact that all lignocellulosic ethanol plants will require pretreated material insure that this work will be used by many.

Recommendations for Additions/Deletions to Project Scope

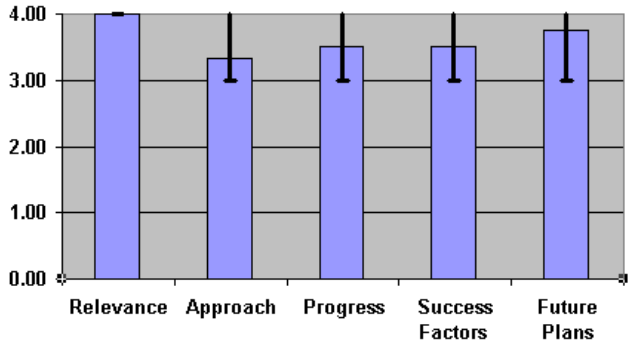
- Improve grinder engineering.
- Better definition of feed and final product qualities.
- Contact and better integration with existing industry in grinding, densification and field equipment.

- Why hasn’t the modular big bale system used successfully for more than 1 million tons of straw per year in Europe (and panned for Chariton Valley) not been included in preprocessing or handling options?
- I see no need for changes to the research scope.

Project Title: Storage & Queuing

Principal Investigator: Corey Radtke, Idaho National Laboratory

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	4.00	0.00	0.00
Approach	3.33	0.33	0.67
Progress	3.50	0.50	0.50
Success Factors	3.50	0.50	0.50
Future Plans	3.75	0.75	0.25
Average	**3.62**		



Question 1: Relevance to Overall Objectives

- There is no question that this is an essential element of designing a sustainable system.
- Given that almost all biomass is seasonal, work on storage is highly relevant to virtually all biomass processors. The very high quality of the work ensures its usefulness and relevance.
- Critical part of process. Clearly focused.
- Storage is an integral part of the overall system. The possibility of preprocessing biomass in storage may offset some storage costs.

Question 2: Approach to Performing the R&D

- "Needs revolution not evolution" is an interesting comment regarding this area of analysis.
- These analyses seemed in-depth, as well.
- Very good systematic analysis. The recognition of where a revolution rather than evolution is required is a good contribution. Investigation of cost is systematic. In general this is a very well designed project.
- Good integration of broad knowledge in moisture etc. Main challenges appear to be clearly identified.
- Wet storage is clearly a challenge.
- Creative. I'm sure the list of possibilities is very large. Keep other possibilities open.

Question 3: Technical Accomplishments and Progress

- The depth and breadth of the analyses were impressive.
- Excellent results to date. An example of this is the systematic analysis of the current cost of drying.
- Good outline of options.
- Storage and water activity.
- Equipment bids basis.
- Good concepts and principles.
- Can ethanol generated in storage be recovered by the processes currently considered? If not, does ethanol act as a sufficiently good preservative to justify the loss of soluble sugars?

Question 4: Success Factors and Showstoppers

- This isn't a flashy topic, but the analyses seemed to be "spot on."
- There are no show stoppers as regards the project. The success factor is the rigorous and thoughtful approach.
- Good progress
- Need to extend storage characterization across regions and conditions.

- Cost will be main showstopper.
- An industrial plant needs reliable quality.
- To what degree can drying/preprocessing be integrated with storage to add value to fractionated product?
- This wasn't clearly called out.

Question 5: Proposed Future Research Approach and Relevance

- The recommended areas of future research seemed logical.
- However, I could have used some more detail. Three bullets seems a bit low to me.
- This is a work in progress, and plans for future research are appropriate.
- Very impressive approach. It is clear that it is in early stages of development.
- Identified a number of potential issues to look at.

Additional Comments

Strengths

- The depth and breadth of research was very impressive.
- Solid analyses.
- I appreciated seeing the publications at the end. This shows a serious commitment.
- Solid high quality technical and cost analysis in a well focused program.
- Good basic approach and information.
- Good identification of potential value added in storage as preprocessing (ethanol). There should be other values that can be obtained.
- Good focus on water soluble carbohydrates.

Weaknesses

- This was a robust, in-depth study. I did not see any specific weaknesses.
- Not quite as stimulating as other presentations.
- No weaknesses are evident.
- Density is a delusion. Densification can be more costly (energy and labor) than benefits. Identify practical density ranges and potential target ranges.
- Need to identify role of leaf fraction in degradation of products during storage. Leaves have highest inorganic and nutrient content and most fragile structure. Should leaves of stover etc. be separated, processed and stored separately?
- How is storage different for thermochemical platform? Still needs to be dry and consistent.
- How do storage methods compare for allowing processor to manage inventory feedstocks of different quality? Bales can be handled in dense blocks of 3 tons or more at rates of 120 tph with a squeeze. How do you shift inventory with ground material?

Technology Transfer/Collaborations

- This area was unclear.
- The high quality and comprehensive nature of this project ensures its usefulness to others.

Recommendations for Additions/Deletions to Project Scope

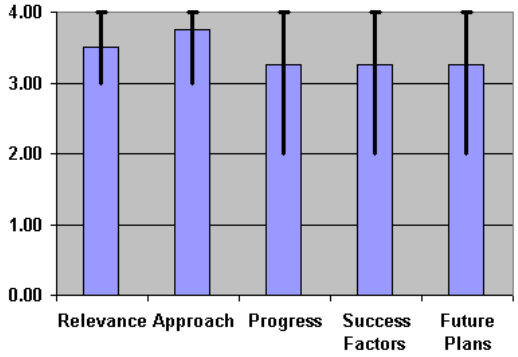
- The scope of the research is appropriate as designed and no additions or deletions are evident to me.
- Add/identify specific health impacts of moisture in storage and processing. We found some people have strong allergies or reaction to bacteria. This is well known in composting science.

- Define characteristics of stored material that are important to specific platforms – sugars, solubility, degradation, dry matter. What other preprocessing steps can be integrated with storage?
- Identify protocol for storage testing for wet or dry feedstocks.
- Provide interactive information for comment and co-development by industry.
- What process plant effluents (CO_2) can be used to offset storage risks (fire, explosion) from ground material?

Project Title: Handling & Transport

Principal Investigator: Judy Partin, Idaho National Laboratory

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	3.50	0.50	0.50
Approach	3.75	0.75	0.25
Progress	3.25	1.25	0.75
Success Factors	3.25	1.25	0.75
Future Plans	3.25	1.25	0.75
Average	**3.40**		



Question 1: Relevance to Overall Objectives

- Good problem statement. Fibrous materials are a major challenge.
- Again, there is no argument that this is a significant area in the critical path analysis of the harvesting to reactor continuum.
- Good preliminary testing of basic properties of materials.
- Because all biomass will be transported, the relevance of this work is high, which is aided by the rigor with which the project is designed and executed.

Question 2: Approach to Performing the R&D

- Good plan to obtain fundamental data needed to design handling systems. I don't expect the Johansen property measurements to provide all the information needed. They did not do much work on fibrous materials. You will need to develop your own measurements, and test apparatus size will be important.
- Use of Johansen indices and Instron are true "state of the art" measurements. You clearly did your homework.
- It's not clear where this research is headed. It appears to be pretty academic. Results need to be compared with real world experience in bin flow and hopper flow and densification.
- One outstanding element of this project is the use of the formalism of Johanson in analyzing flow properties in bins. One consequence of this is the recognition of the interaction of particle size and material flowability.
- Analysis of the rheological properties of biomass slurries will require expertise in characterizing viscosity; the object is a characterization of viscosity as a function of shear rate.

Question 3: Technical Accomplishments and Progress

- Initial tests are a good start, but this is a big project. Some data from the development of silage handling equipment might be available in the literature, particularly at the USDA Dairy Forage Research Center in Madison, WI.
- Capsule method is intriguing. Clearly, you have thought of most of the options.
- I was very impressed, again, with the breadth and depth of knowledge of the presenter…the science was dead-on as well.
- Fills basic data need.
- Results to date from the characterization of switchgrass and wheat straw are excellent.

Question 4: Success Factors and Showstoppers

- Our current approach to handling difficult materials is to increase the size of the handling machinery. That approach is too expensive. The industry will need to work smarter, not larger, to solve this one. Some experience is already available, like the Chariton Valley boiler fuel handling system, and many others, and should be brought to bear on this problem.
- Clearly, the deep extent of the testing is going to smooth many bumps in the road ahead.
- Good characterization. Needs to align with industry experience in handling these materials. They don't flow. How will INL contribution help to break the bottleneck to prevent know problems with fibers? Speculations presented about flow not convincing.
- Cost needs to be added to the analysis of pneumatic conveying, the sooner the better. Given the quality of analysis in this study, in both engineering and cost analysis, the prospects of success are high. I see no show stoppers.

Question 5: Proposed Future Research Approach and Relevance

- Good plan for future work. Need to work with companies with conveying experience.
- I was very impressed with the detailed list of work to be done.
- This was one of the best projects in totally describing what has been done vs. what is yet to be done.
- Need better definition of outcomes of this research. What is it leading to? Best possible expected outcome is improved bin hopped design for loading and unloading material. How does it compare with existing systems? Not convinced that there ahs been good communication with existing suppliers and designers of storage and handling systems.
- Good plans for research that builds on past work.

Additional Comments

Strengths

- Use of STANDARD processes and tests (INSTRON, JOHANSON INDICES, etc.) shows a clear understand of the science and engineering limits of flow theory.
- Fills basic information on properties.
- Very high quality of engineering and cost analysis in a broad search of the issues.

Weaknesses

- None identified.
- What risks does this effort address?
- Question what bottleneck breaking potential of extensive testing.
- Need to relate properties to morphology of materials. This will explain results found in lab tests.
- Results likely to be overly academic.
- Need to relate lab tests to full scale operation. There are many examples in industry.
- None evident; early cost analysis of pneumatic conveying may identify length limitations.

Technology Transfer/Collaborations

- Work will be useful to most projects.

Recommendations for Additions/Deletions to Project Scope

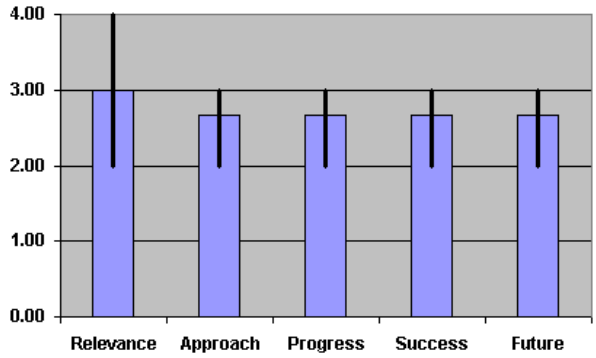
- Need more interaction with industry and to better define pioneer situation of existing industry.

Feedstock Systems Integration Projects

Project Title: Supply Systems Logistics

Principal Investigator: Shahab Sokansanj, Oak Ridge National Laboratory

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	3.00	1.00	1.00
Approach	2.67	0.67	0.33
Progress	2.67	0.67	0.33
Success Factors	2.67	0.67	0.33
Future Plans	2.67	0.67	0.33
Average	**2.73**		



Question 1: Relevance to Overall Objectives

- I have a difficult time seeing a direct positive project link for IBSAL.
- Engineering tool.
- Good presentation of engineering tool and potential uses. This relevance of the tool is the ability to model processes.
- If this work succeeds it will have a high relevance in that it can predict many factors important to biomass. Its relevance will depend critically on the accuracy of the overall model.
- Provides the opportunity to optimize logistics systems using existing equipment, as well as concepts that do not yet exist.

Question 2: Approach to Performing the R&D.

- Integrating biomass supply into corn-ethanol production? Why? Isn't the most efficient method going to be cellulosic?
- Takes into account variability in feedstocks and processes. Continuous model validation will be important.
- A good feature of this work is the recognition of the multiple options in moving biomass from field to plant, for example on farm storage, depot storage or direct transport to the plant for storage.
- Good combination of modeling supported by experimentation to supply missing data. List of risks shows good thinking. Good level of cooperation with other researchers. Expansion beyond local collection point is good. Linkage to ASPEN is under way.

Question 3: Technical Accomplishments and Progress

- Certainly, models can be an excellent way to analyze a system. However, they are much better to show what elements are the most critical and do sensitivity analyses for each variable. IBSAL may or may not be a realistic simulation scheme. We would need to see more, or have some independent scientific validation.
- Model exploration and verification.
- Basic components identified.
- What showstoppers or opportunities has IBSAL identified for high production feedstock.
- Preliminary results quantify case for biomass.
- Model use in existing plants.
- This project has led to the quantification of a number of elements of the biomass chain.
- Good work in building the model and getting the data needed to use it. Need to find or generate data to replace any assumptions that had to be made.

Question 4: Success Factors and Showstoppers

- None seen.
- Validation?
- Optimization results.
- Success at quantifying risks?
- Biggest success factor is ability to identify showstoppers in processes.
- Demonstration of shear shredding is good. That is used in our export forage industry.
- The results of any complex model need to be verified on an ongoing basis against actual data. I think that it is important in the future for reports on IBSAL to discuss ongoing verification efforts. This is a key success factor that appears to be well recognized by the principal investigator.
- Models need to be continuously validated, due to changes in crop properties from plant breeding and in agricultural practices due to increasing farm size and machine productivity.

Question 5: Proposed Future Research Approach and Relevance

- The use of IBSAL with GIS is problematic, at best.
- Focus of this particular task?? Integrated process modeling?
- Who is using model and interfacing validation etc. Can it be distributed to use it for its advantage?
- Continuous verification?
- This is a work that is underway; future planned work builds on past results.
- Future extension to the fuel distribution system will make this into a huge model. Need to balance the benefit of this extension against the cost. Should work with equipment manufacturers to validate the performance of existing machines and to encourage their participation in future model development and application.

Additional Comments

Strengths

- I did appreciate the extensive list of refereed publications.
- System approach.
- Flexible model.
- Integration of fuel distribution.
- Quantification of any process step forces a deeper understanding of that step, hence this kind of research increases insight into unit operations.
- The overall model will be very useful if verified and validated.

Weaknesses

- “To date, it has been modeler to modeler…” The next step is taking it further. THIS IS A MISTAKE. Others should have been involved, up front. Complex models need intense criticism and verification. INDEPENDENT VERIFICATION HAS NOT BEEN DONE, YET. Whoa! This is a weakness. I am not convinced that IBSAL is a robust model. (Admittedly, I would need more data than was given here.).
- Need industry interaction for densification work. There is more science and engineering in existing industry than is reflected in presentation.
- The potential weakness is that the model will mislead unless accurate. It is too early to tell.

Technology Transfer/Collaborations

- A good job has been done in collecting other information. However, the independent verification is late, at best.
- Continuous verification.
- The model will have high use when completed: it is ASPEN for biomass.

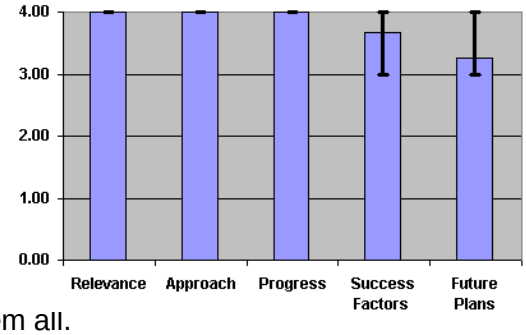
Recommendations for Additions/Deletions to Project Scope

- Better definition of specifically who can use the model.
- Continuous verification? Dept of Defense. Validation and Verification.
- Be more explicit in future presentations on efforts to verify and validate.

Project Title: Feedstock Supply System Design Report

Principal Investigator: Richard Hess, Idaho National Laboratory

Project	Average Score	Delta Minimum	Delta Maximum
Relevance	4.00	0.00	0.00
Approach	4.00	0.00	0.00
Progress	4.00	0.00	0.00
Success Factors	3.67	0.67	0.33
Future Plans	3.25	0.25	0.75
Average	**3.78**		



Question 1: Relevance to Overall Objectives

- Critical to the overall program, since it feeds them all.
- Without question, the logistics are an essential element of a successful system…end of story!
- Very well focused overall approach.
- The vision of a commodity industry supplying feedstock is highly relevant to the emergence of a viable processing industry. The high quality of this work makes it highly relevant.

Question 2: Approach to Performing the R&D.

- Well thought out, but do we know enough about processes to say that all reactor throats look alike? A uniform feedstock specification may not be optimum for all processes.
- Design and data gathering appear to be relevant and "real." These are not 'fudged" data – but real life examples.
- OBVIOUSLY, Richard is an effective team leader, as everyone in his group gave the very highest rated presentations. This speaks very well to both Richard's leadership and to the capabilities of his team.
- Defined goal- two tier wet dry bulk.
- Preprocessing – good attack.
- Emphasis on "uniform format feedstock" maybe big limitation. Should allow more flexible identification of forms of feedstock.
- Systematic and well grounded in both engineering and cost analysis.

Question 3: Technical Accomplishments and Progress

- Very thoughtful analysis of system alternatives.
- "Pioneer design" is obvious realistic.
- A VERY comprehensive approach. I appreciate it when someone says: "We are counting all the costs – we are not "cheating the system" by charging zero labor for the owner, etc.
- Detail of approach, down to dust control and regulations, is amazingly thorough. Fire code, etc. could shut down an operation. THIS DETAIL OF ANALYSIS WAS VERY, VERY impressive!
- Someone really did their homework here! For example, as you push processing upstream, your efficiencies go down. You also go from electrical to diesel.
- Good preliminary investigation and successful approach.
- Should include measures of specific energy efficiency and specific conversion platform needs and specifications. Note they are different for bio and thermo conversion.
- The noteworthy components, as mentioned above, are the engineering coupled with cost analysis.

Question 4: Success Factors and Showstoppers

- Uniform concept may be in conflict with some unique requirements of some processes.
- Again, the detail of analysis was very impressive. Understandably, moving water is expensive. Any way to remove it at the source keeps the costs low. The detail here is impressive, as well.
- Analysis that shows the key is a "commodity-driven" system is an extremely critical finding.
- Recognition of factors.
- Organization of variables, challenges etc. good identification of challenges.
- The progress to date is impressive, and no showstoppers are evident.

Question 5: Proposed Future Research Approach and Relevance

- I couldn't really zero-in on what is left to do. Is it all done?
- In general very good. Caution use of uniform format feedstock as goal and expectations for it. Spend more time defining specifications of platforms and comparing with actual use of materials with similar specifications in industry. Not just 932 projects.
- Future objectives and plans to realize them are sound.

Additional Comments

Strengths

- Again, the detail of analysis was very impressive.
- This was absolutely amazing in that it looked, not only at costs and efficiencies, but "permitting," as well.
- OBVIOUSLY, Richard is a very effective TEAM LEADER, as EVERYONE in his group presented the very highest rated presentations. This speaks very well to both Richard's leadership and to the capabilities of his team.
- Good overall approach.
- Good definition of 425/ton as target on cost curve.
- Solid technical and cost analysis to achieve a vision of a commodity feedstock.

Weaknesses

- Need better definition of range of forms feedstocks can be accepted by conversion platforms. The ¼ inch "flowable" feedstock sounds like a researchers dream not a practical process engineers plan.
- Need more complete industry review to guide project.
- Define use of DGS as feedstock.
- Should emphasize or use measure of reliability of delivery as measure of process suitability. There will be tradeoffs to get reliability. These will cost money.
- Need to consider site specific aspects or localization effects.
- Need to recognize and define limits of grain analogy.
- Wood seems to be largely ignored in this approach.
- Need to better define role of potential commercial organization s in process. Harvesters and balers don't have funds for capital required.
- How do you ensure feedstock quality? That's the biggest issue in 40 million tons of forage harvesting and much more in wood fiber harvesting.
- Where is sustainability? How does overall processing system help sustainability? Identify what nutrients or other elements are lost or could be returned at stages in the system.
- None evident to me.

Technology Transfer/Collaborations

- I think it would be well to see more of the linkages. I feel that they were there, or the detailed data could not be developed, yet I didn't see it.
- The high quality of this work and the broad vision guiding the work will make it highly relevant to most/all future users of biomass.

Recommendations for Additions/Deletions to Project Scope

- Advanced pioneer processing to challenge existing suppliers.
- Building organization infrastructure through existing products and projects. This effort should be educating the engineers who will build the next generation feedstocks systems.
- Price targets are good for driving progress, but at some point need to be treated with caution: a highly efficient processing plant will be able to use more expensive feedstock. In Finland efficient users of woody biomass can outbid inefficient plants, which translate to being willing to transport biomass over a longer distance.
- Recognize that if two or three "commodity" biomass systems emerge, this may reflect economic reality. The oil industry has gravitated to two or more "commodity" crude oils: heavy crudes vs. standard crudes; this isn't a failure for the oil industry; it is an outcome that maximizes efficient processing.

APPENDIX A

Agenda

Day One – Tuesday, August 21, 2007

Evening Opening Reception (tentative)		
7:00	Wine & Cheese Reception	*All participants*
7:30	Overview of Reviewer Instructions	*Kevin Craig, Golden Field Office, Session Moderator & Reviewers Only*

Day Two – Wednesday, August 22, 2007

Introduction		
8:00	Welcome & Program Overview	*John Ferrell, OBP*
8:30	Portfolio Overview	*Sam Tagore, OBP*
9:00	Feedstock Platform Future Directions (MYPP)	*Cindy Riley, NREL*
9:30	USDA Overview	*Bob Fireovid & Bryce Stokes, USDA*
10:00	Q&A	*Introduction Presenters*
10:30	Break	
Feedstock Platform Portfolio – Feedstock Supply & Sustainability		
10:45	Area Overview	*Kevin Craig, Golden Field Office, Session Moderator*
11:30	Biomass Resource Supply Analysis - 30 mins presentation - 15 mins Q&A/Reviewer Reflection	*Bob Perlack, ORNL*
12:15	GIS-based Biomass Resource Sustainability Analysis - 30 mins presentation - 15 mins Q&A/Reviewer Reflection	*Tris West, ORNL*
1:00	Lunch	
2:00	Regional Biomass Energy Feedstock Partnerships - 30 mins presentation - 15 mins Q&A/Reviewer Reflection	*Terry Nipp, National Sun Grant Initiative & Kevin Kephart, South Dakota State Jim Doolittle, South Dakota State*
2:45	Other Feedstock Production Projects - Mississippi State University Sustainable Energy Center (30 mins total) - The University of Tennessee Switchgrass Demonstration Project (30 mins total)	*Bill Batchelor, MSU & Burton English, University of Tennessee*
3:45	Break	
4:00	Other Feedstock Projects - Alternative Fuel Source Study (30 mins total) - Jefferson County Bio-energy Initiative (not present) - Laurentian Bio-Energy Project (not present)	*Ralph Zee, Auburn University; Wade Yates, Jefferson County; & Gary Cerkvenik, Laurentian Energy Authority*
5:30	End of Day Wrap-up & Adjourn	*John Ferrell, OBP*
6:30	Review Committee Evening Work Session	*Review Committee*

Day Three – Thursday, August 23, 2007

Introduction		
8:00	Welcome & Day One Overview	*John Ferrell, OBP*
Feedstock Platform Portfolio – Feedstock Logistics Core R&D		
8:15	Area Overview	*Kevin Craig, Golden Field Office, Session Moderator*
9:35	Harvest & Collection - 30 mins presentation - 15 mins Q&A/Reviewer Reflection	*Kevin Kenney, INL*
10:20	Preprocessing - 30 mins presentation - 15 mins Q&A/Reviewer Reflection	*Chris Wright, INL*
11:05	Break	
11:15	Development of Engineering Data for Feedstock Supply Operations - 20 mins presentation - 10 mins Q&A/Reviewer Reflection	*Shahab Sokansanj, ORNL*
11:45	Storage & Queuing - 30 mins presentation - 15 mins Q&A/Reviewer Reflection	*Corey Radtke, INL*
12:30	Lunch	
1:30	Handling & Transport - 30 mins presentation - 15 mins Q&A/Reviewer Reflection	*Judy Partin, INL*
Feedstock Platform Portfolio – Feedstock Systems Integration		
2:15	Area Overview	*Kevin Craig, Golden Field Office, Session Moderator*
2:35	Supply Systems Logistics - 30 mins presentation - 15 mins Q&A/Reviewer Reflection	*Shahab Sokansanj, ORNL*
3:20	Design Report - 30 mins presentation - 15 mins Q&A/Reviewer Reflection	*Richard Hess, INL*
4:05	Break & Review Committee Caucus	*Review Committee*
5:00	Review Committee Summary Report	*Lyle Stephens, Lead Reviewer*
5:45	Feedstock Review Wrap-up & Adjourn	*John Ferrell, OBP*

APPENDIX B

Conflict of Interest Form

DOE Conflict-of-Interest Policy and Agreement

(Please forward this form, along with your Curricula Vita, to the DOE Review Leader – Sam Tagore

Please copy Laura Neal (Laura.Neal@ee.doe.gov)

You have been invited to serve as a Reviewer for the DOE Biochemical Platform Review. Your participation in this review is greatly appreciated. However, it is possible that your personal affiliations and involvement in certain activities could pose a conflict of interest or create the appearance that you lack impartiality in your evaluations and recommendations for this review. In order to assess if you have a real or perceived conflict of interest in regard to the program/projects that will be evaluated in this review, please complete the information below. This information will be reviewed by the review leader in order to identify potential conflicts of interest.

SECTION 1: AFFILIATIONS, ACTIVITIES AND PROGRAM INVOLVEMENT

At the end of this section you will be asked to identify those specific projects or areas on the agenda where a conflict or appearance of conflict could exist and briefly explain the nature of that conflict. A conflict does not exclude you from serving as a reviewer. However the review leader may call you for more information.

Affiliations or activities that could potentially lead to conflicts of interest may include:

a) work or known future work for parties that could be affected by your judgments on projects that you have been asked to review;

b) your personal benefit (or benefit of your employer, spouse or dependent child) from the developments of the program/projects you have been asked to review;

c) any previous involvement you have had with the program/projects you have been asked to review;

d) any financial interest held by you (or your employer, spouse or dependent child) that could be affected by your participation in this matter; and

e) any financial relationship you have or have had with DOE such as research grants or cooperative agreements.

Personal involvement with the research program or with other DOE program areas:

	Yes	**No**
I previously was involved in research funded by this program/project	_____	_____
I am currently funded through a DOE program, or in some way might be seen as involved in work competing with this program/project	_____	_____
I reviewed this program/project previously.	_____	_____
I am a former professor, student, or co-worker of a Principal Investigator	_____	_____
I previously collaborated with the Principal Investigator in	_____	_____

a research activity in program/project area.

Technical Area or Project on Review Agenda	Nature of conflict of interest (Leave blank if none)

SECTION 2: CONFLICT OF INTEREST AGREEMENT

CONFLICT OF INTEREST AGREEMENT

This agreement must be completed by individuals prior to their participation in DOE peer reviews. Please contact the DOE Review Leader – Sam Tagore (202-586-9210) if you want to discuss any potential conflict of interest disclosure issues.

I have reviewed the information contained on this form and to the best of my knowledge I have disclosed any actual or potential conflicts of interest that I may have in regard to the program/projects that I have been invited to evaluate. In addition, prior to my participation as a reviewer, I agree to disclose any actual or perceived conflicts of interest as soon as I am aware of the conflict.

_____ _____

Signature Date

_____

Printed Name

APPENDIX C

Reviewer Evaluation Form

Project Evaluation Form

Session: [2] [3] [4] **Reviewer Name**: _____

Title of Project: _____

Presenter Name: _____

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

Proposed Stage Placement (Circle One)**: A B 2 3 4 NA**

Reviewer Recommended Stage (Circle One)**: A B 2 3 4 NA**

Comments on Stage Placement: _____

_____

Using the following criteria, rate the work presented in the context of the program objectives and provide **specific, concise** comments to support your evaluation.

Write/print **clearly** please

1. **Relevance** to overall objectives.

The degree to which 1) the project supports the goals and objectives of the DOE Biomass Program Multi-Year Technical Plan or the missions and objectives of USDA Programs, and 2) the market potential is attractive and customers are identified for project outputs.

4-Outstanding. The project is critical to and fully supports plan objectives. Customers/Markets are identified and critical.		Specific Comments
3-Good. Most aspects of the project align with the plan objectives. Customers/Markets are identified and important.		
2-Fair. The project partially supports the plan objectives. Customers/Markets are identified.		
1.-Poor. The project provides little support to the plan objectives. Customers/Markets not identified.		

2. **Approach** to performing the R&D.

The degree to which technical barriers are addressed, the project is well-designed, technically feasible, and integrated with other research. Also, it is clear why the approach is better than alternatives.

4-Outstanding. The project is sharply focused on one or more key technical barriers. Difficult for the approach to be improved significantly.		Specific Comments
3-Good. The approach is generally well thought out and effective but could be improved in a few areas. Most aspects of the project will contribute to progress in overcoming the barriers.		
2-Fair. Some aspects of the project may lead to progress in overcoming some barriers, but the approach has significant weaknesses.		
1.-Poor. The approach is not responsive to project objectives and unlikely to make significant contributions to overcoming the barriers.		

Project Evaluation Form

3. **Technical Accomplishments and Progress**

Toward overall project and DOE or USDA goals – the degree to which research progress is measured against performance indicators and to which the project elicits improved performance (effectiveness, efficiency, cost, and benefits).

4-Outstanding. The project has made excellent progress towards DOE goals and objectives and overcoming one or more key technical barriers. Progress to date suggests that the barrier(s) will be overcome.		Specific Comments
3-Good. The project has shown significant progress toward against DOE goals and objectives and to overcoming one or more technical barriers.		
2-Fair. The project has shown modest progress in overcoming barriers, and the rate of progress has been slow.		
1.-Poor. The project has demonstrated little or no progress towards its objectives or any barriers.		

4. **Success Factors and Showstoppers**

The degree to which the project has identified and addressed the most critical technical or business factors impacting or impeding achievement of the project goals. Factors include legal or regulatory issues that may be barriers to commercialization.

4-Outstanding. All critical success factors and showstoppers are identified and reasonable strategies developed to overcome showstoppers.		Specific Comments
3-Good. Most critical success factors and showstoppers are identified and possible strategies developed to overcome showstoppers.		
2-Fair. Some critical success factors and showstoppers are identified. Strategies to overcome showstoppers are very high level or not developed.		
1.-Poor. Little to no identification of critical success factors or showstoppers. Little to no recognition of relative importance or prioritization of activities.		

Project Evaluation Form

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

Stage Gate Criteria 7: Plan to Proceed

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, etc.

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

Provide Comments on Overall Strengths and Weaknesses

Strengths

Weaknesses

Technology Transfer/Collaborations - the degree to which the project interacts, interfaces, or coordinates with other institutions and projects, providing additional benefits to the Program.

Recommendations for Additions/Deletions to Project Scope