Report NP213 – November 2014

NP 213 Biorefining Panel Report

Michael A. Grusak, Scientific Quality Review Officer
(January 2014-December 2015)

12/29/2014
Date

Michael S. Strauss, Peer Review Program Coordinator

12/22/2014
Date

The Agricultural Research Service
is an agency of the Department of Agriculture's
Research, Education, and Economics mission area.

Introduction

This Panel Report is an overview and analysis of the 2014 National Program (NP) 213 Biorefining Panel Review. The project plans reviewed by these panels were applicable to the mission of the National Program to *"conduct research that enables new, commercially-viable technologies for the conversion of agricultural materials into fuels, value-added co-products, and biobased products."*

Candidates to chair each panel were recommended by the National Program Leader (NPL), Dr. Robert Fireovid, vetted by the Office of Scientific Quality Review (OSQR) and Dr. Michael A. Grusak, Scientific Quality Review Officer (SQRO) approved a Chair for two of the three panels. Panel 3 (Thermochemical) consisted of a single plan for which written reviews were solicited and a composite review prepared under Dr. Grusak's guidance (Table 1).

Table 1. Biorefining Panels with the date of the initial review meeting where all plans before the panel were discussed and rated, the number of panelists appointed to the panel, and the number of projects reviewed by each panel.

Panel	Panel Chair	Panel Meeting Date	Number of Panelists	Number of Projects Reviewed
Panel 1: Biochemical, Sugar/Starch	Dr. Sharon Shoemaker, Executive Director, California Institute of Food and Agricultural Research, University of California, Davis, CA	June 27, 2014	5	4
Panel 2: Biochemical, Cellulosic	Dr. David Thompson, Distinguished Staff Engineer, Idaho National Laboratory, Biological and Chemical Processing Department, Idaho Falls, ID	June 24, 2014	5	4
Panel 3 Thermochemical	Dr. Mike Grusak, SQRO	N/A	5	1

Panel Review Results

Following panel review, OSQR sends each Area Director a document that contains the consensus recommendations for each plan from their Area. This may include recommendations for revision of the plan to which researchers are required to respond in writing and, as appropriate, revise their written plans.

In addition, as part of their discussion panelists provide a judgment of the overall quality of the plan, expressed in terms of the degree of revision that may be required. This judgment is termed an "Action Class." Each reviewer is asked to provide an Action Class rating for each plan. OSQR assigns a *numerical equivalent* to each Action Class rating, and then averages these to arrive at an overall Action Class Score for the plan.

The Action Classes and their Numerical Equivalent are defined below.

Average Score 7.0-8.0 — **No Revision Required (Numerical Equivalent: 8).** An excellent plan: no revision is required, but minor changes to the project plan may be suggested.

Average Score 5.1-6.9 — **Minor Revision Required (Numerical Equivalent: 6).** The project plan is feasible as written, requires only minor clarification or revision to increase quality to a higher level.

Average Score 3.1 -5.0	**Moderate Revision Required (Numerical Equivalent: 4).** The project plan is basically feasible, but requires changes or revision to the work on one or more objectives, perhaps involving alteration of the experimental approaches in order to increase quality to a higher level and may need some rewriting for greater clarity.
Average Score 1.1-3.0	**Major Revision Required (Numerical Equivalent: 2).** There are significant flaws in the experimental design and/or approach or lack of clarity which hampers understanding. Significant revision is needed.
Average Score 0-1.0	**Not Feasible (Numerical Equivalent: 0).** The project plan, as presented, has major scientific or technical flaws. Deficiencies exist in experimental design, methods, presentation, or expertises which make it unlikely to succeed.

For plans receiving one of the first three Action Classes (No Revision, Minor Revision, or Moderate Revision) scientists respond in writing to panel comments in the consensus recommendation document, revise their project plan as appropriate, and submit the revised plan and responses to OSQR through their Area Office. These are reviewed by SQRO and, once he/she is satisfied that all review concerns have been satisfactorily addressed, the project plan is certified and may be implemented. *Certification is not guaranteed, but is contingent upon satisfactorily addressing panel comments and recommendations.* Plans have not "passed" review until receiving the Officer's certification.

When the Action Class is Major Revision or Not Feasible, responses and revised plans are provided as above, but must then be re-reviewed by the panel, which provides a second set of Consensus Recommendations and Action Class. If the re-review Action Class is No Revision, Minor Revision or Moderate Revision the project plan may be implemented after receipt of a satisfactory response and Officer certification as described above. Plans receiving Major Revision or Not Feasible scores at this point fail review (The Action Class and consensus comments are provided to the Area but there is no further option for revision). Such plans are terminated, reassigned, or restructured at the discretion of the Area and Office of National Programs. On occasion, it is elected not to further revise plans that have received a low score on initial review. In such cases these are treated as having not successfully completed (i.e., failed) review, they cannot be certified, and appropriate action becomes the responsibility of the NPL and Area leadership.

NP 213 Program Overview

At the end of each panel meeting, the reviewers are asked to provide general comments or recommendations on the process. In addition, Panel Chairs provide a written statement on the review process and research plans. Below is a summary of those comments for the NP 213 review.

The reviewers appreciated the enhanced view of USDA and felt they received a good education on ARS research and learned about the breadth of the ARS research in this area. The proposals were, in general, well thought out and larger than expected. It was noted, however that scientists tended to self-cite and occasionally neglected to mention important outside work.

Table 2 shows the percentage of initial and final scores for the third (2014) cycle plans. All the plans received an initial score of Moderate Revision or higher. In Table 3, which shows all three cycles (2004, 2009, 2014) of the Biorefining Panels, those in the first cycle (2004) similarly all received initial scores of Moderate Revision or better. In the second cycle (2009) three of 15 plans received scores of Major Revision but were rated higher on the second review. The first cycle had the highest initial and final score (5.66). The second cycle had the lowest initial score (4.61).

Table 2. Proportion of initial and final scores for the third (2014) cycle expressed as percentage of all reviewed and the average initial numerical score for the NP 213 Biorefining Panels. Note that for plans receiving No Revision, Minor Revision, or Moderate Revision, a second score is not received from the Panel so the initial score is recorded as the final score.

Third Cycle, 2014	**Initial Review**						**Final Review**					
	No Revision	**Minor Revision**	**Moderate Revision**	**Major Revision**	**Not Feasible**	**Avg Initial Score**	**No Revision**	**Minor Revision**	**Moderate Revision**	**Major Revision**	**Not Feasible**	**Avg Final Score**
Biochemical, Sugar/Starch (4)	25.0%	50.0%	25.0%	0.0%	0.0%	5.9	25.0%	50.0%	25.0%	0.0%	0.0%	5.9
Biochemical, Cellulosic (4)	0.0%	75.0%	25.0%	0.0%	0.0%	4.9	0.0%	75.0%	25.0%	0.0%	0.0%	4.9
Thermochemical (1)	0.0%	100.0%	0.0%	0.0%	0.0%	5.2	0.0%	100.0%	0.0%	0.0%	0.0%	5.2
NP 213, All	**8.3%**	**75.0%**	**16.7%**	**0.0%**	**0.0%**	**5.38**	**8.3%**	**75.0%**	**16.7%**	**0.0%**	**0.0%**	**5.38**

Table 3. Proportion of initial and final scores for all cycles expressed as percentage of all reviewed and the average initial numerical score for the NP 213 Biorefining Panels. See note above regarding No, Minor, and Moderate initial scores.

	Initial Review						**Final Review**					
	No Revision	**Minor Revision**	**Moderate Revision**	**Major Revision**	**Not Feasible**	**Avg Initial Score**	**No Revision**	**Minor Revision**	**Moderate Revision**	**Major Revision**	**Not Feasible**	**Avg Final Score**
First Cycle (10)	20.0%	50.0%	30.0%	0.0%	0.0%	5.66	20.0%	50.0%	30.0%	0.0%	0.0%	5.66
Second Cycle (15)	0.0%	46.7%	33.3%	20.0%	0.0%	4.61	13.3%	53.3%	33.3%	0.0%	0.0%	5.51
Third Cycle (9)	11.1%	66.7%	22.2%	0.0%	0.0%	5.38	11.1%	66.7%	22.0%	0.0%	0.0%	5.38

Figure 1 suggests that panels with a larger number of reviewers tend to give higher scores. The sample size for this comparison is, however, small. Figure 2 shows the data for all the plans reviewed to date in the third review cycle and suggests that, in fact, the number of reviewers has no influence on the initial score.

Figure 3 shows the distribution of Action Class scores for each of the three review cycles (2004, 2009, 2014). The second cycle had three plans receiving Major Revision on the initial review; however they received higher scores on second review as shown in Figure 4.

Figure 1. Influence of the number of reviewers (Panel Size) on the averaged numerical outcome (Score) received on the first review for the 34 plans in all cycles of the NP 213 Biorefining review. The low R^2 value suggests no influence of panel size on the review outcome. Note that some scores overlap so only 21 points are visible.

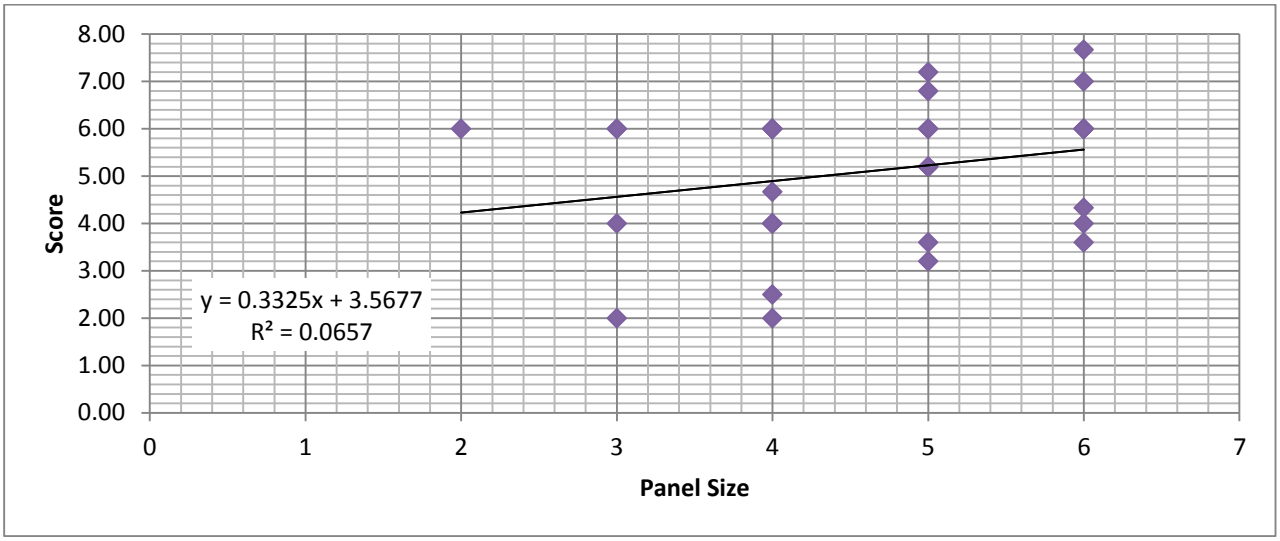


Figure 2. Similar to Figure 1 but data are for all plans reviewed by panels in the current review cycle, with individual reviewer scores plotted in the figure. The very low R^2 value indicates a lack of correlation for score and panel size.

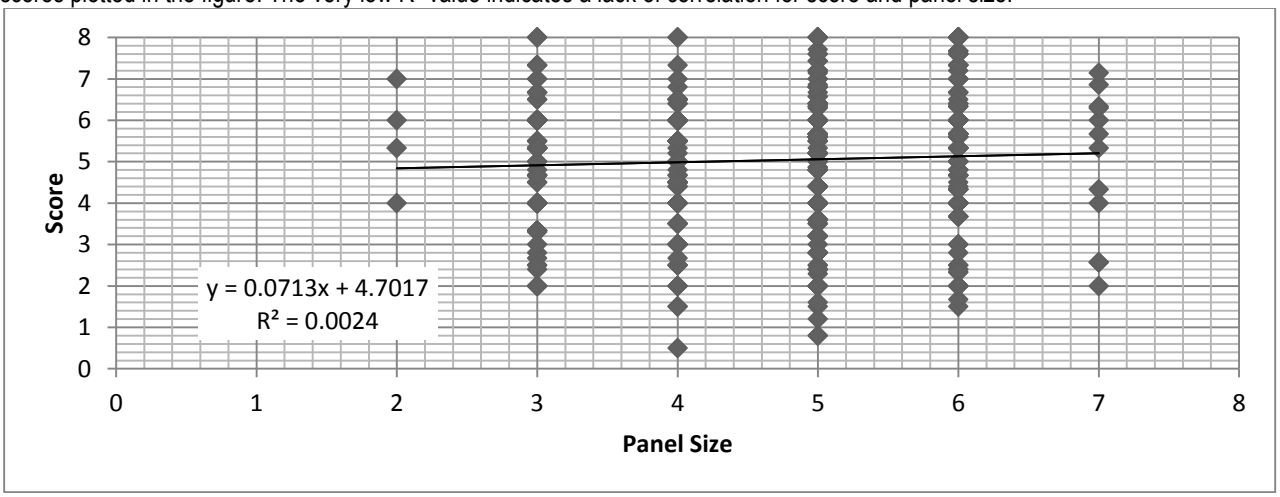


Figure 3. Percentage distribution of initial review scores for the first (2004), second (2009) and third (2014) cycles for the NP 213 Biorefining Panels (5.66; 4.61; 5.38, average composite scores, respectively). The number of plans reviewed by each cycle is in parentheses. Number over columns is the number of plans receiving that score.

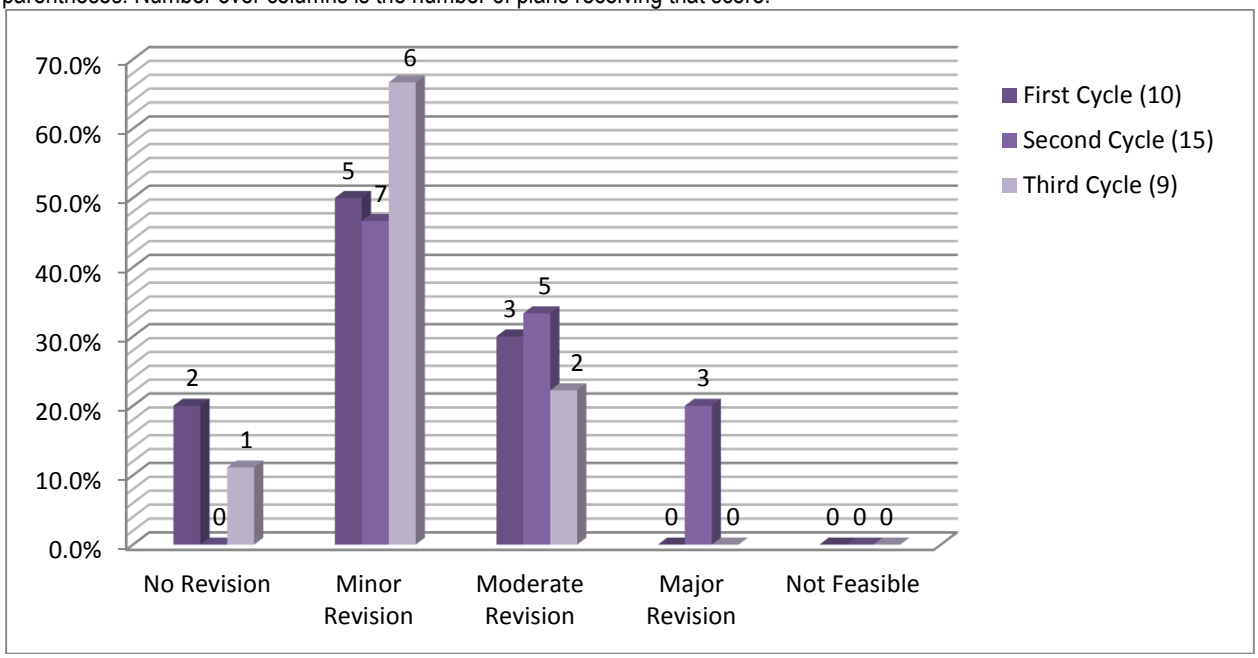
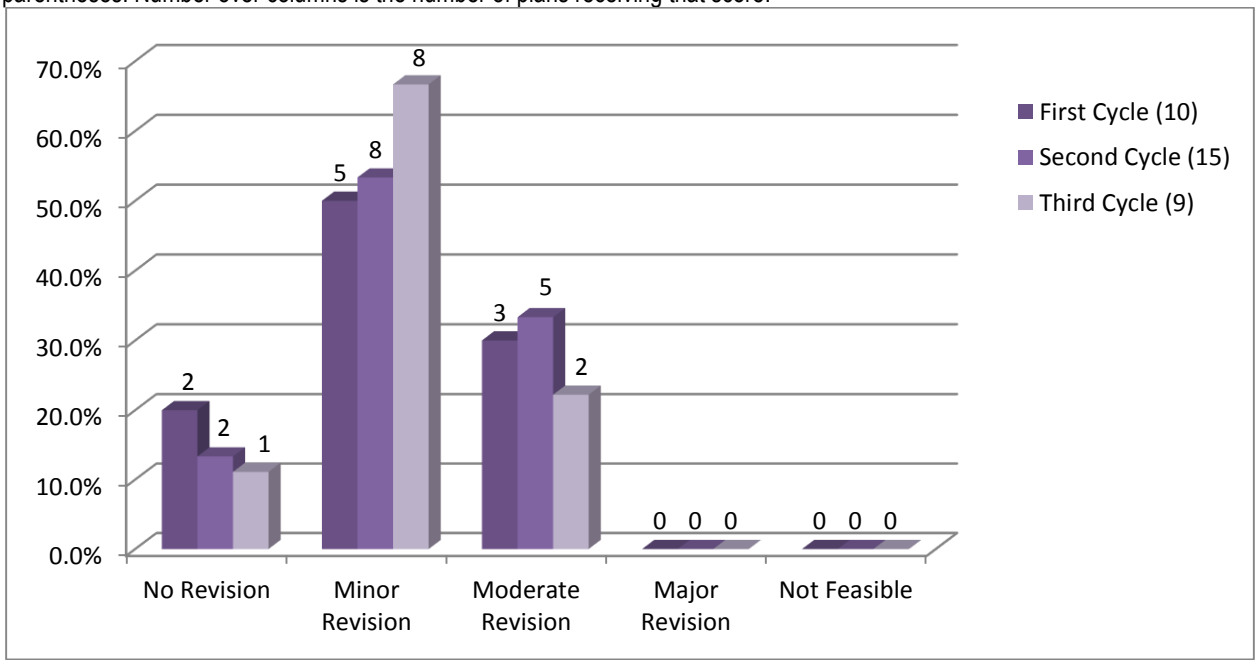


Figure 4. Percentage distribution of final review scores for the first (2004), second (2009) and third (2014) cycles for the NP 213 Biorefining Panels (5.66; 5.51; 5.38, average composite scores, respectively). The number of plans reviewed by each cycle is in parentheses. Number over columns is the number of plans receiving that score.



Panel Characteristics

ARS places responsibility for panel member selection primarily on external and independent Panel Chairs. ARS scientists, managers and the Office of National Programs may recommend panelists but the Panel Chair is under no obligation to use these recommendations. However, the SQRO does review and approve the Panel Chair's panel member selections and may ask for alterations or additions. Several factors such as qualifications, diversity, and availability play a role in who is selected for an ARS peer review panel. The three panels were composed of nationally and internationally recognized experts to review nine projects primarily coded to the Biorefining Program (see Table 1, page 2). The information and charts below provide key characteristics of the Biorefining Panels. This information should be read in conjunction with the Panel Chair Statements.

Affiliations

Peer reviewers are affiliated with several types of institutions, especially universities, but also special interest groups and industry. In some cases, peer reviewers have recently retired but are active as consultants, scientific editorial board members, and are members of professional societies. Table 4 shows the faculty rank of panelists affiliated with universities and the type of institutions with which the Biorefining Panel members were affiliated with at the time of review.

Table 4. Faculty Rank of Panelists Affiliated with Universities and Other Affiliations Represented on the Panels

Panel	Professor	Associate Professor	Assistant Professor	Government	Industry & Industry Organizations	Other
Biochemical, Sugar/Starch (5)	5					
Biochemical, Cellulosic (5)	1	1		1	1	1
Thermochemical (5)	4			1		

Accomplishments

The peer review process is intended to be rigorous and objective, striving for the highest possible scientific credibility. In general, panelists are expected to hold a PhD unless the norm for their discipline tends to not require doctorate level education to achieve the highest recognition and qualification (e.g., engineers and modeling specialists). Panelists are also judged by their most recent professional accomplishments (e.g. awards and publications completed in the last five years). Finally, the panelists who are currently performing or leading research to address a problem similar to those addressed in the National Program are preferred. Table 5 describes their characteristics in the Biorefining Panels.

Table 5. The Panels' Recent Accomplishments

Panel	Published Articles Recently	Received Recent Professional Awards	Having Review Experience	Currently Performing Research
Biochemical, Sugar/Starch (5)*	3	3	4	3
Biochemical, Cellulosic (5)	5	4	5	4

*Complete data not available.

Current and Previous ARS Employment

The Research Title of the 1995 Farm Bill 105-585, mandated ARS's requirements for the peer review of the ARS research projects: 1) panel peer reviews of each research project were mandated at least every five years and 2) the majority of peer reviewers must be external (non-ARS) scientists. Table 6 shows the number of peer reviewers for each panel that are currently or formerly employed by ARS.

Table 6. Affiliations with ARS

Panel	Currently Employed by ARS	Formerly Employed by ARS
Biochemical, Sugar/Starch (5)*	0	0
Biochemical, Cellulosic (5)	0	0
Thermochemical (5)	0	0

Biorefining Panel Chairs

Sharon P. Shoemaker, Ph.D.

Panel 1: Biochemical, Sugar/Starch (2014)

Executive Director, California Institute of Food and Agricultural Research, University of California, Davis, California

Dr. Shoemaker's research interests include cellulose, ligninase, carbohydrases, cellulose, starch, glycans, lignin, phenolics, plant cell walls, plant biomass, carbohydrates, microbial fermentation, biomass conversion, and biopolymers.

David Thompson, Ph.D.

Panel 2: Biochemical, Cellulosic

Distinguished Staff Engineer, Department of Biological and Chemical Processing, Idaho National Laboratory, Idaho Falls, Idaho

Education: B.S. Purdue University; M.S. & Ph.D. Michigan State University

Dr. Thompson's research interests are biomass, biofuel, renewable fuels, renewable chemicals, feedstock supply, chemical preconversion, pretreatment, fermentation, biochemical conversion, thermochemical conversion, sustainability, value-added product and biocommodity.

Panel Chair Statements

All Panel Chairs are required to turn in a statement that describes how their Panel was conducted and possibly provide comments on the review process that might not otherwise be found in the individual research project plan reviews. Panel Chairs are given some guidelines for writing their statements, but are nevertheless free to discuss what they believe is important for broad audiences.

Idaho National Laboratory INL

August 4, 2014

Dr. Michael A. Grusak, Scientific Quality Review Officer
Office of Scientific Quality Review
Agricultural Research Service, USDA
5601 Sunnyside Avenue, MS 5142
Beltsville, MD 20705

Subject: NP 213 Panel Chair Statement Transmittal

Dear Dr. Grusak:

Per your request, I am writing to report on the performance of review panel NP 213 Panel 2: Biochemical, Cellulosic (2014) which was completed via webinar on June 24, 2014. An expert panel of reviewers was selected having technical expertise covering the breadth and depth of all projects reviewed. No conflicts of interest were identified for any of the panel members. As the panel chair, I can say that the process was very streamlined and effective. In particular, in depth discussions were facilitated to vet the ideas and research approaches presented in the plans, and creative thinking was encouraged toward potential alternative approaches to improve the quality of research that may not have been considered by Agency scientists and staff.

As a whole, the review process was a pleasant and effective experience. The panel review webinar required roughly 3.5-4 hours, which was in line with the suggested length provided by OSQR at the initiation of the process. All of the reviewers were well prepared for the review, which speaks to the quality of the selected panel members. Notably, the participating OSQR staff members were particularly well prepared for the review process, and facilitated the process most effectively. The webinar format was utilized to accomplish panel review process, and OSQR staff effectively conveyed important programmatic drivers, review criteria and expectations for the panel members in their roles as peer reviewers in this format.

In summary, this panel fulfilled its duties of reviewing the project plans in exemplary fashion. Projects were thoroughly vetted for adherence to the national objective statements, technical merit and research approaches. Consensus was reached among the panel members on each project. In general, the panel members agreed that the process implemented by OSQR for the reviews was very efficient and should be utilized for future review panels.

Sincerely,

David N. Thompson
Distinguished Staff Engineer
Chemical & Biological Processing Department
Idaho National Laboratory

P.O. Box 1625 • 2525 North Fremont Ave. • Idaho Falls, Idaho 83415 • 208-526-0111 • www.inl.gov
Battelle Energy Alliance, LLC

Projects Reviewed by the Biorefining Panel

North Atlantic Area

Akwasi Boateng
Farm-Scale Pyrolysis Biorefining

Robert Moreau
Enable New Marketable, Value-Added Co-Products to Improve Biorefining Profitability

John Ngheim
Sorghum Biorefining: Integrated Processes for Converting All Sorghum Feedstock Components to Fuels and Co-Products

Mid South Area

Gillian Eggleston
Developing Technologies that Enable Growth and Profitability in the Commercial Conversion of Sugarcane, Sweet Sorghum, and Energy Beets into Sugar, Advanced Biofuels, and Bioproducts

Mid West Area

Kenneth Bischoff
New Biobased Products and Improved Biochemical Processes for the Biorefining Industry

Bruce Dien
Technologies for Improving Process Efficiencies in Biomass Refineries

Badal Saha
Develop Technologies for Production of Platform Chemicals and Advanced Biofuels from Lignocellulosic Feedstocks

Patricia Slininger
Biochemical Technologies to Enable the Commercial Production of Biofuels from Lignocellulosic Feedstocks

Pacific West Area

William Orts

Technologies for Improving Industrial Biorefineries that Produce Marketable Biobased Products

Office of Scientific Quality Review

The Office of Scientific Quality Review manages and implements the ARS peer review system for research projects, including peer review policies, processes and procedures. OSQR centrally coordinates and conducts panel peer reviews for project plans with ARS' National Program every five years.

OSQR sets the schedule of National Program Review sessions. The OSQR Team is responsible for:

- Panel organization and composition (number of panels and the scientific disciplines needed)
- Distribution of project plans
- Reviewer instruction and panel orientation
- The distribution of review results in ARS
- Notification to panelists of the Agency response to review recommendations
- *Ad hoc* or re-review of project plans

Contact

Send all questions or comments about this Report to:

Christina Woods, Program Analyst
USDA, ARS, OSQR
5601 Sunnyside Avenue
Beltsville, Maryland 20705-5142
osqr@ars.usda.gov
301-504-3282 (voice); 301-504-1251 (fax)