

INTERNAL ARS SCIENTISTS BREAKOUT SESSIONS

Break out group name: **CONVERSION AND COPRODUCTS**

Facilitator BILL ORTS

Recorder KEVIN HICKS

- **Identify problem areas (to a large extent non-overlapping and mutually exclusive) for Action Plan**

1. Need for cost effective processes for Thermochemical Conversion of Cellulosics/Biomass/Animal Wastes to Energy and CoProducts

Locations: Wyndmoor, Florence, Corvallis, Beltsville, Albany, Bushland, BioChar/Soil: Mandan, Ames, Peoria

A. Need Scalable Technologies; B. Identification of Key crop traits for thermochemical feedstock. C. Need cost effective methods for Feedstock processing: densification/ drying/size reduction, etc. D. Optimizing Process Technologies including Pyrolysis and Gasification. E. Upgrading/ clean-up of pyro-oil and syn gas and hydrogen. F. Chemical or biochemical conversion of pyro-oil or syn gas to energy and coproducts (biochar). G. Integration into biochemical process. I. Demonstration Projects. J. Economic and Life Cycle Analysis.

2. Need better processes for Biochemical Conversion of feedstocks to Energy/Fuels
Locations: Albany, Madison, Brookings, Wyndmoor, Peoria, Winter Haven, Athens, Bushland

A. Starch/Sugar to Ethanol and Butanol

***Need improved quality and end uses for Distiller's Grains: P,S, Fiber, Fat, Compositional variability due to varied processes, Consistency, Flowability, other Value Added Uses; Real-Time Analysis; Standards?; Mycotoxins; Antibiotics; Improve value of feeds for monogastrics through pre- and post-fermentative processes.**

***Need Improved processes for corn to ethanol: Develop new coproducts by altering production process (granular starch-hydrolyzing enzymes, etc); Dry and Wet Prefractionation of corn prior to fermentation; Water saving processing technologies; Decreased energy and cost technologies; Utilization of corn fiber and germ in processes; Improved enzymes and biocatalysts.**

***Need to evaluate regionally specific alternative Starch-based Feedstocks: Sorghum, Wheat, Barley (especially hull-less), and others.**

B. Need cost effective technologies for converting Cellulose to Ethanol and Butanol

***Pretreatments, saccharification, fermentation, product enrichment and recovery, coproducts, inhibitors, biocatalysts, process economics, process consolidation and integration, fundamental understanding of cell wall structure.**

***Feedstocks-related issues: on-farm or at plant pretreatment technologies**

*** Identification of Key crop traits for best feedstock**

*** Reduction of water usage – treatment recycle!!**

*** Feedstock processing: densification/ drying/size reduction, etc**

C. Need economic processes for conversion of animal wastes by anaerobic digestion and utilization of resulting sludge.

D. New economic processes for Bio Hydrogen production

3. Need to evaluate potential integration of biochemical and thermochemical processes within the biorefinery.

Location: Albany, Wyndmoor, Peoria, Corvallis, Florence,

4. Need for process and economic analysis and models for cellulosic/thermochemical/starch conversion. Also Life Cycle Analysis (including Carbon, air quality, wastewater, emissions, etc). Wyndmoor, Albany, Madison, Peoria, Corvallis.

5. Unique and Important Issues:

A. Coproducts (from all feedstocks) - Peoria, Athens, Wyndmoor, Madison, Albany, Brookings,

B. Pilot Plant Scale ups facilities – Wyndmoor, Albany, Peoria

C. Need to determine bioconversion potential of Region-Specific Feedstocks

D. SEND MORE MONEY!!! All locations.

Uniqueness of ARS Conversion and Coproducts Programs:

A. ARS has the Federal responsibility for Agricultural Security and Sustainability- The guardians for Food, Feed, Fiber, Flowers, *and* Fuel, Forever.

B. Existing infrastructure of 100+ nationwide research locations and 4+ regional utilization research centers (with pilot plants) with 67 year research track record.

C. Productive, long-term working relationship with stakeholders and customers.

D. Unique focus on CoProducts

E. Focus on feedstocks not being addressed by other Federal Agencies and Private sector- Alfalfa, Sorghum, Barley, Wheat,

F. Comprehensive program on bioenergy, from feedstock selection to production and conversion,

G. Synergy from linkages to many National Programs, in-house, addressing continuum of pre- and post harvest issues.

H. Diverse cadre of pre- and post-harvest agricultural research scientists provide unique agricultural perspective-

I. Focus on appropriate scale (on-farm-, community-, coop-scale) technology.

J. Focus on rural economic development.

K. Agricultural processing pilot plants

L. Mandate for accountability of research:

M. ARS is a Problem Solving Agency, with a track record for solving world-wide problems as well as problems of specific agricultural stakeholders.

N. ARS has long term commitment to solving agricultural problems; Base funded research programs being conducted by Career Scientists

O. Long term productive association with International Partners

- **Identify teams and team leaders to write portions of the Action Plan**

Lead: Bob Fireovid

SubComponents:

Thermochemical: Kwesi Boateng (L), Kyoung Ro, Gary Banowetz,
Biochemical: Joe Rich (L), Dominic Wong, et al., Dan Akin, John Nghiem, Paul Weimer, Kurt Rosentrater
Integration: Bill Orts (L), Gary Banowetz, Kwesi Boateng
Process/Economic/Life Cycle Analysis – Andy McAloon (L), Pat Hunt

- **Identify ARS locations involved**

(see problem areas)

- **Identify links to other ARS national programs**

NP 216 – Systems (1;2;3;4)
NP 211 – Water and Soils (1;2;3;4)
NP 206 – Animal Waste (1; 2;3;4)
NP 101 – Animal Production (2;4)
NP 306 – Biobased (1;2;4)
NP 205 – Forages (1;2;4)
NP 301 – Plant Genomics (1;2)
NP 302 – Molecular Genetics (1;2)
NP 108 – Food Safety (Mycotoxins, antibiotics) (2;3)
NP 305 – Crop Production (1;2;4)
NP 103 – Animal Health (2;3)

- **Identify external partnerships**

National Corn to Ethanol Research Center
DOE (including GTL Centers, NREL, ORNL, PNNL, INEL, NETL, BNL, Sandia, ANL), work out mechanism to partner/collaborate
Grower Group Trade Associations: NAWG, NCGA, NBIC, NBGA, etc.
State Government Agr, Energy, and Environmental agencies
EPA, DOT, FDA, DOD, FS, HS,
Ag-processing, biofuel, chemical, enzyme, biotech, food, catalyst, animal feed
Industry – too many to list here
Universities
International Cooperators: EMBRAPA, LABEX, EU, China, Former Soviet Scientist Program, PyNet, Thermonet, etc.

- **If time permits, identify research objectives**

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