

## Concluding Remarks

As can be read in this workshop proceedings report, DOE received significant feedback from Algal Biofuels Strategy Workshop participants. Algae Program personnel participated in the workshop discussions and have reviewed the information provided in this report. There will be a second Algal Biofuels Strategy Workshop in the spring of 2014 to build on the information provided herein and delve deeper into selected topics. DOE will consolidate all of the feedback from both workshops and report back to the algae community at Biomass 2014, BETO's annual conference in Washington, D.C.

DOE BETO's Algae Program would like to express our thanks to Arizona State University and LightWorks for hosting and contributing to this workshop. Similarly, we would like to thank all of the participants for their time, efforts, and contributions. The discussions and information provided through the breakout sessions are extremely valuable to the Algae Program, and we look forward to continued collaboration as we utilize this feedback to inform Program strategies moving forward.

## Appendix A: Workshop Agenda

**Algal Biofuels Strategy Workshop**  
Department of Energy Bioenergy Technologies Office  
**November 19 – 20, 2013**  
Arizona State University, AzCATI  
7418 Innovation Way South; Building: ISTB3  
Mesa, AZ 85212

Day 1 - Tuesday, November 19		
Time	Event	Location
12:30 p.m.	Registration Check-in Opens	Building: ISTB3
1:00 p.m.–1:15 p.m.	Welcome and Introduction	Building: ISTB3, Room 103
1:15 p.m.–1:30 p.m.	Explanation of Objectives and Meeting Structure	Building: ISTB3, Room 103
1:30 p.m.–2:00 p.m.	AzCATI/ATP3 Presentation	Building: ISTB3, Room 103
2:00 p.m.–3:30 p.m.	AzCATI/ATP3 Site Tour	ATP3 Algae Test Bed
3:30 p.m.–5:30 p.m.	Workshop Agenda Setting: Participants Formulate Breakout Session Topics	Building: ISTB3, Room 103

Day 2 – Wednesday, November 20								
	8:00a	8:20a	9:40a	11:00a	12:20p	1:40p	3:00p	4:20p
<b>Room One</b>	<b>Morning Announcements</b>	Thermo-chemical conversion/ HTL (Matthew Atwood)	CO <sub>2</sub> optimization, co-location and delivery (Albert Vitale)	New co-products (Robert McCormick)	<b>Display &amp; Lunch</b>	TEA/LCA development & validation (Byard Wood)	Managing pond ecology (Dan Anderson)	<b>Display</b>
<b>Room Two</b>		GMO/Environmental assessment (Justin Flory)	Deployment of superior strains (Philip Pienkos)	Optimizing low-cost cultivation design (Braden Crowe)		AD and recycling water & nutrients (Lowell Collins)	Algal oil upgrading (Ryan Davis)	
<b>Room Three</b>		Integration (coal, natural gas, and CO <sub>2</sub> ) (Paul Woods)	Characterization of industry standards (Lieve Laurens)	Energy efficient harvesting dewatering and extraction (John Groppo)		Genetic engineering and advanced biology (Jianping Yu)	Mass culture limiting resources (Robin Gerlach)	
<b>Room Four</b>		Wastewater, niche micro algal farms (Deborah Newby)	Uncertainty in feedstock production and crop rotation (Mark Wigmosta)	Algal polyculture— planktonic and benthic systems (Dean Calahan)		DOE funding optimization (Rachel Levinson)	Sensors & systems for precision production (Albert Vitale)	
<b>Room Five</b>		Algal genomics (Rose Ann Cattolico)		DOE facilitating regulation, commercialization and financing (Jacques Baudry-Lousique)		Agricultural vs. Wastewater cultivation (Randy Ryan)	Cell and molecular biology (Stephanie Brunelle)	
<b>Room Six</b>		Extrapolating lab scale results to full scale systems (Michael Huesemann)		Opportunities for industry and academia collaboration (Bill Henley)		Sustainability indicators (Matthew Atwood)	Algal biomass fractionation (Robert McCormick)	

## Appendix B: Abbreviations and Acronyms

ALU	Algal lipid upgrading
HTL	Hydrothermal Liquefaction
AD	Anaerobic digestion
AOCS	American Oil Chemists' Society
ATP3,	Algae Testbed Public-Private Partnership
BAT	Biomass assessment tool
BETO	Bioenergy Technologies Office
CAAFI	Commercial Aviation Alternative Fuels Initiative
CAPEX	Capital expenditure
CCS	Carbon capture and storage
CCU	Carbon capture and use
CO2	Carbon dioxide
DOD	Department of Defense
DOE	Department of Energy
EA	Environmental Assessment
EERE	Office of Energy Efficiency and Renewable Energy
EPA	Environmental Protection Agency
EROI	Energy return on investment
FE	Office of Fossil Energy
FOA	Funding Opportunity Announcement
gge	Gallon gasoline equivalent
GHG	Greenhouse gas
GM	Genetically modified
GMO	Genetically modified organism
IP	Intellectual property
IPM	Integrated Pest Management
LCA	Life cycle analysis
N	Nitrogen
NAABB	National Alliance of Advanced Biofuels and Bioproducts
NABC	National Advanced Biofuels Consortia
NEPA	National Environmental Protection Act
NETL	National Energy Technology Laboratory
NGO	Non-governmental organization
NIST	National Institute of Standards and Technology
OPEX	Operating expenditure
ORNL	Oakridge National Laboratory

OS	Office of Science
P	Phosphorous
PBR	Photobioreactor
PNNL	Pacific Northwest National Laboratory
R&D	Research and development
RAFT	Regional Algae Feedstock Testbed
RFI	Request for Information
RFS	Renewable Fuel Standard
SBIR	Small Business Innovation Research
TAN	total acid number
TEA	Technoeconomic analysis
TRL	Technology Readiness Level
USDA	United States Department of Agriculture
WW	Wastewater

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## Appendix D: Proposed Breakout Topics

Due to space and time constraints, not all breakout sessions proposed by attendees were convened, but many topics were consolidated. Below is the entire list of topics proposed by the participants, as captured during the Agenda Setting Session.

Wastewater Cultivation	Small Scale Funding Opportunities to Facilitate Academic Partnerships
Thermochemical Conversion	Producing Synergies for Industries and Labs
Algal Genomics	New Products in Support of Biofuels
Algal Turf Scrubbing	DOE as a Facilitator for Regulatory Compliance
Mass culture limiting resources	Carbon Capture Utilization and Storage
Environmental Risk Assessment of Algal Mass Culture	Optimizing CO <sub>2</sub> Delivery to Reduce Waste
Uncertainty in Feedstock Production	Predator and Disease Control
Validated Cost Models	Energy Efficient Harvesting and Extraction
Bio-complexity to Enhance Production	Improving and Optimizing Cultivation Design
Niche or Small Scale Farms	CO <sub>2</sub> Transport and Resource Potential
Harvesting and Dewatering Technologies	No-liner Pond Construction
Coal and Natural Gas CO <sub>2</sub> + HTL = Fuels	TEA Modeling
Deployment of Superior Strains	Production Pond Ecosystem Monitoring (microbial)
Integration	Algal Biomass Conversion Processing plus HTL
Cell Molecular Biology of Algae	HTL Fractionation
Predators and Predator Management	Coproduct Generation and Biorefinery
Oleochemicals from Algae	Approaches to Biofuels
Genetic Engineering	
Cross Protected Growth System	
Best Methods to Create Industrial Standards	
Advanced Biology	
Protection Strategies	
Biomass and Bioproduct Characterization	
Algal Oil Upgrading	
Algal Biomass Fractionation	
Communities	
Sensors and Systems for Algal Production	
DOE Portfolio Optimization	
New Focus by DOE on Commercialization	
Recycling Water and Nutrients	
Anaerobic Digestion of Algae as a Substrate	
Varying Costs of Carbon	
Access to Up-to-date Data	
Leveraging Financing	
Agricultural Cultivation vs. Wastewater Treatment Plant	
GMO Regulation and Consumer Awareness	
CO <sub>2</sub> Economic Optimization	
Technoeconomics	
Algal Crop Rotation Strategies	
In-time Harvesting	
Mechanistic Understanding for Reliability	