

NEED AREA: Biomass/Biofuels				
	Today's performance	Near-term Goals	Mid-term Goals	Long-term Goals
Water efficient production processes	SOA processing consumption: 1.5gal water/1gal ETOH	R&D: Include water in life-cycle analysis of biofuels. R&D: Direct conversion of sugars to gas. • R&D: Improved substrates (DOE)		
Thermochemical processing research	Existing proposed processes are water intensive.	R&D: Life cycle analysis of biochemical ETOH production compared to cellulosic thermochemical process. (DOE) T&E: Microchannel continuous processing for ethanol/biodiesel production.		R&D: Direct conversion to alkanes (physical process)
Use of non-traditional waters	Fresh water is used for biofuels, competes for other fresh water uses. Population growth may limit future fresh water availability	R&D: Process—Define outer limits of quality of produced waters (total dissolved solids) for cooling uses(DOE) R&D: Explore the use of sewage treatment plant effluent as a biomass irrigant where pathogens might make them unsuitable for edible crop use (DOE) R&D: Assess use of degraded/produced water for plant growth to reduce fresh water needs for biofuels	T&E: Co-siting of biofuels facility with concentrated animal feedlot operations? With wastewater treatment plant (WWTP)	
Feedstock production	Kelp/algae offer an order of magnitude greater lipid production.	R&D: Assess Kelp/algae as feedstock for liquid fuel processes to reduce competition for food crops and ag land for fuels	T&D: Evaluate kelp/algae feedstock fresh water and energy efficiency for liquid fuel processes.	I: Economically viable kelp/algae feedstock process for liquid fuel processes.
		R&D: Develop more drought tolerant biofuel crops that do not need irrigation	R&D: Evaluation and refinement of new crops that have lower water demand and/or higher oil yields (USDS/DOE)	
Bioenergy	Use of biomass for direct energy- such as wood waste to energy- is currently led by USDA	R&D: Evaluation of bioprocessing improvements on future plant efficiency, performance, and cost R&D: Assessment of the benefits on watersheds and water availability improvements through biomass energy plants (USDA/BLM/DOE)	T&E: Pilot demonstrations of 5-10 MW biomass plants to assess cost and performance	
Biogas production		R&D: Increase methane component through improved digester design(DOE/WERF) R&D: Develop microbial reactors to produce methane gas from waste streams. R&D: Microbiological research on bugs that can function in extreme temperature ranges. R&D: Dewatering liquid manure; separation technologies • R&D: Improve economics of moisture removal processes • T&E: Application of sewage sludge drying techs R&D: Develop monitoring systems for digesters to improve gas production volumes and reliability (DOE/USDA)		

Ethanol/Biofuel Production Processes Research Areas

Topic 1. Water efficient ethanol/biofuel production processes

- Develop processes that can directly convert sugars to gas. As part of this activity, participants identified a need for improved substrates.
- Identify research projects or technology development activities to advance the state-of-the-art in direct-to-gas conversion of sugars.

Topic 2. Thermochemical processing

- Microchannel continuous processing for ethanol/biodiesel production.
- Thermochemical processes that use less water.
- Long-Term activity: Direct conversion of feedstocks to alkanes (physical process).

Topic 3. Use of non-traditional waters

- Define outer limits of quality of produced waters for cooling uses
- Explore the use of sewage treatment plant effluent as a biomass irrigant where pathogens might make them unsuitable for edible crop use

Topic 4. Feedstock production

- Use of sewage treatment plant effluent as a biomass irrigant
- Use of degraded/produced water for plant growth
- Assess kelp/algae as feedstock for liquid fuel processes
- Mid-Term activity: Evaluate kelp/algae feedstock fresh water and energy efficiency for liquid fuel processes
- Mid-Term activity: Evaluate/refine new crops that have lower water demand and/or higher yields
- Long-Term activity: Economically viable kelp/algae feedstock process for liquid fuel processes

Topic 5. Bioenergy

- Assess the benefits on watersheds and water availability improvements through biomass energy plants

Topic 6. Biogas production

- Increase methane component through improved digester design
 - Develop monitoring systems for digesters to improve gas production volumes and reliability
- Develop microbial reactors to produce methane gas from waste streams.
- Microbiological research on digester organisms that can function in extreme temperature ranges.

Comment [C1]: This might even get captured in the env/natural processes data collection section ...

Comment [C2]: We could even delete this ... doesn't save much water, and really didn't get much/any traction until the gaps meetings.