

Algae Cultivation for CCUS Workshop May 2017

Michael Hayes Wilson

Michael.Wilson@uky.edu

Senior Research Engineer

Center for Applied Energy Research

University of Kentucky

Project Timeline

- 2008 – UK Approached by Kentucky State Department of Energy Development and Independence to investigate the techno-economic feasibility of algae based CO₂ mitigation
- 2011-2012: Initial Demonstration Work started at EKPC's Dale Station
- **2012-Present: Demonstration Project at Duke Energy's East Bend Station**
- 2011-Present: Part of US-China Clean Energy Research Center (CERC)
- 2014-Present: Technology Transfer and Research Support for Lian Heng Hui
- August, 2015: NETL Biological CO₂ Utilization Program Award
- March, 2017: NETL – Carbon Utilization Program Award



Research Focus

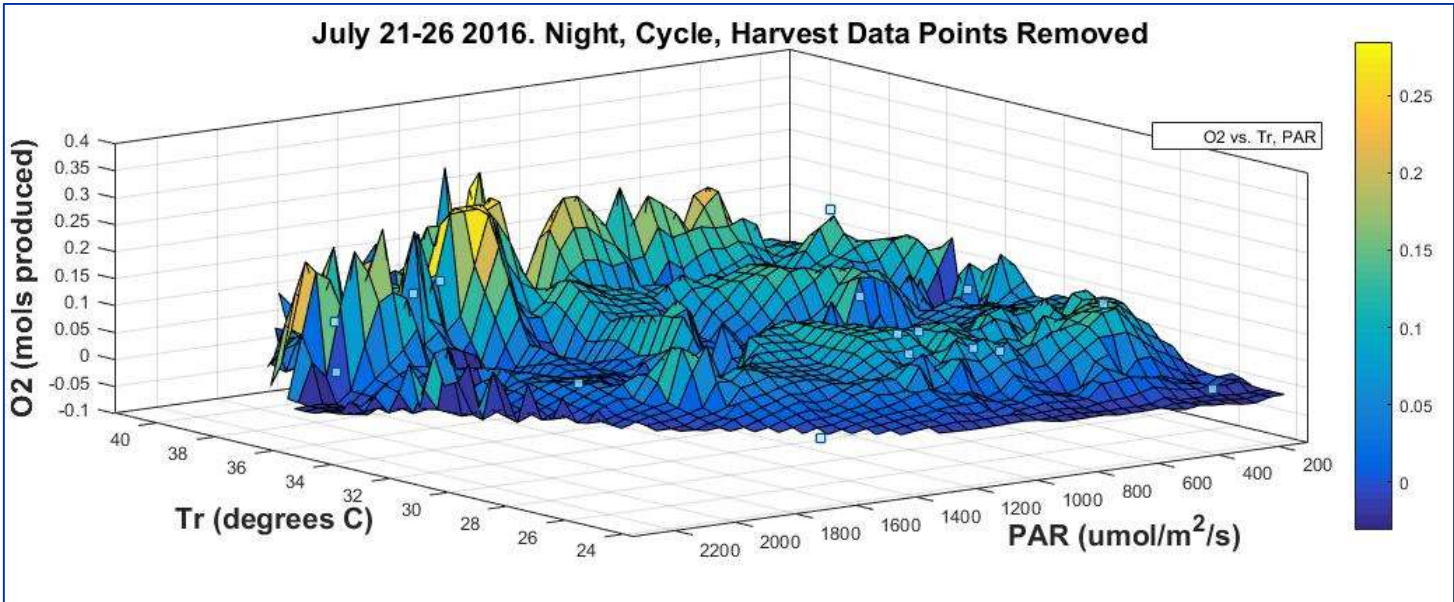
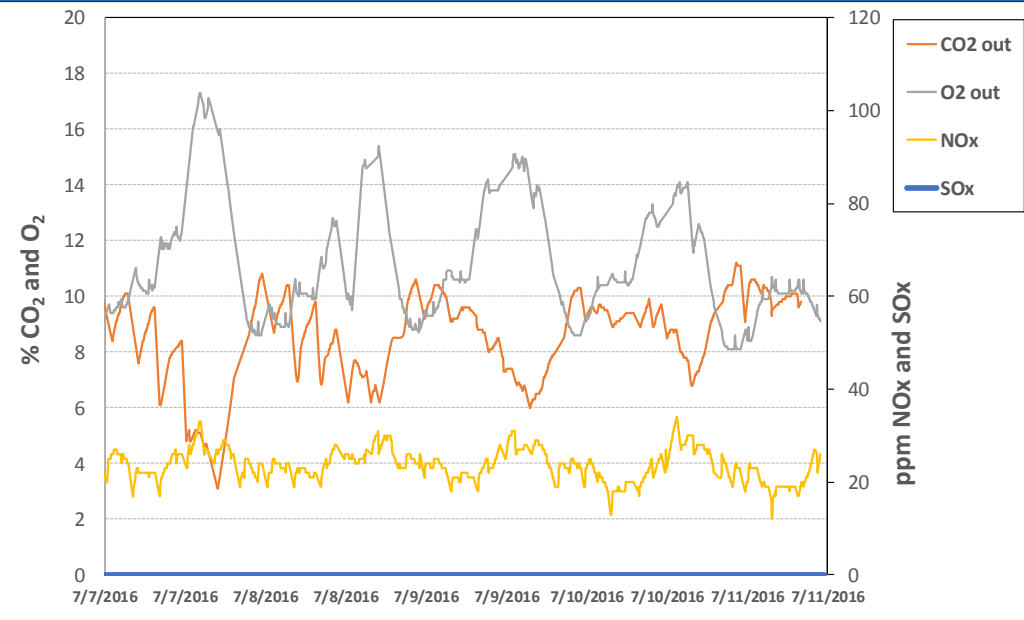
Power plant integration, PBR design, low cost/low energy dewatering, utilization studies, biomass fractionation, techno economic & life cycle modeling

Utilization Studies

Anaerobic digestion, lipid extraction, catalytic upgrading, bio polymers, HTL, pyrolysis, aquaculture, aquaponics, etc.

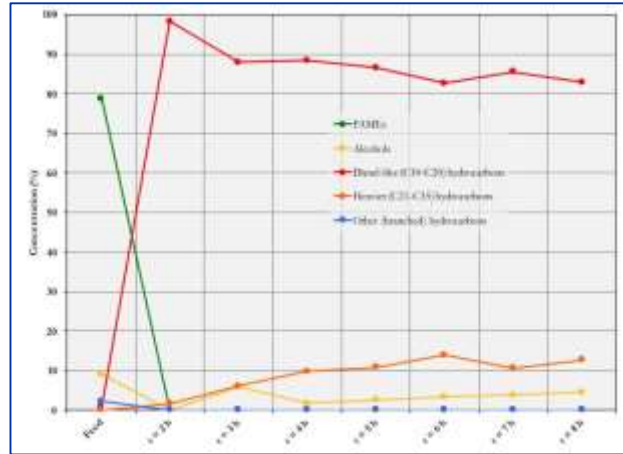
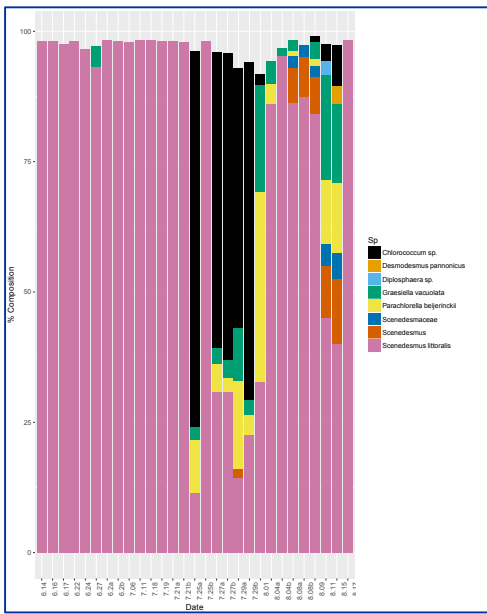


East Bend Station

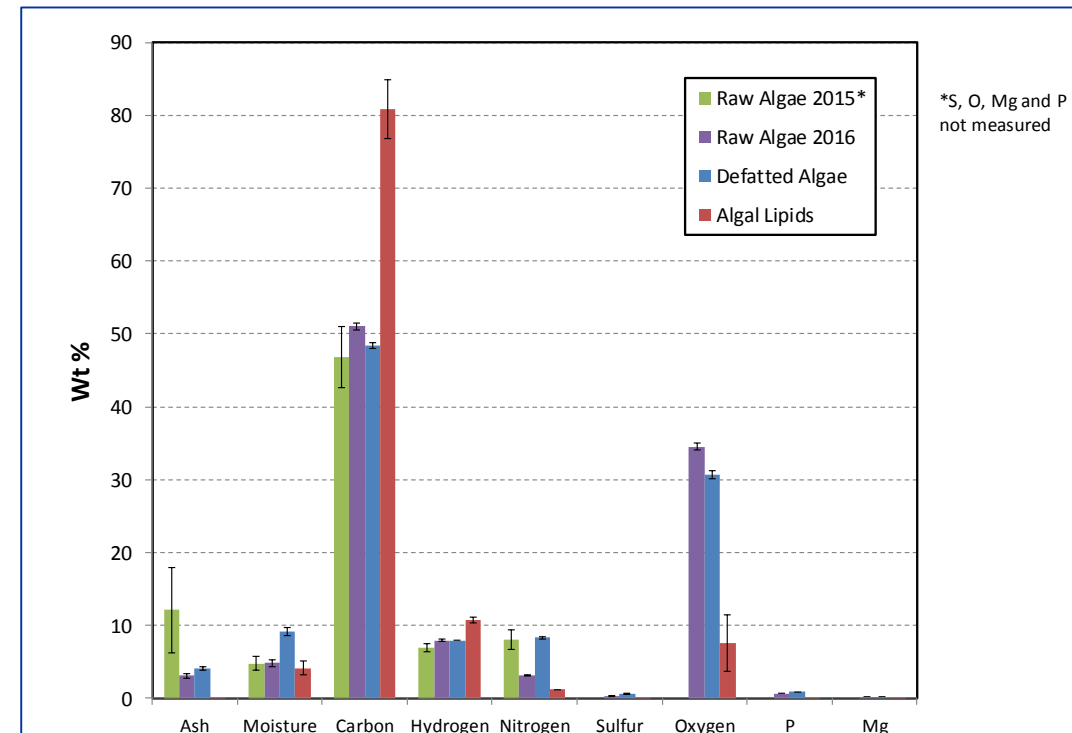
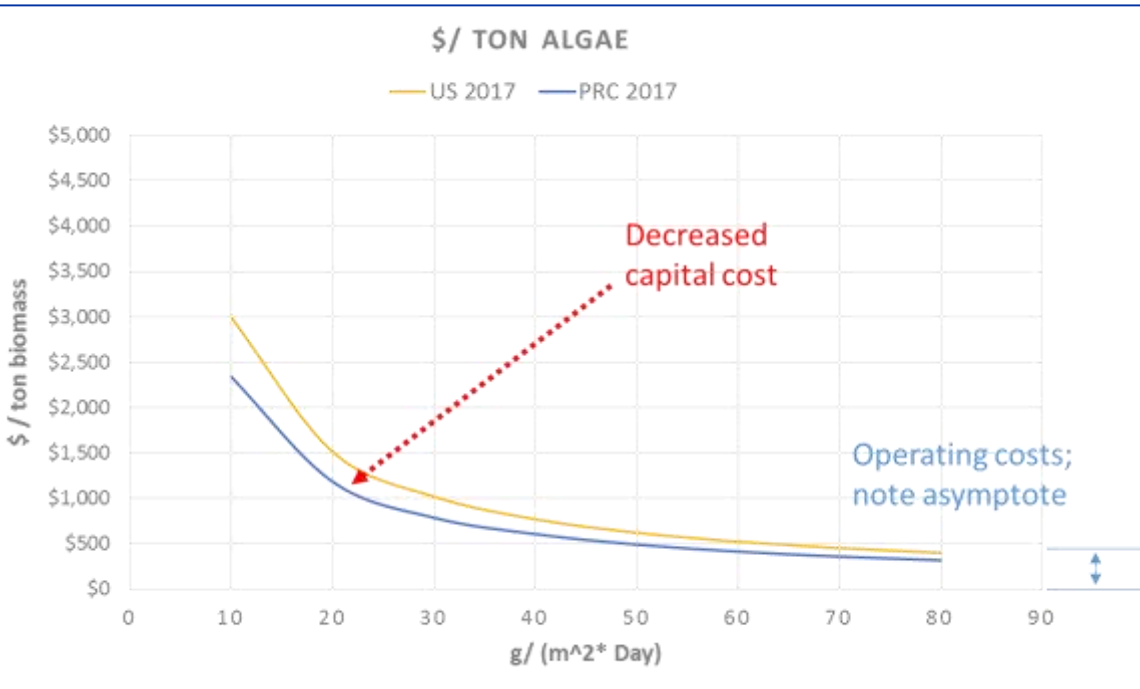


Lessons Learned

- Our strain (*scenedesmus acutus*) LOVES flue gas
- Power plant outages present a significant challenge
- Biomass fractionation processes are critical to overall economics of process
- New reactor design enables net carbon capture on a life cycle basis
 - Targets set in 2013 regarding cost reductions and operating expense reached



(clockwise from top left): DNA/RNA analysis of culture, profile of upgrading process, lessons learned, elemental analysis of fractionation process, Techno-Economic Analysis



Lian Heng Hui Demonstration

