
ASU LightWorks
ARIZONA STATE UNIVERSITY

# Sustainable Algal Biofuels Consortium

# SABC

# biochemical conversion of algal biomass and fuel testing

The Sustainable Algal Biofuels Consortium, led by Arizona State University, focuses on testing the acceptability of algal biofuels as replacements for petroleum-derived fuels.

The group is investigating biochemical conversion of algae to fuels and products, and analyzing the physical chemistry properties of algal fuels and fuel intermediates.

In addition to ASU, other core members of the consortium are the National Renewable Energy Laboratory, Golden, Colorado and Sandia National Laboratories, Albuquerque.

The U.S. Department of Energy awarded ASU a $6 million grant to fund SABC as part of a program focused on algae-based biofuels.

The program supports development of a clean, sustainable transportation sector – a goal of DOE's continued effort to spur the creation of a domestic bio-industry while creating jobs.

The current round of DOE funding totals $24 million for three research groups to tackle key hurdles in the commercialization of algae-based biofuels.

There are two other projects funded by the DOE program: the Consortium for Algal Biofuels Commercialization, San Diego, led by the University of California, San Diego, that will concentrate on developing algae as a biofuels feedstock; and the Cellana LLC Consortium, Kailua-Kona, Hawaii, led Cellana LLC, to examine large-scale production of fuels and feed from microalgae grown in seawater.

## Objectives

The primary objective is to evaluate biochemical (enzymatic) conversion as a potentially viable strategy for converting algal biomass into lipid-based and carbohydrate-based biofuels. Secondary objective is to test the acceptability of algal biofuels as replacements for petroleum-based fuels.

## Team and Organization

The project is led by Dr. Gary Dirks and administered by ASU.

The R&D will be carried out primarily by ASU, NREL and SNL, with additional contributions from Georgia Institute of Technology, Colorado Renewable Energy Collaboratory, Colorado School of Mines, SRS Energy, Lyondell Chemical Company, and Novozymes

A 24-month scope of work will be focused primarily on biochemical conversion of algal residuals and whole algal cells.

## Main Technical Tasks

### Task 1: Biochemical Conversion of Whole Algae/Algal Residuals into Fuels

Investigate several promising biochemical options for converting both whole algae and algal residues into transportation fuels

**Subtask 1.1:** Produce selected algae for biochemical conversion

**Subtask 1.2:** Develop a fundamental understanding of algal chemical composition and structure

**Subtask 1.3:** Identify and test a variety of pretreatment options and hydrolytic enzyme preparations to facilitate release of fermentable sugars and conversion of algae residues/whole algae into fuel intermediates/products

### Task 2: Product Performance of Algal-Derived Hydrocarbon Fuels and Blend Components

The primary objective of Task 2 is to assess the likely end-use performance of algal-lipid derived biofuels in diesel applications. This will be accomplished by a detailed analysis of the impurities present in the fuels produced, as well as assessment of compliance with American Society for Testing and Materials (ASTM) specification performance requirements.

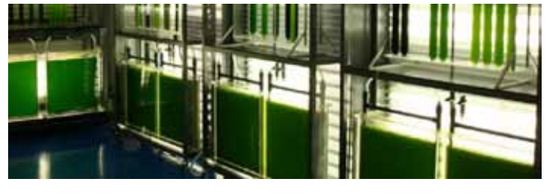
A secondary objective is to characterize fuel blend components produced via biochemical conversion of algal-derived carbohydrate materials.

*"Help us to lead a green revolution, developing new sources of clean energy that will power our economy and preserve our planet."*

—President Barack Obama
ASU Commencement Speech
May 13, 2009

open raceways available for algal feedstock production

photobioreactors available for algal feedstock production



SABC

## Sustainable Algal Biofuels Consortium

*cultivating energy solutions*

## Major Milestones and Deliverables

**Milestone 1:** Produce sufficient amounts of lipid-rich and carbohydrate-rich algal biomass of selected production strains for the identified pretreatment, enzymatic hydrolysis, fermentation, fuel production and fuel characterization tasks from g to kg quantities, throughout the project duration

**Milestone 2:** Compositional analysis of algal biomass and a compositional library as a function of species and growth conditions established

**Milestone 3:** Multiple routes for pretreatment/enzymatic hydrolysis evaluated and the most promising routes chosen for further study and integration.

**Milestone 4:** Downselect best strain(s) and process(es) for maximum lipid and ethanol yields for scale-up testing

**Milestone 5:** Report on chemical analysis and ASTM standards testing for algal biofuels

**Milestone 6:** Final report on project progress including estimation of cost of fuel production using a biochemical or a combined chemical-biochemical approach and identification of critical elements for future cost reduction

**For more information on SABC, contact:**

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