

Control Number **2203-1728**; Proposal Submitted in Response to **DE-FOA-0002203**

**“Microalgae Commodities Production with a Direct Air Capture Process”**

Applicant: **MicroBio Engineering Inc.**  
Principal Investigator: **John Benemann, Ph.D.**  
Topic: **3; Algae Bioproducts and CO<sub>2</sub> Direct-Air-Capture Efficiency (ABCDE)**  
Major Participants: **Cyanotech, Corp, Kailua-Kona, HI, (Cyanotech)**  
**Global Thermostat LLC (GT), Brighton, CO**  
**Pacific Northwest National Laboratory (PNNL), Sequim, WA**

**Project Objective:** The technology to be advanced in this project is the utilization of CO<sub>2</sub> from air to cultivate microalgae and produce biomass for higher value nutritional products in the near-term and commodities, including feeds, biofertilizers, bioplastics and fuels, in the longer-term.

**Project Description:** The two approaches to accomplish this objective are:

1. The direct air-CO<sub>2</sub> capture (DAC) by a physical-chemical process provided by Global Thermostat (GT), that delivers a near 100% concentrated CO<sub>2</sub> stream to the algal cultures. The GT-DAC process could become commercial at the Cyanotech facility in the near-term.
2. The use of the algal cultures and cultivation systems themselves to provide CO<sub>2</sub> absorption from air at a rate supporting algal biomass production approaching that with high CO<sub>2</sub> sources.

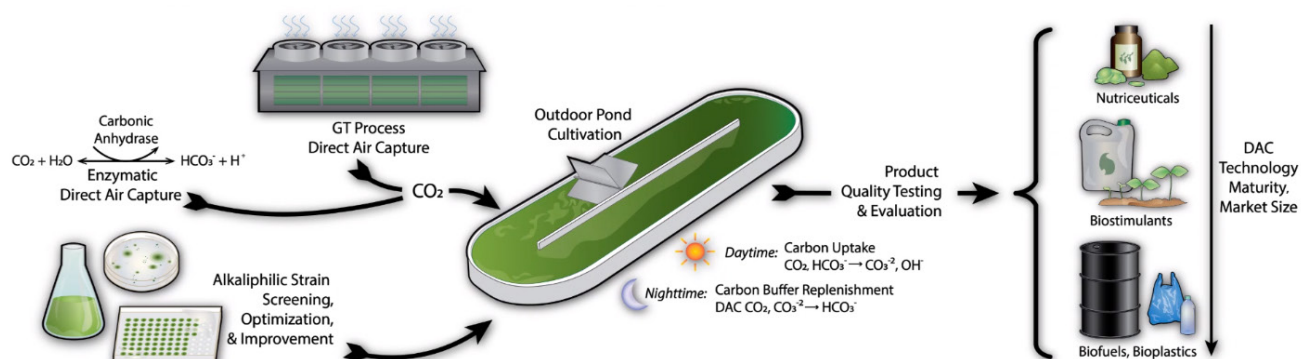
**Project Impacts:**

The targeted improvements for these alternative processes to be achieved in this project:

1. For the GT DAC process: achieving similar productivities in raceway ponds with air-CO<sub>2</sub>, supplied by the GT-DAC as with merchant CO<sub>2</sub>, over several months of sustained cultivation;
2. For cultivation of algae directly on air-CO<sub>2</sub>: achieving productivities in raceway ponds of >50% compared with use of enriched CO<sub>2</sub>, while increasing overall energy consumption <2-fold.

Critical success factors to achieve the targeted performance improvements for this project are:

1. For the GT DAC process: operation of the DAC process for extended time and cultivation of alga in raceway ponds in a process utilizing a continuous, day and night, CO<sub>2</sub> source.
2. For cultivation of algae directly on air-CO<sub>2</sub>: enhancement of CO<sub>2</sub> mass transfer into the algal cultures by action of their endogenous algal carbon concentrating mechanisms and enzymes.



**Schematic: Alternative Air Capture of CO<sub>2</sub> Processed for Cultivation of Alkaliphilic Microalgae Biomass for high-, medium- and low-value bioproducts**