



Technical Standards Position on Meeting the Three Pillars of Sustainability

The purpose of developing Algal Biomass Organization Technical Standards is to accelerate the growth and stability of economic activity in the algal industry. Technical standards are customarily developed by, and negotiated between, the primary economic value chain stakeholders in any industry. Outside subject matter experts are routinely employed by industry stakeholders to develop and promote appropriate positions on particular standards based on common and recognized accreditations. Industry technical standards are then, by their nature, designed to be voluntarily adopted by the industry stakeholders through collaborative consensus activity to create industry standardization.

ABO Technical Standards will be designed to promote Social, Economic and Environmental sustainability:

Social Sustainability: The algal industry must provide well paying and stable jobs.

- 1) Standards must support industry standards and integration with a diverse set of upstream and downstream partners so they are not destabilized by upsets in any one market. E.g. fuel only.
- 2) Educational training and safety standards are necessary in order to provide mobile and sustainable career paths for a potentially large future workforce.

Economic Sustainability: Industry standards that define and measure value creation and delivery are the highest priority for economic sustainability.

- 1) Standards are needed for the performance and constitution of end use products such as algal based fuels, animal feed, and nutraceutical.
- 2) Standards are needed for constituent levels and workability in intermediates destined for downstream refiners like "Green Crude" and unprocessed dry and wet algal biomass.
- 3) Standards are needed for algal industry feedstock inputs such as CO₂, water, land, and other nutrients.

Environmental Sustainability: Measuring sustainability requires that resource inputs and outputs of an industry be meaningfully measured including any loading effects on the environment like pollution.

- 1) Methodology and protocols need to be developed for measuring consumption of water, land, CO₂, nutrients and electricity that are input into a system of algal production.
- 2) Methodology and protocols need to be developed for measuring the outputs of algal production such as fuel, a fuel or chemical precursor or algal biomass in a way that they can be compared with business as usual production of similar products.
- 3) The industry needs to develop an understanding of the life cycle cost and emissions of the output product that may be measured in water, electricity, land, and air emissions per unit of output product.

Question for the ABS Summit participants: Technical standards are voluntarily adopted by the economic stakeholders in the value chain. What entities should be responsible for contributing to ABO standards development? Of the following entities, which ones are the most important to create the type of voluntary standards needed by the algal industry?

1. Regulatory agencies e.g. EPA, USDA, FDA, and etc.
2. National Laboratories e.g. NREL, Sandia, Los Alamos, NETL, NIST, and etc.
3. University & Academics
4. Fuel & Chemical Industry e.g. Dow, Exxon, Valero, Neste, etc
5. Food & Feed Industry e.g. Sysco, Purina, Martek, Cargill, ADM etc
6. Algae Farm developers and builders
7. GMO and Natural Strain Developers
8. Life Cycle Companies E.g. Life Cycle Associates etc
9. Water and Wastewater Companies
10. Industrial CO₂ Producers