Emerging Markets Online

GLOBAL ENERGY AND BIOFUELS MARKET INTELLIGENCE

Top 11 Algae Investment and Market Trends for 2011

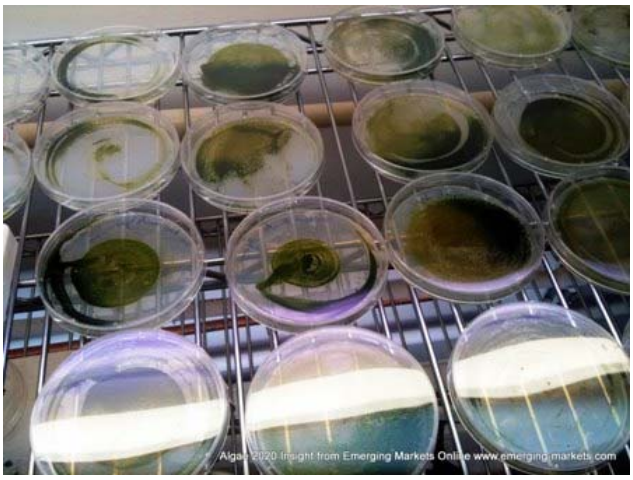
The following is an excerpt from the *Algae 2020* study Vol 2, updated February 2011

1 Algae Winners and Losers for Investments and Growth in 2011

Why are some algae companies attracting capital, and scaling up their enterprises while others continue to peer into the "valley of death" from the laboratory to the pilot phase? Of the 100+ or so companies involved in the algae space, less than 25 have moved from the laboratory to the pilot phase during the economic recession. Few have been able to convince investors to risk placing $10 million USD or more to make this necessary transition. If an algae venture is not (a) able to demonstrate and prove its technology works on a small scale or (b) produce more than 1000 tons of algal biomass or at least 100 gallons of algal oil with its partners, it is unlikely investors will take serious notice. Notably, some companies have been able to attract investment based on initial proof of concept at the lab/bench scale via strategic partnerships, early-stage VC money, and government grants.

2 Renewable Oils Take The Early Lead in Investments and Market Entry

Based on site visits with more than 40 algae related companies, the authors from Emerging Markets Online's *Algae 2020 study* have learned the "brewery" model in algal biofuels ventures is *currently trending* as the preferred model for low-cost, high tech production using standard industrial fermenters. Solazyme is leading the charge in the algae-based brewery/fermentation model, followed by veteran algae producer Martek with support from BP and a recent $1 billion cash investment by DSM.

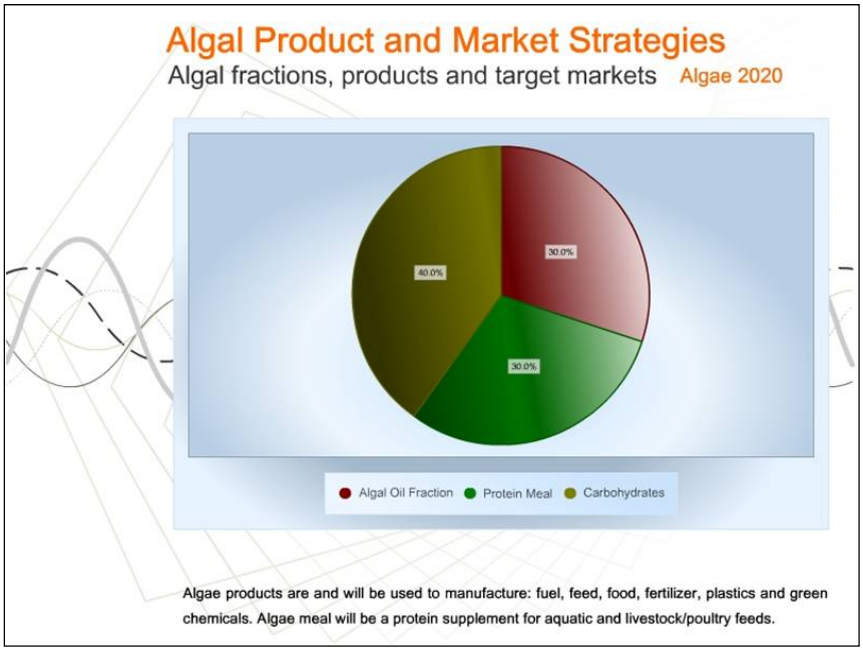


We expect to see similar companies to Solazyme emerging in 2011-2012 time frame and pursuing IPOs world-wide using the microbial brewery model to produce "Renewable Oils" via fermenting sugars as seen with Amyris (green crude and renewable diesel from yeast), Virent (green diesel), LS9 (renewable diesel from bacteria), and others emerging in this space. Where there is cheap sugar, and cellulosic sugars from ag and industrial waste, these commercial ventures will find advantages. Where lower-cost, economically advantaged sugars are available

in the US, EU, China and India, expect increasing military use for collaborative R&D deployment tests. When sugar gets expensive, higher value products and related partnerships will be preferred vis a vis biofuels production.

3 Diversified Products Key to Early-Stage Revenues for Algae Producers

Another key finding from the *Algae 2020 authors* on-site visits with algae producers and investors: in the capital markets, investors have far more confidence in market demand as a measure of long-term opportunity in transport fuels and petrochemical derivatives. For this reason, the early leaders in advanced algal and microbial fuels are diversifying and targeting existing petrol, diesel and aviation markets, as well as related biofuels markets for green chemicals, polymers and power generation. The diversification of biofuels companies beyond one fuel — ethanol and biodiesel — to include a portfolio of advanced biofuels represents a wise long-term strategy to inspire investor confidence.



4 Drop-In Fuels: Emerging Investment Trends

In the biggest markets in Europe, the U.S., Brazil, China and India, government mandates are requiring large oil and gas refiners to blend in biofuels to their existing infrastructure. Most oil and gas companies facing blending mandates, military suppliers, and auto manufacturers and transport companies considering fleet-wide upgrades to higher biofuels blends wish to find fungible fuels that are compatible with existing engines, pipelines, storage systems and petrol stations.

A common theme is found among algae leaders that have progressed into pilot and demonstration scale projects. In addition to biodiesel and ethanol, these organizations are able to produce drop-in replacement fuels from microalgae, and blue-green algae also known as cyanobacteria and other microbes. Military, aviation, government, and petrochem organizations all demand fungible, drop-in fuels and prefer to work with advantaged producers with scalable technologies for R&D and deployment.

5 Strategic Partners for Scale Up and Early Market Entry

Suppliers and buyers are forming early stage R&D relationships in the algae space. Some algae producers now have collaborative R&D partners with big industry players, such as the Exxon-Synthetic Genomics $600 million collaborative for green crude development, the Algenol-Dow for bioproducts, BP-Martek for algae fermentation, Shell-HR Biopetroleum for hybrid PBR-pond development, Chevron-Solazyme for green crude and drop in fuels, Dupont-BAL for biobutanol from seaweed.

6 Seaweed Investment Trends

Seaweed has gained favor with petrochem majors Statoil, Dupont, ENAP because it grows faster than terrestrial crops, has a high sugar content for conversion to ethanol and advanced biofuels, absorbs more airborne carbon than land-based plants, has no lignin, can be easily harvested compared to microalgae, requires no pretreatment for ethanol production, and can be harvested up to six times a year in warm climates. Seaweed biofuels include ethanol, methanol and biobutanol. BP-Dupont's Butamax will collaborate with BAL, a leader in the field to produce biobutanol for drop-in fuels and chemicals.

7 Emerging Markets Growth and Investment

US and EU-based algae producers and licensors of technology are increasingly looking to the Emerging Markets in Latin America, Asia, Africa and the Middle East for faster economic growth, increasing market demand, and more supportive government and regulatory climates for accelerated commercial growth. This follows a key trend by Shell and BP investing $12 and $8 billion respectively in sugar-based conglomerates in Brazil to produce ethanol, bio-butanol, drop-in fuels, and bio-based chemical products.

8 Co-Product Strategies For Algae Producers Attract Investment

An emerging trend in commercial and privately funded algae projects is a biomass focus on high-value products including: livestock and fish meal, omega 3s, health products, cosmetic and pharmaceutical uses. Most algae farmers seek these highest value products for key addressable markets first, and then plan to scale up operations over time for commercial biofuels production. Many ventures will pursue these high-value, addressable markets to develop cash flow for operations, resources and staff, and establish early brand identity.

9 Government R&D Investment in Public-Private Partnerships

Governments in the US, EU, Brazil, China, India, Canada, and world-wide are funding algae R&D collaboratives at universities and laboratories, public-private partnerships, pre-commercial demonstration stage enterprises, pilot and prototype-stage endeavors. Most funded or awarded ventures bring together clusters of industry, government, academia, cleantech investors, and producers to share and collaborate on key challenges and opportunities. Some government algae R&D ventures are now phasing into pre-commercial, deployment-stage algae ventures using pond, photo-bioreactor, and fermentation based production systems. Government R&D, deployment, and commercialization support continues to expand into new countries and territories world-wide.

10 Investment and Market Strategies: Capital Light Investments, Global Export Markets

Based on dozens of site visits, the author of *Algae 2020* learned many pre-commercial, VC and angel backed ventures are increasingly pursuing a two pronged strategy. The first strategy seeks to license technology to partners with capital to develop and scale up the pre-commercial enterprise to commercial levels. This is also known as the capital light strategy. The second strategy is for producers to export technology to local partners in global geographies with advantaged environments for sunlight, operating expenses, market growth, and government support.

11 Global Partnerships for Emerging Markets Growth

Current economic and regulatory tradewinds in the northern countries of the US and EU are shifting algae technology exports southward and east to Central and South America, Africa, and Asia. An increasing number of partnerships are forming and leveraging advantages in technologies, economies, and geographies. Long term tradewinds favor large-scale production supplies of algae from the Americas, the Middle East and Asia with increasing demands for algal biofuels, products and technologies from China and India.

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