

# *Algae Biofuels*

## *Co-products to Fuels*

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## ***Introduction***

With the backdrop of rising petroleum and diesel prices, increasing public pressures to reduce carbon dioxide and other greenhouse gases (GHG), and growing government concerns about dependence on imported energy, the future for biofuels is promising.

Today, about 3% of world fuel demand is being met by biofuels. Most of that production comes from first generation biofuels including ethanol and biodiesel. These first generation biofuels - primarily derived from corn, soy and sugar feedstock - are commercially developed but have high costs and limited scalability. New technologies such as algal biofuels aim to address these weaknesses.

## ***Next Generation Biofuels Outlook***

Biofuels from algal technology have a number of inherent advantages over first generation biofuels. First, algal biofuels provide food chain independence. Algal biofuels do not compete with arable land nor are they susceptible to price volatility associated with other feedstock commodities such as corn and sugar. Algal technologies also provide very high yields and the possibility of producing highly specialized strains through genetic engineering. Realizing this potential, governments have provided significant research and development funding. However, there are still significant barriers to overcome for algal biofuels to be commercially viable as a fuel. Technological challenges in cultivation, harvesting, and extraction have limited algae's cost competitiveness as a feedstock. And despite years of research, algae biofuel markets are nascent with full commercialization and capacity build out projected only in the next 5- 7 years.

## ***Achieving the Promise of Algal Biofuels***

To improve their near-term viability, algal biofuels producers are redefining their go-to-market strategies by focusing development on high value co-products. Co-product end-markets are very diverse and include human nutrition, animal and fish specialty feeds, industrial chemicals, cosmetics and pharmaceuticals. These end markets are generally less price sensitive and provide more differentiation opportunities than fuel. By pursuing co-products, companies can monetize their investment in the near-term until algae biofuel becomes price competitive.

But implementing a co-product strategy is not so easy. Each co-product market presents a new challenge – with very different channels to market, product requirements and entrenched competitors. Given that multiple co-product end-markets are addressable from the same algal biomass, producers will be challenged to build the right internal operational capabilities required to successfully sell into and support those diverse markets.

To support these new strategies, algal producers must be willing to tune their business models and value chain position to address co-products. Many leading pure play producers are developing partnerships or forming co-development agreements with leading end-market players (e.g., large consumer products and cosmetics companies) to share risks, reduce costs, and hasten time-to-market. While this approach has become the primary market expansion strategy for several leading algae companies, there are other strategies to consider. Some algae producers have explored vertically integrating into end markets. For example, one industry leader is producing branded cosmetics products instead of simply being a feedstock provider. Another strategy is for companies to license their technology to third-party developers. This strategy is the lowest-risk, but also presents limited upside in the long term.

Each business model option comes with its own implementation challenges. Companies must evaluate and select the right business model(s) based on their time-to-market targets, risk appetite, investment goals, access to capital and most importantly, their ability to build the operational capabilities needed to enable their go-to-market strategy. In conclusion, the market opportunity for next generation biofuels looks promising, but algae producers must identify synergies with other products and end markets, successfully provide higher value services and co-products, and then transition to fuel.

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