

## **Research and deployment of bioenergy production from algae, a state of technology review**

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Algae remain an attractive target for bioenergy applications over the longer term because of their high photosynthetic efficiency. However, near-term prospects for primary algae-based energy/fuels production remain poor due to the cost of cultivating and harvesting algae. While there has been substantial technical progress on algae-based bioenergy production in recent years, persisting low fossil fuel prices are causing the algae-based industry to shift its focus from biofuels/bioenergy products to higher value (non-fuel/energy) products that can be profitable today. Ultimately, the vision is that algal biomass-based co-products will provide the additional revenue needed to reduce the net cost of producing algal-based biofuels. As such, a biorefinery approach that enables multiple high-value products to be produced will be essential to fully valorize algal biomass and enable bioenergy coproduction. To accelerate implementation of algae-based production, progress in minimizing the energy, water, nutrients and land use footprints of integrated algal-based operations needs to be a primary objective of future larger scale demonstrations. This presentation will summarize findings of a recently completed IEA Bioenergy report on the status and prospects for using microalgae and macroalgae as feedstocks for biofuels and bioenergy production; the report is available at [www.ieabioenergy.com](http://www.ieabioenergy.com). The scope of the areas covered includes international activities advancing bioenergy and non-energy bio-products from algae, bioenergy from macroalgae (both cast and cultivated seaweeds), distinct biochemical and thermochemical conversion pathways, biorefining opportunities, as well as process economics and sustainability issues.

