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ENSC 230 – Energy and the Environment: Economics and Policy

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Green Crude: Energy for the New Climate Era

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In 2005, the Renewable Fuel Standards was signed into law requiring that 7.5 billion gallons of renewable fuel be blended into gasoline. By 2022, that number is projected to be 36 billion gallons of biofuels incorporated into our energy portfolio. While this ambitious policy is possible, there isn't one "silver bullet" to fulfill this pledge; several routes will need to be taken in order to achieve this goal. One possible solution that can help meet these standards can be found in perhaps the "greenest" fuel there is: algae.

Algae are tiny plant-like organisms that thrive by absorbing sunlight and carbon dioxide and efficiently converting them into energy. There are thousands of algae species, many of which contain high-quality lipids (oils) that can be converted into biofuels. Some species of algae have lipids that can account for greater than 60% of their biomass and therefore can produce 2,000 gallons (or more) of oil per acre per year (Marlaire). In comparison, corn can produce about 30 gallons of oil per acre per year while soybeans can produce about 50 gallons of oil per acre per year (Marlaire). The energy in algae can be converted into biodiesel, methane, ethanol and many other forms, making it as diverse as it is plentiful, which any pool owner can attest to.

Algae have another advantage: they don't compete with agricultural land. This year, we have seen devastating droughts, which, in turn, have caused corn prices to skyrocket. With 40%

of our corn yields devoted to ethanol production, we are literally burning our food supply in a time when that land is needed to feed an ever-growing population. Algae can grow in salt water, freshwater and contaminated water, at sea or in ponds, and on land not suitable for food production.

Algae also have several other key advantages. Algae, like other terrestrial plants, are a terrific absorber of the greenhouse gas carbon dioxide, the atmospheric gas that is highly responsible for the changes in climate seen across the globe. Some estimates consider that "90% of the algae's dry weight is absorbed CO2, which could possibly absorb as much as 1000 tons per acre per year" (GGS). As algae absorb CO2, the combustion of this fuel would be carbon-neutral, eliminating the emissions that fossil fuels create. In addition to carbon absorption, the oils from algae could be used to make nutraceuticals and pharmaceuticals, while the remaining biomass could be used to create biogas, food, feed and fertilizer.

Currently, there are a few setbacks that make algae hard to compete with conventional fuels. Highly productive algal strains need to be identified and reliable algae-farming methods need to be developed. The economic viability of algae is still being examined in several key areas— such as the potential for value-added co-products and system design and engineering. The problem with developing fuel from algae comes from the costs of cultivating, harvesting and extracting the fuel. Estimates for algal fuel with today's technology would cost more than $8/gallon; however, research and development practices across the globe are working to assuage the costs of production. Estimates based on high-value co-products and future technologies in open-pond systems could bring that price down to just over $2/gallon (Yang; Rapier). As oil prices continue to rise, prices of oil produced by algae will continue to decrease and become more viable in conjunction with advancements in algal- energy technology.

For the reasons listed above, it is key that research and development continue to be invested in this promising energy sector. In 2010, the U.S. Department of Energy pledged to invest $24 million to several companies working to develop commercially viable energy sources from algae. An example of the importance of these investments can be seen in Los Alamos' Bioscience Division's leading technology to separate algae oil from the water it's grown in. Based on small scale devices tested, they believe they can produce an "ultrasonic algae harvesting device that can concentrate 25 gallons of algae per hour for less than a penny per gallon of lipid" (Yang).

While we move into a new energy era, fossil fuels are becoming a thing of the past (literally and figuratively). Algae needs to be further considered as a candidate to help wean ourselves from these fossil fuels. Much of the world's petroleum already comes from algae that decomposed millions of years ago, but instead of waiting millions of years for algae to become oil, industrial processes can transform algae into oil in a matter of days. There are still hurtles that need to be overcome, but further investment in research and development can make algae the "green" fuel of the future.

Citations:

Marlaire, Ruth. "NASA Envisions "Clean Energy" From Algae Grown in Waste Water." *NASA.gov*. NASA, 22 Apr. 2009. Web. 17 Nov. 2012. <http://www.nasa.gov/centers/ames/news/features/2009/clean_energy_042209.htmlhttp://>.

Yang, Joyce. "Innovation at Los Alamos Unlocking a New Source of Domestic Oil... From Algae!" *Energy.gov*. Department of Energy, 17 May 2011. Web. 8 Nov. 2012. <http://energy.gov/articles/innovation-los-alamos-unlocking-new-source-domestic-oil-algae>.

"Vertical Bioreactors FAQ." *Global Green Solutions*. Global Green Solutions, n.d. Web. 12 Nov. 2012. <http://www.globalgreensolutionsinc.com/s/VertigroFAQ.asp>.

Rapier, Robert. "Current and Projected Costs for Biofuels from Algae and Pyrolysis." *Consumer Energy Report*. n.p., 7 May 2012. Web. 28 Nov. 2012. <http://http://www.consumerenergyreport.com/2012/05/07/current-and-projected-costs-for-biofuels-from-algae-and-pyrolysis/>.