CRC CAPITAL RESEARCH CENTER

Green Watch

Algae Energy — Dead in the Water?

By Alison Morris

Summary: *In February, President Obama touted his plan to fund algae biofuel as a domestic alternative fuel source. But years of government investment have failed to overcome the obstacles algae faces to becoming a viable source of fuel, and as with other alternative energy enthusiasms, disturbing connections have arisen between campaign contributors and government grants.*

President Obama detailed his solution for the nation's "energy problem" to an audience at the University of Miami this February. Though most of the plan consisted of the same old dubious solutions like solar power, he made one new and surprising addition: algae.

"We're making new investments in the development of gasoline and diesel and jet fuel that's actually made from a plant-like substance—algae…. You've got a bunch of algae out here, right? If we can figure out how to make energy out of that, we'll be doing all right."

It sounds like science fiction, but the federal government has explored algae biofuel for decades. It began in the Carter administration as a small portion of the newly created Department of Energy called the Aquatic Species Program and continued into the 1980s as a hoped-for alternative to increasingly expensive gasoline (sound familiar?). Though algae research has continued, very little actual progress has been made toward the goal of algae as a feasible energy source.

No unicorns were harmed in shooting this photo: Algenol is one of several pie-in-sky biofuel companies trying to make algae energy production affordable. They'll need all the luck they can get.

And yet, since November 2008, the federal government has invested $2 billion for still more algae biofuel research and development. The Energy Department has already spent $85 million to purchase the fuel—and plans to spend upwards of $30 million more, *Forbes* reports. Clearly, the Obama administration believes algae biofuel can be made into a significant fuel source for the oil-hungry United States. But how viable of an energy source is algae?

The Great Green Hope

Algae biofuel is created by growing thousands of pounds of slimy pond scum, then squeezing it down to reap oil. This oil, which gives algae its greasy texture, is

September 2012

then chemically processed to create a type of ethanol—the same fuel created from corn and soybeans in other parts of the country. And, like soybeans and corn, we have algae in abundance in the United States, as President Obama observed in February, and more could be grown. The plants "multiply like gangbusters," says *Popular Science*'s Barry Gutierrez, and they need only water, sunlight, and a bit of space to flourish.

Once the oil has been extracted, what is left of the algae can be used as fertilizer or livestock feed, reducing the need for farmers to grow corn for animal consumption. And the oil produced by the tiny plants requires "exponentially less acreage" than oil from corn, soy, or palm biofuel, which, according to Maureen O'Conner of *AlternativeConsumer.com,* encourages farmers to free up more cropland for food or algae production.

Algae's most widely touted benefit, however, is its diet. Like other plants, algae absorbs carbon dioxide and, if grown in large quantities, may be able to halt or even reverse the effects of global warming, some environmentalists claim. Growing algae near carbon-emitting factories, they say, will not only neutralize alleged carbon pollution, but *reduce* it.

So what is the problem then?

A (Pond) Scummy Alternative

Obama alluded to the problematic nature of algae energy himself, whether knowingly or not, when he spoke to the Miami students in February. He bragged that algal biofuel could replace 17 percent of our transportation oil use, amounting to roughly 21 billion gallons a year. Talk about aiming high: Obama and his administration are spending billions in the hopes of producing less than a quarter of our transportation oil use, which itself only makes up 70 percent of our total oil consumption, according to the Institute for Energy Research.

But, of course, there's a reason for everything. Citing a study performed by the Pacific Northwest National Laboratory, Larry Bell reports in *Forbes* that even to replace that small percentage of our oil consumption would require algae cultivation across a land area roughly the size of South Carolina, plus about 25 percent of all U.S water currently consumed for crop irrigation, just to compensate for evaporation. Beyond that, a considerable amount of energy would be needed to provide an optimal environment for the algae—which includes tasks like maintaining temperature, preventing contamination, and providing adequate light—not to mention the energy necessary to process the fuel, another large drain on resources.

And all of that to make only 21 million gallons of algae biofuel. Imagine the resources needed to produce the 140 million gallons per year required to replace all petroleum-based transportation fuel.

The Pacific Northwest National Laboratory did the math: As *Forbes* columnist Jeff McMahon notes, the laboratory calculated that because it takes 350 gallons of water to produce 1 gallon of algal oil, the US would need to provide algae production three times the total water currently used for all existing agricultural irrigation, a controversial proposition in a world with limited freshwater resources. And, Barry Gutierrez adds, this algae project would use 95 million of the available 434 million acres of cropland in the contiguous United States. Dedicating nearly a quarter of our total farmland to algae would mean less home-grown food and higher food costs for the American public.

Then there is the issue of testing the oil to see how it performs as a fuel source. Though it is apparently edible (*CNET*'s Michael Kanellos says it tastes like stale Wesson), no official testing has been done on how the fuel burns in an average commuter vehicle (its only test was in a decommissioned U.S. Navy destroyer in 2011). A few hippies drove around in an algae-fueled car at Park City, Utah's Sundance Film Festival last year, but little can be said of their scientific authority. For all we know, algal oil may produce *more* pollutants than petroleum, or—more likely—it may turn out to burn quicker, which would mean our fuel consumption would rise.

No wonder conservative pundits are crying foul. Newt Gingrich, for example, said that the suggestion of algae-based fuels sounded "like a *Saturday Night Live* skit" or something from "Cloud Cuckoo Land." But his comments were backed with logic: he argued in the *Conservative Times* that "there's a big difference between [supporting private research and development] and offering algae today as an answer to high gas prices, or using taxpayer money to subsidize this particular technology."

Editor: Scott Walter
Publisher: Terrence Scanlon
Address: 1513 16th Street, NW
Washington, DC 20036-1480
Phone: (202) 483-6900
Email: swalter@capitalresearch.org
Website: www.capitalresearch.org

Green Watch is published by Capital Research Center, a non-partisan education and research organization classified by the IRS as a 501(c)(3) public charity. Reprints are available for $2.50 prepaid to Capital Research Center.

Syndicated columnist Charles Krauthammer has pointed out that it is ridiculous to spend millions on a fuel not yet feasible, while also rejecting the Keystone XL Pipeline, which would supply "real oil from Canada to put in real refineries and put in real existing cars." Senate Minority Leader Mitch McConnell agreed, reasoning that, "the American people realize that a President who's out there talking about algae–algae!–when we're having to choose between whether to buy groceries or fill up the tank is the one who is out of touch."

Algae's Corny Companion

In short, not only is algae biofuel an irrational choice right now, but its sudden federal backing is also a story we have seen before. How many times have government-funded "clean energy" programs either vanished from the minds of the unimpressed public or imploded under the weight of their own unintended consequences? From Cash for Clunkers (which ended up dramatically increasing the price of used cars) to electric cars (which were developed, but were far too expensive for the average consumer), we have seen nothing but inefficiency and failure coming out of the realm of government-sponsored energy programs.

The government program most akin to algae biofuel is its cropland compatriot: corn-based ethanol. Ethanol derived from corn has been used as an additive to gasoline since the late 1970s, but it was not until methyl tertiary butyl ether (MTBE), a more popular additive, was found to be contaminating groundwater that corn ethanol became widely used. By 2005, the United States was the largest producer of ethanol fuel, and the federal government began offering subsidies to American farmers to grow yellow corn—an edible crop—and, rather than sell it for use as food, allow ethanol manufacturers to purchase the farmers' spoils and, well, spoil them.

It seemed America had found a solution to its dependence on fossil fuels. Growth Energy, an ethanol production company, launched ad campaigns boasting "No beaches have been closed due to ethanol spills" and "no wars have ever been fought over ethanol." Americans were slowly decreasing the amount of petroleum they put into their cars, as the amount of ethanol blended in each gallon of gasoline rose slowly each year. The Department of Energy proudly declared that "ethanol results in fewer greenhouse gas (GHG) emissions than gasoline"—and most of the studies coming out in the early 2000s backed up that claim. But what America and its government did not realize is that policies stimulating ethanol production were both creating a global food crisis and also causing more carbon emissions than ever before.

Corn is a staple in the American diet. The U.S. Department of Agriculture reported in its *Agriculture Fact Book* that the average American consumed 28.4 pounds of corn products and 85.3 pounds of corn-based sweeteners per year. America's poor consume the most corn products because they rely more upon cheaper processed or packaged foods to sustain themselves. The poor, then, were most hurt when corn prices began skyrocketing—jumping from $3.49 to $6.10 per bushel in the first half of 2010, according to Elizabeth Weise of *USA Today*—as a result of a higher demand for the kernelled crop.

Nor were Americans the only ones who suffered the unintended consequences of ethanol use. Higher demands for yellow corn caused what is now called the "Tortilla Crisis" in Mexico. As prices rose, more American farmers began producing yellow corn rather than its white relative, which is used to make the tortillas that are a mainstay in Mexicans' diet, especially among the poor. As the supply of white corn fell, the price nearly tripled, reports Gunther Hamm of Reuters—which put a heavy burden on Mexican families accustomed to low-cost American white corn products. Many families who make only $5 a day were forced to spend more than a fifth of their daily money on feeding themselves, thanks to America's ethanol policy.

The move toward corn ethanol wasn't just an economic disaster. As the years went by, study after study proved that growing and refining corn for fuel put *more* carbon into the atmosphere, pulling the rug out from beneath the claims of pro-biofuel environmentalists. For example, a study published in the February 2008 edition of *Science* explained that many prior studies—which claimed that substituting biofuels for gasoline would "reduce greenhouse gases"—had "failed to count the carbon emissions that occur as farmers worldwide respond to higher prices and convert forest and grassland to new cropland to replace the grain (or cropland) diverted to biofuels." When these factors were included, the *Science* study found that rather than reducing emissions, ethanol policies would double emissions over 30 years and continue increasing greenhouse gases for 167 years.

Not exactly an environmental victory after all.

Worse, another study in the same issue of *Science* found that if forests or peatlands were cleared to produce more corn, farmers would incur a "biofuel carbon debt," releasing 17 to 420 times more carbon dioxide than "the annual greenhouse gas reductions that these biofuels would provide by displacing

fossil fuels." And as Jason Mick reports for *DailyTech*, because corn production does not allow for a fallowing period (where the land recovers its nutrients), growing corn slowly rids the land of its vital carbon, which requires farmers to use more fertilizer, which then further increases the release of greenhouse gases.

Despite all of these struggles with corn ethanol, the United States government still refuses to pull completely away from policies that promote the fuel source. But ethanol does seem to have lost some of its appeal to politicians, as one can see from their latest excitement over algal oil. Algae, they say, avoids many of the problems that corn posed: it is not a food source, and rather than adding to carbon emissions, it reduces them. But surely the Obama administration must be able to see the likenesses between the two plants' stories: a fuel source is touted as the greatest new thing and, before extensive research is done on all of its effects on the planet's economic and ecological environments–and after billions of tax dollars have been wasted–the truth comes out. Algae energy clearly has its own problems, which make it likely to become, like corn, a failed and costly experiment.

The Slimy Truth

It makes one wonder why on earth algae energy would be promoted by the Obama administration anyway. There may be an easy answer, though it turns out to be the slimiest part of the whole topic.

The federal support for this biofuel has been called everything from a "cozy algae racket" (Michelle Malkin) to a "green scam" (*Forbes*), because the Obama administration appears to have a certain understanding with the biofuel manufacturers deep into algae research and development. Many of those companies give support only to Democratic campaigns and candidates–and they receive plenty in return.

For example, Paul Woods, CEO of Florida-based biofuel manufacturer Algenol, seemed to know that the 2008 appointment of Steven Chu to Energy Secretary would bode well for his company. When asked about the appointment, he said, "You see this smile on my face? It's not going away. Everyone is really excited by this." It did indeed pay off: Algenol received $25 million in the American Recovery and Reinvestment Act of 2009 (also known as the stimulus bill).

Similarly, the CEO of Sapphire Energy, Jason Pyle, donates only to Democratic candidates and campaigns, including a $5,000 donation to the Democratic Congressional Campaign Committee in 2008. And Sapphire's reward? The company received $105 million in the 2009 stimulus package.

Probably the worst offender of the bunch, Solazyme, not only donates largely to Democrats, but has officials working inside the Obama administration itself. On March 21, syndicated columnist Michelle Malkin reported that the biofuel manufacturer's officials have contributed a total of over $360,000 to Democratic campaigns since 2007, much of which went to Barack Obama's campaign. In return, their strategic adviser T.J. Glauthier was heavily involved with the energy portion of the stimulus bill. Not surprisingly, the company received a big payout: they were granted $27.7 million for a new refinery, according to *Forbes*.

But the algae oil corruption doesn't end with bailout money. After the U.S. Navy promised to use alternative energy sources for half of its needs by 2020, it "invested" nearly $12 million to buy 450,000 gallons of algae biofuel priced at a whopping $26 per gallon, according to *Bloomberg News*. Although that's a bargain for the still-in-development source, it will replace jet fuel that could have been purchased at a fraction of the cost. Such wasteful spending hardly seems appropriate when the government is sharply cutting military budgets, and all those wasted millions will pull money away from other efforts that would actually strengthen our defenses.

But, of course, the Navy isn't just wasting our money to fuel a couple of jets. They are using the purchase–the biggest federal purchase of biofuel ever–in naval exercises in Hawaii. And though Chief of Naval Operations Admiral Gary Roughead insisted the exercises were not a "public relations gimmick," naval officials' most evident priority seemed obvious: garnering good press. Calling the retrofitted ships the "Great Green Fleet Carrier Strike Force"–a comical allusion to Teddy Roosevelt's Great White Fleet–officials used the exercises as evidence that they are not only fighting terrorism in the Middle East, but also boosting American energy independence with alternative fuels.

Fossil Fuels vs. Algae – No Contest

The topic of energy sources is contentious, but nearly everyone agrees that the status quo is not tolerable – both in the short and long term. Even conservative Newt Gingrich noted, "If someday in the future, we're all driving cars based on inexpensive fuel from algae, it's possible that would be a positive development." The problem, however, is finding a real, albeit temporary solution for a real – and very current – energy crisis. Especially in our struggling economy, we cannot afford to spend precious taxpayer dollars on the theoretical, rather than letting market forces press on to develop technologies that

will create wealth, prosperity, and energy independence for the American people.

How odd that we spend so little time looking into the alternatives we *do* have available, such as oil and coal, as well as natural gas which is now plunging in price thanks to innovative drilling techniques like "fracking."

Two fossil fuels (namely coal and oil) made up almost 90 percent of energy consumption globally in 2000, and they will continue to be the dominant energy source until 2100, according to a 2007 U.S. Climate Change Science Program report. This isn't because we are stubborn. It's because right now, coal and oil are the easiest, cheapest, and most developed resources available to us.

Natural gas is the most viable alternative, yet many environmentalists worry that the use of "fracking" to extract it from shale is dangerous, because of a chance that the chemicals used to fracture the shale rock could contaminate underground water supplies (although there has never been a case of this occurring).

Wind power, which is only viable if supplemented by power from coal plants, ends up being less fuel efficient than just using coal. Summarizing several studies, including one conducted this year for Obama's Energy Department by the Argonne National Laboratory, the Institute for Energy Research reports that wind power has hidden problems, especially with regard to carbon emissions. Because wind turbines only generate power intermittently, they require back-up coal power plants to ensure a power grid doesn't go dark. But it "takes more energy and thus more carbon dioxide emissions to ramp a coal plant up and down" in response to the wind's waxing and waning than if "the same coal plant is operated at a continuous, efficient base-load level."

Solar power, likewise, has a dilemma: it requires using either cheap and inefficient panels, or highly efficient panels with an extremely high price tag. And nuclear power, though once capable of producing nearly 14% of the global electricity demand in 2009 (according to the International Atomic Energy Agency), has been slowly losing traction; reopening many of the closed nuclear plants would cost more than two times what it takes to build a new coal plant, *Scientific American* reports.

In other words, in a flailing economic environment we should focus on what actually exists and what already works. A government concerned primarily with recovery simply can't invest money we don't have in technologies that–like algae–may prove unworkable.

Clearly, recovery is not at the top of the federal government's agenda. Its highest priority, at least where energy is concerned, seems to be supporting unrealistic schemes just to satisfy its own rent-seeking desires. A desire to conserve resources certainly isn't the administration's priority, because large-scale production of algae biofuel would drain the American landscape of resources that could be used more efficiently elsewhere. Worse, the administration rejects the use of fuel sources that are not only cheaper and better established in the United States, but, if fully developed, would create thousands of jobs. (See: Keystone Pipeline.)

In times of economic hardship–with unemployment last reported at 8.3% and GDP growth in 2011 coming only to a measly 1.7%–we should not try to dream up hypothetical schemes with purely political benefits, but instead find the most efficient ways to use energy that is cheap and fully developed.

Alison Morris participated this summer in the Capital Research Center's Henry Haller Internship Program. She may be reached at alisonmorriswrites@gmail.com.

GW

GreenNotes

"Dangerous and Foolhardy"—that's the judgment on the **U.S. Navy**'s biofuel programs made by energy expert and Korean War naval veteran **Donn Dears**. While many critics have noted the enormously higher costs of biofuels compared to the Navy's standard jet fuel and fuel oil, Dears points to additional problems with the **Obama administration**'s demand that the **Defense Department** use alternative fuels for half of all its consumption by 2020; namely, greatly complicated logistics. "When in a foreign port, ships typically acquire supplies from local sources that are less expensive or obviate the need for transport across the ocean," but "biofuel refineries aren't likely to be found in Asian, Mideast, or Mediterranean ports, so biofuels would have to be transported across the ocean." That raises costs and also the likelihood of environmental accidents. The Navy will have to increase its expenses and complicate its logistics by purchasing additional supply ships. Worse, the Navy will more often have to re-supply while underway at sea, a difficult task that "can cause a collision with damage to both ships and possible loss of life."

Because biofuels "don't improve range, don't improve efficiency, and aren't less expensive," Dears concludes, "any comparison with the Navy's shift from coal to oil is ludicrous." Not only did the shift to oil improve range and efficiency, it "eliminated the need for coaling bases" as well as the "back-breaking and time-consuming effort to reload the ship with coal."

The Obama administration and its environmental activist allies have vigorously opposed using federal lands for the extraction of fossil fuels, the *Wall Street Journal* notes, yet with no activist opposition the **Interior Department** recently "announced that it will allow construction permitting on 285,000 acres of public land in **Arizona**, **California**, **Colorado**, **Nevada**, **New Mexico**, and **Utah** for solar energy projects." In addition, the Department encouraged solar firms to ask permission to build installations on roughly 19 million acres, "a larger land mass than **Connecticut**, **Massachusetts**, **New Hampshire**, and **Vermont** combined." Interior also pledged to minimize regulatory obstacles for solar firms.

U.S. government support for ethanol production continues to receive heavy criticism from numerous sources. Most recently, the **United Nations** "called for an immediate suspension of government-mandated U.S. ethanol production," the *Financial Times* reported. The director-general of the U.N.'s **Food and Agriculture Organization** pleaded for the suspension so more corn could be "channeled towards food and feed uses." Criticism also came from Archbishop **Silvano Tomasi**, who represents the **Vatican** at the U.N. "Water and food are a human right that needs to be respected," he said, "and therefore the policies have to be developed to prevent the excessive use of agricultural products for biofuels, ethanol in particular."

The **European Union**'s **Energy Commissioner**, **Guenther Oettinger**, expressed fears about Europe's energy and environmental policies in a recent newspaper column. Summarizing his concerns, Reuters said the German-born EU official fretted over "runaway power prices in his home country, where subsidizing of fast-expanding green power is burdening industrial and household consumers." Oettinger also sounded the alarm that the EU's "drive towards a low-carbon economy" has significantly eroded the Continent's industrial base.

"The average Chinese person's carbon footprint is now almost on a par with the average European's," Britain's *Guardian* newspaper reports. **China** has been the world's largest emitter of carbon dioxide since 2006.