

**Statement for the Record**  
**by the Algal Biomass Organization**  
**Committee on Ways and Means**  
**Subcommittee on Select Revenue Measures and Subcommittee on Oversight**  
**Joint Hearing on Energy Tax Policy and Energy Tax Reform**  
**September 22, 2011**

The Algal Biomass Organization (ABO) would like to thank the Subcommittee on Select Revenue Measures and the Subcommittee on Oversight for holding this hearing on the future of energy tax policy, which is an issue of fundamental importance both to our member organizations and to our nation's future.

ABO represents stakeholders involved in the use of algal biomass for the production of next generation biofuels. We believe that the nation's energy and tax policies should be aligned in order to ensure that future generations have access to an affordable, abundant energy supply that is environmentally sustainable and not dependent on imported oil. Although this is an ambitious goal, every year breakthroughs in renewable energy technologies bring the country closer and closer to making this goal a reality. Our country has always had robust energy and tax policies, yet these policies have not always been well-integrated, and tax incentives in particular have not always been carefully designed to achieve the most efficient outcomes. Comprehensive tax reform provides Congress with an opportunity to re-examine the nation's energy policy and ensure that it enacts tax provisions that support these broader policy objectives.

Specifically, ABO believes that energy tax reform should be guided by the following principles: (1) providing certainty for market participants; (2) establishing technology-neutral tax subsidies that advance specific policy goals; (3) promoting American energy independence; and (4) providing targeted support for nascent, cutting-edge technologies to assist their progression from the demonstration phase to commercialization.

Before we discuss these three principles of energy tax policy, we would like to provide an overview of our membership as well as the significant benefits of algae-based biofuel.

**The Algal Biomass Organization**

As an industry trade association, ABO promotes the development of viable technologies and commercial markets for renewable and sustainable products derived from algae. Specifically, we focus on facilitating the commercialization and market development of algal biomass into fuels that can serve as direct substitutes for petroleum fuels, such as gas, diesel, and jet fuel, as well as producing other renewable fuels like ethanol.

By way of background, algae is one of nature's most prolific and efficient photosynthetic organisms; in fact, it is the source, millions of years ago, of all of the Earth's crude oil. Over the

past two to three years, more than 90 algae-based fuel companies have emerged, each making its own unique contributions to the field. ABO members are among the most prominent firms in the algae-based fuel industry. Most are producing transportation fuels or developing state-of-the-art algae-based biological carbon capture and beneficial reuse applications. For example, Sapphire Energy – a California-based company with operations in San Diego and Las Cruces, New Mexico – has successfully produced 91-octane gasoline (regular, unleaded fuel) that fully conforms to ASTM certification standards. Additionally, Sapphire has also produced renewable diesel and jet fuels that have been successfully tested in two commercial flights (Continental and JAL). Algenol, a Florida-based company, is developing algae-based ethanol, as well as valuable co-products, such as plastics and animal feed. Finally, Solazyme, a California-based company, produced the algal-based fuel used in the military’s first flight ever using algal-based jet fuel in June 2011.

In many respects, algae is an ideal energy crop: algae-based fuels are renewable, produced in the United States, possess a low carbon footprint over their lifecycle, have no adverse environmental impacts, are price-competitive, and can be drop-in fuels that fit seamlessly into the country’s existing energy infrastructure. Thus, algae-based fuels have tremendous potential to ensure America remains an energy-rich country that is fueled by domestically-supplied, environmentally-friendly and cost-competitive fuels. Further, algae-based fuel is not a science fiction fantasy or a theory that works in the test tube but not in application. The algae fuels industry is on the verge of commercialization and is ready to provide viable alternatives to petroleum fuels, either through “drop-in” fuels that are direct substitutes for, and in some respects superior to, traditional petroleum fuels, or other renewable fuels like ethanol. As such, ABO expects that algae-based fuels will have a profound impact on the nation’s economy, energy policy, and national security in the near future. Commercial scale projects are being developed today. We expect to be able to provide significant market volumes – millions of gallons per year – by 2016. And close to 6 billion gallons by 2022.

### *Energy Density*

Algae-based fuels are very low in sulfur, have no benzene, result in superior diesel fuels with high cetane levels, and are slightly higher in energy density than traditional petroleum-based fuels. Algae’s high energy content is due to its unique composition. Nearly all of algae’s biomass is concentrated in the chloroplast – the engine that turns sunlight and CO<sub>2</sub> into organic carbon – so algae does not “waste” energy making stalks, roots, leaves, or fruits. This efficiency leads to very high yields of oil. For example, while palm oil (a first generation biodiesel) can yield 554 gallons of oil per acre, algae can yield approximately 5,000 gallons per acre, increasing the oil output by a factor of ten. In fact, algae produces 50 times more energy per acre than traditional biofuel feedstocks.

### *Environmentally Sustainable*

Algae does not compete with other feedstocks used to produce biodiesel and ethanol. Unlike other feedstocks, algae does not require arable land or potable water. Instead, algae can be grown quickly in brackish or salt water in the desert. Consequently, algae-based fuels do not

pose any of the land use or “fuel versus food” issues which often accompany other types of biofuels.

Further, algae’s short growing cycle makes it scalable to millions of barrels per day. Since a full algae crop can be harvested every 7-13 days, a small amount of land can produce large quantities of algae-based fuel. For example, seven MM acres of algae can displace 15 percent of the country’s transportation fuel; to displace that same amount, corn ethanol requires 90 MM acres.

### *Impact on Climate Policy*

On average, algae fuels have a life-cycle carbon impact that is roughly 2/3 less than that of petroleum-based fuels and significantly lower than other conventional biofuels. Algae-based fuels meet and exceed the 50% reduction in green house gases as required by the EPA in the RFS. One of the reasons for algae’s low carbon footprint is the role that carbon dioxide plays in the cultivation of algae. Carbon dioxide is one of algae’s principal feedstocks. Algae actually consumes enormous amounts of carbon dioxide, drawn from both industrial and atmospheric sources, in its growth process. For example, in order to produce one gallon of crude oil from algae, algae consumes between 29 and 33lbs (13-15 kg) of carbon dioxide. Consequently, the environmental benefits of using algae as a feedstock are exceptional: algae-based fuel provides a “two-for-one” benefit over the use of fossil fuel, by using the carbon dioxide emitted by commercial facilities (such as coal-fired electric utilities) as a feedstock for the production of algae-based fuels that displace traditional fossil fuels with heavy carbon footprints.

### *Potential of “Drop-In” Fuel Technology*

Most algae companies are producing “drop-in” transportation fuel that is fully compatible with the country’s existing energy infrastructure, including the existing network of refineries, pipelines, and terminals and the existing fleet of cars, trucks, and jets. Given the nation’s current fiscal situation, the ability of algae-based fuels, such as green crude, jet fuel, diesel and gasoline, to fit seamlessly into our current fuel infrastructure saves the country billions in additional capital investments needed to make certain renewable fuels compatible with existing infrastructure.

### *The Practical Prospects for Algae-Based Fuel*

ABO recognizes that in order to serve as an alternative to imported oil, algae-based fuels must be cost-competitive in the long term with current and future crude oil prices. Technological advances in the production of algal biomass have brought the industry closer to commercialization and cost-efficient production than ever before. Certain ABO members are undertaking large-scale production projects which, at full scale, will be able to produce one million gallons of fuel annually beginning in 2012. Indeed, as algae fuels move down the cost curve, ABO anticipates that at the point of commercialization, algae-based fuels will be cost-competitive with petroleum fuels at \$75-85 per barrel, producing millions of gallons a year by 2016.

In addition to providing a competitive alternative to petroleum fuels, the rapid expansion of the algae industry has other practical consequences. Currently the algae sector employs, either directly or indirectly, more than 20,000 workers at approximately 100 companies. ABO estimates that once algae fuel production reaches commercial scale in 2022 the industry could provide approximately 107,000 direct jobs. This figure does not include indirect job creation, such as those positions related to infrastructure construction, transportation and shipping, marketing, and other key positions along the value chain. If one includes these ancillary jobs, then ABO's job estimate increases by at least threefold. Further, the jobs being created in the algae fuel industry are steady, high-paying jobs for skilled workers, spanning across a wide variety of educational backgrounds and occupations.

### *National Security*

Algae fuel also has a pivotal role to play in advancing national security interests and weaning the country off of its dependence on foreign oil. For every one dollar increase in the price of a barrel of oil, the U.S. Navy and Marine Corps pays an additional \$30 million in fuel costs. During his testimony before the House Energy and Commerce Subcommittee on Energy and Power in June 2011, Tom Hicks, the Deputy Assistant Secretary of Navy for Energy, testified:

A robust advanced drop-in biofuels market is an essential element of our national energy security. Energy security for the Nation requires unrestricted, uninterrupted access to affordable energy sources to power our economy and our military. Traditional fossil-fuel based petroleum derived from crude oil has increasingly challenging market and supply constraints. Chief among these is limited, unevenly distributed, and concentrated global sources of supply. Advanced biofuels that use a domestic, renewable feedstock provide a secure alternative that reduces the risks associated with petroleum dependence.<sup>1</sup>

Accordingly, the Navy has adopted a goal of replacing one-half of conventional petroleum-based fuel use with domestically sustainable fuel alternatives by 2020. As the Navy strives to replace foreign oil with domestic fuel alternatives, algae fuels emerge as one of the few cost-competitive, viable energy sources in the near term. Additionally, the capacity of some algae-fuels to be drop-in fuels further advances the country's path toward energy independence.

### **Energy Tax Policy**

ABO believes that tax policy can play a critical role in supporting and advancing the nation's broader energy policy. Currently, the tax code contains numerous provisions pertaining to energy production or conservation; in 2010, tax provisions specifically targeting energy cost the

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<sup>1</sup> *The American Energy Initiative: Hearing on H.R. 909, A Roadmap for America's Energy Future before the H. Subcomm. on Energy and Power of the H. Energy and Commerce Comm, 112th Cong. 4 (2011) (statement of Tom Hicks, Deputy Assistant Secretary of Navy for Energy).*

country \$37.2 billion.<sup>2</sup> Although the federal government currently provides significant tax subsidies to the energy sector, often times these subsidies are technology-specific and not well-integrated into broader energy policy goals, such as developing alternative fuel sources to foreign oil. Comprehensive tax reform provides Congress with the opportunity to clearly define the objectives of the nation's energy and tax policies and make sure the two are aligned.

As stated above, ABO believes that tax reform should be guided by basic principles in order to create an energy tax regime that accomplishes certain objectives, including: (1) providing certainty for market participants; (2) establishing technology-neutral tax subsidies that advance a specific policy goal; and (3) providing targeted support for nascent, cutting-edge technologies to assist their progression from the demonstration phase to commercialization. ABO will address each structural feature of the energy tax code below.

### *Certainty*

Currently, the majority of energy tax provisions are temporary. For example, at the end of 2011, 17 energy tax provisions are scheduled to expire.<sup>3</sup> Yet while most energy tax provisions are temporary, the vast majority of energy projects are long-term investments. In order to attract the private investment necessary to finance the significant up-front capital costs many of these projects require, tax policy needs to provide long-term certainty to investors. Tax provisions with a long-term horizon enable investors and companies to accurately price projects so that market participants can accurately predict what their rate of return will be years out. For example, a typical biofuels plant could take five years to site and construct; if the production tax credit for the fuel produced by the facility expires in three years, private companies are unlikely to make the investment. Indeed, Robert Carroll, the former Deputy Assistant Secretary for Tax Analysis at Treasury and now a Principal at Ernst & Young, testified before the Senate Finance Committee earlier this year that, “[u]ncertainty over tax provisions also undermines their effectiveness . . . . The uncertainty of these provisions makes it difficult for businesses to incorporate them into planning and investment decisions, thereby undermining their effectiveness.”<sup>4</sup>

### *Tax Incentives Should Be Technology Neutral*

In effect, tax incentives establish the price the federal government is willing to pay for a certain unit of energy production or conservation. To be economically efficient, the federal government should identify specific goals for its energy tax policy and then craft specific tax incentives that

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<sup>2</sup> U.S. ENERGY INFO. ADMIN., DIRECT FEDERAL FINANCIAL INTERVENTIONS AND SUBSIDIES IN ENERGY IN FISCAL YEAR 2010 xi (2011).

<sup>3</sup> STAFF OF JOINT COMMITTEE ON TAXATION, JCX-2-11, 112th CONG., LIST OF EXPIRING FEDERAL TAX PROVISIONS 2010-2020 7-17 (2011).

<sup>4</sup> *How Do Complexity, Uncertainty and Other Factors Impact Responses to Tax Incentives Hearing Before the S. Comm. on Finance*, 112th Cong. 8-9 (2011) (statement of Robert Carroll, the former Deputy Assistant Secretary for Tax Analysis at Treasury and now a Principal at Ernst & Young).

provide the same dollar amount of subsidy per energy unit regardless of how that energy unit is produced or conserved.

Currently the energy tax code is technology-specific, resulting in several negative consequences. From ABO's perspective, the section 40 production tax credit for alcohol used as fuel excludes certain forms of alternative fuel production, like algae-based fuels, which provide comparable, if not superior, energy benefits to the fuels covered by the credit. More specifically, in recent years Congress has established a series of tax incentives, including a tax credit of \$1.01/gallon for the production of cellulosic biofuel. However, most of these tax incentives are *not* available for algae-based fuel. This is not the result of a policy decision to exclude algae-based fuel; rather, algae-based fuel, which was not well-known when the relevant tax incentives were created, simply does not fit the existing technical definitions. For example, to qualify for the tax credit for cellulosic biofuel under section 40, a fuel must be either hemicellulosic or lignocellulosic, and algae-based fuel is neither. As a result, current federal tax policy actually *discourages* the production of algae-based fuel, by failing to treat it equivalently to the production of other renewable fuels.

To address this disparity, members of Congress have introduced legislation in both the House and Senate that amends the section 40 cellulosic biofuel credit and the section 168(l) bonus depreciation allowance to include not only cellulosic ethanol but also algae-based biofuel.<sup>5</sup> While ABO believes that Congress should transition to a technology-neutral energy tax regime over the long-term, during the interim transition Congress should amend the existing code provisions to include algae-based fuels. Providing algae-based fuels with tax parity under the existing tax regime enables them to compete on a level playing field with comparable renewable fuels currently covered by the tax code, and ABO strongly supports these legislative efforts.

Indeed, the case of algae-based fuels is only one example of the unintended consequences of a technology-specific tax regime. The tax code contains myriad examples of technology-specific provisions that exclude the newest technologies, forcing Congress to periodically amend the

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<sup>5</sup> Senator Nelson (D-FL), along with Senators Bingaman (D-NM) and Kerry (D-MA) introduced the "Algae Fuel Tax Parity Act" ( S. 748) which would include algae-based fuel under both the section 40 production tax credit and section 168 bonus depreciation provisions. H.R. 1149, introduced by Representatives Bilbray (R-CA), Bartlett (R-MD), Bono Mack (R-CA), Carnahan (D-MO), Davis (D-CA), Dreier (R-CA), Hunter (R-CA), and Inslee (D-WA) and cosponsored by Reps. Calvert (R-CA), Filner (D-CA), Hanabusa (D-HI), and Hirono (D-HI), similarly provides tax parity for algae-based fuel, while also allowing algae-based fuel to be used to meet the Renewable Fuel Standard. Most recently, a group of senators introduced the "Ethanol Reform and Deficit Reduction Act" (S.1185) which also provides tax parity for algae-based fuel while scaling back the Volumetric Ethanol Excise Tax Credit and modifying and extending the alternative fuel vehicle refueling property credit. Importantly, in order to be most effective, legislation establishing tax parity for algae-based fuel should also include a special rule in the case of "green crude." Many algae companies use a combination of algae, carbon dioxide, and sunlight to produce unrefined, renewable biocrude rather than renewable finished fuel. This biocrude can then be shipped to conventional refineries where it is refined into finished fuel. The special rule clarifies that the companies producing the green crude, rather than the operators of the conventional refineries, can claim the benefits of the section 40 production tax credit and bonus depreciation allowance. It also clarifies that biocrude which is later refined into renewable fuel does not violate the section 40(b)(6)(E)(iii) exclusion for low-quality fuel, so long as the refined fuel itself produced from the green crude feedstock meets the credit's quality standards.

code to correct these flaws. While Congress can correct these inadvertent exclusions over time, as it is attempting to do in the case of algae-based fuels, a technology-specific tax regime still creates inefficiencies not present in a technology-neutral regime.

A regime which excludes technologies which are equally capable as technologies covered by the code is ineffective and arbitrary; in effect, it undersubsidizes the desirable activities it was designed to incentivize. Additionally, since tax policy directly impacts investment decisions, technology-specific provisions can lead to a misallocation of capital and market inefficiencies. A new technology that is excluded from the tax code may be just as cost-effective and beneficial as an older, covered technology, yet its disparate tax treatment reduces its ability to compete in the marketplace and may make it less profitable than investments covered by the code.

### *The Valley of Death: Support through Commercialization*

ABO believes that energy tax policy should reflect the various phases of business development energy firms undergo. Ultimately, energy tax incentives should support incipient, cutting edge technologies as they grow to reach commercial scale, at which point it may be appropriate for federal tax incentives to be scaled back.

More specifically, tax incentives that are established to foster the development of emerging energy technologies should be designed to help these technologies reach the point of commercialization. Energy projects are typically capital intensive with high variable costs. For example, in the case of emerging advanced biofuels, the main cost component is capital costs, which comprise 35 percent to 50 percent of a firm's costs, followed by feedstock expenses, which comprise 25 percent to 40 percent.<sup>6</sup> As technologies reach commercial scale, firms move down the cost curve to become more cost-competitive. For example, as solar energy power has increased its scale, the cost of solar photovoltaics modules has fallen by 50 percent.<sup>7</sup>

The practical effect of this cost curve is the "valley of death," which refers to the gap between venture capital and project finance. More specifically, the valley of death is the period of time where a technology is too capital intensive to attract venture capital investment, but too risky to attract bank or private equity investment.<sup>8</sup> Tax policy should be structured to help start-up firms bridge this gap.

Supporting energy firms to the point of commercialization, at which point their costs often precipitously fall, corrects a market failure in the energy sector. Positive discoveries in technology and modes of production have spillover effects to others in the energy industry, such that while the "first movers" incur all of the costs, the entire industry benefits from their discoveries. The phenomenon of energy costs declining as scale increases has also been characterized by some as the "learning by doing" effect. As a recent CRS report explains,

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<sup>6</sup> INTERNATIONAL ENERGY AGENCY, TECHNOLOGY ROADMAP: BIOFUELS FOR TRANSPORT 31 (2011)

<sup>7</sup> BLOOMBERG NEW ENERGY FINANCE, CROSSING THE VALLEY OF DEATH: SOLUTIONS TO THE NEXT GENERATION CLEAN ENERGY FINANCING GAP 4 (2010).

<sup>8</sup> Stephen Lacey, *The Valley of Death: Why Energy is Not like IT*, THE RENEWABLE ENERGY WORLD (September 14, 2010), <http://www.renewableenergyworld.com/rea/news/podcast/2010/09/the-valley-of-death-why-energy-is-not-it>.

“[l]earning-by-doing refers to the tendency for production costs to decline by experience. As firms become more experienced in the manufacturing and use of energy-efficient technologies their knowledge may spill over to other firms without compensation. In energy markets, early adopters of energy-efficient technologies and practices may not be fully compensated for the value of the knowledge they generate.”<sup>9</sup>

Thus, the tax policy of supporting emerging technologies through the valley of death to the point of maturity corrects a market failure and ensures that next generation technologies have the opportunity to compete at full-scale with older, established energy technologies.

## **Conclusion**

ABO would again like to express its gratitude for the Ways and Means Committee’s interest in the future of energy tax policy. Tax policy must support the nation’s broader energy policy. Indeed, as Congress undertakes fundamental tax reform, it is important to remember that America’s tax regime does not exist in a vacuum. Energy is a global commodity and American energy firms often compete internationally. Consequently, the nation’s energy tax policy can play an important role in ensuring that America remains energy-rich and other countries continue to look to her for their energy solutions.

In closing, ABO looks forward to working with the Ways and Means Committee as it tackles energy tax reform to establish an equitable, economically efficient, and purposeful new energy tax regime.

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<sup>9</sup> Margot Crandall-Hollick and Molly Sherlock, CONG. RESEARCH SERV., R41769, ENERGY TAX POLICY: ISSUES IN THE 112<sup>TH</sup> CONGRESS 3 (2011).