

Appendix A

Biotechnology Industry Organization

Comments to the California Air Resources Board

On the Harmonization Chapter

October 21, 2011

The Biotechnology Industry Organization (BIO) appreciates the opportunity to submit comments on the draft “Harmonization” chapter (the chapter). BIO is the world’s largest biotechnology organization with more than 1,100 member companies worldwide. Among its membership, BIO represents over 85 leading technology companies in the production of conventional and advanced biofuels and other sustainable solutions to energy and climate change challenges. BIO also represents the leaders in developing new crop technologies for food, feed, fiber, and fuel.

BIO member companies represent many of the low carbon fuel producers that will supply the State of California with the fuels for Low Carbon Fuel Standard (LCFS) compliance. Government programs, including the LCFS, are especially important to industry because when they become stable, long-term predictable policies, they become the basis upon which we are able to secure investment for the commercialization of our fuels.

LCFS Harmonization with Federal Laws

BIO and its member companies commend the goals of the State of California to significantly reduce greenhouse gas (GHG) emissions under its LCFS. Further, we appreciate CARB’s efforts to design the LCFS to complement federal laws, including the federal Renewable Fuel Standard (RFS).

BIO believes the RFS is the fundamental policy enabling the nascent advanced biofuels industry to raise sufficient private capital to achieve commercial volumes with certain levels of GHG emissions reductions. Any biofuel produced going forward will have to meet the GHG reduction requirements contained in the RFS in order to qualify under that law. The California LCFS can be an important driver to incentivize and achieve further GHG reductions for biofuels beyond the levels mandated under the RFS.

With respect to consideration of a national LCFS, as stated above, BIO and its members believe that the RFS is the appropriate and fundamental federal policy driving continued investment in the research and development of commercial volumes of advanced biofuels that would “result in significant quantities of low-CI biofuels that could be used toward compliance with California’s LCFS.”¹ Consideration of a national LCFS may be appropriate once the RFS has taken full effect as the stable long-term federal policy driving investment in the commercialization of advanced biofuels.

¹ California Air Resources Board, Draft *Advisability for Harmonization*, October 2011.

LCFS Program Elements Considered

The draft harmonization chapter asserts that program elements that should be considered for harmonization include LCA analysis, sustainability requirements, and reporting requirements.² With respect to lifecycle analysis (LCA) harmonization, BIO and its members support the methodology established by the U.S. Environmental Protection Agency (EPA). We encourage CARB to maximize the compatibility of its LCFS LCA methodology with EPA's RFS LCA methodology. Individual state LCA methodology should be consistent with federal methodology to minimize regulatory uncertainty and facilitate commercial deployment of advanced biofuels that may be supplied to states, including California. To that end, BIO and its members urge CARB to work with other state and regional LCFS programs, such as the current effort underway in the Northeast under the Northeast States for Coordinated Air Use Management (NESCAUM) to adhere as closely as possible to the LCA methodology published by the EPA in its 2010 final rule for the revised federal Renewable Fuels Standard (RFS2), while also recognizing the need for continuous update of values used as new model data becomes available.

With respect to LCFS harmonization with other sustainability principles and requirements, BIO and its members wish to reiterate the messages from our August 5, 2011, comments on this topic.³ As we stated, CARB's approach to implementing the LCFS has important implications for the future of advanced biofuels, as well as all agricultural activity and climate change policy. As such, the LCFS should be implemented in a manner that supports and encourages deployment of sustainable low carbon fuel alternatives, including advanced biofuels. CARB should make every effort to ensure that any LCFS sustainability criteria complement other state, federal and international laws. They should not be new and distinct requirements, should remain within the scope of the LCFS law, and should sufficiently consider economic sustainability and its consequences. Further, any sustainability objective beyond GHG reductions should be achieved through voluntary and incentive-based programs.

With respect to CARB's LCFS reporting requirements, BIO believes that CARB should create a fluid process for fuel developers to advance markets for new alternative fuels. CARB should thus avoid onerous reporting requirements in the LCFS.

Finally, BIO appreciates California's inclusion of a provision to address high carbon intensity crude oil (HCICO) in the context of the LCFS. As CARB makes reference, 'some crude oils require additional energy to produce or emit higher levels of GHG emissions during the production process. Since the California LCFS considers full lifecycle assessment, these additional GHG emissions should be taken into account if California refineries process these crudes.'⁴ BIO believes that any future state, regional, or federal low carbon fuel policy vehicle should be inclusive of this principle.

We thank you for your consideration of these comments.

² *Id.*

³ Biotechnology Industry Organization, Comments on *Draft LCFS Sustainability Principles, Criteria, Indicators Principles 4, 5, 6, 7*, August 5, 2011.

**BEFORE THE
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD**

**Comments of Biotechnology Industry Organization on
Proposed Regulations to Implement the Low Carbon Fuel Standard**

BIO is the world's largest biotechnology organization, with more than 1,100 member companies worldwide. BIO represents leading technology companies in the production of conventional and advanced biofuels and other sustainable solutions to energy and climate change. BIO also represents the leaders in developing new crop technologies for food, feed, fiber, and fuel.

BIO and its member companies wish to provide brief, high level comments in response to the model structure and parameter changes; specifically related to GTAP work on indirect land use change (ILUC), and other indirect effects from biofuel production. We understand CARB will be incorporating this data, and subsequent modeling work on indirect effects, to update the overall carbon intensity (CI) calculations for at least four biofuel pathways in California's Low Carbon Fuel Standard (LCFS). Our response is specific to the preliminary 'results' presented by Purdue University at the September 14th public meeting.

BIO supports California's efforts to reduce the carbon intensity of transportation fuels. However, BIO urges the CARB Board, and the Executive Officer of the Board, to employ sound science in the determination of key variables for sensitivity analysis and selection of the range of uncertainty in those variables. It is critical that CARB approach potential model changes that could affect these values with the utmost care, open-mindedness, and flexibility. To deliver the maximum real GHG reductions, CARB's computation of GHG equivalent emissions, employing lifecycle analysis (LCA) and econometric modeling (e.g. GTAP), should: (1) follow consistently applied and thoroughly vetted methodology; (2) be based on contemporary and complete data; (3) account for, and encourage, a range of future technology advances to ensure continued reductions in the carbon intensity of the state's fuel mix; and (4) ensure consistent methodology is applied, and offer stability in the program that will enable fuel producers to plan long range strategies for compliance. BIO references more nuanced concerns on the GTAP model and CARB's approach to ILUC inclusion in comments to the original regulation order, submitted to CARB in April 2009. (See attached)

BIO is seeking clarification on the GTAP preliminary model changes listed below:

Sensitivity of land cover changes with respect to changes in the food demand induced by higher food prices due to biofuel production

- One scenario assumes that consumer food demand stays the same with higher food prices. This assumption is contrary to observed behavior and economic modeling, which shows that consumers in developing countries decrease expenditures on less efficient feed sources, such as meat and dairy, while maintaining cereal consumption. BIO urges CARB to review the available economic literature, including but not limited to the following references:
 - Seale, James, A. Regmi and J. Bernstein (2003) *International Evidence on Food Consumption Patterns*, United States Department of Agriculture, ERS Research Briefs.
 - Abler, D. (2010). Demand Growth in Developing Countries. Paris, OECD: 48.

In contrast, for developed countries food demand has been shown to be less elastic. Consumers decrease expenditures on restaurant meals as well as other goods and services to compensate for the larger percentage of their income spent on food. Spending on travel and larger expenditures such as vehicles and appliances might decrease, which may in turn result in a reduction of GHG emissions. How could these potential market dynamics be included in the modeling? Would this be solely within the nested variables within GTAP? And if so, a figure (diagram) of the nested categories within the version of GTAP Purdue is running would be most helpful.

- BIO strongly discourages incorporating fixed food consumption in the modeling. The issue of food consumption is important but should not be handled by modeling of ‘virtual’ land use change from biofuels production, which would not be expected to take place in the real world.

Sensitivity of land cover changes with respect to yield-to-price elasticity

- As stated on page viii of the Tyner report “Calculation of Indirect Land Use Change (ILUC) Values for Low Carbon Fuel Standard (LCFS) Fuel Pathways”, there are no crop yield improvements built into the model. The yield-to-price elasticity is the only way that yield improvements are captured. Sound science dictates using the totality of literature when setting the appropriate range for sensitivity analysis. Literature reviews on yield-to-price elasticity (Keeney, R and T. Hertel, 2008. The Indirect Land Use Impacts of U.S. Biofuel Policies: the Importance of Acreage, Yield and Bilateral Trade Responses” GTAP working paper number 52), show a range of 0.22 to 0.67 for these values. Berry “Technical Report for the ICCT: Empirical Evidence on Crop Yield Elasticities” shows that most crop yield improvements are due to technology advancements, and not necessarily caused by price increases. While the Berry model may do a good job fitting within crop year trends in the United States, it is not indicative of what happens in the medium to long term nor is it indicative of what happens on a global basis. For example, if crop prices are expected to be higher, BIO member companies will invest additional dollars in research and development. It takes approximately ten years for new biotech traits to reach the market, so these impacts will not be seen in one year. In addition, farmers are more likely to invest additional dollars in new releases of seeds that contain biotechnology traits if

prices are expected to be high. Other investments by farmers may include more efficient equipment.

- BIO strongly recommends that the totality of literature be considered to set the range of price to yield elasticities, and that the analysis be done on a medium to long term basis.
- Given the long steady increase in historical crop yields, regardless of price, inputting projected yields is a more appropriate way to account for this factor in the model. BIO suggests the sensitivity should reflect the projected rate of yield increases.

Sensitivity of land cover changes with respect to crop transformation elasticity

- BIO appreciates the effort to match this elasticity to the actual data available. This method should be used wherever possible to determine the most accurate elasticity value to use in the model. We also anticipate the additional work on disaggregating land types will be issued.

Sensitivity of land cover changes with respect to endogenous productivity change for cropland pasture

- CARB has requested that the GTAP model be run with the endogenous yield adjustment set to zero for both regions as a sensitivity. As stated by Tyner on page 7 of his most recent report to CARB, “This is one of those cases where economic logic tells us that some positive value is appropriate for this parameter, but we do not have an empirical basis for what number to use.” CARB has argued that ILUC needs to be included in the regulation, even with its great uncertainties, because logic states that it should not be zero. For the same reason, setting the productivity change to zero should not be a valid scenario. The range for the sensitivity should be set to positive numbers, not including zero.
- UNICA, in comments previously submitted to CARB (Valesco, 2009), determined that the endogenous yield adjustment for pasture intensification was 0.6 rather than the 0.2 utilized in the base model.

BIO assumes that the potential GTAP model changes listed above utilize the most recently determined baseline GTAP runs, that were used to calculate overall indirect effects, and subsequent CI values, updated through the CARB look-up table as of January 2011. BIO wishes to clarify this point. With respect to the overall notion of indirect effects inclusion, the US will soon be producing about 13.5 billion gallons of corn grain ethanol. Is it possible to now see what effect this increase in grain ethanol has had on land use? Further, CARB is only considering some indirect emissions in their analysis. We understand this work by Purdue is focused on the ILUC effects, specifically the economic model behind CARB’s separate ‘indirect effects’ numbers, shows that biofuels production leads to a decrease in paddy rice fields as well as livestock production. It is well known that paddy rice fields emit methane, and that the livestock sector is also a major source of GHG emissions (see e.g. the report ‘Livestock’s Long Shadow’ by the United Nations Food and Agricultural Organization). On this basis, we recommend that CARB also commission a sensitivity analysis estimating the GHG implications of the indirect effects on paddy rice and livestock production, similar to the analysis conducted by Winrock for the EPA RFS2.

BIO has included a list of recent ILUC information and studies for further review:

- The EU Commission has put a hold on applying specific crop ILUC factors until 2016 at the earliest - <http://www.trust.org/alertnet/news/update-1-eu-to-delay-action-on-biofuels-indirect-impact/>
- F. Taheripour, W. Tyner, M. Wang , [GTAP Cellulosic Biofuels Analysis of Land Use Changes](#), 2011.
- Analysis by Hertel et al. (2010) as improved by Tyner et al. in the report called [Land Use Changes and Consequent CO2 Emissions due to US Corn Ethanol Production: A Comprehensive Analysis](#)
- Indirect Land Use Change for Biofuels: Testing Predictions and Improving Analytical Methodologies, Seungdo Kim and Bruce E. Dale, 2011

We thank you for your consideration of these comments.

**BEFORE THE
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD**

**DRAFT CHAPTER ON ENVIRONMENTAL IMPACTS
COMMENTS OF THE BIOTECHNOLOGY INDUSTRY ORGANIZATION
SEPTEMBER 12, 2011**

The Biotechnology Industry Organization (BIO) is pleased to comment on the Draft chapter on Environmental Impacts (“the draft chapter”). BIO is the world’s largest biotechnology organization, with more than 1,100 member companies worldwide. BIO’s Industrial and Environmental Section represents over 85 leading companies in the production of conventional and advanced biofuels and other sustainable solutions to energy and climate change. BIO also represents the leaders in developing new crop technologies for food, feed, fiber, and fuel.

As expressed in previous comments, BIO and its member companies commend the Board for its openness, inclusiveness and transparency throughout the LCFS rulemaking process. Further, BIO supports California’s efforts to reduce the carbon intensity of transportation fuels and believes that biofuels can and must contribute significantly to this important objective.

The Draft Chapter Disproportionally Focuses on the Impacts of Biofuels

BIO is pleased that the staff of the California Air Resources Board (“CARB”) have recognized the vital role advanced biofuels can play in satisfying the requirements of the California Low Carbon Fuel Standard (“LCFS”). However, BIO and its members are concerned that the draft chapter places disproportional emphasis on biofuels. For instance, why isn’t CARB staff placing the same or similar rigor on analyzing the environmental impacts for other types of alternatives, such as power generation?

There are several places in the draft chapter that fail to account for impacts from other alternative fuels that will be produced and consumed to meet LCFS compliance. For example, on page three, CARB staff discuss the results of their health risk assessment to estimate the potential cancer risk from a biorefinery. In fairness and to fully evaluate health risks associated with the production of fuels that will be used for LCFS compliance, CARB staff should perform and take into account similar health risks associated with facilities used to produce other types of alternative fuels, such as power generation.

On page two, CARB staff states that they “assumed that any additional electricity use would be offset by the switch to a 33 percent renewable portfolio standard and off-peak charging.” Does CARB staff also assume that there will be no additional impacts from additional electrical use, including lifecycle and land-use change emissions from even the cleanest power generation projects?

In addition, in the “Recommendations” section of the draft chapter under the subheading “Considerations for Highly Impacted Communities”, CARB staff suggest that “[a]ny environmental analysis for a new or expanding biorefinery project should include consideration of these cumulative impacts, public vetting of those impacts, and recommendations for mitigation of any significant impacts.” If new or expanding biorefinery projects are subject to this consideration and rigorous assessment, so should new or expanding facilities producing other alternative fuels for LCFS compliance.

The Draft Chapter Excludes Several Types of Advanced Biofuels That Will be Used for LCFS Compliance

The draft chapter does not take into account several types of advanced biofuels that could be available on the California market to consumers in the State. For example, on page two under the subheading “Summary of the 2009 Environmental Analysis,” CARB staff estimate ethanol, cellulosic ethanol and biodiesel facilities that could be operational in the State by 2020. But, what about other advanced biofuels and biofuel facilities that could also be operational in the State in that same time period? These may include renewable hydrocarbons, biobutanol, algae-based biofuels, solar fuels, waste derived fuels, among others.

Similarly, on page nine of the draft chapter, CARB staff discuss “the types of biofuels that could potentially be produced at a California biorefinery” which include “ethanol from grains, sugarcane, and cellulose; biodiesel; renewable diesel; biogas; hydrogen; and biogasoline.” This list does not fully represent the “the types of biofuels that could potentially be produced at a California biorefinery.” That list should include other advanced biofuels, including renewable hydrocarbons, biobutanol, algae-based biofuels, solar fuels, and waste derived fuels.

There is No Need for More Stringent Requirements

CARB staff assert throughout the draft chapter that their analysis and recommendations are based on the “most current stringent emission limits for process equipment used at biorefineries and options available to mitigate mobile source emissions associated with biorefineries...”⁴ Existing state and federal law is already stringent and sufficient to effectuate significantly reduced air emissions. BIO recommends that CARB focus on enforcement of these existing laws and regulations and avoid putting in place overly burdensome and potentially competing provisions that could unintentionally prevent alternative fuel producers from doing business in California for economic reasons. Should CARB choose to put new air emissions laws and regulations in place, it should do so for all fuels, including those associated with electrical generation facilities, to ensure a level playing field.

BIO Comments on Sustainability and the LCFS

Section D of the draft chapter includes a discussion and recommendations on “[s]ustainability and the LCFS.” BIO recently submitted written comments to CARB staff on this topic and have attached them to these comments. Please see Appendix A for BIO’s comments on the DRAFT document by California Air Resources Board’s (CARB) Low Carbon

⁴ See page 3 and 11.

Fuel Standard (LCFS) Sustainability Working Group on LCFS Sustainability Principles, Criteria, Indicators for Principles 4, 5, 6, and 7.

Thank you for considering these comments.

BEFORE THE
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD

Comments of Biotechnology Industry Organization on
DRAFT LCFS Sustainability Principles, Criteria, Indicators
Principles 4, 5, 6, 7

The Biotechnology Industry Organization (BIO) is pleased to comment on the DRAFT document by California Air Resources Board's (CARB) Low Carbon Fuel Standard (LCFS) Sustainability Working Group on LCFS Sustainability Principles, Criteria, Indicators for Principles 4, 5, 6, and 7 (Draft Sustainability Principles).⁵ BIO is the world's largest biotechnology organization, with more than 1,100 member companies worldwide. BIO's Industrial and Environmental Section represents over 85 leading companies in the production of conventional and advanced biofuels and other sustainable solutions to energy and climate change. BIO also represents the leaders in developing new crop technologies for food, feed, fiber, and fuel.

As expressed in previous comments, BIO and its member companies commend the Board for its openness, inclusiveness and transparency throughout the LCFS rulemaking process. Further, BIO supports California's efforts to reduce the carbon intensity of transportation fuels and believes that biofuels can and must contribute significantly to this important objective.

CARB's approach to implementing the LCFS has important implications for the future of advanced biofuels, as well as all agricultural activity and climate change policy. As such, the LCFS should be implemented in a manner that supports and encourages deployment of sustainable low carbon fuel alternatives, including advanced biofuels. BIO is concerned that, while well intentioned, the Draft Sustainability Principles would substantially hinder the goals of the LCFS. Further, as they are currently constructed, the obligations these provisions place upon feedstock and biofuels production would significantly suppress the development of innovative low carbon biofuels produced or sold in the State of California.

The Draft Sustainability Principles Appear to Go Beyond the Scope Of CARB Regulatory Authority and Unfairly Single Out Low Carbon Fuel Produced from Biomass

⁵ http://www.arb.ca.gov/fuels/lcfs/workgroups/lcfssustain/07182011draft_principles.pdf

The requirements included under the Draft Sustainability Principles appear to go beyond the scope of CARB's authority under the LCFS. CARB and the LCFS seek to reduce and control harmful air emissions in the State of California. In the Draft Sustainability Principles, however, CARB would burden advanced and conventional biofuels and feedstock producers with requirements regulating not only sustainability of air quality, but also of conservation, biodiversity, water and soil quality. Moreover, these requirements are much more stringent than those under federal law. For instance, the requirements under the section on "Principle 5: Soil" would prohibit feedstock producers from utilizing otherwise legal pesticides and herbicides to enhance the yield and quality of crops to be used for biofuel production.

In addition, as indicated in past comments, BIO and its member companies urge CARB to use a technology-neutral approach as it implements the LCFS. The requirements in the Draft Sustainability Principles appear to be directed only to producers of one type of low carbon fuel and feedstocks used for that fuel. If sustainability requirements are applied to biofuel producers, and biofuel feedstock producers and processors, it follows that they should be applied to all regulated parties generating compliance credits under the LCFS program. And, such requirements should be made with equal rigor to measure and report supply chain sustainability impacts of *all* forms of low carbon energy, including land, water and species impacts of all forms of electricity produced in California and imported from other states.

If imposing sustainability requirements is the direction CARB seeks to pursue, it needs to approach this radical shift in regulatory policy carefully, with proper authority, and with maximum flexibility in order to minimize economic harm and other unintended consequences. Otherwise, CARB risks arbitrarily picking winners and losers on the basis of potentially inconsistent environmental data as it implements the LCFS. Furthermore, it may be discouraging viable ways to achieve LCFS compliance and goals. To that end, the requirements would provide additional support to LCFS opponents trying to find reasons the law should be delayed or repealed.

The Draft Sustainability Principles Do Not Sufficiently Consider Economic Sustainability and Consequences

The Draft Sustainability Principles fail to consider or attempt to mitigate the economics and related consequences of placing the proposed environmental sustainability requirements on biofuel producers and biofuel feedstock producers and processors. As previously mentioned, BIO and its member companies want to help CARB and want the LCFS to succeed. However, the Draft Sustainability Principles contain reporting and record-keeping requirements that go far beyond what is currently required in other states and under federal and international law. For instance, they would require environmental impact assessments that are costly both in terms of time and money. They would also mandate intense and specific environmental management plans requiring producers and processors to establish plans to conserve or enhance biological diversity; prevent or reverse soil degradation; minimize air pollution emissions; and, assess potential impacts on water quality and quantity only from biomass/biofuel operations, including potential negative effects on the water supplies of "the local communities and ecosystems that rely on that water and [to] identify any mitigation measures."

The costs of requiring these types of environmental management plans likely outweigh the benefits of producing or selling low carbon fuels in California. As the requirements are currently written, biofuel producers and biofuel feedstock producers and processors would be responsible to plan and mitigate certain potential environmental effects that may or may not happen, and which go well beyond current reporting requirements. For instance, under the section on “Principle 6: Water” biofuels producers and biofuel feedstock producers and processors must “provide evidence that the water plan identifies *any* negative impacts resulting from biomass/biofuel operations and that they are mitigated” (emphasis added). Among other things, the breadth of this requirement adds confusion and undue cost to obligated parties. For instance, how would “any” be defined? Where would the line be drawn on the types of potential negative effects that must be documented?

BIO member companies have significant concerns that, if the sustainability reporting requirements proposed here are implemented, it will not be economically feasible for them to continue to produce, buy or sell biomass in the State of California for biofuels production. They are also concerned that it will not be economically feasible to sell and import low carbon fuels into the State.

BIO Recommendations

For the reasons stated above, BIO recommends that CARB proceed with its sustainability work as follows:

1. CARB should direct its staff to continue soliciting input from all stakeholders on appropriate ways to encourage environmental and economic sustainability, while also facilitating LCFS achievement by all obligated parties producing or processing LCFS compliant energy and energy components.
2. Sustainability gains beyond carbon reduction should be achieved through incentives or voluntary measures. CARB should make sustainability criteria and efforts that are not directly targeted at air emissions (i.e. ones applying to soil, conservation, biodiversity and water) eligible for extra credits under LCFS, thereby encouraging voluntary sustainability efforts by those entities that can afford them.
3. If CARB elects to make sustainability requirements mandatory, it should calculate compliance costs for low carbon alternative fuels producers and provide commensurate carbon intensity rewards or other mechanisms sufficiently high in value to cover the additional cost burden of complying with the new sustainability requirements. Furthermore, CARB should apply equally rigorous compliance requirements to all regulated parties producing alternative fuels under the LCFS program.
4. Also, if CARB intends to make sustainability requirements mandatory, it should provide broad guidance and requirements that may be met in various ways. Such flexibility would help mitigate the burden and expense of complying with highly detailed and specific requirements.

Conclusion

BIO and its member companies want the LCFS to succeed through the use of low carbon energy sources in California, including biofuels. For the reasons explained throughout these comments, the current Draft Sustainability Principles and the mandatory nature of its

requirements risk substantially inhibiting the ability of biofuel producers and biofuel feedstock producers and processors to conduct business in California. This unintended consequence will simultaneously inhibit the goals and compliance of the LCFS.

Thank you for considering these comments. BIO and its member companies look forward to working with CARB staff to find workable solution to the Board's sustainability goals under the LCFS.

Biotechnology Industry Organization
Comments to the California Air Resources Board
On the Technology Assessment, Supply and Availability Chapter
September 12, 2011

The Biotechnology Industry Organization (BIO) appreciates the opportunity to submit comments on the draft “Technology Assessment, Supply and Availability” chapter (the chapter). These comments supplement the comments BIO submitted on July 15, 2011 on the “Supply and Availability,” and “Technology Assessment” chapter outlines. BIO understands that these two outlines have been consolidated to make up this one chapter.

BIO is the world’s largest biotechnology organization with more than 1,100 member companies worldwide. Among its membership, BIO represents over 85 leading technology companies in the production of conventional and advanced biofuels and other sustainable solutions to energy and climate change challenges. BIO also represents the leaders in developing new crop technologies for food, feed, fiber, and fuel.

BIO member companies represent many of the low carbon fuel producers that will supply the State of California with the fuels for Low Carbon Fuel Standard (LCFS) compliance. Government programs, including the LCFS, are especially important to industry because when they become stable, long-term predictable policies, they become the basis upon which we are able to secure investment for the commercialization of our fuels.

The feasibility of the LCFS depends on an accurate projection of low carbon fuels commercialization. Through BIO’s comments and participation on the California Air Resources Board (CARB) Advisory Panel on LCFS implementation, BIO aims to serve as a resource to CARB staff and provide information on this expected commercialization directly from the companies that are making investments and working to commercialize low carbon fuels.

Advanced Molecules, Such As Butanol, Renewable Diesel and Other Renewable Hydrocarbons

As the chapter suggests on page 20, some of the challenges under the LCFS associated with increasing requirements for biofuels may be addressed through commercial blending of advanced biofuels such as butanol, or through the use of unblended drop-in fuels such as renewable diesel from algae or other advanced feedstocks. In the chapter, CARB staff also project the Flex Fuel Vehicles (FFVs) and infrastructure that would be necessary to meet the federal Renewable Fuel Standard and the additional demand from the LCFS.

BIO believes CARB has underestimated both the rate and variety of advanced biofuel penetration into the California market under a well-structured LCFS. We elaborate on this assertion in subsequent sections. Given the uncertainty of commercialization timelines, we urge CARB staff to consider adding additional scenarios that anticipate rapid uptake of a variety of advanced biofuels, including cellulosic and algae-based fuels, biobutanol, hydrogenation derived renewable diesel, solar fuels, waste derived fuels, and other advanced molecules.

Also, it appears that CARB staff has made some very aggressive calculations on what the E85/FFV market will support from a volume basis of ethanol that will have to be consumed in California in order to meet the LCFS compliance requirements. BIO and its members would appreciate a clarification on the source(s) of these calculations and to the following related questions: (1) Are these calculations supported by current market trends? (2) Will CARB put in place any incentives to facilitate these calculations/volumes? and, (3) is CARB working with the federal government to ensure that federal policies will support the projected growth?

Cellulosic and Advanced Biofuel Commercialization Timelines

BIO believes that the EIA projections of cellulosic biofuel commercialization used by CARB in its analysis are an overly conservative representation of how long it will take for cellulosic fuels to continue scaling-up. EIA significantly under-predicted the increase in commercial corn ethanol volumes. BIO believes that EIA is similarly under-predicting cellulosic scale up. At least 15 commercial cellulosic projects representing nearly 200 million gallons of production a year are now under construction and scheduled to come on line by 2014 (see Appendix A). Many of these projects are backed by loan guarantees from the U.S. Departments of Agriculture (USDA) and Energy (DOE). USDA is expected to announce an additional round of loan guarantees for commercial cellulosic projects before the end of the fiscal year.

In addition, there are a host of advanced biofuel technologies that do not depend on commercialization of cellulosic biomass conversion technology. Advanced biofuels such as advanced alcohols and renewable hydrocarbons can be produced from feedstocks such as sugarcane and starch as cellulosic conversion technologies mature. Several commercial non-cellulosic advanced biofuels projects are now under development and can be expected to provide advanced biofuel to the California market. BIO therefore disagrees with CARB's conclusion that advanced biofuels will be unable to provide the volumes necessary to meet the LCFS requirements.

We urge CARB to consider adding additional scenarios that anticipate rapid uptake of a variety of advanced biofuels, including cellulosic and algae-based fuels, biobutanol, hydrogenation derived renewable diesel, solar fuels, waste derived fuels, and other advanced molecules.

Cellulosic and Advanced Biofuels Volumes in California

Because California offers a premium for low carbon fuels such as cellulosic and advanced biofuels, BIO and its Members believe that a proportionately higher volume of cellulosic biofuels will be sold into the California market compared to other states. BIO recommends that CARB staff consider including in the chapter another scenario where the majority of all low carbon biofuels produced in the United States will be sold into the California LCFS market. Some BIO members plan to sell a high proportion of their initial output in California.

Fuel Categories

In Section B, BIO recommends that CARB include an additional type of fuel category (see proposed subsection "13. Solar Fuels" below) and has included a proposed definition for this emerging category. BIO recommends CARB consult with the U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E), which is currently funding a project area on solar fuels, to ensure CARB's category definition is consistent with that used by DOE.

13. Solar fuels

This emerging category describes liquid fuels that are directly produced by biological or chemical means powered by sunlight. The fuels are produced from the sun's energy directly. Solar fuel processes are designed to leverage or mimic photosynthesis, such as requiring sunlight, CO₂ and water as inputs.

Conclusion

Thank you for the opportunity to submit these comments on the draft “Technology Assessment, Supply and Availability” chapter. This work is very important to the future of the biofuels industry in California and throughout the country, and BIO would like to continue to serve as a resource to CARB staff as they finalize the chapter. Please do not hesitate to contact BIO for any additional data or perspective that would assist CARB staff in making more aggressive and realistic projections of what the advanced and cellulosic biofuels industry will be able to achieve with respect to LCFS compliance in California.

APPENDIX

Current and Projected Production

BIO has tracked cellulosic ethanol projects since 2007 and made the results public through the Biofuels and Climate Change blog: <http://biofuelsandclimate.wordpress.com/about/>. Proposed projects have been added to and removed from the list on a regular basis as information about their status has been updated. Inclusion in the list requires that the project demonstrate a funding and/or feedstock procurement agreement in place; many of the funding agreements are in the form of state or federal support for the project.

A. Operating Biorefineries as of 2011

Name	Location	Fuel	Capacity (mgpy):	Start Year
AE Biofuels	Butte, Mont.	Cellulosic Ethanol	0.15	2008
Coskata	Madison, Pa.	SynGas/Ethanol	0.04	2009
DuPont Danisco Cellulosic Ethanol LLC	Vonore, Tenn.	Cellulosic Ethanol	0.25	2009
Fiberight, LLC	Blairstown, Iowa	Cellulosic Ethanol	5.6	2010
Gulf Coast Energy	Livingston, Ala.	FT Diesel/Ethanol	0.4	2009
Kior	Houston, Texas	Wood chips Renewable Crude	0.23	2010
KL Energy Corp.	Upton, Wyo.	Cellulosic Ethanol	1.5	2008
Mascoma	Rome, N.Y.	Cellulosic Ethanol	0.2	2009
POET	Scotland, S.D.	Cellulosic Ethanol	0.02	2009
Terrabon	Bryan, Texas	Ketones/ Green Gasoline	0.1	2011
Verenium	Jennings, La.	Sugarcane Ethanol/Cellulosic Ethanol	1.4	2009
Total			9.89	

B. Biorefineries Expected to Begin Production in 2011

Name	Location	Fuel	Capacity (mgpy):	Start Year
ZeaChem	Boardman, Ore.	Cellulosic Ethyl Acetate/Ethanol	0.25	2011
New Production in 2011			0.25	
Cumulative Total			10.14	

C. Biorefineries Expected to Begin Production in 2012

Name	Location	Fuel	Capacity (mgpy):	Start Year
Alpena Biorefinery	Alpena, Mich.	Ethanol, Biobutanol	.985	2012
BlueFire Ethanol	Lancaster, Calif.	Syngas Ethanol	3.9	2012
Fulcrum BioEnergy/Sierra Biofuels	Reno, Nev.	Syngas Ethanol	10.5	2012
ClearFuels Technology	Commerce City, Colo.	FT Diesel	1.5	2012
GeoSynFuels	Golden, Colo.	Cellulosic Ethanol	0.25	2012
PureVision Technology	Fort Lupton, Colo.	Biomass Sugars/ Ethanol/Butanol	2	2012
Qteros	Chicopee, Mass.	Cellulosic Ethanol	0.001	2012
New Production in 2012			19.136	
Cumulative Total			29.276	

D. Biorefineries Expected to Begin Production in 2013

Name	Location	Fuel	Capacity (mgpy):	Start Year
Enerkem, Inc.	Pontotoc, Miss.	Syngas Ethanol	20	2013
ICM Inc.	St. Joseph, Mo.	Cellulosic Ethanol	1.5	2013
Ineos Bio	Vero Beach, Fla.	Cellulosic Ethanol	8	2013
New Production in 2013			29.5	
Cumulative Total			58.776	

E. Biorefineries Expected to Begin Production in 2014

Name	Location	Fuel	Capacity (mgpy):	Start Year
DuPont Danisco Cellulosic Ethanol	Tenn.	Cellulosic Ethanol	25	2014
Gulf Coast Energy	Cleveland, Tenn.	FT Diesel/Ethanol	25	2014
Kior	Columbus, Miss.	Wood chips, Renewable Crude, Diesel and Gasoline	11.5	2014
POET	Emmetsburg, Iowa	Corn/Cellulosic Ethanol	25	2014
Vercipia	Highland Co., Fla.	Cellulosic Ethanol	36	2014
New Production in 2014			122.5	
Cumulative Total			181.276	

F. Biorefineries Expected to Begin Production in 2015

Name	Location	Fuel	Capacity (mgpy):	Start Year
Abengoa Bioenergy	Hugoton, Kan.	Cellulosic Ethanol	11.4	2015
BlueFire Mecca LLC	Fulton, Miss.	Syngas Ethanol	18	2015
ClearFuels Technology	Collinwood, Tenn.	FT Diesel	20	2015
Coskata, Inc.	Boligee, Alabama	Syngas Ethanol	55	2015
Frontier Renewable Resources	Kinross, Mich.	Cellulosic Ethanol	40	2015
Terrabon	Port Arthur, Texas	Ketones/ Green Gasoline	1.3	2015
New Production in 2015			145.7	
Cumulative Total			326.976	

G. Biorefineries Expected to Begin Production After 2015

Name	Location	Fuel	Capacity (mgpy):	Start Year
AE Biofuels	Keyes, Calif.	Cellulosic Ethanol	14	
DuPont Danisco Cellulosic Ethanol	Midwest, U.S.	Cellulosic Ethanol	25	
Genahol/Powers Energy	Lake County, Ind.	Syngas Ethanol	32	
Lignol	Ferndale, Wash.	Ethanol		
Logos/EdenIQ	Visalia, Calif.	Cellulosic Ethanol	10	
UOP Renewables	Kapolei, Hawaii	Pyrolysis oil		
West Biofuels	Yolo Co., Calif.	Cellulosic Ethanol	0.182	