Comments of Biotechnology Industry Organization on
EPA's Call for Information on Greenhouse Gas Emissions
Associated with Bioenergy and Other Biogenic Sources

EPA Docket No. EPA-HQ-OAR-2010-0560

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The Biotechnology Industry Organization ("BIO") is pleased to submit comments on how the Environmental Protection Agency ("EPA") should account for greenhouse gas ("GHG") emissions from biogenic sources for purposes of the Prevention of Significant Deterioration and Title V programs (hereafter, collectively referred to as "Title V programs") and, more generally, for other rulemaking purposes, beyond the Title V programs, that are within EPA's purview. BIO is the world's largest biotechnology organization, with more than 1,200 member companies worldwide. BIO's members are the leaders in the development and production of conventional and advanced biofuels, bioplastics, and other bioproducts, bioprocesses, biocatalysts, and next generation energy crops, such as switchgrass, miscanthus, short rotation woody crops, and algae.

Important national objectives are served by increased usage of biofuels, biochemicals and bioproducts that use renewable biomass in substitution for fossil feedstocks. The use of these fuels and products can reduce dependence on imported petroleum products, create new markets for sustainably grown crops, improve land utilization, and, not least, reduce concentrations of GHG emissions in the atmosphere. EPA's Call for Information starts in the right place by seeking information on the differences between biogenic and fossil fuel sources of GHG emissions. These differences are profound.

Combustion of fossil fuels permanently and irreversibly leads to increased concentrations of carbon dioxide ("CO_2") in the atmosphere. Combustion of biofuels and other biogenic energy sources recycles CO_2 emissions through renewable biomass feedstocks. If sustainably sourced, such combustion does not result in lasting increases in CO_2 concentrations

in the atmosphere. Other uses of biogenic carbon, such as biochemicals and bioplastics, may even sequester CO_2, reducing atmospheric GHG concentrations.

It is essential to recognize that not all sources of biogenic carbon are renewable. Biogenic carbon from old growth forests, peat bogs, or other sensitive and enduring ecosystems is clearly not rapidly renewable. Its use as a feedstock for biofuels or other bioenergy would result in damage to vital ecosystems and increased atmospheric concentrations of CO_2, and is not supported by BIO and its membership.

The U.S. Congress has worked diligently to develop definitions of renewable biomass for authorized bioenergy and bioproducts programs that preclude the use of biogenic carbon from such unsustainable sources and maintain the carbon embodied in the nation's standing biomass. The proceeding comments refer only to renewable sources of biomass sanctioned by Congress, in particular as defined under the Food, Conservation and Energy Act of 2008, which is incorporated by reference in other programs that EPA administers, such as the Renewable Fuel Standard ("RFS"), and in tax code provisions incentivizing the production and use of renewable biofuels.

These comments are also developed under the assumption that EPA intends to pursue an economy-wide system of GHG regulation. BIO recognizes that there are lifecycle GHG emissions associated with the production, manufacture and distribution of all fuels – fossil or biogenic – that must be accounted for in any comprehensive GHG regulatory regime. BIO assumes in its comments that EPA will regulate such lifecycle emissions through appropriate programs, including Title V and the RFS.

With these considerations in mind, EPA should take account of the fundamental difference between combustion of fossil fuels and combustion of biofuels and other bioenergy

sources using renewable biomass by excluding the latter from regulation under the Title V programs, and by adopting other regulatory methodology that fully accounts for the carbon uptake of renewable biomass sources. BIO's comments develop the rationale, which was missing from the Tailoring Rule, for recognizing that biofuels and bioenergy sources using renewable biomass should not be subject to permitting programs that regulate only point source emissions through requirements for use of best available control technologies. For other regulatory programs, EPA may need to develop accounting methods for measuring life-cycle changes in GHG emissions associated with biofuels and other biogenic sources. BIO's comments set forth a number of scientifically–based principles that should guide EPA's development of life-cycle methodologies for use in the specific contexts of non-Title V regulatory programs.

I. EPA Should Issue a Temporary Rule, Prior to the January 1, 2011 Effective Date of the Tailoring Rule, Excluding from the Title V Programs GHG Emissions from the Combustion of Biogenic Fuels or from other Biogenic Sources using renewable biomass

EPA's Tailoring Rule, issued June 3, 2010, made Title V programs applicable to covered stationary sources that emit GHGs. To avoid permitting burdens that would be created under statutory emission thresholds, the Tailoring Rule prescribed higher transition thresholds that effectively exempt certain types of GHG sources from the Title V programs. The Tailoring Rule did not take a position one way or the other on whether to exclude or to include CO_2 emissions from combustion of biogenic fuels and other biogenic energy sources. In deferring action on biogenic GHG emissions, the Tailoring Rule did not foreclose EPA's reliance on rationales other than permitting burden to justify exclusion of biogenic GHG emissions from the Title V programs.

A compelling rationale for excluding biogenic GHG emissions from renewable biomass sources from the Title V programs lies in the fact that combustion of biogenic fuels from renewable biomass sources does not permanently and irreversibly increase atmospheric concentrations of CO_2 as is the case from combustion of fossil fuels. The long-duration increases in atmospheric CO_2 levels from fossil fuel combustion formed the basis for EPA's endangerment finding that triggered applicability of Title V programs to GHG emissions. By contrast, carbon emissions from biofuels and other bioenergy sources derived from renewable biomass do not increase long-term atmospheric concentrations of CO_2, since such fuels derive their energy from carbon that would otherwise have been emitted as CO2, methane, or more potent GHGs through decomposition of feedstock biomass in the field or forest.

Because GHG emissions associated with land use are not regulated under the Title V programs, there is no mechanism to directly account for the recycling and beneficial use of carbon that derives from the substitution of renewable biomass feedstocks for fossil feedstocks. To capture this fundamental distinction and ensure investment in feedstocks that do not contribute to long-term increases in atmospheric CO_2 concentrations, EPA should exclude emissions from renewable biomass sources from regulation under the Title V programs.

All combustion (including from biomass) clearly adds CO_2 to the atmosphere. In the case of fossil fuels, this addition is permanent and would not have occurred but for the extraction and combustion of fossil fuels. Renewable biomass, the feedstock for sustainable biogenic fuels, biochemicals, and bioproducts, is different.[1] Through the natural process of plant respiration, new growth of renewable biomass absorbs and recycles CO_2. Carbon in renewable biomass that

[1] Renewable biomass is well defined in the Food, Conservation and Energy Act of 2008, which is incorporated by reference in other programs that EPA administers, such as the Renewable Fuel Standard, and in tax code provisions incentivizing the production and use of renewable biofuels.

is harvested for use in biofuels and bioenergy sources releases, upon combustion, the same amount of CO_2 into the atmosphere as the plant captured through photosynthesis in its growth. Thus, the combustion of biofuels and other bioenergy sources does not permanently increase atmospheric CO2 concentrations, provided that renewable biomass is used as the feedstock and is replenished on a sustainable basis.

This fundamental distinction between the permanent and irreversible increase in GHG emissions associated with fossil fuel combustion and the naturally recurring recycling of CO_2 in renewable biomass underlies the conclusion in the IPCC Guidelines, quoted in EPA's Call for Information, that so long as there is not "a long-term decline in the total carbon embodied in standing biomass,"[2] combustion of biogenic fuels and materials does not appreciably add to atmospheric carbon concentrations and is, therefore, carbon neutral. It is for this reason that under IPCC guidelines national level inventories of GHGs exclude CO_2 emissions from combustion of biogenic fuels and that biogenic carbon is instead accounted for based on long-term changes in biomass stocks and land use.[3]

The natural recycling of CO_2 from combustion of renewable biomass is a complicated process and measuring net impacts over time on atmospheric carbon concentrations depends upon complex assumptions relating to choice of feedstocks, agricultural methods, fuel production processes, and the timing and extent of land use change. But, as a first order approximation, because biogenic fuels and biogenic energy from renewable biomass sources do not add additional sources of carbon to the atmosphere, nor appreciably change land stock, they are carbon neutral and do not materially contribute to increases in atmospheric concentrations of

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[2] EPA Call for Information, 75 Fed. Reg. 41174-75 (July 15, 2010), *quoting*, Revised 1996 IPCC Guidelines at p. 1.10.

[3] *See id.*

GHGs as do combustion of fossil fuels. The Title V programs have been applied by EPA to CO_2 emissions solely because of the apparent dangers of permanent, increased atmospheric concentrations associated with fossil fuel combustion. This rationale plainly does not justify regulation of biogenic energy sources or the combustion of biogenic fuels using renewable biomass. For this reason, EPA should categorically exempt CO_2 emissions from biogenic fuels and biogenic energy sources using renewable biomass from the Title V programs, and other future applicable rulemaking.

It is imperative that EPA promulgate this exemption before the January 1, 2011 effective date of the Tailoring Rule and that the exemption remain in place at least until such time, if ever, as EPA adopts through a statutorily mandated rulemaking process regulations that prescribe an official means of accounting for and treatment of biogenic CO_2 emissions for purposes of the Title V programs.

One unique biofuel process that must be considered in determining the proper accounting of biogenic CO_2 is algae-based fuel. Algae consumes enormous amounts of CO_2 in its growth process; 13-15kg of CO_2 are required to produce a single gallon of algae-based fuel. Thus, while algae-based fuel represents at least a 50% reduction in lifecycle GHG emissions, as recently verified by the EPA, and algae-based "green crude" directly replaces petroleum at a rate of approximately 1.3 to 1, further displacing fossil fuels and their resultant emissions, it is important to note that algae, unlike other plants, reuse CO_2 from both atmospheric and industrial sources. This fact should distinguish the treatment of algae-based fuel from other biofuels, which can be explored in another context.

From a scientific or economic perspective, net impacts on atmospheric concentrations of CO_2 may be analyzed using complex life-cycle models and methodologies. These models and

methodologies employ heroic assumptions to measure, over long periods of time, differences in the natural recycling of CO_2 associated with different types of renewable biomass, different means of cultivation, and different patterns in long-term land-use change. In appropriate regulatory contexts, life-cycle analyses may have their place, such as when statutes require specific measurement of differences in life-cycle CO_2 emissions between biogenic fuels and fossil fuels. The federal Renewable Fuel Standard program and California's Low Carbon Fuel Standard require use of life-cycle measurements of net reductions in CO_2 emissions associated with biofuels. However, Title V programs regulate sources on the basis of their emission output upon combustion, without any consideration of life-cycle impacts. Indeed, a permitting program based on the rate of emissions of point sources is not easily adapted to take account of life-cycle impacts of those emissions and the long-term recycling of those emissions through a complex production process. Thus, EPA must make an administrative determination that, at least as a transition matter, CO_2 emissions from biogenic fuels, biochemicals, and bioproduct sources using renewable biomass should be excluded from the Title V programs. For purposes of the Title V programs, EPA should incorporate by reference the definition of renewable biomass from the Food Conservation and Energy Act of 2008.[4]

BIO strongly recommends that EPA categorically exempt from the Title V programs CO_2 emissions from renewable biomass, and perhaps address algae-based fuels separately.

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[4] The Food Conservation and Energy Act of 2008 defines renewable biomass as materials that are byproducts of preventive treatments (e.g., trees, wood) that are removed to reduce hazardous fuels, to reduce or contain disease or insect infestation, or to restore ecosystem health; would not otherwise be used for higher value products; and are harvested from National Forest System land or public lands in accordance with public laws, land management plans, and requirements for old-growth maintenance. Renewable biomass is also defined as any organic matter that is available on a renewable or recurring basis from non-Federal land or land belonging to Indian tribes, including renewable plant materials (feed grains, other agricultural commodities, other plants and trees, algae), waste material (crop residue, other vegetative waste material including wood waste and wood residue), animal waste and byproducts (fats, oils, greases, and manure), construction waste, and food waste/yard waste.

II. General Principles on Accounting for GHG Emissions from Biogenic Fuels and Energy Sources Using Life-Cycle Analyses in Regulatory Programs other than the Title V Programs

EPA's Call for Information seeks information on approaches to accounting for biogenic GHG emissions in rulemakings other than the Title V programs covered by the Tailoring Rule. BIO emphasizes that there is no single, "all-purpose" accounting methodology that is appropriate for all regulatory programs requiring measurement of GHG emissions associated with particular energy feedstocks, combustion sources or economic activities. Clearly, in assessing impacts of biogenic fuels or energy sources or of land use activities on permanent GHG concentrations in the atmosphere, life-cycle methodologies are appropriately used. However, EPA should develop approved life-cycle methodologies adapted for use in the specific regulatory context before it. There is, in short, no one-size-fits-all life-cycle methodology that is suitable for use in all regulatory contexts.

For example, as explained in Part I of these comments, for purposes of the Title V programs, discrete application of life-cycle methodologies to specific biofuels and biogenic energy sources is not appropriate or necessary and, at least as a transition matter, EPA should make an across-the-board determination that combustion of renewable biomass is carbon neutral for Title V and non Title V programs. By contrast, the Renewable Fuel Standard program requires a life-cycle comparison of GHG emissions from fossil fuels such as gasoline and diesel with GHG emissions from cellulosic and advanced biofuels. This comparison requires only a determination as to whether use of certain fuels reduces GHG emissions more than prescribed threshold percentages, but does not require on-going regulation of point source emissions or of discrete measurements of actual reductions (other than whether, on average, for a broad category of fuel type, those reductions exceed percentage thresholds).

The RFS life-cycle methodologies may require adaptation if Congress were to enact a Low Carbon Fuel Standard similar to that which has been adopted in California, which does require discrete, ton-by-ton measurements of actual emission reductions achieved by individual producers or users of energy over time. Moreover, were Congress to enact comprehensive climate change legislation that incorporates offset credits for activities that reduce GHG emissions, life-cycle methodologies would need to be appropriately adapted for use in measuring both baseline emissions and creditable emission reductions or offsets.

In the case of the Title V programs, all fuels and energy sources using renewable biomass should be treated uniformly as being carbon neutral, and, therefore, as excluded from regulations under the programs. Title V programs regulate point source emissions through prescription of best available control technologies or maximum achievable control technologies that can reduce those source emissions. Title V programs are mandated by the Clean Air Act ("CAA") to regulate stationary sources of air emissions; there is no current authority under the CAA for title V permits to also regulate the life-cycle GHG impacts of the use of biogenic fuels and energy sources. Therefore, while Title V permitting programs under the Tailoring Rule will regulate some universe of GHG emissions, neither the CAA nor the Tailoring Rule authorizes the Title V program to regulate different fuels and energy sources based on their life-cycle impacts.

However, in other regulatory contexts, where Congress authorizes more categorical regulation than that embodied in Title V permitting programs, EPA might appropriately consider life-cycle calculations in making broad regulatory classifications of materials and end-uses. For example, the use of feedstocks from tropical forests or from peat lands may be accounted for differently under offset programs that are part of a comprehensive cap and trade program to

reduce GHGs. In this case, EPA should make determinations in the context of particular statutory programs, in light of the best available scientific evidence and analytical methodologies for attaining the likely multiple objectives of the particular programs.

While there is no one-size-fits-all approach to GHG accounting, standardized life-cycle analyses should be based on internationally recognized standards, such as those prescribed by the International Standards Organization (ISO). Where international standards have not been adopted for particular purposes, fuels, or end-uses, EPA should take special care to consider the widest possible peer review of methodologies and assumptions and to adopt only methodologies that enjoy widespread international consensus.

In particular, BIO does not support the recently circulated concept of a so-called carbon debt for biogenic carbon sources. ISO methodology clearly outlines that lifecycle accounting for biogenic carbon begins with the uptake of carbon by the feedstock biomass and concludes with its combustion or alternate end use. The concept of carbon debt erroneously initiates carbon accounting with combustion and assumes a necessary payback period of carbon uptake by subsequent biomass growth. This methodology is inconsistent with ISO standards and should be rejected.

Even where there are international standards for life-cycle methodologies, in application of those standards, EPA may be faced with making choices with respect to complex matters requiring simplifying assumptions that may lack scientific consensus. For example, while there may be achievable consensus on methodologies to use for measuring direct emission impacts in each stage of the biofuel production life-cycle, there is no similar consensus on methodologies to use to take account of so-called indirect effects, such as land use change and opportunity costs. Accordingly, absent a statutory directive to EPA to adopt indirect life-cycle

measurements of carbon emissions, EPA should abstain for the time being from prescribing particular methodologies to measure or take account of indirect land-use change or opportunity costs. Instead, EPA should study and describe the numerous, complex considerations and assumptions that would need to be considered in accounting for indirect life-cycle emissions impacts, such as indirect land use change from the use of biomass from agricultural or forestry products.

It is clear that in using life-cycle methodologies to measure GHG emissions attributable to biofuels and bioenergy sources, land use activities loom large. In the first instance, the use of renewable biomass allows for sustainable recycling of CO2 emissions from biofuels and bioenergy sources. As a first order approximation, the use of renewable biomass should be deemed to be carbon neutral for purposes of justifying the exclusion of biofuels and biogenic energy sources using renewable biomass from Title V programs. However, where statutory directives require use of life-cycle methodologies, the type of land used to increase biogenic feedstocks (forest, pasture, or idle and underutilized land), the type of crop used, the type of agricultural practices employed, and a variety of other complex factors must be analyzed and taken into account through simplifying assumptions based on sound scientific and economic evidence. At present, there is insufficient scientific evidence on which to reach consensus on appropriate assumptions as to each of these land use and land use change factors. Indeed, these matters largely fall outside the special expertise of EPA and require engagement of experts from other agencies, such as the Department of Agriculture and the Department of Interior. For these reasons, EPA should move carefully and deliberately into adopting life-cycle methodologies that will require it to consider and to measure life-cycle carbon impacts of fuels and activities attributable to land use and land use change.

BIO wishes to underscore its belief that ultimately EPA and other federal agencies will be called upon to recognize and to quantify life-cycle GHG emission reductions attributable to changes in agricultural and forestry practices. These changes in practices will result in long-term increases in the soil sequestration of carbon and concomitant reductions in overall net GHG emissions. Such demonstrated, permanent increases in soil sequestration should become eligible as carbon offsets and the producers of crops and users of tilling practices that increase such soil sequestration should be eligible for receiving carbon credits. In these future regulatory programs, the use of life-cycle methodologies will be appropriately focused on directly measuring and rewarding upstream land use changes that result in reductions in GHG emissions, instead of on the regulation of point sources that use biogenic fuels or other materials.

In section I.D of the Call for Information, EPA requests comment on the treatment of biogenic sources of CO_2 emissions not used directly in the production of energy. Among the sources listed, the Call for Information specifically refers to CO_2 from "fermentation processes in ethanol production" and requests comment on how such sources should be considered and quantified. CO_2 that is captured from the fermentation process in biofuels production and used in industrial or food applications should be treated as a carbon credit. The starch fermentation process produces CO_2 that is very high in purity and is attractive for use in food and industrial applications. Such CO_2, when captured for food/industrial applications, displaces other sources of non-biogenic or fossil CO_2. For purposes of the Renewable Fuel Standard program, on a per ton basis, ethanol producers should account for biogenic CO_2 captured from the fermentation process as a credit in the per MJ LCA calculation of the finished fuel product. The credit should be quantified based on actual tons converted in the CO_2 processing/liquefaction facility.

Similar care should be taken in assessing the GHG impacts of bioproducts, such as bioplastics, that use biogenic materials in place of materials derived from fossil fuels. In regulating bioproducts, EPA should recognize that, as with biofuels, carbon is absorbed naturally in the renewable cycle of feedstock production. However, unlike biofuels, which release carbon upon combustion, durable bioproducts sequester carbon in a fixed product that may not decompose for decades. Thus, as a first order approximation, whereas renewable biomass used as a fuel is carbon neutral, renewable biomass in bioproducts is carbon negative. Thus, it is particularly appropriate in a carbon offset program under cap and trade legislation to allow credits for durable bioproducts using renewable biomass, which reduce atmospheric concentrations of GHGs by displacing fossil-fuel based products.

In sum, BIO makes the following recommendations regarding EPA's use of life-cycle based methodologies and measurements in non-Title V programs:

1. Methodologies applied to biofuels and other bioenergy sources should apply uniformly to all end uses, fuels and feedstocks, with the possible exception of algae, for purposes of both inventory-based and life-cycle based regulatory programs.

2. In regulating biofuels, life-cycle based methodologies should start from the premise that all renewable biomass gets full credit for recycling carbon. Deviations from this premise should be considered only as consistent with internationally recognized methodologies for taking into account all direct life-cycle emission impacts.

3. Indirect emission impacts, such as indirect land use change or sectoral opportunity costs should not be included in life-cycle analysis absent internationally recognized methodologies that enjoy widespread consensus in the scientific and economic communities. Indirect impacts that are appropriately taken into account in life-cycle analyses are not appropriate for inventory-based, point-source regulatory programs similar to Title V programs.

4. Bioproducts that sequester CO2 and bio-industrial processes that avoid the production of non-biogenic or fossil CO2 should be eligible for carbon credits in regulatory regimes that recognize carbon offset activities.

BIO appreciates EPA's initial consideration of the complex issues associated with carbon accounting for biogenic materials and energy sources. BIO looks forward to participating in future regulatory proceedings that will consider how to adapt accounting for biogenic GHG emissions for specific regulatory purposes that may differ from the Title V program.