25x'25 National Steering Committee Response to EPA regarding the
Call for Information on Greenhouse Gas Emissions Associated with
Bioenergy and Other Biogenic Sources

September 13, 2010
(via email)
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Cover Letter to EPA

September 13, 2010

Reference: Docket ID No. EPA-HQ-OAR-2010-0560

Dear Interested Parties:

I am writing on behalf of the 25x’25 National Steering Committee to transmit our reply to the Call for Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources.

EPA has issued a final Tailoring Rule on May 13, 2010. A major intent of the rule is to limit the number of entities which will be affected by EPA’s enactment of its obligation to limit greenhouse gas emissions. Given the EPA mandate from the Supreme Court, this is a positive approach, which demonstrates EPA’s attempt to effect emissions reduction using the Clean Air Act in an efficient manner.

For bioenergy feedstock producers and bioenergy value chain partners, this same rule also creates a radical departure from prior bioenergy accounting and policy practices specified by EPA and by essentially all previous global policy and practice. Historically, and legitimately, emissions from the combustion of biomass – biogenic emissions – were exempted from inclusion in greenhouse gas accounting totals since they represented an equal and opposite return to the atmosphere of the carbon dioxide which was previously sequestered via photosynthesis to support the growth of the very same biomass now being combusted.

EPA’s draft Tailoring Rule retained this biogenic exemption, but the final rule eliminated it. The EPA invitation for comment on this topic is the result. Elimination of this exemption causes other, non-combustion sources of biogenic emissions to also lose their exemption, which sources include emissions such as from fermentation during ethanol production or emissions from manure management.
One of the first uses of this final rule that eliminates the biogenic emissions exemption is the anticipated determination of Best Available Control Technology standards for industrial boilers under the New Source Review program.

Previously, if biomass was substituted for fossil fuels in a boiler operation the revised emissions accounting showed a lower total, given that fossil emissions are rightfully not exempt and biomass combustion emissions are exempt in the accounting. Now, under the final rule which eliminates this biogenic emissions exemption, the substitution of biomass for fossil fuel sources does not reduce emissions. This is because biomass combustion emissions are no longer exempt and are in fact counted on the same basis as fossil energy emissions. Worse still, as a consequence of energy density and moisture issues, there is a small net loss in efficiency of the conversion of fuel to energy when biomass is compared to fossil fuels. That net loss in efficiency is a reality that must be included in the accounting.

The combination of these two factors suggests that when even the lowest carbon content biomass (e.g. forest residues previously decomposing on forest floors) is substituted for fossil energy (e.g. coal) the revised accounting under EPA will show a net increase in carbon dioxide emissions. This is inaccurate and fails to reflect reality under a reasonable set of bioenergy accounting and policy constructs as suggested by the content of this response from the 25x’25 National Steering Committee.

Under the expected January and July 2011 EPA BACT implementations for industrial boilers, several segments of the biomass and bioenergy industries will bear the immediate consequences of this change. Disregarding the fact that the Tailoring Rule only applies to larger emitting entities (those in excess of 75,000 or 100,000 tons per year) the types of operations which will be affected as a consequence of their bioenergy use and/or simply having other biogenic emissions, include:

- small wood mills
- integrated pulp and paper plants
- electric utilities
- biorefiners
- CAFOs
- animal rendering plants

The BACT issues are just one of the many ways in which all bioenergy feedstock producers and their value chain partners will be affected by the loss of this exemption. The main issue is the loss of the exemption, and the negative consequence on the relative comparisons of the greenhouse gas accounting between fossil and bioenergy systems. It is clear that this loss of the exemption will produce an impediment to the needed shift to a low carbon renewable energy future and instead favor fossil energy systems. In addition, subsidiary environmental consequences of the move to bioenergy systems and away from fossil energy will be also lost; improvements such as reduced criteria pollutants, reduced coal mercury emissions, etc. will be foregone. There will also be new compliance costs for entities that will be covered by the Clean Air Act for the first time as a consequence of greenhouse gas emissions.
In Appendix A, Principles and Policies for Bioenergy Comparative Accounting, we submit a comprehensive view on important bioenergy accounting and policy principles and guidelines. By taking a comprehensive approach, there is always the risk that the most critical issues could be lost in the larger body of work. For that reason, we want to emphasize the first 12 issues on our list of 56. The first 12 are the ones which carry the most potential for the positive or negative outcomes which determine whether bioenergy will be allowed to fulfill its promise. They address the following key issues:

1. land use accounting challenges
2. differences between emissions from bioenergy and fossil energy
3. the need to employ the latest information, the marginal impacts or opportunity costs
4. the need for clear uniform definitions of eligible biomass
5. the importance of having uniform rules on which types of land may produce biomass
6. the fact that sequestration of atmospheric carbon precedes its release via bioenergy combustion
7. bioenergy accounting must cover a full cycle of biomass growth, harvest, combustion
8. “additional” feedstocks should be treated differently
9. the means chosen for identifying biomass as “additional” are important
10. the relationships between bioenergy production and its coproducts are important
11. temporary storage (sequestration) of carbon has a measurable value
12. reliance on life cycle analysis requires properly employing its multiple forms

The topics are familiar, but the detailed substance matters. We would be pleased to clarify or discuss our input after you have had an opportunity to absorb its substance. We would in fact welcome the opportunity to facilitate your interaction with the full membership of a discussion group convened in recent weeks to help tease out the nuances of bioenergy accounting and policy. That group, the Comparative Bioenergy Accounting Work Group (CBAWG) encompassed approximately 30 persons from 25 organizations. Participation included environmental, agricultural, educational, bioenergy industry, and carbon market accounting standards organizations.

Thank you for the opportunity to submit this response,

Nathan L. Rudgers
25x’25 Steering Committee Member and Chair of Carbon Work Group

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Background and Scope for this 25x’25 Response:
25x’25 is an Alliance of nearly 1000 entities who are committed to a vision that by year 2025, America's farms, forests and ranches will provide 25 percent of the total energy consumed in the United States, while continuing to produce safe, abundant, and affordable food, feed, and fiber.

25x’25 convened the Comparative Bioenergy Accounting Working Group (CBAWG) in mid-August 2010 with the intent to collaboratively develop understandings and ideas for our organizational responses to the EPA Call for Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources. CBAWG as a group has approached the EPA Call as an opportunity to articulate principles and issues concerned with GHG emissions accounting that can facilitate science-based policy development which recognizes the important differences between emissions from bioenergy and other biogenic sources, and emissions from fossil fuels.

The 25x’25 Steering Committee developed a list of core bioenergy accounting principles (Appendix A) and this comment, based on the CBAWG discussions. These comments are presented on behalf of the 25x’25 Steering Committee and should not be taken to reflect the opinions of any other bodies. For its part, 25x’25 captured the full scope of issues which arose within the context of the group discussions, and incorporated them into this comment, subject to its own interpretations and value systems.

The 25x’25 Steering Committee appreciates the opportunity to provide EPA with information that can be used in rulemakings that are expected to substantially impact the course of societal change from a fossil fuel economy towards a low carbon renewable energy future. An expansive view of this request for input suggests the need to outline the full range of science based bioenergy accounting conditions and policy values required to appropriately support the bioenergy component of the renewable energy transition. This response endeavors to provide a comprehensive assessment.

The bioenergy accounting principles presented within this response are designed to assist EPA in appropriately privileging bioenergy’s superior carbon management capabilities as compared to the fossil energy systems they must supplement and displace.

25x’25 has chosen to focus on how accounting for greenhouse gas emissions, most importantly but not exclusively carbon dioxide, should be conducted when based upon rigorous science and policy judgments that are appropriate to three criteria. These three criteria are: 1) ensuring a balanced comparison to fossil fuels and fossil energy systems; 2) ensuring that effective bioenergy accounting and policy constructs are logical and operational complements to the wider transition to a low carbon renewable energy future; and 3) ensuring that bioenergy accounting and policy is separable from and independent of important related issues which must be independently addressed, such as land use or sustainability policy and requirements.
**EPA Policy Shift**

There has been a long history of exempting biogenic emissions from greenhouse gas accounting rules. The chart on the following page lists a number of policies, from various jurisdictions and voluntary programs, which have heretofore employed the exemption. EPA itself, based upon prior work, has until recently promulgated rules which employ this same exemption. The two exceptions are the recent LDVS beginning in 2016 and the new Tailoring Rule.

This is a significant global paradigm shift which warrants delay while EPA sorts out the issues and implications more fully.
Policy Comparisons:
Showing the Majority of Policy, Including from EPA, Provides an Exemption of Biogenic Emissions from Standard Accounting

<table>
<thead>
<tr>
<th>Comparative Bioenergy Accounting</th>
<th>Biogenic CO2 exemptions or exclusions</th>
<th>NO biogenic CO2 exemptions or exclusions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EPA Policies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFS (LCA)</td>
<td>√</td>
<td>---</td>
<td>GREET, the life cycle model employed by EPA, exempts the combustion emissions and emissions from fermentation.</td>
</tr>
<tr>
<td>Mandatory Reporting</td>
<td>√</td>
<td>---</td>
<td>Biogenic not counted in general; but information collected on biomass combustion.</td>
</tr>
<tr>
<td>EPA Endangerment</td>
<td>√</td>
<td>---</td>
<td>Study of public health and welfare explicitly excluded biogenic carbon dioxide emissions.</td>
</tr>
<tr>
<td>LDVS</td>
<td>√</td>
<td>√</td>
<td>Biogenic exemption until 2016 then a shift to NO Biogenic exemption, and no differentiation from other tailpipe emissions. EPA mobile source emissions analysis/quantification work excluded EtOH &amp; BD ems.</td>
</tr>
<tr>
<td>Proposed Tailoring Rule</td>
<td>√</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Final Tailoring Rule</td>
<td>---</td>
<td>√</td>
<td>Note that the shift here and for LDVS is toward loss of the exemption, previously the EPA standard.</td>
</tr>
<tr>
<td><strong>Other Government Policies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CA LCFS (LCA)</td>
<td>√</td>
<td>---</td>
<td>GREET, the life cycle model employed by CARB, exempts the combustion emissions and emissions from fermentation.</td>
</tr>
<tr>
<td>National C&amp;T Legislation</td>
<td>√</td>
<td>---</td>
<td>Proposed legislation has generally exempted biogenic, and emissions from bioenergy.</td>
</tr>
<tr>
<td>Offset Programs</td>
<td>√</td>
<td>---</td>
<td>Proposed legislation has generally exempted biogenic and allowed forest based, and select bioenergy offsets.</td>
</tr>
<tr>
<td><strong>IPCC/UNFCCC</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Inventory</td>
<td>√</td>
<td>---</td>
<td>Emissions from bioenergy combustion, and other biogenic sources not counted. LUC emissions counted including forest stock changes.</td>
</tr>
<tr>
<td>Kyoto Offsets</td>
<td>√</td>
<td>---</td>
<td>Stock changes monitored for forestry, afforestation, reforestation, deforestation.</td>
</tr>
<tr>
<td>State RES/RPS (typical)</td>
<td>√</td>
<td>---</td>
<td>Biomass generally included as an eligible energy category; treated same as wind, hydro, solar.</td>
</tr>
<tr>
<td>Corporate/ Entity Level Inventories</td>
<td>√</td>
<td>---</td>
<td>ISO and GHG Protocol standards include calculation of emissions from bioenergy and biogenic sources, but report these emissions separate from other sources.</td>
</tr>
<tr>
<td>Product/Supply Chain LCA</td>
<td>√</td>
<td>---</td>
<td>ISO and GHG Protocol standards include calculation of emissions from bioenergy and biogenic sources, but report these emissions separate from other sources.</td>
</tr>
</tbody>
</table>
APPENDIX A: Principles and Policies for Bioenergy Comparative Accounting

Background and Purpose:
The Comparative Bioenergy Accounting Working Group (CBAWG) was convened mid-August 2010 by 25x’25 with the intent to collaboratively develop understandings and responses to the EPA Call for Information on Greenhouse Gas (GHG) Emissions Associated with Bioenergy and Other Biogenic Sources. This document, Draft Principles and Policies Narrative, is an outgrowth of that work and represents the 25x’25 National Steering Committee input to the EPA Call for Information. More generally, it is a compilation of important bioenergy accounting and policy issues which EPA and related government agencies must properly address in a coherent and comprehensive fashion in order for bioenergy to be fairly compared relative to fossil energy and other alternatives.

Issues List and Narratives – Critical Foundational Principles
The first 12 of the 56 issues below represent particularly vital aspects of bioenergy accounting and policy consideration and principles.

Issue #1

Bioenergy accounting and policy must be separate from and independent of land use policy, given that land use policy must encompass food, feed, and fiber production systems and value chains as well as bioenergy systems, and must also account for broader social, cultural, and economic land use drivers.

Land use in the United States and elsewhere is influenced by a wide range of economic, social, and cultural drivers. These economic drivers include the production of food, feed, fiber, and fuel for energy along with urban and sub-urban development and sprawl. EPA and others (e.g. RPS and CA LCFS), while modeling the carbon emissions consequences of bioenergy production, have begun to rely on complex models that attempt to assign direct and indirect causal responsibility for land use changes across the globe which are attributed in part to the production of bioenergy from a variety of pathways in the U.S. As has been widely discussed, these modeling efforts are difficult at best and potentially highly inaccurate and detrimental to sound policy development at worst. Many persons believe that any attempt to assign causation to just one of the wide range of land use drivers, within the context of a single policy arena, bioenergy policy in this case, will never succeed.

At the same time, in our globally linked world, we must find effective means to set land use policy which meets multiple imperatives starting with food, energy, and climate change impacts. The apparent solution is that land use policy will need to be solved separately from and independently of bioenergy accounting and policy. Land use policy will need to be complementary to and linked with energy, food production and climate change polices. Principle #1 only makes the point that bioenergy policy cannot independently be the means for the development of land use policy.
Issue #2

Bioenergy accounting and policy must appropriately privilege and incent biomass combustion relative to fossil fuel combustion in recognition of the qualitative and quantitative differences between shifts within the active carbon pool and additions to the active pool represented by bioenergy and fossil energy emissions respectively.

In the absence of further fossil fuel combustion, which adds geologic age carbon into the equation, there is a relatively fixed-sized, active pool of carbon that circulates between the atmosphere, the oceans, and terrestrial systems. Over the past two and one-half centuries or so, hundreds of billions of tons of ancient carbon have been added to the active pool from the extraction and combustion of fossil energy sources, which otherwise would have remained stored over geographic time frames (millions of years). Over the same past two and one-half centuries or so, land use changes have caused the shift of billions of tons of carbon from the terrestrial pools into the atmospheric and oceanic pools.

The net effect of the additions to and the shifts within the active pool of carbon has been the increase in the atmospheric concentrations of carbon dioxide from an historic and relatively stable 280 ppm to approximately 390 ppm, with significant environmental consequences. If new additions from fossil energy were not constantly adding new carbon to the active cycles, global policies could successfully reverse the shifts and increase the terrestrial systems uptake, thereby alleviating carbon stocks in the atmosphere. However, the addition, without any hopes of reversal, of carbon from fossil fuels into the active pool, has different consequences and implications than shifts within the relatively fixed-size, active pool. The active circulation pool of carbon, under reasonable assumptions, cannot be expanded endlessly by fossil carbon additions over the next century if there is to be any hope of avoiding the more severe consequences of the atmospheric build-up.

Bioenergy and fossil energy emissions are qualitatively and quantitatively different. Thus, bioenergy accounting and policy must appropriately privilege and incent biomass combustion relative to fossil fuel combustion. This is NOT CURRENTLY THE CASE. While there are many ways to accomplish this differentiation, one simple way to accomplish this critical objective would be to compare emissions from bioenergy systems by a weighting factor such that policy counted a unit of fossil energy emissions to have an appropriately greater impact to a recyclable unit from bioenergy.

Issue #3

Bioenergy accounting and policy must be based upon the increasing marginal productivity of managed biomass feedstock and bioenergy production systems; and for comparison, fossil fuel accounting must employ the increasing carbon emissions from marginal sources such as tar sands, hydraulic fracturing, deep water drilling, and mountaintop removal mining.

Bioenergy accounting and policy should be forward looking, concerned with the opportunity costs of future decisions, and less backward looking based upon average outcomes of the past. The next forward step, the marginal consequence, is most relevant. Thus average yields are often less germane.
than the yields of marginal actions, which may be higher (use of good lands and the latest agricultural technologies) or lower (use of marginal lands). In general, as seen during the continuously updated life cycle analyses for biofuels, the production of bioenergy feedstocks continues to improve and require the latest data on the marginal impacts. Fossil fuels by way of contrast, as a consequence of fixed supply and production from increasingly inaccessible sources, appear to face an increasing carbon intensity of acquisition and combustion (e.g. hydraulic fracturing, deep water drilling, and tar sands production). Regardless of the anecdotal observation that bioenergy will benefit in its comparisons with fossil energy as a consequence, both must be equally assessed upon this marginal view, which more accurately reflects real world outcomes.

Issue #4

Bioenergy accounting and policy requires a definition of biomass that is science based and applicable across all bioenergy accounting and policy.

Biomass should be defined scientifically and in a policy neutral manner and then, in the default case, applied uniformly across all bioenergy related federal policies and ideally global and state and regional policies as well. The mix of policies includes at a minimum: inventory rules from the entity to global scales; caps and offsets applicable at all scales; renewable portfolio or energy standards; EPA actions under the Clean Air Act; transportation fuel policies, including volumetric rules such as the Renewable Fuel Standard; greenhouse gas intensity rules, such as the California Low Carbon Fuel Standard; and any and all policies requiring a life cycle analysis, at either attributional or consequential scopes.

Issue #5

Bioenergy accounting and policy requires that land type eligibility criteria for biomass production be clarified on a uniform basis and applied to all bioenergy accounting and policy.

The ideal approach would employ uniform land type eligibility criteria and avoid any attempts to use this rather macro-scale tool to achieve related objectives, such as those pertaining to sustainability or habitat protection. These objectives are best achieved independently from land type eligibility rules for the production of biomass. Biomass production, when properly circumscribed, can be a positive contributor to overall stewardship of land resources.

Issue #6

Bioenergy accounting and policy must recognize that bioenergy combustion returns an equal and opposite quantity of previously sequestered carbon dioxide to the atmosphere.

The carbon dioxide released when biomass is combusted has, by definition, always been previously removed from the atmosphere via photosynthesis. All bioenergy accounting and policy must recognize this as a starting point.
Issue #7

Bioenergy accounting and policy must employ successive full cycle temporal boundaries that commence with the initial biomass growth and extend through the cycle to harvest, processing, transportation, and ultimately combustion.

Bioenergy can only result from a cycle which always begins with the growth of biomass and its associated removal of carbon dioxide. Bioenergy accounting must always choose a time frame for analysis, and the appropriate temporal scale is a full cycle, commencing with the first growth of biomass (including any emissions associated with planting or otherwise facilitating that growth, including direct land use change effects as appropriate). Legitimate other questions (e.g. about whether the biomass and carbon being harvested is additional or whether the biomass has come from eligible lands) should coexist, but do not change this fundamental point. Harvest is a dividend from prior investment, not the creation of a carbon debt, a biased concept which inappropriately may even go so far as to privilege coal power over bioenergy.

Issue #8

Bioenergy accounting and policy must distinguish between additional and non-additional sources of bioenergy feedstocks.

Deciding which feedstocks and energy pathways are additional and which are not (or whether tests for additionality have been met) is a matter of policy, not science. The intent to differentiate between business as usual outcomes, which would have occurred anyway, and those which are additional as a consequence of policy, is a valid way to choose how to account for carbon stocks and emissions and to set up systems of measurement and reward. As the exhaustive literature on the subject makes clear, there are significant practical difficulties with choosing the policy details. Various problems abound, including the impossibility of ever being certain about the counterfactual outcomes which did not occur under business as usual assumptions. Given the significant role for bioenergy within the low carbon renewable energy future, a policy tolerating a limited portion of false positives is a valid means to ensure a significant production of bioenergy.

Issue #9

Bioenergy accounting and policy should logically qualify “additional carbon” based upon performance standards such as sectoral (e.g. a positives list of practices) and/or temporal thresholds (e.g. all carbon sequestered since 1990) given that all definitions of additional are a matter of policy, not science, and given the need to incent a movement to bioenergy systems from fossil energy systems.

Given the need to substitute bioenergy for fossil energy wherever advantageous net carbon reductions will be achieved, there are several means to effectively define “additional” in an operationally efficient manner that also incent maximum net positive change. Generally this suggests the use of standardized additionality eligibility criteria in preference to project specific tests and record keeping. Development of performance standards are one effective and often used approach. Livestock anaerobic digesters for
manure management are an example. Since just a tiny fraction of animal agriculture operations currently employ digesters, a declaration that all digesters are additional and eligible for carbon credits can accelerate this form of bioenergy. A temporal threshold is another strong tool. Given that carbon sequestration has been a global focus since at least 1990 (the original Kyoto Protocol and UNFCCC baseline year) bioenergy accounting policy might, for example, stipulate that all biomass grown since 1990 is additional.

In contrast, accounting policy is inherently problematic when it is based upon assumptions about counterfactual outcomes and multiple tests for additionality. From an overall effectiveness standpoint, what counts is net reduction of carbon emissions, which can be achieved by generous recognition rules that inevitably reward some free riders (false positives), but maximize net carbon accounting outcomes.

**Issue #10**

Bioenergy accounting and policy must recognize that the majority of bioenergy feedstock production occurs as one in a mix of products, often including food, feed, fiber, and/or carbon storage, and produces co-benefits including sustainability, soil health, or others.

Given that bioenergy is so often a co-product or by-product within a mix of products from the land, it is important to perform bioenergy accounting which appropriately allocates emissions and energy utilization to each component. Life cycle analysis (LCA) can include such allocation. While comprehensive LCAs are required for policy development, in order to minimize policy overhead burdens on individual entities, default options based upon analyses performed by policy administrators can be provided to individual producers such as in the RFS. At the same time, individual entities that have created improved bioenergy pathways via superior biomass production systems or conversion technologies should have the option to perform their own LCAs, in a tightly proscribed manner, to gain recognition for their lowered carbon footprint and/or higher energy yields.

**Issue #11**

Bioenergy accounting and policy must solve the formidable challenge regarding the uniform identification and adoption of consensus measures to acknowledge and reward the climate change benefits of temporary removal of atmospheric carbon dioxide and its storage in biomass systems, even when that biomass is subsequently harvested for bioenergy use.

There is consensus that carbon dioxide temporarily sequestered for a hundred years and then released, i.e. a forestry cycle, is better than the same carbon dioxide being released today. There are measurable, tangible differences in the net radiative forcing over the next hundred years under these two scenarios. Less easily perceived, but also true, carbon dioxide temporarily sequestered for ten years or five years and then released is also an improvement over the release today. As we increasingly attempt to manage these temporary shifts within the active carbon cycle between atmospheric and terrestrial (or oceanic) pools, accounting and policy must accurately measure the effects and incent the preferred outcomes (holding large amounts of carbon dioxide in temporary storage in preference to atmospheric
buildups). Accurate and equitable bioenergy accounting and efficient policy require a transparent, uniform means to value and incent temporary removal and storage. This valuation and incentive structure should apply regardless of subsequent events such as the harvesting of the biomass for use in a bioenergy pathway.

**Issue #12**

Bioenergy accounting and policy must distinguish between attributional and consequential life cycle analysis and choose the method appropriate to the circumstances.

Bioenergy accounting and policy must be developed via attributional life cycle analysis for individual pathways, and via consequential life cycle analysis for evaluating the effects of policies, market dynamics, predictive, and inherently challenging secondary, non-linear and indirect effects. Failure to understand and choose the right tool can result in biased outcomes, or be ineffective or detrimental.

**Issues List and Narratives – Other Vital Issues**

Each item on the remainder of this list of fifty-six separate issues is seen as a separate and important part of a coherent and comprehensive framework for comparative bioenergy accounting and policy development.

**Issue #13**

Bioenergy accounting and policy in the U.S. should be constructed with both the goal of global cooperation and the willingness to proceed independently.

Bioenergy accounting and policy is in many ways inseparable from the larger goal of a move to a low carbon renewable energy future. It will affect all nature of policies, including carbon caps, whether driven by EPA under the Clean Air Act or another federal program. There is a risk that U.S. policy could disadvantage the competitiveness for particular industries. The phrase “willingness to proceed independently” is intended to point to both the environmental imperatives to move towards a low carbon renewable energy future, and the expectation that bioenergy accounting policy may threaten the competitive advantage of biomass and bioenergy industries. Many possible models for protection could apply. One example is a border adjustment mechanism.

**Issue #14**

Bioenergy accounting and policy must maximize the beneficial role which the bioenergy sector will play in concert with other renewable energy assets - such as wind, solar, hydro, and geothermal – all working in concert toward a low carbon renewable energy economy.

Bioenergy accounting and policy, based upon demonstrable outcomes, is a key part of the renewable energy transition. There are many ways that the country’s bioenergy potential can be bolstered or compromised by policy, such as the inclusion or removal of the exemption for carbon dioxide emissions from biomass combustion. Excluding bioenergy sources from a renewable electricity standard in order
to ensure that no forests will be harvested is a crude means to achieve an unrealistic end, one that prevents society from receiving the benefits of bioenergy. Proper policy can incent and support bioenergy supplies, including the avoidance of significant deforestation. A comprehensive, balanced, and uniform set of bioenergy accounting rules and policies will appropriately empower these sectors to play their significant energy production and emissions reduction roles.

**Issue #15**

Bioenergy does not stand alone; it is part of an overall societal energy systems transition.

Bioenergy accounting and policy needs to fit within the portfolio of policies that lead to a low carbon renewable energy future. Appropriate policy will offer economic opportunity, while protecting the sustainability of our land heritage, and will coordinate with intersecting policies for land use, climate change mitigation, and international competitiveness.

**Issue #16**

Bioenergy accounting and policy should be complementary to policies which increase overall energy efficiency and reduce aggregate energy consumption.

Energy efficiency and energy use reduction are unique objectives covered by policies which are different from but complementary to bioenergy accounting and policy. Both sets of policies share the objective of developing a societal energy system and infrastructure that is sustainable over the long haul.

**Issue #17**

Bioenergy accounting and policy must be compatible with adjunct policies which support the transition away from a fossil fuel economy such as electrical and thermal renewable energy credits (RECs), net metering, or feed-in tariffs, all utilized with renewable portfolio and renewable energy standards (RPS/RES), or related policies, such as carbon markets.

Such policy constructs are an important complementary aspect of the movement from fossil fuels to bioenergy, but they are not specifically addressed within this CBAWG “carbon centric” bioenergy accounting and policy conversation.

Bioenergy accounting can play a major role in determining how existing state RPS programs or a future federal RPS operates. In general, an RPS/RES policy mandates target percentages of electrical output (or other energy output) which must be produced from renewable sources. In one recent notable case, consultants working for the state of Massachusetts conducted a life cycle analysis purporting to objectively compare some bioenergy alternatives to a fossil fuel alternative. That study\(^1\), widely viewed

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\(^1\) See: Biomass Sustainability and Carbon Policy Study
as flawed, violates many of the principles outlined here. This outcome represents a prime example of how the right tools used inappropriately will result in the wrong outcomes. Namely, the probable disqualification of forest biomass bioenergy pathways from renewable energy eligibility under state RPS rules. A counterproductive outcome is even possible, one where the loss of revenue streams from the sale of energy and environmental attributes encourages landowners to relinquish lands to development pressures, an opportunity cost not well examined.

**Issue #18**

Bioenergy accounting and policy must recognize that sustainability is a primary underpinning of bioenergy systems, but is not the direct subject of bioenergy accounting and policy; rather it is the subject of a well established and evolving separate set of laws, regulations, practices, and certifications managed by governmental and private sector entities.

Sustainability has major significance for uses of land and resources. However, like land use, it is a criteria which encompasses much more than just sustainable bioenergy feedstock production. As such it must continue to be addressed independently.

**Issue #19**

Bioenergy accounting and policy must recognize, separate, and compare the relative GHG emissions impacts of bioenergy and fossil energy systems.

Bioenergy accounting and policy must be formulated based upon the scientifically demonstrable beneficial outcomes associated with an accelerated move from fossil fuels to bioenergy. Real differences, where separable, recognizable, and measureable, must be used to compare bioenergy and fossil energy systems, which are fundamentally different alternatives.

**Issue #20**

Bioenergy accounting and policy must recognize that while the emissions impacts of primary concern from energy systems are atmospheric emissions of carbon dioxide and related carbon stocks, nitrous oxide and methane must be included in the accounting.

There are well established mechanisms, based upon global warming potential, that account for the impacts of the three major GHGs relevant to bioenergy, along with others like sulfur hexafluoride, which relate to some energy systems. The common denominator metric useful for many reporting purposes is carbon dioxide equivalent.

**Issue #21**

Bioenergy accounting and policy must privilege and incent bioenergy systems as compared to fossil energy systems, predicated upon science-based support, given the imperative to move to a low carbon renewable energy future.
Bioenergy systems have been acknowledged as an important element in the transition to a low carbon renewable energy future. Bioenergy systems offer opportunities complementary to, but different from, other renewable energy sources such as wind, solar, hydro, and geothermal. Unique advantages toward displacement of fossil transportation fuels and both thermal and electric energy accrue to bioenergy systems in ways not replicable by other renewable energy systems. Given the unique role for bioenergy, and given the objective to move toward the low carbon renewable energy future, it is important to appropriately privilege bioenergy as compared to fossil energy systems. This issue is the heart of what is meant by “comparative bioenergy accounting and policy”. In order to provide true parity, the comparisons must put bioenergy on a level field with fossil energy. Policy development must privilege and incent bioenergy by acknowledging the scientifically demonstrable benefits, and by counterbalancing the existing substantial fossil energy subsidies.

**Issue #22**

Bioenergy accounting and policy must recognize that bioenergy systems cause temporary **shifts** of carbon between atmospheric and terrestrial pools and stocks within the active carbon cycle.

Bioenergy production involves a continuous cycle where photosynthesis sequesters carbon from the atmosphere, and portions of that carbon are released when biomass is harvested and combusted for energy. The net result is a continuous shifting of carbon within the active carbon pool as it cycles between terrestrial and atmospheric stocks. These shifts may be successfully managed to remove atmospheric carbon and hold stores in terrestrial systems. The ability to successfully manage these shifts to minimize the problematic consequences of high levels of atmospheric carbon is inherently difficult even when there are no net additions of carbon from the fossil pool into the active carbon pool (see Issue #13). The difficulty increases when the total amount of carbon in the active carbon cycle is continuously increasing from mining and combusting of fossil fuels.

Bioenergy accounting and policy does not currently address the shifts within the active carbon pool in a way which includes oceanic stocks, and is therefore limited to the atmospheric changes driven by terrestrial activities.

**Issue #23**

Bioenergy accounting and policy must recognize that fossil carbon, once mined and combusted, is an **irreversible addition** of ancient carbon to the active carbon cycle.

The total sum of stocks of carbon in atmospheric, terrestrial, and oceanic pools is fixed at any given time. Over time, however, the total net carbon in these pools is continuously growing as a consequence of the mining and combustion of fossil fuels, which bring ancient carbon, previously safely stored for millennia, into the active cycle. These additions significantly unbalance the global carbon cycle, and have resulted in the rising atmospheric levels which propel climate change.
Issue #24

Bioenergy accounting and policy, subject to satisfactory resolution of ownership issues, should credit bioenergy production for the reduction of emissions which occurs as a consequence of the substitution for fossil fuels at the marginal rates.

Bioenergy accounting and policy must incent the desired carbon and energy outcomes via explicit decisions about the ownership of environmental attributes such as carbon credits or RECs. The need is for the good actor to be rewarded in all cases. Therefore, when a bioenergy source displaces a fossil energy source and lowers total emissions at the margin, the bioenergy provider should receive the environmental attributes, a REC or carbon credit in this example, even though the physical location of the reductions will be the fossil energy site. In both the case of electricity and heat production from biomass and liquid biofuels, reduced emissions result because at the margin, higher emission sources of energy are backed down or out of the equation. At present it is the fossil energy providers who are awarded these credits in most cases instead of the good actors (i.e. the bioenergy providers who have caused the reductions).

Issue #25

Bioenergy accounting and policy, given the inclusion of indirect impacts for bioenergy production, must assess fossil fuel emissions by comparably including direct and indirect impacts such as from sustainability, human health, and economic consequences.

Indirect impacts of all types are inherently challenging to assess with accuracy and confidence. It is argued elsewhere within this document that land use in particular is a consequence of so many variables beyond just bioenergy systems, that modeling, planning, and policy needs must be independently derived and can only then be applied to bioenergy systems and all other major land use systems. Land use change is an indirect consequence of bioenergy systems and understandably does need to be addressed, as appropriate means to do so emerge. Indications are that indirect land use changes from fossil energy systems are more modest than those from bioenergy systems, but this does not negate the importance of their inclusion in bioenergy accounting and policy development.

Similarly, there are major indirect consequences of fossil energy systems, including ones, where in all probability, the scope and size of the effects from fossil energy systems greatly exceed those from bioenergy systems. In these cases too, a balanced treatment demands that such effects be comparably included and cover areas such as sustainability, human health, and economic consequences.

Issue #26

Bioenergy accounting and policy must be formulated based upon the scientifically demonstrable beneficial outcomes associated with an accelerated move from fossil fuels to bioenergy.

Bioenergy accounting and policy, even when based upon the scientifically demonstrable beneficial outcomes associated with an accelerated move from fossil fuels to bioenergy, tends to be limited by
fears that entrenched interests will prevent change. But bioenergy accounting and policy must be formulated based upon benefits of that change, not based upon the presumption that beneficial changes simply cannot be accomplished.

Issue #27

Bioenergy accounting and policy, in recognition of the long-term investment and commitments required to achieve benefits from bioenergy, must provide stable, consistent rules, which can foster a transition beyond the current sunk investments in fossil energy capital infrastructure.

Fossil energy systems have benefited from decades long subsidies and tax incentives designed to reflect their long capital planning cycles and the need for business investment certainty. Bioenergy also requires decades long commitments that are made now, not short term tax credits, or other examples of policy that create uncertainty. Bioenergy can best assist the low carbon renewable energy transition under long-term stable policy circumstances.

Issue #28

Bioenergy accounting and policy must recognize that carbon capture and storage (CCS), subject to further confirmation of its effectiveness, when used with bioenergy systems, removes carbon dioxide from the atmosphere and places it into long-term managed storage.

CCS, often considered as a partial solution to the combustion of coal at power stations, is equally applicable to biomass combustion at power stations. The net benefit of a bioenergy application in terms of removal of atmospheric carbon for long-term storage is superior to use with coal stations where the net result is transfer of carbon from safer, permanent geologic storage to shorter less secure storage.

Issue #29

Bioenergy accounting and policy must recognize that CCS, subject to further confirmation of its effectiveness, when used with fossil energy systems, captures carbon removed from secure geologic storage and places it into long-term managed storage.

CCS for coal-powered electric plants, under the most optimistic circumstances, moves carbon from a more stable, geologic stored state to a less stable, human managed stored state. CCS is neither a panacea nor the exclusive purview of coal plants (see Issue #28).

Issue #30

Bioenergy accounting and policy must recognize that biochar production systems, subject to further confirmation of effectiveness, are applicable to bioenergy but not fossil energy systems.

Real differences between important bioenergy accounting and policy opportunities for bioenergy and for fossil energy systems deserve explicit acknowledgement.
Issue #31

Bioenergy accounting and policy must recognize that biochar production systems, subject to further confirmation of effectiveness, produce bioenergy and place carbon recently removed from the atmosphere into long-term underground storage in highly recalcitrant forms.

Biochar systems remove carbon from the atmosphere, produce energy, store the carbon long-term, and positively affect agriculture via the reuse of nutrients and other outcomes. These systems deserve special attention within bioenergy accounting and policy development given their potential to be net carbon negative producers of energy under even the most rigorous full life cycle assessments.

Issue #32

Bioenergy accounting and policy must be scientifically based and accurate; and it must create clear and complete rules for market participants.

Most of Issue #32 requires no discussion. One part however, the need for “complete” accounting, requires some. Tools and methods for complete accounting have been constantly improving. Life cycle analysis, for example, has come into wide use, including such challenging aspects as measurement of land use change. There are still some subtleties, as bioenergy accounting and policy development matures, which seem to evade inclusion; and yet to be complete, they must be captured. Two examples will suffice to make the point. When previously ignored forest residues are collected, there are at least two quantifiable emissions reductions benefits which are not presently being included in most analyses. First, the removal of residues decreases the incidence and extent of forest fires, which avoids the loss of carbon and increase in emissions which would have occurred in the absence of residue removals. Similarly, if the residues had been left to decompose, they would have caused emissions, including some portion as methane with its high greenhouse gas potency. These avoided emissions might even exceed the emissions from direct combustion. And at the worst, direct combustion for bioenergy only slightly accelerates the release of emissions which would have occurred naturally in any event. These examples demonstrate some of the challenges and gaps in current attempts to achieve completeness.

Issue #33

Bioenergy accounting and policy refers to “bioenergy” in an inclusive manner including liquid biofuels as well as electrical and thermal bioenergy, plus biogas, bio-oil, syngas from biomass, and biomethane since they are intermediaries for the ultimate electrical or thermal energy or liquid biofuels.

This is a clarification that bioenergy is not to be narrowly interpreted; rather it is inclusive of all manner of bioenergy pathways and technologies and intermediates created on the way toward energy production from biomass sources.

Issue #34

Bioenergy accounting and policy must recognize the emissions from bioenergy feedstock production, transportation, and processing (PTP emissions), and comparably for fossil energy.
These PTP emissions, sometimes referred to as process emissions, exist for both bioenergy systems and fossil energy systems and therefore all full accountings, such as life cycle analysis, must include these sources. This category of emissions includes any relevant nitrous oxide and methane emissions as well as carbon dioxide emissions.

**Issue #35**

Bioenergy accounting and policy must recognize that bioenergy systems are NOT inherently “carbon neutral” since these systems produce PTP emissions which must be included.

Claims of “carbon neutrality” based upon Issue #6, i.e. the equal and opposite return of carbon dioxide, must be modified to include the reality of PTP emissions (Issue #34). Bioenergy systems are thus not carbon neutral in the default case.

**Issue #36**

Bioenergy accounting and policy must incent sequestration of additional carbon.

In order to maximize the beneficial effects of bioenergy production on the climate change problem, there is a need to substitute bioenergy for fossil energy when advantageous from the vantage point of a net carbon accounting. Policy designed to increase carbon sequestration and avoid the release of fossil carbon must successfully incent the sequestration of additional carbon.

**Issue #37**

Bioenergy accounting and policy must define “additional” in a simple, operationally efficient manner.

In practice, accounting for additionality is prone by its nature to complexity. Based upon the lessons learned to date through carbon accounting programs around the world, this accounting must be made simple and operationally efficient. A system designed to be perfect, an impossible objective, can demand record keeping and management related to policy reporting which is prohibitively expensive and thwarts the very outcomes sought.

**Issue #38**

Where non-additional carbon is utilized in a bioenergy pathway, “carbon return on investment” rather than “carbon debt” is a beneficial perspective.

Inevitably it will make sense under some circumstances to harvest non-additional biomass for bioenergy. Given photosynthesis (Issue #6, the equal and opposite return of carbon dioxide), even when biomass is non-additional there is no carbon debt since combustion only returns carbon previously removed from the atmosphere. The investment of non-additional carbon in a bioenergy pathway leads to a concept of carbon return on investment, a superior metric to a misleading carbon debt concept.
**Issue #39**

Bioenergy accounting and policy must recognize changes in carbon stocks from coproducts such as wood products or distillers grains, including product substitutions such as wood for concrete.

While Issue #10 (i.e. a mix of coproducts) points mainly to emissions issues surrounding coproducts, it is important to also account for carbon stock changes which may have reduced stocks in one place (e.g. forests) but increased stocks in another, long-lived wood products, or other forms of substitution of biobased products for fossil-based products. A full accounting must cover these stock changes and any associated changes in emissions which result from the substitutions for fossil fuels.

**Issue #40**

Bioenergy accounting and policy should differentiate as appropriate between carbon stock accounting and emissions fluxes to the atmosphere for all types of greenhouse gases.

Both carbon stock accounting, particularly for forest biomass, and emissions accounting (fluxes to the atmosphere) have relevance in comparative bioenergy accounting. In most cases, both types of accounting produce comparable results, given data availability and quality, and consistency and accuracy of accounting procedures. The simplest example is that forest residues removed from the forest and combusted, reduce the forest carbon stock by an amount equivalent to the carbon in the carbon dioxide emissions from combustion.

**Issue #41**

Bioenergy accounting and policy should be scale independent, either via single metrics employed over multiple scales or simple metrics that are additive over increasing scales, allowing consistent rules for the global and national inventory scale down to individual entity, project, or bioenergy pathway assessments.

This is imperative in order to achieve accuracy and credibility.

**Issue #42**

Bioenergy accounting and policy must accommodate spatial scales which capture local and regional differences as well as total biomass stocks across rotating age classes and management activities.

Although the accounting must be accurate at any scale, measurements of net carbon effects might be misleading if scales too small (e.g. focusing on a harvested forest stand instead of its place within a larger system) or too large (e.g. losing the distinction between a well managed stand and a poorly managed one, each with distinct bioenergy and emissions footprints).

**Issue #43**

Bioenergy accounting and policy must be independent of biomass, energy, and carbon prices, but should be designed to avoid perverse outcomes from such market impacts.
Market prices for biomass, energy, and carbon can be expected to continue to vary as a consequence of various supply and demand drivers. Bioenergy policy must anticipate change and be designed to avoid perverse outcomes as a consequence of this change.

**Issue #44**

Bioenergy accounting and policy must incent the desired carbon and energy outcomes via explicit decisions about the ownership of environmental attributes (e.g. carbon credits or RECs).

Bioenergy accounting and policy must incent the desired carbon and energy outcomes via explicit decisions about the ownership of environmental attributes such as carbon credits or RECs. This is in order to avoid the potentially conflicting claims between land owners and those who lease the land for production, or between feedstock producers and their downstream bioenergy value-chain partners. This point is a more general case of Issue #24, which focuses on the need to reward the good actor when fossil energy displacement by bioenergy providers reduces emissions. The same fundamental principle applies: the good actor must be rewarded. The California LCFS, on the other hand, allows downstream blenders to earn credit when improved bioenergy feedstock production results in lowered emissions.

**Issue #45**

Bioenergy accounting and policy should be neutral with respect to technology, not directing the selection of technology winners.

Since technology evolution is unpredictable, programs like the California LCFS, which measure the ultimate carbon intensity of transportation fuels but do not dictate the technology employed, are the preferred design to facilitate innovation. Thus all forms of electric vehicles and internal combustion vehicles are given equal measure without trying to privilege a technology that is perceived as superior by policy makers.

**Issue #46**

Bioenergy accounting and policy should be bioenergy feedstock (biomass type) neutral.

Similar to Issue #45, it is impossible to anticipate all factors and pre-determine which bioenergy feedstocks will provide the greatest benefits. Policy neutrality for bioenergy feedstocks will facilitate innovation and let the marketplace determine which feedstocks will succeed.

**Issue #47**

Bioenergy accounting and policy measurement systems and market forces inherently compare alternatives on the basis of selected metrics, in spite of technology and feedstock neutrality.
The point here is that metrics and reward systems will produce outcomes which employ more of certain technologies and feedstocks than others, even when the policy design intention has been to create a level field of opportunity.

**Issue #48**

Bioenergy accounting and policy should not privilege new sources of bioenergy over existing sources of bioenergy.

All attempts to create change, in this case more bioenergy and more emissions reductions, risk neglecting existing sources of bioenergy. The objective is to produce more total bioenergy, and more emissions reductions, not to displace existing bioenergy with new bioenergy.

**Issue #49**

Bioenergy accounting and policy should be designed to incent higher efficiency (e.g. CHP) over lower efficiency, but should not set efficiency thresholds.

If policy employs a technology threshold such as a CHP system to incent an outcome, efficiency in this case, the policy may miss opportunities to motivate improvements in efficiency from other choices. A CHP system for example is only valuable if there is an end use for the captured thermal energy in close proximity to the electric production location; a condition which is not always true.

**Issue #50**

Bioenergy accounting and policy must recognize that carbon or carbon dioxide equivalent emissions may be an appropriate summary metric, but science and bioenergy accounting policy must be driven by an underlying assessment of climate impacts using metrics such as global warming potentials and net radiative forcing which capture the relevant consequences of emissions releases and sequestration over the atmospheric lifetime.

Climate change is driven by greenhouse gas emissions. But, as noted under Issue #42 concerning the time value of temporary sequestration, accounting for only the metrics tonnes of carbon dioxide or carbon dioxide equivalent cannot capture the net radiative forcing effects of emissions today compared to emissions at some future time. Accounting and policy must set scientific validity above simplicity. The policy implementation may still be simplified for end users, while still being scientifically comprehensive in its derivation.

**Issue #51**

Bioenergy accounting and policy must recognize that some managed bioenergy production systems have the potential to exceed the net primary productivity (NPP) that would happen naturally and therefore can accelerate the carbon storage and removal capacity on some lands.
It is possible for managed production systems to achieve NPP that far surpasses that of the native ecosystem which existed previously. This Issue is a reminder that all natural systems are not inherently better than a change to a managed bioenergy system if the objective is renewable energy and reduced emissions, subject to separate and appropriate land use and sustainability criteria.

**Issue #52**

Bioenergy accounting and policy may be conducted differently based upon a particular policy type or energy end use such as the production of liquid biofuels or renewable electricity, or upon its use in national or entity level inventory, offset project, or life cycle accounting.

This is a reminder that offset policy and accounting differs from a national inventory system, which differs from a corporate inventory system or a liquid biofuels life cycle analysis. While several of the issues herein have stressed accounting and policy uniformity and independence from elements such as boundaries, technologies, and feedstock (biomass) types, ultimately the use of bioenergy accounting and policy must conform to the needs of the differing policy objectives represented by these different examples.

**Issue #53**

Bioenergy accounting and policy should recognize that ATTRIBUTIONAL LIFE CYCLE ANALYSIS reports on the direct impacts and emissions of the processes and inputs associated with the production of an average unit of a particular bioenergy or related product.

This issue is directed at the general need for practitioners and policy makers alike to better recognize and incorporate the subtleties of one of the most powerful bioenergy accounting tools: life cycle analysis.

**Issue #54**

Bioenergy accounting and policy should recognize that CONSEQUENTIAL LIFE CYCLE ANALYSIS reports on the direct and indirect impacts and emissions of the bioenergy products and inputs associated with the production of a marginal unit of a particular product or products, and the associated changes in the production of related products as a result.

This issue is directed at the general need for practitioners and policy makers alike to better recognize and incorporate the subtleties of one of the most powerful bioenergy accounting tools, life cycle analysis.

**Issue #55**

Bioenergy accounting and policy should define BIOGENIC EMISSIONS (from for example decomposition or fermentation) in a manner which clearly distinguishes them as separate and different from the emissions from the combustion of biomass.
There appears to be continuing confusion in the use of the term biogenic emissions. Clarification is needed.

**Issue #56**

Bioenergy accounting and policy must be simple such that bioenergy feedstock providers are not hobbled by burdensome record keeping obligations.

Bioenergy accounting policy must be simple so that bioenergy feedstock providers are not hobbled by burdensome record keeping obligations, or the necessity to conduct life cycle or other complex forms of analysis individually. The accounting and policy rules must show a preference for standardized, default, look-up values that can be aggregated and are applicable across a wide range of bioenergy accounting and policy conditions. That is, the complex analysis should be performed by policy and standards organizations, not individual value-chain entities or offset providers except as an optional means to earn larger incentives.