EPA Scientific Advisory Board Biogenic Carbon Emissions Panel

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Attn: Draft Accounting Framework for Biogenic CO2 Emissions from Stationary Sources

October 18, 2011

Dear EPA Scientific Advisory Board Biogenic Carbon Emissions Panel:

Thank you for this opportunity to comment on The Accounting Framework for Biogenic CO_2 Emissions from Stationary Sources, released September, 2011. The discussion section of EPA's draft framework outlines many of the core issues involved in accurately accounting for these emissions. We appreciate the clear analysis of such a controversial and complex issue. However, the methodology ultimately proposed actually repeats past errors in treatment of biogenic emissions by crediting bioenergy with the growth of forests that would occur anyway. That is a logical error, and one with important implications. According to Pan et al. (2011)[1] forests globally offset significant anthropogenic emissions and "there are extensive areas of relatively young forests with potential to continue sequestering C in the future in the absence of accelerated natural disturbance, climate variability, and land use change". EPA's proposed framework would allow biomass energy expansion to completely eliminate this important forest sink before emissions are recognized and regulated, resulting in much higher atmospheric carbon levels.

The first section of our comments examines the claims made for the reference point baseline. The second examines spatial and temporal issues. The third highlights sources of uncertainty in the proposed reference approach. The fourth addresses some of the computational challenges related to

[1] Pan, Yude, Birdsey, Richard A., Fang, Jingyun, Houghton, Richard, Kauppi, Pekka E., Kurz, Werner A., Phillips, Oliver L., Shvidenko, Anatoly, Lewis, Simon L., Canadell, Josep G., Ciais, Phillipe, Jackson, Robert B., Pacala, Stephen, McGuire, David A., Piao, Shilong, Rautiainen, Aapo, Sitch, Stephen, Hayes, Daniel. 2011. A Large and Persistent Carbon Sink in the World's Forests. Science Express, 10.1126/science.1201609.

proposed parameters and equations. The final section proposes an alternative approach for the Scientific Advisory Board to consider.

1. Baselines

The reference point baseline does not distinguish the emissions effects from a permitted facility from the many other influences on forest carbon stocks in a region. The next several pages of these comments respond to specific passages in the draft framework that we believe misrepresent the advantages of the reference baseline approach.

> *p. 25 "Reference Point: If stocks increase or remain constant from that level, then this approach would conclude that the biogenic feedstock source region itself is not contributing to an increase in CO_2 concentrations,* ***and therefore*** *stationary source emissions of CO_2 from consumption of biologically based feedstocks from this region are also not contributing to an increase in CO_2 concentrations." [emphasis added]*

> *p. 43 This is a simplifying assumption, however, because other significant factors—unrelated to the production of biogenic feedstocks—may influence changes in land-based carbon stocks. These factors range from anthropogenically induced factors such as land-use change (e.g., urbanization) and timber harvest for roundwood, forest management decisions that might increase or decrease carbon stocks in a given area, to natural disturbances such as insect infestation, storm damage, drought, and fire. As long as carbon stocks on land are increasing, this* ***contribution of other factors does not change the methodological result because, in the aggregate, depletion of carbon stocks caused by all other factors, including harvest of biogenic feedstocks for use in stationary sources, is balanced by sequestration****" [emphasis added]*

The logical inference made in these passages does not hold true. EPA is tasked with regulating emissions from stationary sources, not with regulating emissions from regional forest landscapes. Hence the biogenic emissions methodology must not only indicate whether emissions from forests across a region are increasing or decreasing, it must indicate *which activities* caused a *net* increase so that EPA can fairly regulate those under its jurisdiction. Biomass utilization is just one among many influences on forest carbon levels. Using an analogy from statistical analysis, we need a multiple regression, not a simple regression or correlation, to tease out the impacts of the various independent variables on the dependent variable of forest carbon stocks. Since it is impractical to project forest growth, management practices, pest and disease cycles, competing wood uses, etc. on a regional scale, the only practical way to specify the net effects of additional bioenergy wood use is through forest growth and harvest modeling both with and without the proposed bioenergy use (see suggested approach in Section 5 below).

> *p. 27 "The reference point approach answers the question "is the region gaining or losing carbon to the atmosphere?" More specifically, it asks "is the* ***theoretical condition required*** *for biogenic feedstocks to have no net CO_2 impact on the atmosphere from losses of land-based biomass (i.e., that land-based carbon stocks are not declining) being met?" The answer will show whether the atmosphere gained or lost CO_2 from,* ***at least in part****, production and use of the biogenic feedstocks in a region." [emphasis added]*

Constant or rising carbon stocks across a region are *neither a necessary nor a sufficient condition* for biogenic feedstocks to have a negligible net CO_2 effect. The phrase "at least in part" in the selection above points to the difficulty. *Multiple* anthropogenic and natural forces influence whether a region's forest carbon stocks are increasing or decreasing. An *increase* due to the *combination of all these influences* cannot rule out the possibility that biomass utilization, *in isolation*, is *slowing* that increase. Conversely, increasing regional carbon stocks are *not* a theoretical condition required for biogenic feedstocks to have no net CO_2 impact. It is entirely possible for a region to be *losing* net carbon (for instance to severe unnatural fire), but for biomass operations in the region to *reduce that loss* by reducing fuel loads.[2]

> *p. 42 "If carbon stocks were historically* ***constant or increasing and continue to do so****, then the reference point baseline approach would show that the biogenic feedstock source region—and the associated use in the stationary source itself—is not contributing to an increase in net CO_2 concentrations,* ***and therefore*** *stationary source emissions of CO_2 from consumption of feedstocks from this region are also not contributing to an increase in net CO_2 concentrations." [emphasis added]*

"Constant or increasing" are treated in this passage as equivalent states, but they are not. If carbon stocks were *constant* in recent years, and they continue to be stable after new biomass energy facilities begin operating, *with all other uses held constant*, then there is valid reason to believe that the biomass operations are not increasing net atmospheric CO_2. However, if carbon stocks were *increasing* in recent years, and we expect them to continue increasing, then a transition to *constant* stocks after biomass energy facilities begin operating represents a *net emission*. A fixed reference point baseline would permit newly-established biomass facilities to slow or even halt the process of carbon accumulation in forests recovering from past disturbances, without any regulation of the net emissions that result.

> *p. 41 "This framework seeks to quantify the annualized net CO_2 emissions associated with using biogenic feedstocks in stationary sources at the regional scale. This is done by analyzing landscape-level changes in carbon stocks,* ***consistent with the way carbon debt is described*** *by Fargione et al. (2008) and Zanchi et al. (2010). In the framework, the "debt" is factored into annualized net emissions." [emphasis added]*

This passage implies that the proposed framework is consistent with treatment in Zanchi et al., while in actuality this source clearly supports the methodology suggested in section 5 of these comments. Carbon debt is not actually acknowledged by the draft framework until it accumulates to the point where it reduces forest carbon across an entire broad region.

> *p. 27 "For this reason, any GHG mitigation policy affecting terrestrial sequestration or biogenic CO_2 emissions would likely need to estimate future emissions and sequestration levels in scenarios* ***with and without the policy*** *in order to assess its possible impacts. Either the anticipated future or the comparative approach could be effectively employed in such situations. Because both approaches use projections of future emission levels, the uncertainty inherent in those projections*

[2] Studies of the net effects of fuels reduction thinning on long-term carbon stocks have yielded variable results – leading many researchers to conclude that the effects are too uncertain to be incorporated in a standardized accounting system.

would need to be considered and addressed appropriately. In the case of carbon stocks on land, uncertainties are related to modeling and extrapolation, as well as to the potential for unexpected future events, both biophysical and economic." [emphasis added]

p. 28 "Conversely, the reference point approach allows for assessment of whether the atmosphere gained or lost CO_2 from a particular region. This approach is useful for situations that ***do not require an evaluation of the possible impacts*** *of a specific policy or program, but rather seek a measurement of what has or has not occurred on the landscape. Such an approach will implicitly incorporate, for example, historic trends in forest stocks, current forest management conditions, and other demands for biogenic feedstock materials that could influence carbon stock changes. [emphasis added]*

As illustrated by these passages, EPA does acknowledge the usefulness of a "with-and-without" approach for some purposes, but it does not recognize regulation of stationary source GHG emissions as one of those purposes. We agree that a "with and without" approach is necessary to assess the effectiveness of policies designed to decrease GHG emissions. We believe that regulation of biogenic GHG emissions is such a policy – like regulation of criteria pollutants, regulation of GHG emissions is intended to reduce those emissions by limiting them at each source. We concur that the modeling required for such an approach is uncertain, but measurement of current carbon stocks is equally fraught with uncertainty (see Section 3 below).

The draft framework describes three alternative baseline approaches, and explains why the other alternatives are not recommended. The discussion of alternate baseline approaches is unnecessarily confusing because it fails to distinguish differences in basic accounting assumptions from differences in methodology appropriate to distinct research questions. We believe that Fargione et al., Searchinger et al. and Manomet (as well as Zanchi et al., which receives less attention) are all compatible approaches that differ only in response to the demands of contrasting research questions.

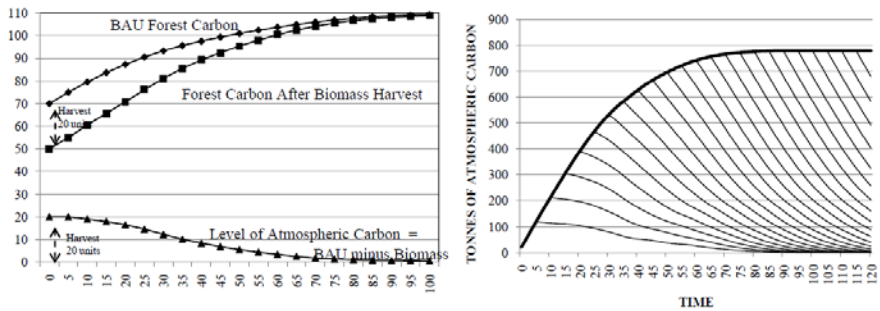
- Fargione et al. (2008) assessed the carbon impacts of land conversion to supply feedstocks for biofuels. Fargione et al. arbitrarily defined the loss of carbon over 50 years as the carbon debt, assuming that the new lower carbon equilibrium will be established by that date (though most of the debt occurs much more quickly during land clearing operations). That debt is repaid by reduced fossil emissions over time. Fargione et al. calculations are on a per-hectare basis, and they do not address the question of how much conversion would result from each unit of biofuel produced, a critical component of assigning land use emissions to a production facility. In order to use their approach to regulate stationary source emissions, it would be necessary to establish a without-biofuels baseline of land conversion rates, and assess net emissions based on a change to with-biofuels conversion rates (presumably higher) – then multiply additional hectares converted by the per-hectare carbon debt.

- Searchinger et al. (2009) build on the Fargione et al. approach by acknowledging a broader set of land management changes incentivized by bio-energy uses, including those that fall short of land conversion. They explicitly introduce the need for a comparison of emissions with and without bioenergy uses in order to assess net GHG impacts. "*Bioenergy therefore reduces greenhouse emissions only if the growth and harvesting of the biomass for energy captures carbon* ***above and beyond what would be sequestered anyway*** *and thereby offsets emissions from energy use. This additional carbon may result from land management changes that increase plant uptake or from the*

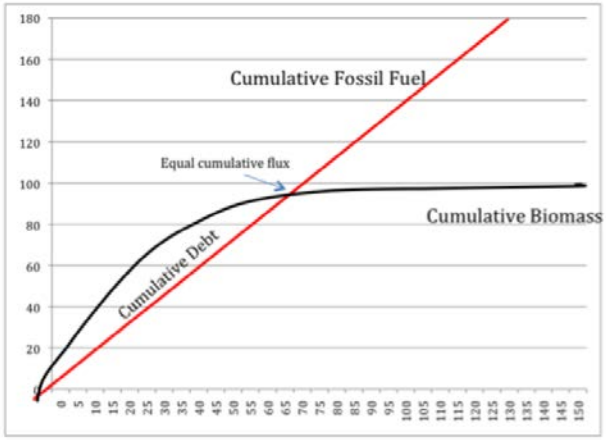
use of biomass that would otherwise decompose rapidly" (Searchinger et al. 2009). [emphasis added]

- The Manomet (2011) approach is very similar to the previous two, but in the Massachusetts context changes in land management that fall short of actual conversion represent the major source of carbon debt. They omit soil carbon impacts, and consider only the immediate losses of forest carbon due to increased intensity of harvest removals during previously-planned operations. Though their initial modeling was done at a stand level, they have also aggregated stands up to a landscape scale for a plant operating continuously over time (see right-hand chart below).

Spatial and Temporal Aggregation of Stand-Level Plots



Landscape Scale Cumulative Carbon Debts & Dividends



From Walker, Tom. November, 2010. Manomet & Biomass: Moving Beyond the Sound Bite. Presentation to: Clean Energy States Alliance

Despite the fact that forest carbon impacts occur on multiple stands over time - unlike the mostly-one-time conversion impacts considered by Fargione et al. - a new landscape-wide carbon equilibrium is eventually reached. (This example assumes that the new biomass use continues indefinitely but does not expand in scale. Modeling also assumes a single harvest on each stand –

repeat harvesting before forest carbon fully recovers on managed stands would delay the equilibrium point but would reduce the total acreage required to feed a facility). As for Fargione et al. the landscape carbon debt is repaid over time by reduced fossil emissions.

For EPA's anticipated application, we believe that Fargione et al., Searchinger et al. and Manomet all support a projected baseline that considers likely trends in terrestrial carbon stocks without a contemplated new use, then considers carbon stocks with the new use, and calculates net impacts as the difference between the two. The common thread is the projection of the without-biomass and with-biomass situations over time. Despite the uncertainties involved with such projections, this is the only legitimate approach to determining net effects of a particular contemplated wood use. By emphasizing the differences between these studies, EPA overlooks a growing consensus around biogenic carbon accounting among scientifically rigorous assessments.

2. Importance of Spatial and Temporal Factors

Aside from appropriate baselines, net emissions should be assessed at an appropriate scale and with explicit recognition for changing emissions over time. The results of the draft framework depend strongly on the defined *regional boundaries*, as illustrated by the New Hampshire case study. Regional definitions will be subject to intense political pressure and influence. According to the text on p. 39, "*the framework quantifies the changes in carbon stocks on the landscape where the biogenic feedstock is produced or collected*." On the contrary, the proposed framework does *not* restrict analysis to the landscape where the feedstock is produced. Rather, it combines that landscape – where forest carbon impacts may occur – with a much broader region where compensating changes may mask impacts in a specific facility woodshed. Consistent with BACT determinations for individual plants, assessment should be based on conditions *within the woodshed of each individual plant*.

The discussion on p. 24 about excluding reserved and "nonworking" lands further highlights the difficulties of defining appropriate spatial limits for a regional reference baseline.[3] Clearly, biomass plants operating in a region should not count sequestration on reserved lands, which would occur regardless of the level of biomass removals, as an offset to their emissions. The same difficulty applies to forestland that is not reserved but is not actively managed – for instance, smaller woodlots surrounding rural residences that are held primarily for nontimber purposes. If emissions

[3] "*Ideally, an accounting framework would allow for a distinction between "working" and "reserved" lands. For instance, if all forestland is included in the calculation of changes in carbon stocks, then intensive harvests on "working" forests could be offset by carbon sequestration on "reserved" lands. However, there is an active debate about just what constitutes the working forest land base (i.e., Alig et al., 2002). Some fraction of the land base is "reserved" by legal limits on logging, and there is clearly a significant fraction of the remaining forest land that is not available for harvest because of a wide range of biological, physical, legal, economic, and social concerns (Buchholz et al., 2010; Butler, 2008). These limits on the availability of working forest land are difficult to quantify and may vary over time. For example, the increasing "parcelization" of forest land (i.e., subdivision into smaller ownerships) is generally assumed to reduce the land available for harvest because harvest operations are impractical on very small landholdings. The minimum effective size of a working forest may well change over time, however, with changes in harvest technology and/or commodity prices*" (Draft p. 24).

were assessed as the difference between with-biomass and without-biomass projections under conditions appropriate to a particular facility's woodshed (for instance by scaling up the Manomet stand level approach to incorporate multiple stands over succeeding years), it would not be necessary to delineate working and non-working lands on the landscape.

Aside from supporting the concept of a without-biomass baseline, the Manomet approach also emphasizes the importance of emissions timing. On p. 22[4] the EPA draft framework describes the Fargione et al. carbon debt concept as a permanent debt, never repaid as long as the land use conversion is permanent. But even a temporary debt affects the climate during the time period before it is repaid. And even without permanent land use changes, if a new debt is incurred with each year's additional biomass combustion, the net effect is a permanent debt (lower equilibrium forest carbon stocks) until those operations are shut down and the source forests have time to fully recover. That temporary effect must be reflected in emissions regulations. Ignoring it would be equivalent to exempting particulate emissions from regulation because they eventually settle out of the air where people no longer breathe them in. The methodology hedges as to whether even a permanent debt due to land use change must be addressed in emissions regulations.[5] The assumption that temporary emissions are not significant is illustrated by the following statement, which indicates that a delay in reabsorption by source forests is irrelevant to carbon accounting.

> *p. 33 "Re-growth in a sustainably managed forest would result in sequestration on a time scale* ***concurrent with*** *harvest removals." [emphasis added]*

Given a sustainably managed forest – presumably meaning growth equals removals – adding a new bio-energy use will inevitably lower carbon stocks, at least temporarily, until a new equilibrium is reached. We recommend that the Scientific Advisory Board explicitly discuss the significance of the timing of emissions, and its relevance to climate mitigation goals. A consistent treatment should acknowledge the importance of temporary emissions increases, and assign them a relevant value relative to permanent changes.

3. Certainty and Simplicity of Proposed Approach Compared to a Projected Baseline

Regardless of the merits of a reference point versus a projected baseline, or the significance of the region or the timing of emissions relative to forest absorption, EPA's draft seems to imply that a reference baseline is preferred because it is measurable and simple to administer, while a projected baseline would be too uncertain and complex to be practical.

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[4] "*The form of carbon debt relevant to stationary source accounting is incurred when there is a reduction in long-term average carbon stocks on an area of land, when the land is converted from a prior land use (typically with high levels of carbon stocks) to a land use devoted to production of a biomass feedstock (but typically with lower levels of carbon stocks). The magnitude of the debt is a function of the difference in the long-term average carbon stocks under the two land uses. The debt is incurred over the period of time that the system moves from the old carbon stock level to the new level, and the change over time can be annualized*" (Draft p. 22).

[5] "*As stated earlier, it may or may not be necessary to consider these concepts in an accounting framework for biogenic CO_2 emissions from stationary source*" (Draft p. 22).

> *p. 27 "In essence the first approach [reference baseline] addresses the **observable** change from the initial condition, while the second and third approaches [anticipated future and comparative] include progressively greater elements of the opportunity cost, which explains what the outcomes would be **if alternative futures and different system descriptions** are compared. The choice of baseline determines how the comparison with the observed condition is represented, and thus ultimately determines the outcome of the accounting framework." [emphasis added]*

> *p. 42 "This type of baseline was selected because, in developing a framework for a stationary source to adjust its total onsite biogenic emissions, answering the question "Is there more or less carbon stored in the system (the stationary source and its feedstock-supply source) at the end of an assessment period than there was at the beginning?" is **a straightforward way** to assess an individual stationary source's emissions using **existing data**." [emphasis added]*

These passages imply that the reference point baseline relies on measurable factors, while the other two approaches are increasingly speculative. Simplicity of administration and measurement are irrelevant if the parameter being measured is the wrong one for the task at hand (see Baselines section of these comments). In addition to yielding results that fail to serve the intended purpose, however, an observed change in forest carbon across broad regions is much less certain than is often assumed. The proposed methodology is highly reliant on FIA data. Though FIA data provide the best and most consistent forest inventory estimates of perhaps any country in the world, these data were not designed to track forest carbon stocks or fluxes on a yearly basis.

First, FIA data are subject to relatively large *sampling errors* and the process of making inventories *consistent from state-to-state* is still incomplete. Definitions vary regionally as to what tree volume is incorporated in these measurements (minimum tree diameters, noncommercial species, unsound wood, etc.), and some states are far behind others in adopting an annual schedule. If regions are sufficiently large to provide statistically valid estimates of changes in forest carbon stocks, any marginal change caused by a single biomass facility would likely be well *within the range of sampling error* for this data set. The draft framework case studies use growth and removals estimates to calculate the GROW factor. Growth and removals FIA data depend upon remeasurement of plots, hence sampling errors are higher than for volume estimates – particularly for removals since relatively few plots experience removals during a sampling interval.

Second, the proposed methodology defines the reference baseline using a *single carbon pool* that is most directly related to actual FIA measurements – above ground live biomass. Actual FIA measurements are limited to tree species and diameter and sometimes height. FIA uses allometric equations to calculate tree volume and biomass, and these equations have an associated estimation error that varies depending on the completeness of the data set used to develop each equation. Proxies are used when a particular species has no associated equation. When it comes to biomass and carbon estimates, this adds a new difficult-to-quantify source of error to the known sampling errors.

Finally, valid FIA estimates suffer from a significant *time lag*. Most FIA surveys sample a panel of plots each year and statistically valid estimates require combining data from multiple years of sampling, usually at least five. This is why the methodology proposes using a five-year rolling average to assess the GROW term (p. 54). Any changes due to increased biomass use or other

factors will be fully reflected in the data only 5 or more years after a biomass facility begins operating. The significance of this lag can be illustrated by considering estimates of nonsoil forest carbon from Annex 3 of EPA's 2011 GHG Inventory. The change in nonsoil forest carbon based on the sum of the most recent FIA inventory for each state is reported as -155.9 million metric tons C (negative numbers in this context represent an increase in carbon stocks).[6] The change for the nation as a whole, based on mean changes from the USFS "carbon calculator" for the years 2000 to 2009[7], is reported as -166.8 (220.6 total forest minus 53.8 soil). Hence the most recent surveys for each state indicate net forest sequestration that is 7% lower than the reported national average, which incorporates some earlier data years. Assuming this represents a real downward trend, this is a large difference over a short period of time, so a five-year lag in monitoring could result in significant net emissions going undetected.

If future forest carbon levels depart from past patterns, it is unclear whether or how this would affect the permit status of existing plants. If forest stocks begin to trend downward *after* a set of biomass plants has been permitted, the logic of the reference baseline would call for reclassifying those plants as net emitters. Once new plants have been licensed, however, it will be extremely challenging to change course if forest impacts are recognized so long after the fact and such adjustments would increase risk for regulated facilities. The discussion of average versus marginal assessments on p. 29 seems to assume that *only changes caused by new plant capacity* should affect emissions calculations (though how those changes are allocated among wood users in a region is subject to discussion).

We point out these limitations not to criticize the FIA program, which is the best tool of its kind, but to urge the Scientific Advisory Board to carefully examine the assumed measurability and certainty of the reference point baseline, before rejecting any alternatives on that basis.

4. Role of Specific Parameters and Computations in the Proposed Framework

When the draft framework moves from general discussion to specific computations, the weaknesses of the proposed approach become clear in a lack of clarity and the need for ad hoc variables added to the equation to patch obvious loop-holes. Some computational weaknesses are inevitable for a methodology that must approximate field conditions using very incomplete data, but their existence means that the reference baseline is not in practice much simpler or clearer than a projected approach. Several modifications to the basic reference methodology have been proposed to cover obvious loopholes, and these additions render the resulting methodology highly complex and subject to manipulation.

- Total forest carbon stocks include carbon stored in below-ground live tree biomass, understory, standing and down dead wood, forest floor, and soil carbon, yet the reference baseline uses only

[6] Annex 3 Table A-215. Mean year of data collection was 1994 for New Mexico, 2001 Wyoming, 2003 Oklahoma, 2004 Louisiana, with most states in the 2005-7 range.

[7] Note that numbers in the "carbon calculator" are extrapolated and interpolated to fill in the years between surveys, so it is unclear precisely which years this average actually represents, but it is incorporates some data from survey years just before or after the year 2000 - overall an older data set than the state-by-state data.

above-ground live tree biomass, so the GROW term will not reflect any changes in the other pools. Intensive biomass harvesting could well deplete dead wood and eventually forest floor and soil pools, and these changes would need to be captured in the **SITE_TNC** term of the proposed equation. Bringing site-specific factors into the methodology as an add-on makes computations just as uncertain and complex as a straightforward projection would be. It is unclear how this term will be calculated for a particular facility, nor whether it will be sufficiently broad. The text implies that the methodology will capture these effects.

> *p. 40 "Depending on the nature and quantity of land that is converted from one land-use type to another, the implications for the change in carbon stocks on land could be fairly minimal to quite large. For example, changes that result from **shorter harvest cycles** for forests and the impacts of different land uses and management regimes on **carbon pools such as live biomass, dead biomass, and soil carbon** are reflected in this framework." [emphasis added]*

The case study treatment, however, indicates that changes in management incentivized by new biomass uses will not be fully reflected in the SITE_TNC term.

> *p. 79 "This case study assumes that feedstock was sourced from managed timberland, using established harvesting methods, and thus **assumes** that there are no changes in site CO_2 emissions or sequestration as a result of the feedstock production."*

- Although the discussion mentions the relevance of feedstock type (waste versus forest residues versus roundwood, for instance), the methodology does not use this information directly to determine net emissions. Instead, the methodology proposes a new term (**AVOIDEMIT**) that reflects "anyway emissions" of waste and residue feedstocks. The proposed framework provides little guidance for quantifying this term. Treatment in the text implies a very broad interpretation of this term, beyond waste sources, that would include virtually any material that has no current commercial market.

> *p. 30-31 There are occasions when woody biomass may be removed from a forest without affecting markets for commercial roundwood. In such cases, leakage effects are minimal or non-existent, and the **alternate fate of this biomass would be loss to management-induced prescribed fire, wildfire, or decomposition**. Examples include harvest of pulp-quality biomass for energy purposes in a region where a pulp market is absent, pre-commercial thinning of trees that are not of a merchantable size, low-grade biomass harvests in large areas of forest damaged from insects (e.g., beetle-killed timber), hurricanes, or wildfire. [emphasis added]*

Defining the AVOIDEMIT term would require, at a minimum, tracking various feedstock sources and calculating rates of decomposition or combustion given alternative fates. It would seem more straightforward to report these feedstock sources separately and apply generic factors that reflect the net effect of immediate combustion versus emissions from alternative uses.

- The text suggests that additional ad hoc adjustments should be made when forest carbon reductions occur that are not related to biomass harvesting.

> *p. 28 "An accounting framework that seeks to account for carbon stock changes occurring offsite should nevertheless acknowledge the possibility that these exogenous factors are likely to*

> *influence carbon stocks on land and—depending on the policy or program—may potentially attempt to account for these factors."*
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> *p. 43 "When carbon stocks are declining, however, understanding attribution is more important. Arguably, producers and consumers of a biogenic feedstock* ***should not bear responsibility for declines*** *in carbon stocks if other factors are the primary drivers of the decline… Ultimately, the decision about how to handle attribution in situations where carbon stocks are declining is critical but* ***not resolved*** *within this framework."*

The case studies do not employ ad hoc adjustments of this type, but the averaging approach for regions with declining biomass produces much the same result. Case Study 2 Average Method on p. 88 of the draft apportions decreasing forest biomass across all timber users, even when it is a new biomass energy facility that tips the region from sink to source. This method would allow biomass combustion facilities to shift a portion of their emissions impact to unregulated sectors. Facilities in regions with increasing forest carbon do not similarly share credit for increases (which in fact would be illogical since all timber users likely reduce carbon sequestration compared to a non-use reference point). Using averaging in regions with declining forest biomass, while permitting sources in regions with increasing forest biomass to use the full amount of the increase as an exclusive offset, would introduce a double standard which would treat biogenic sources in the most favorable way possible in all cases.

5. Alternative Approach for Consideration

The key element of a biogenic emissions accounting framework must be an assessment of how feedstock sources offset stack emissions by either absorbing carbon dioxide or avoiding emissions at another location. Since emissions clearly occur at the stack, the burden should be on regulated facilities to demonstrate that those off-site offsets in fact occur. To simplify administration and reduce enforcement costs for both agency and permitted facilities, EPA may wish to establish some standardized factors and methods that regulated facilities may use to demonstrate the offsets. We have argued above that the draft framework as presented has serious flaws as a standardized method, and that these flaws need to be remedied.

In response to the EPA's Call for Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources in 2010, The Wilderness Society recommended an approach that we think is simpler and no less certain than the recommendation being forwarded to the SAB for review. We recommend that the SAB consider this approach (outlined below, slightly modified[8]) as an alternative to the draft framework.

[8] Acknowledging the uncertainty of carbon benefits from forest fuel treatments, we have deleted the special category for fuel reduction thinnings.

A. Distinguish four categories of woody biomass feedstocks that differ in their greenhouse gas impacts, and require biomass combustion facilities to track and report feedstock quantities by source category[9]:

   i. wood waste (including mill, clean construction and post-consumer waste, and urban tree trimmings);

   ii. logging residues from commercial timber operations;

   iii. annual and short-rotation biomass crops; and

   iv. whole trees from expanded harvest operations.

B. Develop a carbon intensity factor (similar to the "biogenic accounting factor" in EPA's draft methodology, but specific to each feedstock type) for each of these fuel types for regions of the country with relatively uniform forest types, product mixes, silvicultural practices, and alternative fates for waste wood. Facilities that can document that their source differs from this regional average may petition for a lower carbon intensity based on evidence they provide about feedstock sources.

   i. Carbon intensity factors would be relatively low for materials diverted from the waste stream. There will be a minor negative climate effect due to accelerated emissions from combustion of materials that would otherwise decompose over a longer time period, particularly those deposited in anaerobic landfills. There may also be negative climate effects if waste materials are diverted from recycling or reuse. There will be a small positive climate effect if combustion reduces methane emissions compared to business-as-usual decomposition. Factors should be updated as monitoring improves understanding of how alternative uses of wood waste affect emissions or sequester long-term carbon.

   ii. Logging residues from existing commercial timber operations would likely have a carbon intensity similar to that for wood waste, based on the half-life of dead wood in regional forests. This low carbon intensity would apply only to use of residues from harvest operations that would have occurred in the absence of biomass energy use. It is difficult to demonstrate, however, that a harvest operation would have occurred in the absence of biomass markets. A rough proxy might be the proportion of feedstock from tops and limbs versus chipped whole trees. Unfortunately, tops are likely to be mixed with whole low-quality trees that represent new live-tree removals and hence fall into the fourth feedstock category. The AVOIDEMIT factor in the proposed methodology faces this same difficulty of distinguishing "anyway" emissions from new emissions.

   Foresters overseeing harvests that include biomass shipped to a regulated facility may be asked to report proportion of material from tops and limbs, versus chipped whole trees.

[9] Note that such tracking would be required in order to calculate the AVOIDEMIT factor in any case.

Ideally, EPA might develop a materials test based on bark percentage or some other measurable factor to confirm percent of a load sourced from whole trees.

Since intensive use of this source may potentially damage soils, residual stands, and wildlife habitat, its use would need to be guided by procurement standards that protect ecosystem health. If a regulated facility does not incorporate mandatory procurement standards that include such protections, carbon intensities should be set higher to reflect possible losses of future forest carbon potential through damage to soils and residual stands.

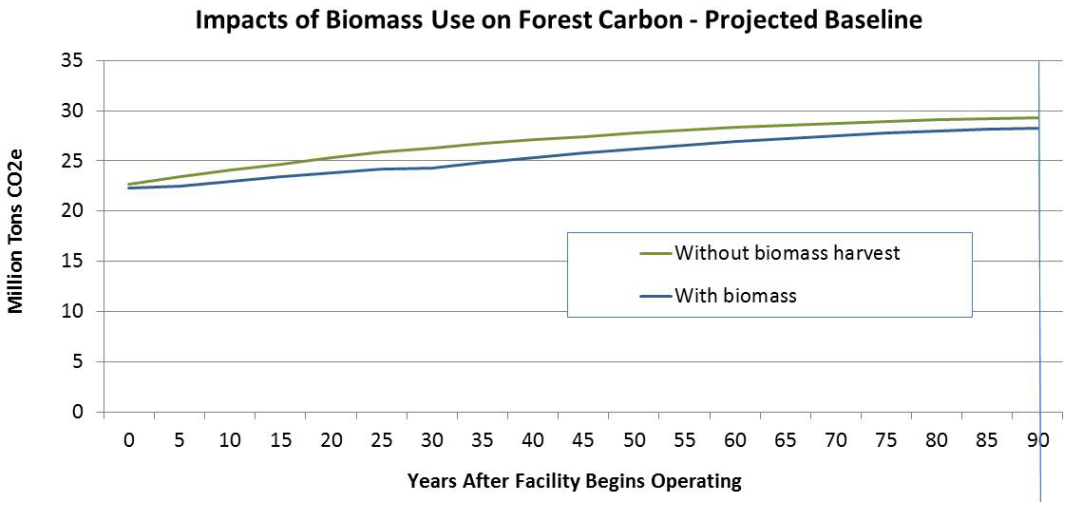
iii. Short-rotation biomass crops harvested on a continuing basis may have carbon intensities near zero if previous land uses maintained similar or lower mean levels of carbon stocks (e.g. cropland), and if carbon stocks recover rapidly post-harvest (e.g. less than ten year rotation). If biomass crops are grown on land converted from higher-carbon uses (e.g. mature forest), the intensity factor would be higher. For purposes of calculating a regional carbon intensity factor, EPA should document previous land uses for biomass plantations and apply those proportions to develop a regional weighted average. Carbon intensities should also reflect the likelihood that source lands may undergo land use change and hence fail to reabsorb the carbon released after the previous rotation. Monitoring over time would permit EPA to update these factors.

iv. Materials from dedicated harvesting of live vegetation from lands not planted exclusively for bioenergy should be assigned carbon intensities based on modeling “without-biomass” and “with biomass” scenarios. Rather than project highly-uncertain future forest carbon levels across entire woodsheds (which will vary depending on unknown factors such as climate, weather events, pest and disease pressures, and non-biomass harvest volumes) it is sufficient to model the net biomass harvesting impacts at the stand level (similarly to the approach used for the Manomet Massachusetts study and by Zanchi et al.), using forest types, stand ages and stocking levels, and management approaches that represent conditions across the facility woodshed. The without-biomass baseline would be based on common harvest practices within that woodshed, stratified by forest type and ownership if necessary to reflect significant differences in management. The with-biomass projection would estimate changes to forest carbon pools given expected new roundwood harvest methods for operations supplying biomass feedstocks. The with- and without-biomass projections can then be aggregated up to the full woodshed scale and extended over the facility lifetime, based on representation of each stand type and practice across the entire woodshed. This approach would net out the effects of influences not related to harvest activities for biomass. It would also avoid the difficulties with regional definition, and marginal versus average treatment, since only the net effects of the regulated facility would be explicitly modeled – all other influences would be the same for with-and-without scenarios and so would not need to be modeled.

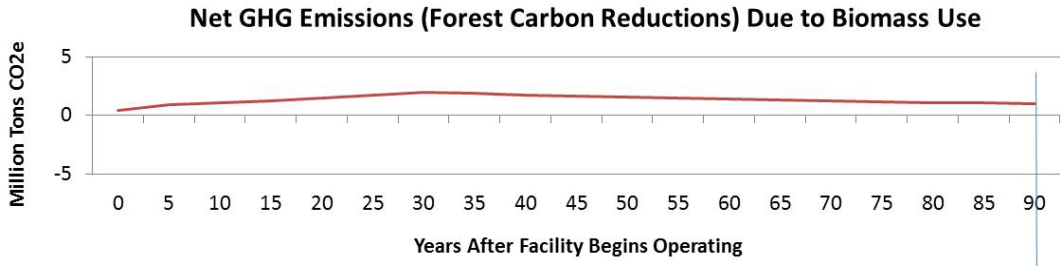
Facility reporting of roundwood feedstock quantities, surveys of forest practices on lands with and without biomass harvesting, and tracking of regional carbon stocks over time could be used to periodically update modeling assumptions for purposes of permit renewal.

To illustrate how the with-and-without projection might work, the charts below illustrate the net forest carbon impacts from introducing a stationary biomass combustion facility burning roundwood over a thirty-year lifetime in a region where "business as usual" is increasing forest carbon. Note that a reference point baseline would indicate that this facility has zero net GHG emissions, which is clearly not the case.

The first chart assumes, as does the Manomet stand-level modeling, that harvesting reduces current carbon stocks but also increases the rate of post-harvest regrowth for source forests (this response would only occur for fairly mature forests where competition has begun to slow net growth, and would be delayed if harvests involve clear-cutting with little advanced regeneration).

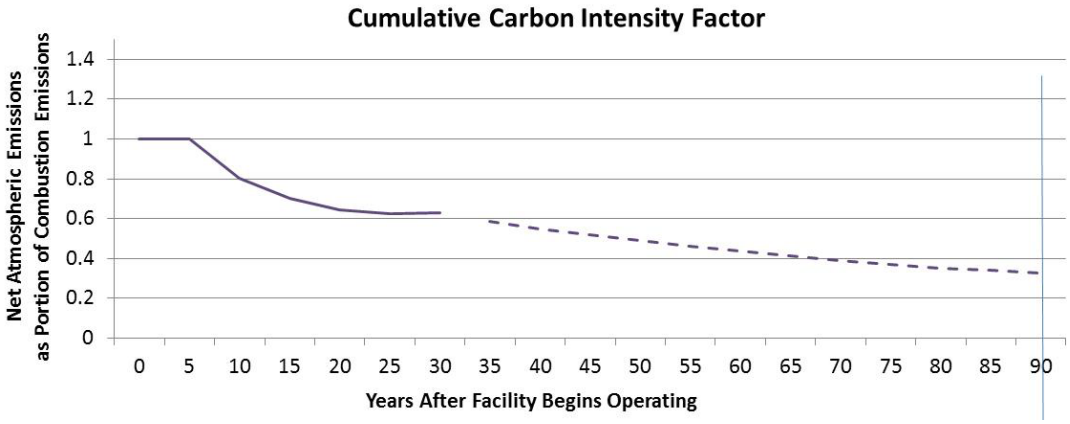


The second chart shows net GHG emissions (the difference between with- and without-biomass projections) resulting from operation of this facility over time. Note that the net effect continues to diminish after the plant ceases operation as forests continue to recover.



The third chart shows cumulative carbon intensity (net emissions based on changes in forest carbon stocks divided by total combustion emissions). Net emissions decline over the

facility lifetime as previously harvested areas recover and actually grow at a faster rate than unharvested forest areas. For simplicity, EPA could apply the mean value consistently throughout the facility lifetime. If this plant were to extend its operation beyond 30 years, the carbon intensities would eventually stabilize as continued reductions in forest carbon from new harvest are only partly offset by regrowth of previous harvest sites. If the plant ceases operations as planned at year 30, however, and if harvest sites continue to recover, carbon intensity of the plant's emissions would continue to decline. It is this decline that leads some to advocate for ignoring biogenic emissions; however, the net emissions effects last for many decades or even centuries, so their atmospheric impacts need to be reflected in GHG regulations.



Given modeling uncertainties, EPA might assign a relatively high carbon intensity factor to this feedstock type (hence encouraging use of the previous three categories which clearly have lower net emissions). Individual facilities might petition for a lower factor based on documented carbon-conserving practices on source lands, including required certification by Forest Stewardship Council or similar third party, documented new planting on formerly low-carbon lands, easements that protect sources lands from conversion, etc.

C. Once regionally-appropriate or woodshed-specific carbon intensity factors are developed for each feedstock source, a permittee would estimate feedstock volumes from each source and multiply each by the appropriate factor to estimate net emissions to be reported. BACT might be based in part on maximizing use of lower-emissions feedstock.

D. Another factor, mentioned only briefly in the framework document, that may be relevant to BACT determinations is the efficiency with which feedstocks are converted to useful output. EPA's goal for regulating GHG emissions from biogenic energy should be to minimize emissions per unit of useful energy. Aside from reducing net emissions, increasing output from the tons of feedstock combusted is another way to achieve this objective. Hence BACT may be related to a minimum energy conversion efficiency, which may be met by combined heat and power operations or technological improvements to combustion equipment.

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Thank you for the opportunity to comment on EPA's draft Accounting Framework for Biogenic CO2 Emissions from Stationary Sources. We welcome any further opportunities for public input into this process.

Sincerely,

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