



National Alliance of Forest Owners  
*Investing in the Future of America's Forests*

July 15, 2011

Holly Stallworth, Ph.D.  
Designated Federal Officer  
EPA Science Advisory Board  
United States Environmental Protection Agency  
1300 Pennsylvania Avenue, NW  
Washington D.C. 20004

**Re: National Alliance of Forest Owners' Comments on "Invitation for Comment on the Biogenic Carbon Emissions Panel Nominees" (June 24, 2011).**

To Whom It May Concern:

The National Alliance of Forest Owners ("NAFO") welcomes the opportunity to submit the following comments in response to the Invitation for Comment on the Biogenic Carbon Emissions Panel Nominees issued by the Environmental Protection Agency ("EPA"). NAFO's mission is to protect and enhance the economic and environmental values of private forests through targeted policy advocacy at the national level. At the time of this submission, NAFO's members represent 79 million acres of private forests in 47 states. NAFO was incorporated in March 2008 and has been working aggressively since then to sustain the ecological, economic, and social values of forests and to assure an abundance of healthy and productive forest resources for present and future generations. NAFO is a solutions-oriented organization and is prepared to help EPA understand how biomass combustion for energy affects the forest carbon cycle and to assist the agency in developing long-term policy that helps achieve the nation's renewable energy and climate change objectives.

As evidenced by the 2011 State of the Union Address, this Administration is committed to a policy of expanding renewable energy.<sup>1</sup> In announcing EPA's decision to defer greenhouse gas (GHG) permitting requirements for industries using biomass, EPA Administrator Jackson observed: "Renewable, homegrown power sources are essential to our energy future, and an important step to cutting the pollution responsible for climate change."<sup>2</sup> In a statement supporting EPA's decision, Secretary of Agriculture Vilsack stated "EPA's action today will provide the agency with the time it needs to ensure that greenhouse gas policies properly account for the emissions and carbon sequestration associated with biomass. In many cases, energy produced from biomass will provide significant reductions of greenhouse gases relative to fossil fuels."<sup>3</sup> The Administration has clearly set a policy course of encouraging the expansion of renewable energy and has identified expanded renewable energy as "an important step to cutting the pollution responsible for climate change." The question before EPA is how to craft an accounting methodology for biogenic CO<sub>2</sub> emissions that is consistent with and supportive of that policy goal. The role of the SAB is to ensure the EPA understands the underlying science that will inform the policy choices the agency must make.

In order to provide EPA with a proper scientific and technical peer review of the accounting methodologies proposed in its draft study, the selected panel must have both the requisite expertise and a proper understanding of the role that they are to play. ***EPA has convened this panel to provide "scientific and technical advice" to the Administrator, as authorized under 42 U.S.C. § 4365(a), on EPA's proposed accounting methodologies, not to develop those methodologies or advise EPA on its regulatory goals.*** To be effective,

---

<sup>1</sup> Barack Obama, U.S. President, State of the Union Address (Jan. 25, 2011), *available at* <http://www.whitehouse.gov/the-press-office/2011/01/25/remarks-president-state-union-address>.

<sup>2</sup> [http://www.epa.gov/aging/press/epanews/2011/2011\\_0112\\_1.htm](http://www.epa.gov/aging/press/epanews/2011/2011_0112_1.htm).

<sup>3</sup> <http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2011/01/0008.xml>.

panel members must be able to distinguish between EPA's policy goals and regulatory approaches and the scientific and technical information on which they are based. They must also be willing to work within the Administration's policy goals and limit review to scientific and technical issues. In addition, panel members must be experienced subject matter experts in specific fields that are pertinent to EPA's selection of an accounting methodology for biogenic CO<sub>2</sub> emissions. Neither advocates nor policy theorists can or should provide the type of review that EPA requires. Further, EPA must select individuals who have expertise in the practical operation of the sectors that EPA is considering regulating to ensure that the proposed accounting method will be effective in the specific context where it will be used.

#### I. The SAB Panel Must Focus on Scientific and Technical Questions Rather Than Policy Principles

To achieve its purpose, the SAB panel must remain focused on the science of the carbon cycle and the practical realities of a biogenic carbon accounting system. The panel must also adhere to the Administration's established policy on renewable energy and "limit[] its advice to the scientific and technical underpinning on which those decisions rest."<sup>4</sup> As EPA selects the individuals who serve on the panel, it must ensure they are able and willing to limit their review to the scientific and technical assumptions embodied in EPA's draft study and not seek to challenge the broad policy goals which an accounting methodology must serve. At the same time, the panel must recognize and point out instances where a policy choice is inappropriately described as a scientific finding or conclusion.

---

<sup>4</sup> U.S. EPA Science Advisory Board, Overview of the Panel Formation Process at the Environmental Protection Agency Science Advisory Board 2 (Sept. 2002) (SAB Overview), *available at* [http://yosemite.epa.gov/sab/sabproduct.nsf/WebFiles/OverviewPanelForm/\\$File/ec02010.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/WebFiles/OverviewPanelForm/$File/ec02010.pdf).

A. The Panel Must be Capable of Distinguishing Between Science and Policy Issues

The most important characteristic of an effective panel member is the ability to distinguish between science and policy questions. As NAFO has previously shown,<sup>5</sup> there is broad consensus regarding the underlying scientific principles upon which the carbon neutrality of biomass combustion is based. All wood products – including biomass combusted for energy – are a natural part of the carbon cycle through which CO<sub>2</sub> is sequestered during photosynthesis and emitted during decomposition or combustion. Because it is part of this natural and dynamic cycle, the CO<sub>2</sub> that is released during the combustion of biomass was only recently sequestered from the atmosphere, will be replaced by an equivalent amount of CO<sub>2</sub> through regeneration, and would have eventually been released through decomposition, regardless of combustion. This dynamic process stands in stark contrast to the combustion of fossil fuels which release CO<sub>2</sub> that has been stored for millennia, could remain in the state indefinitely, and, when combusted, permanently increases atmospheric CO<sub>2</sub> concentrations.

Despite the broad consensus with respect to basic scientific principles, policy preferences – which are sometimes presented as scientific principles – have generated much of the controversy surrounding the carbon neutrality of biomass combustion. This has been particularly true in instances where science is framed with assumed time and space parameters that artificially constrain the presentation of carbon cycle dynamics. While it is true that a single set of underlying scientific principles can support multiple policy preferences, it is the role of policy makers to select an appropriate policy and then design regulations that will achieve it. As the body charged to peer review EPA's draft study, it is the panel's role to ensure that the proposed accounting methodology is consistent with established scientific principles and does

---

<sup>5</sup> See, e.g., National Alliance of Forest Owners' Comments on "Deferral for CO<sub>2</sub> emissions from Bioenergy and Other Biogenic Sources under the Prevention of Significant Deterioration and Title V Programs: Proposed Rule", 76 Fed. Reg. 15249 (Mar. 21, 2011) Docket EPA-HQ-OAR-2011-0083 (May 5, 2011) (Exhibit A).

not overstate or contradict what science concludes. To do so, the panel must first distinguish EPA's policy preferences and regulatory decisions from the underlying scientific findings. Second, it must ensure the accuracy of those scientific findings. The panel's advisory role as scientific experts is fundamentally different from EPA's role as a policy-maker, and EPA must select panel members who understand and are willing to adhere to this distinction as they fulfill their assigned task.

**B. The Panel Must Ensure That EPA's Proposed Accounting Methodology is Technically Feasible**

In addition to having a basis in sound science, EPA's regulatory approach must be capable of successful implementation. To do so, it must reflect the realities of U.S. forestry, the forest products sector, and the biomass energy sector. As with the scientific principles addressed above, the panel will play an important role in identifying the technical assumptions on which EPA's proposed accounting methodology will rely and assuring it will achieve the Administration's policy goals.

Unlike the scientific principles, which are universally applicable, these technical assumptions must reflect the realities of those sectors and entities that will be subject to EPA's regulations. Thus, the panel must be capable of distinguishing between conditions that are possible in an abstract sense and those which are likely to occur in the sectors subject to regulation. For example, while some have suggested that renewable energy could lead to the widespread combustion of entire mature forests, the economics of the forest sector dictates that biomass combustion relies on other sources. In a similar fashion, despite theorizing that harvested forest stands might not be regenerated, the overwhelming evidence shows that U.S.

forest stocks are currently growing and are expected to do so in the future.<sup>6</sup> As it reviews EPA's draft study, the panel must ensure that EPA's regulatory decisions are based on the realities of U.S. forestry, the forest products sector, and the biomass energy sector rather than abstract assumptions that will not come to pass. Without such assurances, EPA cannot determine whether its proposed accounting methodology will be consistent with the Administration's policy goals.

C. The Panel Must Accept, If Not Support, the Administration's Renewable Energy Policy

The role of the panel is to "conduct a review of the scientific and technical issues" supporting EPA's biomass accounting methodology<sup>7</sup> – not to develop its own methodology or set policy. Thus, the panel will have a duty to police itself and ensure that limits its review to those subjects where its scientific and technical expertise can be applied. The panel is required to "take[] special care and note those instances" where its advice touches on policy issues<sup>8</sup> -- including instances where it identifies scientific or technical flaws and must question whether EPA's regulatory approach can achieve the Administration's policy goals. To ensure that the panel does not exceed its authority, EPA must select individuals who are capable of separating their own policy preferences from the underlying scientific and technological principles and providing an impartial and independent review of EPA's draft study.

---

<sup>6</sup> See, e.g., National Alliance of Forest Owners' Comments on "Call for Information: Information on Greenhouse Gas Emissions Associated With Bioenergy and Other Biogenic Sources; 75 Fed. Reg. 41173 (July 15, 2010)," Docket ID: EPA-HQ-OAR-2010-0560 (Sept. 13, 2010) 6-9 (Exhibit B).

<sup>7</sup> 76 Fed. Reg. 23587 (Apr. 27, 2011).

<sup>8</sup> SAB Overview, at 2.

EPA should ensure that the panel is not sidetracked by debates on policy that is properly set by Congress and the President. EPA has also committed to selecting “a balanced panel . . . characterized by the inclusion of candidates who possess the necessary domains of knowledge, the relevant scientific perspectives (which among other factors, can be influenced by work history and affiliation), and the collective breadth of experience to adequately address the charge.”<sup>9</sup> These two goals are not mutually exclusive. The panel’s balance must be based on the individuals’ scientific and technical qualifications, not their policy preferences. To select individuals based on the diversity of their expressed policy preferences or to select those who are openly opposed to the Administration’s renewable energy policy will limit the panel’s effectiveness and increase the risk that the panel’s review will shift into policy debates. The panel’s role is limited to scientific and technical review of EPA’s draft study and EPA’s selection criteria should facilitate rather than complicate that review. To the extent that potential panel members cannot support the Administration’s broad policy goals with respect to renewable energy, their presence on the panel will only frustrate the review process.

## II. The Panel Must Be Composed of Subject Matter Experts In the Scientific and Technical Fields That Will Be Affected by EPA’s Proposed Accounting Methodologies

The panel selected by EPA must be composed of experts who are capable of distinguishing between the scientific and policy issues presented by EPA and evaluating the technical assumptions included in the draft report. In the nomination notice, EPA sought out “nationally and internationally recognized scientists” capable of “provid[ing] independent advice to EPA” on a draft accounting methodology for biogenic CO<sub>2</sub> emissions.<sup>10</sup> To meet this requirement, a nominee must be a subject matter expert in one of the seven categories

---

<sup>9</sup> 76 Fed. Reg. 23588.

<sup>10</sup> *Id.* at 23587

identified by EPA and should possess an advanced degree in a pertinent field of science, engineering, or economics. In addition, an effective panel must include members who possess expertise in the forest carbon cycle and in the realities of silvicultural science -- forest management, forest product streams. Finally, nominees who have expressed opposition to the principles of the Administration's renewable energy policy would not meet criteria (b)-(e) set out in the Request for Nominations.<sup>11</sup> Without these characteristics, the panel will lack the requisite background to evaluate EPA's draft study and will run the risk of providing policy critiques rather than the desired scientific and technical peer review.

A. Subject Matter Experts Must Have Experience in the Empirical Measurement and Validation of Regulatory Programs

In its Request for Nominations and Invitation for Comments, EPA identified seven areas of scientific experience and knowledge that would be relevant to the panel's review process. This section will identify the types of knowledge and experience that NAFO believes will be most helpful in completing the review of EPA's draft study. In each case, the key traits are related to the measurement and validation of scientific theories rather than the development of policy approaches. This is because the panel will seek to validate (or disprove) the scientific and technical assumptions underlying EPA's regulatory decisions rather than proposing its own theoretical guidelines.

Forestry, Agriculture, and Land Use Change

An expert qualifying under this criterion must possess a strong empirical background in the carbon sequestration impacts of land use management practices. EPA will provide the panel with several alternative accounting methodologies to measure carbon flux associated with

---

<sup>11</sup> *Id.* at 23587.

changes in management practices. The role of the panel is to assess the carbon sequestration impacts of the proposed management practices, not to simply critique the theoretical assumptions and offer alternative theories. Expertise in soil science and soil carbon sequestration and in forest fires and pathology on unmanaged lands will be especially valuable. Moreover since DOE estimates that 15% of renewable energy needs will be met by woody biomass by 2021,<sup>12</sup> expertise in the silvicultural sciences will be critical. This is an area where extensive knowledge of the field would be particularly beneficial, in addition to expertise in one or more of the silvicultural specialties. Without a background in these types of empirical analyses, a nominee will lack the experience to predict the on-the-ground implications of EPA's proposed accounting methodology.

#### Inventory, Measurement, and Carbon Accounting Methodologies

An expert qualifying under this criterion must possess specific experience in evaluation of the science implications of accounting methodologies for determining net carbon flux over time. EPA will choose the spectrum of accounting methodologies which it will consider in this case, making experience in the development of accounting methodologies unnecessary and unhelpful. Instead, EPA must identify nominees with experience in monitoring and evaluating the success of previously implemented natural resource accounting methodologies. Such experience is necessary to ensure that EPA's proposed methodology is consistent with the Administration's policy goals.

---

<sup>12</sup> Forisk Consulting, Economic and Regional Impact Analysis of the Treatment of Biomass Energy Under the EPA Greenhouse Gas Tailoring Rule 14 (Dec. 2010) (citing Energy Information Administration, Department of Energy, Annual Energy Outlook 2010 (April 2010)), available at <http://nafoalliance.org/wp-content/uploads/NAFO-Study-Tailoring-Rule-Economic-Impact-20101214.pdf>.

### Land Use Economics, Ecological Relationships, and Biomass Supply and Demand

An expert qualifying under this criterion must possess experience in the supply and demand dynamics of biomass. While the economic and ecological impacts of EPA's selected accounting methodology may touch on a variety of subjects, there is no doubt that the primary impact will occur in the biomass energy and forest products sectors. As a result, the supply and demand dynamics of biomass will be the primary drivers of economic and ecological change resulting from EPA's proposed accounting method. While a breadth of experience would be beneficial for any nominee, core competence in analysis of forest product streams is an essential prerequisite.

### Environmental Science and Climate Change

As indicated by EPA, an expert qualifying under this criterion must provide a multi-disciplinary perspective to environmental science and climate change. But no matter how broad, a nominee's expertise must still be *scientific* expertise relevant to the question of how different biogenic CO<sub>2</sub> accounting methodologies will relate to actual fluxes in atmospheric CO<sub>2</sub> concentrations. Expertise in the process of carbon sequestration in soils, cropland, and forest would be especially relevant because it is directly related to the biogenic processes that are the subject of EPA's study.

### Engineering of Solid-Fuel-Fired Boilers and Related Air Pollution Control Systems

An expert qualifying under this criterion must possess experience in the design and operation of the types of facilities that may be subject to regulation due to their biogenic CO<sub>2</sub> emissions. This expert must also have substantial practical experience in the diverse fuels and fuel-streams used in these boilers, so that EPA is given a realistic perspective on the burdens that are imposed by accounting requirements. In selecting an accounting methodology, EPA

will make assumptions regarding the design and operational capabilities of these facilities. Experts familiar with these facilities will understand the potential technological challenges and feedback loops that additional regulatory constraints might pose and can assess the technical feasibility of EPA's proposed accounting methodology.

#### Design and Implementation of Regulatory Programs

An expert qualifying under this criterion must possess experience in the implementation of regulatory programs. Technical feasibility and an understanding of implementation and monitoring challenges are key features in assessing the viability of a regulatory approach. A proper assessment of EPA's proposed accounting methodology will require such implementation experience. EPA must be sure to distinguish between experience in the practical implementation of regulatory programs and experience in the promulgation of regulatory programs. Only the former experience is necessary as EPA will have already developed the proposed accounting methodologies. Care must also be taken the nominee has a breadth of experience in this area and is not an advocate for one approach or another.

#### Accounting Approaches for Agriculture, Land Use, Land Use Change, and Forestry

An expert qualifying under this criterion must possess experience in evaluation of the science implications of existing accounting approaches. As discussed above, EPA's draft study will provide the potential accounting methodologies and the role of the panel will be to assess their scientific accuracy and practical feasibility. Thus the critical experience is the analysis of such accounting methodologies, not their development.

#### B. The Panel Must Include Members With Specific Expertise in the Forest Carbon Cycle

In order to ensure that the panel can properly review EPA's draft study, it must include members with scientific expertise in the forest carbon cycle. As EPA has recognized throughout

this regulatory process, the fundamental scientific questions revolve around the carbon neutrality of biomass combustion. A central purpose of EPA's grant of NAFO's Petition for Reconsideration was to "examin[e] the science associated with CO<sub>2</sub> emissions from biomass-fired and other biogenic stationary sources."<sup>13</sup> In deferring the applicability of PSD and Title V permitting requirements to biogenic CO<sub>2</sub> emissions, EPA asserted that the "uncertainties and complexities [of accounting for biogenic CO<sub>2</sub> emissions] are exacerbated because of the unique role and impact that biogenic sources of CO<sub>2</sub> have in the carbon cycle." Unless the panel includes members with specific scientific expertise on this issue, it will lack the means to provide the appropriate review of EPA's proposed accounting methodology.

Expertise in the forest carbon cycle does not fit neatly into any of the seven categories of scientific expertise identified by EPA. However, the categories are not mutually exclusive and experts in any of those fields could potentially have expertise in the carbon forest cycle as well. As EPA selects panel members, it should ensure that as many members as possible have expertise in this matter and that their combined expertise reflects the diversity of forest systems across the country. As it evaluates nominees in each category, their expertise in the forest carbon cycle should be a primary criterion selecting the final panel members. While a breadth of knowledge is essential for an effective peer review, EPA cannot lose sight of the central issue at stake in this endeavor – the carbon neutrality of biogenic CO<sub>2</sub> emissions due to their role in the forest carbon cycle. Unless the panel is qualified to answer this fundamental question, the peer review process will not achieve its goal.

---

<sup>13</sup> Letter from Gina McCarthy to Roger Martella (Jan. 12, 2011) granting NAFO's Petition for Reconsideration, *available at* <http://www.epa.gov/nsr/ghgdocs/McCarthytoMartella.pdf>.

C. The Panel Must Include Members with Technical Expertise in Silvicultural Science --  
Forest Management and Forest Product Streams and Forest Economics

The panel must also include members with expertise in the realities of forest management and forest product streams. EPA's draft study will do more than review the scientific basis for biomass carbon neutrality; it will also propose an accounting method for biogenic CO<sub>2</sub> emissions. The accounting methods identified by EPA in the Request for Nominations will have vastly different effects on U.S. forestry. Unless panel members have technical expertise in the sectors that will be impacted by these policy decisions, the panel will be unable to provide EPA with substantive review of the real-world impact that the proposed accounting method will have on forest owners and ownership, the forest products sector, and the biomass energy sector. For example, a policy that promotes biomass removals may increase total forest carbon stock by increasing the number of forested acres. Unless the panel includes members with technical expertise related to the realities of forest management, forest product streams and the economics of forests in the marketplace, it will be unable to provide EPA with the necessary feedback to permit EPA to assess the practical effects of the different accounting methodologies and select the one that is most closely aligned with the Administration's policy goals.

D. The Panel Members Must Be Committed to the Administration's Stated Renewable  
Energy Policy

Finally, the nominees selected to serve on the panel must be committed to the Administration's stated policy of expanding renewable fuels. The purpose of the panel is to provide scientific and technical guidance to EPA with respect to the draft study. It is not intended to critique the Administration's policy objectives or even to design and propose regulations to meet those policy objectives. While it is appropriate for the panel to scrutinize

and critique the validity of the scientific and technical assumptions that EPA makes as it seeks to implement this policy, it must operate within the Administration's chosen policy framework. This task can best be completed by individuals who are not opposed to the Administration's policy with respect to renewable fuels.

Ensuring a commitment to the Administration's policy of expanding renewable fuels is also consistent with EPA's goal of appointing a balanced panel. The balance sought by EPA encompasses breadth in domains of science, scientific perspectives, and work experience.<sup>14</sup> It does not require breadth or balance of opinion regarding already established policies. While a breadth of scientific expertise will enhance the panel's critical assessment of the scientific and technical issues raised by EPA's draft study, a breadth of perspectives on established policies will likely detract from it. Rather than focusing on the validity of EPA's scientific and technical assumptions, the panel may become sidetracked by policy debates that have already been resolved by the responsible policy makers.. If the panel becomes involved in policy debates, it is unlikely that it will be capable of providing the disinterested and independent review that is required.

## VI. Conclusion

NAFO supports EPA's decision to seek an independent peer review of its proposed accounting methodology for biogenic CO<sub>2</sub> emissions. Such a review will enhance the credibility of EPA's final regulatory action and ensure that it is consistent with sound science and practically feasible. The success of the review will depend upon the capabilities of the panel selected by EPA and NAFO has sought to provide a number of criteria that can guide EPA as it selects individuals from the current nominees. The nominees chosen by EPA must have deep subject matter expertise in the relevant scientific and technical fields – including the forest

---

<sup>14</sup> 76 Fed. Reg. 23588.

carbon cycle and the forest management and bioenergy sectors. They must also be capable of distinguishing between scientific issues where their expertise can be applied and policy issues which must be left to policy makers. NAFO believes that many of the nominees possess these qualities and is confident that EPA can assemble a panel that will achieve the important task to which it has been assigned.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'D. Tenny', with a long horizontal flourish extending to the right.

David P. Tenny  
President and CEO  
National Alliance of Forest Owners

# **Exhibit A**



National Alliance of Forest Owners  
*Investing in the Future of America's Forests*

May 5, 2011

Submitted via [www.regulations.gov](http://www.regulations.gov)

Environmental Protection Agency  
EPA Docket Center (EPA/DC)  
Mailcode: 28221T  
Attention Docket ID No. EPA-HQ-OAR-2011-0083  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460

**Re: National Alliance of Forest Owners' Comments on "Deferral for CO<sub>2</sub> emissions from Bioenergy and Other Biogenic Sources under the Prevention of Significant Deterioration and Title V Programs: Proposed Rule", 76 Fed. Reg. 15249 (Mar. 21, 2011) Docket EPA-HQ-OAR-2011-0083**

To Whom It May Concern:

The National Alliance of Forest Owners ("NAFO") welcomes the opportunity to submit the following comments in response to the Deferral for CO<sub>2</sub> emissions from Bioenergy and Other Biogenic Sources under the Prevention of Significant Deterioration and Title V Programs: Proposed Rule ("Proposed Deferral"), 76 Fed. Reg. 15249 (Mar. 21, 2011), issued by Environmental Protection Agency ("EPA"). NAFO's mission is to protect and enhance the economic and environmental values of private forests through targeted policy advocacy at the national level. At the time of this submission, NAFO's members represent 79 million acres of private forests in 47 states. NAFO was incorporated in March 2008 and has been working aggressively since then to sustain the ecological, economic, and social values of forests and to assure an abundance of healthy and productive forest resources for present and future generations. NAFO is a solutions-oriented organization and is prepared to answer any questions EPA has regarding biomass combustion and the lifecycle of forest biomass and to assist the agency in developing long-term policy that helps achieve the nation's renewable energy and climate change objectives.

As the organization that requested EPA reconsider its position in the Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule (“Tailoring Rule”) regarding the treatment of biomass emissions, NAFO is an acutely interested stakeholder in EPA’s finalization of this rule that would defer the regulation of biomass emissions. NAFO applauds the steps EPA is taking to alleviate the disincentives the Tailoring Rule has created for utilizing renewable biomass, and offers comment on three areas of the proposed deferral rule. First, we present clarifying comments regarding the scientific principles, policy choices, and regulatory actions that underlie the deferral rule, which are important for the Agency to improve its further actions and activities regarding biomass emissions. Second, NAFO offers suggestions for how the operative provisions of the deferral rule should be altered to ensure that the deferral fully achieves its goals. Third, NAFO offers preliminary suggestions regarding the shape of the Agency’s upcoming inquiry into the appropriate treatment of biomass emissions.

## **COMMENTS ON THE BACKGROUND OF THE DEFERRAL RULE**

EPA’s proposed rule would appropriately defer regulating carbon dioxide emissions from biomass combustion under the Prevention of Significant Deterioration (“PSD”) and Title V Clean Air Act (CAA) stationary source permitting programs.<sup>1</sup> This deferral results from three primary factors: 1) the science of biomass emissions, known as the carbon cycle; 2) the prior treatment of combustion of biomass at stationary sources; and 3) the administrative infeasibility of regulating biomass emissions through the Clean Air Act’s stationary source permitting programs.

### **I. The Science of Biomass Emissions—the Carbon Cycle.**

Biomass is a carbon beneficial alternative to fossil fuels that can reduce greenhouse gas (“GHG”) emissions and mitigate the effects of climate change. NAFO has provided significant analysis to EPA on past occasions regarding the distinctions and advantages of utilizing biomass compared to fossil fuels.<sup>2</sup> In brief, biomass can be

---

<sup>1</sup> See Deferral for CO<sub>2</sub> emissions from Bioenergy and Other Biogenic Sources under the Prevention of Significant Deterioration and Title V Programs: Proposed Rule (“Proposed Deferral”), 76 Fed. Reg. 15249 (Mar. 21, 2011); Letter from Gina McCarthy to Roger Martella (Jan. 12, 2011) granting NAFO’s Petition for Reconsideration.

<sup>2</sup> See, e.g., National Alliance of Forest Owners’ Comments on “Call for Information: Information on Greenhouse Gas Emissions Associated With Bioenergy and Other Biogenic Sources; 75 Fed. Reg. 41173 (July 15, 2010),” Docket ID: EPA-HQ-OAR-2010-0560 (Sept. 13, 2010) (Exhibit A).

an effective tool in reducing U.S. GHG emissions because it is part of the natural carbon cycle and does not add additional carbon to the atmosphere. This is because growing plants absorb carbon dioxide from the atmosphere. All plant materials are ultimately derived from this carbon dioxide drawn from the atmosphere, and so when biomass is burned, the carbon dioxide emitted contains the same carbon that was sequestered by the plant feedstocks, which also would have been emitted if the plant materials were left to decay. Indeed, as EPA has repeatedly reported, if one considers net fluxes of carbon dioxide from the forestry sector as a whole, including growth and parallel combustion, the sector is a net carbon sink. Thus, the combustion of biofuels does not result in net carbon dioxide emissions.

Indeed, the renewable power generated by combustion of biomass actually reduces atmospheric concentrations of carbon dioxide in three respects. First, combustion of biomass displaces combustion of fossil fuels, meaning that combustion of biomass actually means fewer emissions of geologic carbon dioxide than would occur in its absence.<sup>3</sup> Second, biomass energy avoids the biogenic greenhouse gas emissions (mainly methane) of the various alternative disposal fates of biomass residues, replacing them with the lower potency greenhouse gas emissions of energy production.<sup>4</sup> Third, biomass combustion actually promotes further forest growth by providing land owners with an incentive to maintain forests instead of converting to other land use options that sequester less carbon.

This final point—that increased demand for forest products leads to increased forest—is simple commonsense. But there seems to be a misconception falsely perpetuated by some that demand for forest products could lead to decreased forest stocks. This ignores the fact that forests are a renewable resource—as the value of forests increase, forests themselves will multiply.<sup>5</sup> Economic returns to wood production and forest-based manufacturing provide important incentives for private forest

---

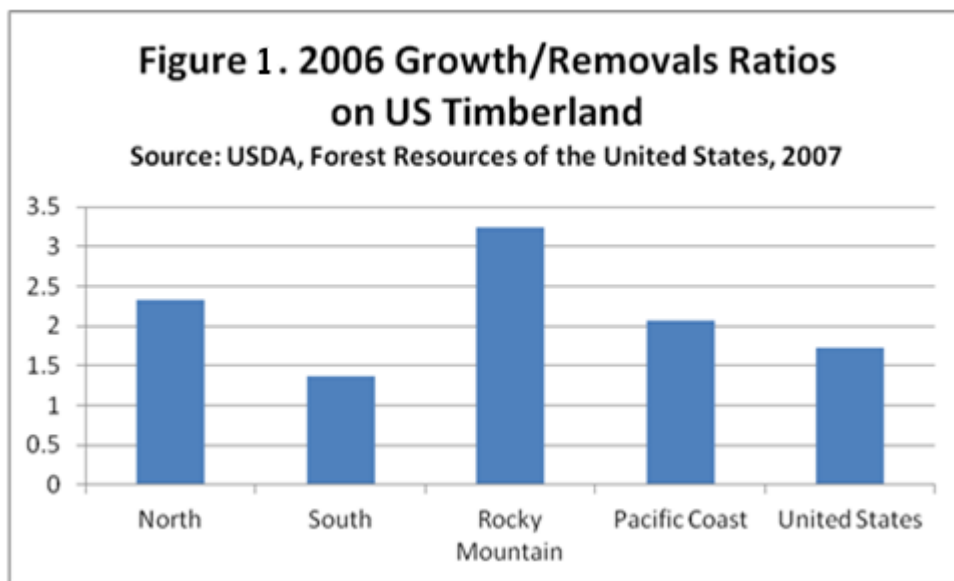
<sup>3</sup> See Gregory Morris, Ph.D., *Bioenergy and Greenhouse Gasses* (2008).

<sup>4</sup> *Id.* at 4.

<sup>5</sup> The notion that restrictions on using forests for biomass combustion *could help preserve forests* is equally misguided. If the government restricts the use of a renewable resource, stocks of that resource will naturally fall. Clutter, M., Abt, R., Greene, W.D., Siry, J., and Mei, R., *A Developing Bioenergy Market and Its Implications on Forests and Forest Products Markets in the United States* (Executive Summary prepared for NAFO) (2010), available at <http://nafoalliance.org/clutter/>.

stewardship in the United States.<sup>6</sup> Absent these incentives, many working forests would be converted to non-forest uses.<sup>7</sup> New markets for bioenergy feedstocks can enhance the economic sustainability of working forests and thus contribute to maintaining or increasing the extent of forests on private lands.

The Forest Inventory and Analysis (FIA) Program of the U.S. Forest Service, see generally <http://fia.fs.fed.us/>, confirms that as biomass production has increased, U.S. forests are stable or increasing. Even in the South, which has experienced an increase in removals since 1980, the ratio of growth to removals was above 1.3 in 2006.



More importantly, estimates of the net flux of CO<sub>2</sub> confirm that forest sequestration is increasing, meaning that the net flux of carbon into forest biomass is greater than the

---

<sup>6</sup> Wear, D.N. and J.P. Prestemon, "Timber market research, private forests and policy rhetoric," (pages 289-300), in H.M. Raucher and K. Johnsen (eds.) *Southern Forest Science: Past, Present, and Future* (2004) General Technical Report SRS-75, Southern Research Station, USDA Forest Service. Asheville, NC.

<sup>7</sup> Lubowski, R. N., S. Buchholtz, R. Claassen, M.J. Roberts, J.C. Cooper, A. Gueorguieva, and R. Johansson, *Environmental Effects of Agricultural Land-Use Change: The Role of Economics and Policy*, Economics Research Report No. 25., Economic Research Service. US Department of Agriculture, Washington, D.C.

flux returning to the atmosphere due to respiration, decay, and combustion.<sup>8</sup> This even better-than-neutral balance applies to all forests, both public and private.<sup>9</sup>

For these reasons, as EPA is aware, carbon stocks in United States forests have been increasing, and will continue to increase. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008* at 3-10 (April 15, 2010) (EPA 2010 Inventory), available at [http://www.epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010\\_Report.pdf](http://www.epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010_Report.pdf). Thus, the generation of bioenergy from forest biomass has massive climate benefits.

## **II. The Established Regulatory Treatment of Biomass Combustion.**

Given the science of the carbon cycle, it is not surprising that, with the sole exception of the final Tailoring Rule, the established domestic and international practice is that carbon dioxide emissions from biomass combustion are not counted toward regulatory thresholds at stationary sources. The Intergovernmental Panel on Climate Change guidance and United Nations Framework Convention on Climate Change reporting protocols both recognize the carbon neutrality of biomass. Similarly, the European Union (“EU”) directive on carbon trading specifies “Biomass is considered as CO<sub>2</sub>-neutral.”<sup>10</sup> Instead, they measure increases in forest stock at the national level, measuring the net sequestration rate by examining forest growth.

American policy and regulation has wisely followed this established and accepted international practice of not counting carbon dioxide emissions from combustion of biomass in the stationary source sector. That is, combustion of biomass is carbon neutral, and increases in forest stock should be measured at the national forest level. As EPA has concluded, there is “[s]cientific consensus . . . that the CO<sub>2</sub> emitted from burning biomass will not increase total atmospheric CO<sub>2</sub> if this consumption is done on a

---

<sup>8</sup> Heath, Linda S., *et al*, Managed Forest Carbon Estimates for the U.S. Greenhouse Gas Inventory, 1990-2008, *Journal of Forestry* (April/May 2011) 167.

<sup>9</sup>See Haynes, R. W., *The 2005 RPA timber assessment update*, Gen. Tech. Rep. PNW-GTR-699, USDA Forest Service, Pacific Northwest Research Station (2007); Heath, L. V., *Greenhouse Gas and Carbon Profile of the U.S. Forest Products Industry Value Chain*, Environmental Science and Technology (2010).

<sup>10</sup>EU guidelines for the monitoring and reporting of greenhouse gas emissions, Annex I, 4.2.2.1.6, available at [http://inni.pacinst.org/inni/climate\\_change/EUGuidelinesGHGJan2004.pdf](http://inni.pacinst.org/inni/climate_change/EUGuidelinesGHGJan2004.pdf).

sustainable basis.”<sup>11</sup> Consequently, EPA’s Mandatory GHG Reporting Rule uses an expansive definition of biomass and does not include biogenic CO<sub>2</sub> in its reporting threshold. Similarly, the Department of Energy’s (DOE’s) Voluntary Reporting of Greenhouse Gases Program, authorized by Section 1605(b) of the Energy Policy Act of 1992, provides for exclusion of combustion of biomass fuels.<sup>12</sup>

Thus, strong agreement exists supporting the government’s practice of **not** counting emissions from combustion of biomass like emissions from combustion of fossil fuels. As explained in NAFO’s prior comments on EPA’s Call for Information regarding biomass combustion, the carbon neutrality of biomass combustion is also well established in the scientific literature.<sup>13</sup> NAFO’s prior comments also explain the flaws in recent studies challenging the carbon neutrality of biomass combustion.<sup>14</sup>

### **III. The Proposed Deferral Rule and the Administrative Infeasibility of Assessing the Net Impact of Biomass Combustion at Stationary Sources.**

The proposed deferral rule is the latest step in EPA’s necessary journey back to restoring the established position that carbon dioxide emissions from combustion of biomass do not count toward regulatory thresholds for stationary sources.

#### **A. EPA Proposed Maintaining the Traditional Rule Against Counting Stationary Source Carbon Dioxide Emissions From Combustion of Biomass.**

On October 27, 2009, EPA published a proposed rule for greenhouse gas permitting, known as the “Tailoring Rule,” that dictated which stationary sources of greenhouse gases would have to obtain permits and meet other requirements under

---

<sup>11</sup>Environmental Protection Agency Combined Heat and Power Partnership, *Biomass Combined Heat and Power Catalog of Technologies*, 96 (Sept. 2007), available at [www.epa.gov/chp/documents/biomass\\_chp\\_catalog.pdf](http://www.epa.gov/chp/documents/biomass_chp_catalog.pdf).

<sup>12</sup>See DOE, *Technical Guidelines: Voluntary Reporting of Greenhouse Gases (1605(b)) Program* at 77 (“Reporters that operate vehicles using pure biofuels within their entity should not add the carbon dioxide emissions from those fuels to their inventory of mobile source emissions because such emissions are considered biogenic and the recycling of the carbon is not credited elsewhere.”).

<sup>13</sup> See National Alliance of Forest Owners’ Response to Call for Information: Information on Greenhouse Gas Emissions Associated With Bioenergy and Other Biogenic Sources; 75 Fed. Reg. 71173 (July 15, 2010) 9-16 (Exhibit A).

<sup>14</sup> *Id.* at 16-19.

EPA's Prevention of Significant Deterioration (PSD) and Title V permitting programs.<sup>15</sup> Specifically, the proposed rule directed that sources should rely on EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks "to calculate a source's GHG emissions."<sup>16</sup> That inventory does not count carbon dioxide emissions from combustion of biomass at stationary sources; rather, in accordance with settled policy, "[i]t is assumed that the C released during the consumption of biomass is recycled as U.S. forests and crops regenerate, causing no net addition of CO<sub>2</sub> to the atmosphere."<sup>17</sup> EPA did not indicate or suggest that it was proposing a deviation from this policy in the proposed PSD and Title V permitting programs.

Thus, it seems clear that EPA proposed to follow settled government policy and not to count carbon dioxide emissions from combustion of biomass at stationary sources toward the applicability thresholds it proposed for the PSD and Title V permitting programs—and, naturally, this is how stakeholders understood the rule.<sup>18</sup> In the Proposed Deferral preamble, however, EPA suggests that NAFO, along with other stakeholders, "misunderst[oo]d [EPA's] intent," and that its references to the Inventory had not been meant as "an indication, direct or implied, that biomass emissions would be excluded from permitting applicability merely by association with the national inventory."<sup>19</sup> EPA stated that instead, it referred to the Inventory for [Global Warming

---

<sup>15</sup> Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 74 Fed. Reg. 55,292 (Oct. 27, 2009).

<sup>16</sup> *Id.* at 55,351, 55,352, 55,361.

<sup>17</sup> EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-1997 at Energy 3-1-3-2.

<sup>18</sup> See National Alliance of Forest Owners' Comments on "Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule," Docket ID: EPA-HQ-OAR-2009-0517 (Dec. 28, 2009) (Exhibit B).

<sup>19</sup> 76 Fed. Reg. at 15,256. We also note that EPA repeatedly misrepresents that commenters requested that EPA "exclude" biogenic carbon dioxide (CO<sub>2</sub>) emissions." See 76 Fed. Reg. 23587 (April 27, 2011); 76 Fed. Reg. at 15,256; 75 Fed. Reg. 31514, 31590 (June 3, 2010). NAFO explicitly asked EPA to confirm its proposal to follow the exiting policy separating biogenic emission from fossil fuel emissions, as proposed: "EPA in the final Tailoring Rule should confirm its proposed methodology that would exclude biogenic emissions from triggering prevention of significant deterioration permitting requirements." National Alliance of Forest Owners' Comments on *Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule*, Docket EPA-HQ-OAR-2009-0517 (Dec. 28, 2009) (Exhibit B).

Potential] identification purposes only.”<sup>20</sup> This, however, is not true. The proposed Tailoring Rule specifically and repeatedly stated that EPA would use the Inventory not only for determining a pollutant’s global warming potential, *but also* “for guidance on how to calculate a source’s GHG emissions.” 74 Fed. Reg. at 55,351, 55,352, 55,361. Furthermore, whatever EPA’s unexpressed intent, the actual rule it proposed was best read as consistent with longstanding government policy of not counting carbon dioxide emissions from combustion of biomass. After all, EPA not only tied its rule to the Inventory; it also gave no indication that it was rejecting the settled policy against counting biomass emissions—much less gave any reason for doing so.

B. The Final Tailoring Rule Inappropriately Counts Emissions From Combustion of Biomass.

Thus it was a sudden and unprecedented reversal when, on June 3, 2010, the final Tailoring Rule provided that carbon dioxide emissions from biomass combustion *would* count toward the rule’s applicability thresholds for the PSD and Title V permitting programs.<sup>21</sup> EPA did not offer any explanation for this reversal. Indeed, EPA’s short discussion of the issue only suggested reasons not to change course: EPA expressed uncertainty about the propriety of counting biomass emissions, but acknowledged that “many state, federal, and international rules and policies” do not count biomass emissions in the same manner as fossil fuel emissions and that biomass fuel could play a role “in reducing anthropogenic GHG emissions.”<sup>22</sup>

On July 30, 2010, NAFO petitioned EPA to reconsider the Tailoring Rule’s treatment of biomass combustion, noting that (1) EPA had not offered a reasoned explanation for reversing the established government position that it had followed in the proposed Tailoring Rule, and that (2) EPA’s unexpected change-of-course in the final Tailoring Rule was not a logical outgrowth of its proposed Tailoring Rule.<sup>23</sup> NAFO requested that EPA (1) reconsider its decision to count CO<sub>2</sub> emissions from biomass

---

<sup>20</sup> *Id.*

<sup>21</sup> See 75 Fed. Reg. 31,514, 31,590-91 (June 3, 2010).

<sup>22</sup> 75 Fed. Reg. at 31,590–91.

<sup>23</sup> NAFO also petitioned for review of the Tailoring Rule in the United States Court of Appeals for the District of Columbia Circuit. See *NAFO et al., v. EPA*, D.C. Cir. Case No. 10-1209 (filed Aug. 2, 2010) (consolidated with *Southeastern Legal Foundation, Inc. v. EPA*, No. 10-1131, *et al.*). That case is pending.

combustion toward applicability thresholds for PSD and Title V and (2) stay the application of the PSD and Title V permitting programs to emissions of CO<sub>2</sub> from biomass combustion pending reconsideration.

C. EPA Appropriately Granted Reconsideration of Its Tailoring Rule, and Proposed Deferral.

On January 12, 2011, EPA granted NAFO's petition for reconsideration, and, rather than staying the rule, committed to "complete a rulemaking to defer for three years the application of the pre-construction and Title V permitting requirements to CO<sub>2</sub> emissions from biomass-fired and other biogenic sources" by July 1, 2011.<sup>24</sup> At the same time, EPA also committed to use the three year delay to undertake a scientific and technical study of how to account for "CO<sub>2</sub> emissions from biomass-fired and other biogenic stationary sources . . . in ways that are scientifically sound and also manageable in practice."<sup>25</sup> During the same period, EPA will complete a notice and comment rulemaking to establish "the system for determining applicability of the Clean Air Act's pre-construction permitting requirement to projects that result in CO<sub>2</sub> emissions from biomass fired and other biogenic sources."<sup>26</sup>

EPA's decision to reconsider its Tailoring Rule appropriately was met with broad endorsement by the Obama Administration. In her statement announcing this decision, EPA Administrator Jackson noted: "Renewable, homegrown power sources are essential to our energy future, and an important step to cutting the pollution responsible for climate change."<sup>27</sup> In his statement supporting EPA and pledging to work with EPA,

---

<sup>24</sup> Letter from Gina McCarthy to Roger Martella (Jan. 12, 2011) granting NAFO's Petition for Reconsideration *available at* <http://www.epa.gov/nsr/ghgdocs/McCarthytoMartella.pdf>. During the three-year period, EPA will complete a notice and comment rulemaking to establish "the system for determining applicability of the Clean Air Act's pre-construction permitting requirement to projects that result in CO<sub>2</sub> emissions from biomass fired and other biogenic sources." *Id.*

<sup>25</sup> EPA also promised to issue guidance to "help permitting authorities establish a basis for concluding that the best available control technology (BACT) for CO<sub>2</sub> emissions at such sources is simply combustion of biomass fuels." *Id.* This guidance was released in March. See Guidance For Determining Best Available Control Technology For Reducing Carbon Dioxide Emissions From Bioenergy Production, <http://www.epa.gov/nsr/ghgdocs/bioenergyguidance.pdf>.

<sup>26</sup> *Id.*

<sup>27</sup> [http://www.epa.gov/aging/press/epanews/2011/2011\\_0112\\_1.htm](http://www.epa.gov/aging/press/epanews/2011/2011_0112_1.htm).

Secretary of Agriculture Vilsack stated: “EPA’s action today will provide the agency with the time it needs to ensure that greenhouse gas policies properly account for the emissions and carbon sequestration associated with biomass. In many cases, energy produced from biomass will provide significant reductions of greenhouse gases relative to fossil fuels.”<sup>28</sup>

The Proposed Deferral itself noted another problem with EPA’s change of course in the final Tailoring Rule. Accounting for the net carbon dioxide added to the atmosphere by a given biomass combustion facility is hopelessly complex. As EPA stated:

Establishing an accounting system for the net atmospheric impact of biogenic CO<sub>2</sub> emissions from stationary sources is complex. As mentioned above and below, commenters to the [Call For Information] made suggestions ranging from a categorical exclusion of facility-based emissions to a case-by-case analysis approach. Multiple factors need to be considered to accurately assess the net atmospheric impacts of the use of a particular type of fuel by a stationary source over a specified time period, that extends into the future: Net emissions to the atmosphere (emissions from the facility and sequestration elsewhere) of carbon from the biomass used for bioenergy; the time scale against which net emissions should be measured; delineation of geographic areas for measurement; and leakage.<sup>29</sup>

Consequently, EPA determined that it could rely “on the same rationale as EPA used to justify the Tailoring Rule’s phase-in approach”<sup>30</sup>—that is “the ‘absurd results’ doctrine, which authorizes agencies to apply statutory requirements differently than a literal reading would indicate, as necessary to effectuate congressional intent and avoid absurd results; and (2) the ‘administrative necessity’ doctrine, which authorizes agencies

---

<sup>28</sup>

<http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2011/01/0008.xml>.

<sup>29</sup> 76 Fed. Reg. at 15,258.

<sup>30</sup> 76 Fed. Reg. at 15,262.

to apply statutory requirements in a way that avoids impossible administrative burdens.”<sup>31</sup>

## **COMMENTS ON THE PROPOSED DEFERRAL’S PROVISIONS**

NAFO strongly supports the Proposed Deferral. As described below, EPA has ample legal authority to finalize this rule. Nevertheless, there are also important and necessary areas for improvement. In particular, EPA must remove the automatic sunset date from the final rule. It must also ensure that the states accept EPA’s judgment that regulation of biomass is administratively infeasible, and, to be consistent with its broader actions under the Tailoring Rule, must modify any state implementation plans that cannot demonstrate that they have the resources to regulate biomass combustion.

### **I. EPA Has Clear Legal Authority and Discretion Not to Count Carbon Dioxide Emissions From Combustion of Biomass at Stationary Sources.**

The Clean Air Act and supporting caselaw provide EPA clear legal authority to distinguish GHG emissions from biomass combustion versus other sources, and thus to exclude such emissions from Clean Air Act regulatory and permitting regimes. First, EPA has significant authority and discretion not to bring such emissions within the Clean Air Act framework given that GHG emissions from biogenic sources have no adverse impact on human health or the environment. Second, EPA has general authority to distinguish carbon dioxide emissions from combustion of biomass from other carbon dioxide emissions. Third, EPA has historically excluded certain air emissions from the PSD and other CAA programs—even when such emissions are otherwise regulated in some contexts. Fourth, EPA can use its discretion to avoid imposing burdens on permit applicants and permit authorities that, like regulating biomass, would be administratively impossible.

#### **A. The Clean Air Act Does Not Authorize EPA to Regulate Emissions such as Biogenic GHG Emissions Which Do Not Adversely Effect the Environment.**

A core principle underlying much of EPA’s regulatory authority under the Clean Air Act is that EPA shall regulate only air pollutants that endanger human health or public welfare. Unlike CO<sub>2</sub> emissions from other sources, emissions from the

---

<sup>31</sup> 76 Fed. Reg. at 15,255.

combustion of biomass will not increase net atmospheric levels of CO<sub>2</sub>.<sup>32</sup> This is because net fluxes of CO<sub>2</sub> to the atmosphere from the combustion of biomass in the United States are, at a minimum, “carbon neutral” in that any CO<sub>2</sub> emissions associated with the combustion of biomass are offset by biological processes that remove CO<sub>2</sub> from the atmosphere.

Because biogenic CO<sub>2</sub> emissions have no adverse effect on public health or public welfare and because Congress did not specifically direct EPA to regulate such emissions under the CAA, EPA lacks regulatory authority to address them in the first instance. In the Endangerment Finding, EPA specifically concluded that that the combined emissions of GHGs from new motor vehicles and new motor vehicle engines cause and contribute to air pollution that endangers public health and welfare. EPA based this conclusion on the fact that GHGs associated with these sources (primarily from the combustion of fossil fuels) represented 23 percent of total U.S. emissions of well-mixed GHGs.<sup>33</sup> Because of its “carbon neutral” lifecycle, biogenic CO<sub>2</sub> is fundamentally different from GHGs emitted from sources regulated under section 202(a) of the Clean Air Act. Biogenic CO<sub>2</sub> resulting from combustion, unlike fossil fuel combustion, has no net effect on the atmospheric level of “well-mixed” GHGs. It is not a contributor to climate change and, therefore, does not cause or contribute to the endangerment of public health or welfare. Thus, EPA should properly exclude biogenic CO<sub>2</sub> from the scope of its Clean Air Act regulatory authority based on the lack of any adverse effects.

B. EPA Has Clear Discretion to Distinguish Biogenic CO<sub>2</sub> Emissions From Other GHG Regulations.

In its landmark *Massachusetts v. EPA* decision, the Supreme Court recognized from the outset that EPA has significant discretion regarding the scope of climate change regulations. While the Supreme Court held that EPA has the authority to regulate emissions of GHGs from new motor vehicles based on the Court’s finding that GHGs fit within the Clean Air Act’s definition of “air pollutant,” the Court also made clear that EPA’s determination as to when and how such regulation should proceed is within

---

<sup>32</sup> See COMMENTS ON THE BACKGROUND OF THE DEFERRAL RULE § I.

<sup>33</sup> 74 Fed. Reg. at 66540 (Dec. 15, 2009).

the discretion of the Agency.<sup>34</sup> “[A]n agency has broad discretion to choose how best to marshal its limited resources and personnel to carry out its delegated responsibilities.”<sup>35</sup> Courts specifically have affirmed EPA’s discretion regarding the timing and approach to the regulation of GHGs following the Court’s decision in *Massachusetts v. EPA*. For instance, in rejecting a petition to compel the regulation of GHGs after the *Massachusetts* decision, Judge Tatel observed that “nothing in section 202, the Supreme Court’s decision in *Massachusetts v. EPA*, or our remand order imposes a specific deadline by which EPA must determine whether a particular air pollutant poses a threat to public health or welfare.”<sup>36</sup> In the Tailoring Rule itself, EPA surgically exercised such discretion to limit the scope and reach of GHG regulation by specifically defining the precise “greenhouse gases” that will be “subject to regulation” as set forth in that rulemaking. See 75 Fed. Reg. at 31,606. EPA chose to limit its definition of “greenhouse gases” to “the aggregate group of six” chemicals and excluded other chemicals that also have climate impacts. *Id.*

EPA certainly could assert similar discretion to make clear that the PSD permitting program does not include GHG emissions from the combustion of biomass given that, as demonstrated above,<sup>37</sup> any environmental effect of biomass combustion on atmospheric concentrations of carbon dioxide is a beneficial one. EPA has discretion to recognize such readily apparent benefits of substituting a carbon neutral fuel for one that releases carbon which may have been geologically stored for literally millions of years. Such discretion is further supported by past practice; EPA has long differentiated biogenic emissions from fossil fuel emissions in its Inventory of U.S. Greenhouse Gas

---

<sup>34</sup> *Massachusetts v. EPA*, 549 U.S. 497, 528-29, 533 (2007).

<sup>35</sup> *Id.* at 527 (citing *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842-845 (1984)); see also *Am. Coke & Coal Chems. Inst. v. EPA*, 452 F.3d 930, 941-42 (D.C. Cir. 2006) (“The court owes particular deference to EPA when its rulemakings rest upon matters of scientific and statistical judgment within the agency’s sphere of special competence and statutory jurisdiction.”).

<sup>36</sup> *Massachusetts v. EPA*, Order Denying Petition for Writ of Mandamus, No. 03-1361 (D.C. Cir., June 26, 2008) (Tatel, J., *concurring in part and dissenting in part*). Similarly, the Northern District of California also rejected an argument that EPA is compelled to regulate all GHGs following *Massachusetts*. *S.F. Chapter of A. Philip Randolph Inst. v. EPA*, 2008 U.S. Dist. LEXIS 27794 at \*10-11 (N.D. Cal. Mar. 28, 2008). Consistent with the D.C. Circuit’s conclusion, the California court recognized that “[t]he Supreme Court was careful not to place a time limit on the EPA, and indeed did not even reach the question whether an endangerment finding had to be made at all.” *Id.*

<sup>37</sup> See COMMENTS ON THE BACKGROUND OF THE DEFERRAL RULE § 1.

Emissions and Sinks. Here, EPA can and should exercise its well established discretion in interpreting the Clean Air Act requirements for the PSD permitting program by distinguishing biogenic CO<sub>2</sub> GHG emissions from fossil fuel GHG emissions.

C. EPA Has Limited the Regulatory Reach of the PSD Program in Other Contexts.

There is abundant support for EPA to exclude biogenic CO<sub>2</sub> emissions from the PSD program based on EPA's long standing implementation of the PSD program regarding other pollutants.<sup>38</sup> Differentiating between sources of GHG emissions is consistent with EPA's longstanding exclusion in its PSD regulations of certain volatile organic compounds (VOCs) from the otherwise applicable statutory definition.<sup>39</sup> Specifically, the regulation excludes certain compounds from the definition of VOCs even though they are technically "volatile" and "organic," because such compounds would have negligible environmental impact.<sup>40</sup> A similar approach is warranted for biogenic CO<sub>2</sub> emissions as such emissions will not increase atmospheric levels of CO<sub>2</sub>.

EPA has routinely exercised its discretion in implementing other aspects of the PSD program to avoid bringing in air pollutants in certain contexts within the reach of the PSD program. In *Alabama Power Co. v. Costle*, the D.C. Circuit recognized EPA's discretion, in administering the Clean Air Act's provision requiring PSD review for any "modification" of a major emitting facility, "to exempt from PSD review some emission increases on grounds of de minimis or administrative necessity."<sup>41</sup> Consistent with that decision, EPA's regulations have long excluded routine maintenance, repair, and replacement from triggering New Source Review program requirements.<sup>42</sup> Distinguishing biogenic CO<sub>2</sub> from other GHG emissions is similarly warranted based on either a de minimis, or "neutral" impact. In this regard, biomass CO<sub>2</sub> emissions are

---

<sup>38</sup> Notably, the regulation of biogenic emissions does not comport with the CAA's stated goals for stationary sources, which are clearly aimed at reducing industrial source emissions through evolving pollution control technologies while minimizing economic harm. See *generally* 42 U.S.C. § 7470.

<sup>39</sup> 40 C.F.R. § 51.100(s); see also 40 C.F.R. §§ 52.21(b)(2)(ii) and 52.21(b)(3).

<sup>40</sup> See 40 C.F.R. § 51.100(s); 57 Fed. Reg. 3941, 3943-44 (Feb. 3, 1992) (disagreeing with comment that definition exceeded EPA's statutory authority, asserting that EPA's definition is a "policy choice clearly within the Agency's discretion" and explaining that "it is an administrative necessity and reasonable to define VOC to include all organic compounds except those EPA has determined to be negligibly reactive").

<sup>41</sup> 636 F.2d 323, 400 (D.C. Cir. 1979).

<sup>42</sup> 40 C.F.R. parts 51-52.

clearly below any possible threshold for excluding such emissions as *de minimis* under the Clean Air Act, given that, as described above, they have a neutral to beneficial impact on public health and public welfare. Thus, NAFO strongly agrees with EPA's recognition in the Proposed Deferral that it has the authority not to count CO<sub>2</sub> emissions from combustion of biomass, just as it does not count other *de minimis* emissions, such as those below significant emissions rates.<sup>43</sup>

D. EPA Has Discretion to Avoid Imposing Unmanageable Burdens on Local Permitting Authorities.

As demonstrated above,<sup>44</sup> any environmental effect of biomass combustion on atmospheric concentrations of carbon dioxide is a beneficial one. Even if some contend that future, complex studies might eventually show that, in certain situations, combustion of certain types of biomass might have some adverse impact on atmospheric carbon dioxide, EPA has correctly determined that placing the burdens of those studies on local permitting authorities that already face permitting backlogs would be unmanageable.

State and local permitting authorities are currently overwhelmed with other tasks, including implementing EPA's new GHG rules. As Illinois's permitting authority recently explained, "[t]he cumulative efforts of Illinois EPA to address the [GHG permitting burdens] is placing an enormous resource drain on our already stressed resources and involves the pulling of personnel from their normal day-to-day activities."<sup>45</sup>

These permitting authorities are facing numerous other burdens, including new National Ambient Air Quality Standards (NAAQS) for both sulfur dioxide and nitrogen dioxide, as well as an anticipated reconsidered ozone NAAQS and Clean Air Interstate and Clean Air Mercury Rules. Even worse, these authorities are coping with reduced federal funding coming at a time of state budget crises that has, in many instances, led to furloughs and reduced staffing. Finally, some of these authorities face a multi-year backlog of pending PSD applications. As EPA's proposed rule appropriately acknowledges, local permitting authorities simply do not have the staffing or resource capabilities necessary to begin complex analyses designed to root out purely hypothetical situations in which it is contended that some types of biomass might not be

---

<sup>43</sup> 76 Fed. Reg. at 15,261.

<sup>44</sup> See COMMENTS ON THE BACKGROUND OF THE DEFERRAL RULE § 1.

<sup>45</sup> Letter from Illinois EPA to EPA regarding Tailoring Rule (July 29, 2010).

carbon neutral.<sup>46</sup> This bolsters each of the three previous rationales for deferral, and, in the alternative, also supports EPA's administrative necessity and absurd results rationales for the Proposed Deferral.<sup>47</sup>

## **II. EPA Must Modify the Proposed Deferral To Avoid the Risk of Automatic Application of Its Permitting Requirements to Biomass.**

EPA proposes to alter its Tailoring Rule provisions by inserting the words: "For purposes of this paragraph (b)(48)(ii)(a), prior to [DATE 3 YEARS AFTER THE EFFECTIVE DATE OF THE FINAL DEFERRAL RULE], the mass of the greenhouse gas carbon dioxide shall not include carbon dioxide emissions resulting from the combustion or decomposition of [biomass]." <sup>48</sup> EPA must delete the clause that states "prior to [DATE 3 YEARS AFTER THE EFFECTIVE DATE OF THE FINAL DEFERRAL RULE]." This rare EPA sunset clause is inconsistent with EPA's commitment to *reconsider* its decision to apply its permitting program to carbon dioxide emissions from combustion of biomass. If finalized in this form, the Tailoring Rule would provide that carbon dioxide emissions from combustion of biomass would be included in its thresholds at the conclusion of the three year period, whether or not the agency had finished reconsidering this application.

This is not a theoretical concern, as there are always reasons to fear that any agency may not be able to finish a rulemaking on time. EPA is currently struggling to meet deadlines to propose New Source Performance Standards for Electric Utilities and Refineries, and is also implementing new NAAQS for both sulfur dioxide and nitrogen dioxide, reconsidering an existing ozone NAAQS, and responding to the vacatur of its Clean Air Interstate and Clean Air Mercury Rules. At the same time, the Agency is attempting to respond to suits requesting GHG regulation of numerous other sectors.

---

<sup>46</sup> 76 Fed. Reg. at 15,262.

<sup>47</sup> *Id.*

<sup>48</sup> 76 Fed. Reg. at 15,265-66. NAFO notes that this provision would appropriately provide that sources that begin construction or obtain a preconstruction permit during the three year deferral would not face PSD permit requirements even after the three-year period expired, regardless of the outcome of EPA's reconsideration. That is, as a *preconstruction* permit requirement, the PSD program would no longer apply to them. Any deviation from this would, of course, completely undercut the deferral—facing the possibility of retroactive application of PSD requirement, the biomass energy sector would be paralyzed by uncertainty, contrary to the expressed policy of the Administration, and the intent of the deferral rule.

The sheer quantity of regulatory actions is already causing even the hardest deadlines to slip. EPA recently was forced to request a 15-month extension of an existing court-ordered deadline to promulgate maximum achievable control technology (MACT) standards for commercial and industrial boilers, and that request was denied on January 21, leaving the Agency even further behind and facing likely reconsideration on many aspects of those standards.<sup>49</sup> This jam-packed schedule is only likely to grow worse as the Agency implements budget reductions for the balance of 2011 and faces the prospect of continued reductions going forward.

Consequently, the automatic sunset provision will create debilitating uncertainty for the biomass sector. If, for any reason, EPA fails to hit the target deadline, biomass combustion will become suddenly subject to regulatory requirements as though there was no distinction at all from fossil fuels. The Agency has already concluded that this approach would be inappropriate.<sup>50</sup> Thus the biomass sector will face the possibility that an approach that has already been rejected as unfairly punitive against biomass may be applied. Moreover, should the rules automatically revert to their pre-deferral content, there would be no guarantee that an appropriate policy is established for addressing PSD permit and Title V applications already in process or issued. The resulting uncertainty could prevent the biomass sector from achieving the benefits that Administrator Jackson and Secretary Vilsack envisioned for it—threatening the sector’s ability to “cut[ ] the pollution responsible for climate change.”<sup>51</sup>

Thus, it is imperative that EPA keep its commitment to ensuring that its treatment of biomass is reconsidered before biomass is automatically reinstated into its Clean Air Act permitting programs. NAFO, of course, understands and applauds the desire to ensure prompt reconsideration of the appropriate treatment of biomass emissions. But that can be ensured without using an automatic reversion such as the one proposed. Instead, EPA should use the method it has already employed in the Tailoring Rule—adopting an “enforceable commitment” to carrying through the study and rulemaking that

---

<sup>49</sup> See *Sierra Club v. Jackson*, No. 01-1537, 2011 WL 181097 (Jan. 20, 2011).

<sup>50</sup> 76 Fed. Reg. at 15,262.

<sup>51</sup> [http://www.epa.gov/aging/press/epanews/2011/2011\\_0112\\_1.htm](http://www.epa.gov/aging/press/epanews/2011/2011_0112_1.htm);  
<http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2011/01/0008.xml>

EPA has promised to complete in the next three years.<sup>52</sup> That course would utilize an already-existing EPA policy regarding ongoing regulatory review, be more legally consistent with the parallel Tailoring Rule, and would also avoid the uncertainties described above.

### **III. EPA Should Limit Approval of State Implementation Plans (SIPs) That Are Inconsistent With The Proposed Deferral Rule.**

EPA notes that some states have already altered their law to comply with the Tailoring Rule provisions that EPA is now reconsidering, and that it may be difficult to undo these changes. EPA has requested comment on what to do with these States:

Thus, States that cannot interpret their PSD SIP or Title V requirements to incorporate the three-year deferral are strongly encouraged to submit SIP revisions or Title V program revisions to adopt the three-year deferral. However, EPA recognizes that some States may not have any, or may have only a few, sources that combust biomass, and may have adequate information and resources as to the nature of biogenic emissions from those sources. EPA requests each State to advise EPA by letter, during the comment period for this proposal, as to the number and type of biomass sources in the State and what the State expects to be the number and type of biomass sources over the next three years, and the State's resource constraints, to the extent that information is available. EPA solicits comment on how to treat States in light of this information and any preferences that the States may express.<sup>53</sup>

Fortunately, EPA has already formulated a solution to exactly this problem. After completing the Tailoring Rule, many states still had SIPs that applied to thousands more sources than the Agency believed appropriate. In response, EPA "narrowed its previous approval of those approved PSD SIP programs . . . withdrawing their previous approvals of those programs to the extent" they applied to "emissions below the Tailoring Rule thresholds" without affecting the portions of the SIP that applied above the tailored

---

<sup>52</sup> 40 C.F.R. §§ 50.22, 70.12, 71.13, 75 Fed. Reg. at 31,607-08.

<sup>53</sup> 76 Fed. Reg. at 15,263.

thresholds.<sup>54</sup> EPA should employ a consistent approach here, narrowing the approval of states whose SIPs still apply to carbon dioxide emitted from biomass combustion.

As EPA explained in finalizing this limitation of approval, this solution does not affect “permitting obligations under state law.”<sup>55</sup> Rather, it only “eliminate[es] the PSD obligations under federal law.”<sup>56</sup> Thus, a limitation of approval does not eliminate states’ lawful authority to adopt whatever permitting requirements they believe are appropriate. State laws that inappropriately restrict the use of biomass, however, could endanger the “significant reductions of greenhouse gases” attributable to “energy produced from biomass.”<sup>57</sup> Consequently, as in the previous limitation of approval, and consistent with the Administration’s position on the benefits of biomass combustion, EPA should “strongly encourage[ ] states to eliminate [inconsistent] state law obligations by revising their state law as promptly as possible.”<sup>58</sup>

### **IMPORTANT CONSIDERATIONS FOR STUDY OF TREATMENT OF BIOMASS**

The Proposed Deferral also contained a significant discussion of some of the alternative approaches to biomass accounting that have been suggested.<sup>59</sup> For this reason, NAFO offers the following guiding principles as EPA begins to study these possible approaches. At the same time, we urge EPA not to prejudge any issues that will be assessed in the fuller upcoming technical and scientific review process; NAFO and other stakeholders intend to participate fully in that process and provide a record on which these issues can be definitively resolved.

---

<sup>54</sup> Limitation of Approval of Prevention of Significant Deterioration Provisions Concerning Greenhouse-Gas-Emitting Sources in State Implementation Plans, 75 Fed. Reg. 82,536, 82,538 (Dec. 30, 2010).

<sup>55</sup> *Id.* at 82,540.

<sup>56</sup> *Id.*

<sup>57</sup>

<http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2011/01/0008.xml>.

<sup>58</sup> Limitation of Approval of Prevention of Significant Deterioration Provisions Concerning Greenhouse-Gas-Emitting Sources in State Implementation Plans, 75 Fed. Reg. 82,536, 82,540 (Dec. 30, 2010).

<sup>59</sup> 76 Fed. Reg. at 15,259.

**I. The Appropriate Treatment of Biomass Raises Both Scientific and Policy Questions, Which Must Be Distinguished From Each Other.**

Discussions regarding the impact of biomass combustion on climate change and the issue of carbon neutrality have become clouded by a confusion between science and policy. As EPA further considers issues related to biomass emissions under the Agency's regulatory framework, EPA must distinguish between the science establishing the carbon neutrality of biomass, which is based on the carbon cycle, and the policy preferences used to select accounting principles to measure carbon fluxes. Despite broad consensus with respect to the underlying scientific principles, policy preferences—which are often confused with scientific principles—can influence the perception of the carbon impacts of biomass combustion. EPA must be careful not to treat assumptions and policy arguments as scientific facts. Instead, it should focus on the clearly established science of the carbon cycle and then develop a policy that reflects the realities of U.S. forestry, the forest products sector, and the biomass energy sector and is consistent with the Administration's policy on renewable energy.<sup>60</sup> Such an approach will demonstrate that biomass energy is a carbon neutral energy source with significant carbon benefits.

The science that underpins the carbon neutrality of biomass combustion and distinguishes biomass CO<sub>2</sub> emissions from fossil fuel CO<sub>2</sub> emissions is well-understood and uncontroversial. Wood products—including biomass combusted for energy—are a part of the natural carbon cycle. CO<sub>2</sub> is sequestered in forests through photosynthesis and emitted through decomposition and combustion. The dynamic processes of carbon sequestration and emission occur simultaneously and form an ongoing cycle by which emitted carbon is sequestered and vice versa. The woody biomass derived from forest products is carbon neutral because combustion (or decomposition) releases CO<sub>2</sub> that was recently sequestered from the atmosphere and is replaced by an equivalent amount of CO<sub>2</sub> through regeneration. In contrast, fossil fuels are formed over millennia and carbon emissions associated with the combustion of fossil fuel permanently increase

---

<sup>60</sup> Letter from President Barack Obama to Governors John Hoeven and Chet Culver (May 27, 2009), *available at* <http://www.governorsbiofuelscoalition.org/assets/files/President%20Obama's%20Response5-27-09.pdf>; see also President Barack Obama, Memorandum for the Secretary of Agriculture, the Secretary of Energy, and the Administrator of the Environmental Protection Agency, 74 Fed. Reg. 21531-32 (May 5, 2009).

atmospheric carbon dioxide concentrations.<sup>61</sup> As even those who oppose use of biomass admit, “if we were writing a science paper, yes, [biomass] would be carbon neutral.”<sup>62</sup> Thus, the disagreements in this controversy concern policy questions.

## **II. The Forest Carbon Cycle is Best Measured on a National, Long-Term Time Scale.**

One important policy question is the appropriate time and geographical scale at which to measure biomass emissions. The forest carbon cycle is a dynamic, global, and ongoing process and accounting at a national scale most closely reflects this reality. Furthermore, forest product streams are interconnected and fluid and not easily subdivided into small geographic units. Forest owners often own properties in diverse locations and the companies and brokers that harvest and market forest products operate over vast and overlapping geographic areas. To further complicate matters, individual biomass combustion facilities purchase feedstocks from a diverse and ever-changing collection of forest owners, logging companies, and brokers. As a result, any attempt to account for CO<sub>2</sub> fluxes at a smaller spatial scale would ignore the realities of the forest products industry and create arbitrary boundaries that distort the forest products market. As it develops its policy with respect to biomass combustion, EPA must select an accounting system that reflects the national scale on which the carbon cycle and forestry industry operate.

It is also critical that EPA select a proper temporal scale that reflects the continuous nature of the carbon cycle. Any attempt to choose a “beginning” for the carbon cycle will be arbitrary, and it is equally arbitrary to suggest that the cycle begins at harvest, creating a carbon debt, or that it begins with regeneration, creating a carbon credit. Instead, once an appropriate spatial scale is applied, it becomes clear that sequestration occurs on a continuous temporal scale and the accounting method selected should reflect this reality. Due to rotational harvesting, forest management activities producing biomass used for energy in a given year only represent a small fraction of the total forested land managed for forest products. The rest of the forests are actively sequestering carbon. As a result, sequestration and emission occur simultaneously and the quantity of carbon emitted during combustion is offset by the

---

<sup>61</sup> See COMMENTS ON THE BACKGROUND OF THE DEFERRAL RULE § I.

<sup>62</sup> Remarks of Richard Wiles, Senior Strategist at the Partnership for Policy Integrity, April 5 Public Hearing on Proposed Deferral Rule, Transcript of Public Hearing at 60.

quantity of carbon sequestered through the continuous growth of trees on forested land throughout the United States. To capture the continuous nature of the carbon cycle, an accounting system must measure changes in the national carbon stocks at regular intervals to determine net changes in carbon stocks rather than implementing a debit and credit system for individual tracts of land. This would be consistent with national inventory approach applied by the U.S. Forest Service that has demonstrated a net increase in overall forest carbon stocks in the U.S. of nearly 50% over the second half of the 20th Century.<sup>63</sup> Notably, this increase has come during a time of unprecedented increase in demand for forest products for home construction, consumer goods, and energy.

Accounting systems that incorporate large spatial scales and continuous temporal scales consistently demonstrate that biomass provides a carbon neutral energy supply with significant carbon benefits through displaced fossil fuel consumption. These accounting systems are well known in the scientific literature and NAFO has previously brought these studies to EPA's attention.<sup>64</sup> In contrast, recent studies challenging the carbon neutrality of biomass energy have chosen to follow a policy of unnecessarily restricted spatial and temporal scales. For example, the study conducted by the Manomet Center<sup>65</sup> which suggested that biomass combustion produces a "carbon debt" was based on an inappropriate stand-based spatial scale that ignored the reality of rotational harvesting, and arbitrarily "began" the carbon cycle at the time of harvest to emphasize emissions over sequestration. Despite the fact that all of these studies are based on the same scientific principles rooted in the carbon cycle, they reach different results due to the policy preferences that inform the accounting methods. Rather than assuming a lack of scientific consensus, EPA must carefully assess the policy preferences underlying the biomass debate and choose those preferences which reflect

---

<sup>63</sup> Society of American Foresters, *State of America's Forests* (2007).

<sup>64</sup> See National Alliance of Forest Owners' Comments on "Call for Information: Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources; 75 Fed. Reg. 41,173 (July 15, 2010)," at 9-16, Docket ID: EPA-HQ-OAR-2010-0560 (Sept. 13, 2010) (Exhibit A).

<sup>65</sup> Walker, T., *et al.*, *Biomass Sustainability and Carbon Policy Study*, Manomet Center for Conservation Sciences, Brunswick, ME (2010).

both sound science and the realities of the forestry industry, and are consistent with the government's renewable energy policy.<sup>66</sup>

### **III. The Most Appropriate Treatment of Biomass Emissions Is A Categorical Exclusion From Counting These Emissions at Stationary Sources.**

In the Proposed Deferral EPA identifies four accounting methodologies that could be applied in regulating CO<sub>2</sub> emissions from biomass combustion: a categorical exclusion, a contingent exclusion, a feedstock-based approach, and a case-by-case analysis. As it assesses the merits of these options and chooses an accounting methodology, EPA must ensure that it is consistent with the policy considerations described above and capable of efficient implementation. As described below, a categorical exclusion is the only option that meets both of these criteria.

#### *Categorical Exclusion*

Under a categorical exclusion, all CO<sub>2</sub> emissions from biomass combustion would be excluded when assessing PSD and Title V applicability to stationary sources. This approach is consistent with the policy goals described above because it utilizes a nation-wide spatial scale and recognizes that biomass energy is carbon neutral because emissions from biomass combustion are balanced by sequestration from forest regeneration. Furthermore, a categorical exclusion is straightforward and avoids unnecessary administrative and compliance costs. In fact, EPA already has experience with this accounting method because it is employed in the annual GHG Inventory program.

It is also important to emphasize that such an exclusion merely recognizes that biomass carbon is not appropriately regulated through regulation of *stationary sources*. Forests, of course, are already subject to numerous regulatory initiatives from multiple federal and state agencies. These agencies have particular expertise in assessing net fluxes due to the carbon cycle, and many of these initiatives promote sequestration of carbon.

---

<sup>66</sup> Letter from President Barack Obama to Governors John Hoeven and Chet Culver (May 27, 2009), *available at* <http://www.governorsbiofuelscoalition.org/assets/files/President%20Obama's%20Response5-27-09.pdf>; see also President Barack Obama, Memorandum for the Secretary of Agriculture, the Secretary of Energy, and the Administrator of the Environmental Protection Agency, 74 Fed. Reg. 21531-32 (May 5, 2009).

### *Contingent Exclusion*

Under a contingent exclusion, emissions from biomass combustion would be excluded when assessing PSD and Title V applicability unless a built-in contingency is triggered. This approach raises significant concerns regarding both the appropriateness of the method and the ease of implementation. First, it would not be sound as a matter of science or policy to apply PSD and Title V because of carbon fluxes to the atmosphere that would have taken place without biomass combustion. While NAFO's members can ensure that their own forests are managed in a responsible manner, that alone will not ensure that a contingency is not triggered. Natural processes such as forest fires, disease infestations, and powerful storms can have significant effects on short-term carbon fluxes, but are largely beyond the control of private forest owners. In addition, land use changes, including those driven by federal, state, and local policies, can have significant impacts on carbon storage.<sup>67</sup> These events have the potential to trigger a specified contingency, yet are not caused by biomass combustion. Indeed, forest management and biomass combustion can play a crucial role in preventing these fluxes by lowering the risk of forest fires. An approach that wrongly attributed these natural events to biomass combustion will only create uncertainty regarding the long-term applicability of the exclusion and reduce investment in biomass energy. As noted below, this can create a counterproductive feedback loop where the reduction in market demand will reduce investment in forests and further diminish the stock of carbon stored in forests.

Putting aside the inability to control whether a triggering event will occur, a contingent exclusion would also prove difficult to implement. For example, EPA would have to determine the effect of a triggering event on regulated entities. For example, a small reduction in national forest stocks would obviously not warrant treating biomass as *identical* to fossil fuels; instead the Agency would have to provide something less than full credit to emissions from biomass combustion. To do so, EPA would have to quantify and apply the appropriate offset each year under such a program. Finally, EPA would have to determine a way to address the risk that a single catastrophic event could cause a short-term and temporary triggering event. For example, severe forest fires or disease outbreaks could make forests a net source of CO<sub>2</sub> emissions for a single year, despite a

---

<sup>67</sup> For example, changes in subsidies for ethanol production could cause changes in land use between forests and agricultural land.

general trend of increased forest carbon storage. Rather than penalizing regulated entities for a single instance of triggering a contingency or subjecting them to on-again, off-again regulation, EPA may need to develop an averaging program to account for the noise that may be associated with individual measurements and focus instead on broader trends. These few examples demonstrate that a contingent exclusion would be much harder to develop and implement than a categorical exclusion.

In addition, the application of a contingent exclusion on a smaller scale, such as a state level, would exacerbate the problems. Reducing the spatial scale of the area subject to a contingency makes it more susceptible to episodic triggering of the contingency through events such as forest fires and disease infestations. It would also create a risk of leakage if some parts of the nation operated under an exclusion while others did not. This risk is magnified by the fact that the forestry industry operates across state and other geographic boundaries making implementation and enforcement of partial exclusions difficult. Finally, movement toward regulation of the forestry and biomass industry on a smaller spatial scale creates precedent for future regulation based on ever smaller geographic sub-units which are less representative of the forestry industry and are more susceptible to episodic triggering of contingencies.

#### *Feedstock-Based Approach*

When discussing a feedstock-based approach, EPA incorrectly asserts that “[a]n important area of consensus from the commenters was the idea that feedstocks are different, and that the net impact of bioenergy and other biogenic emissions may be traceable to the feedstock that is used.”<sup>68</sup> There is no consensus on this issue. NAFO and others have consistently noted in comments to EPA that all woody biomass is carbon neutral and offers the same climate change benefits. Given the lack of consensus among commenters on this issue, EPA should not apply a feedstock-based approach.

All feedstocks are part of the same carbon cycle and, from a scientific standpoint, should be treated equally. For example, there is not a separate carbon cycle applicable to different forest product streams or parts of a tree or forest. Therefore, any attempt to differentiate feedstocks must be based on policy preferences rather than underlying scientific properties. As described above, a proper spatial and temporal scale

---

<sup>68</sup> 76 Fed. Reg. 15259 (Mar. 21, 2011).

incorporates continuous sequestration and emissions from all forested land. Such an approach reflects the nature of the forestry industry and the realities of forest management and is simply not consistent with a feedstock-based approach. Any attempt to differentiate the carbon attributes of different species of trees, parts of trees, or specific forests will produce arbitrary results that confuse rather than clarify the nature of the carbon cycle as well as the carbon impact of biomass combustion and the forestry industry as a whole.

To some degree the interest in a feedstock-based approach appears rooted in the irrational fear that “whole trees” will be used for energy production. Such fears are based on a lack of understanding of the role that biomass plays in the forest products sector. Forest products are allocated by market forces and energy production is among the lowest-value products. The average price per green ton of biomass is significantly less than the price of pulpwood or the price of saw timber.<sup>69</sup> In other words, a forest owner would not sell timber for biomass if it can be sold as pulpwood or saw timber. The “whole trees” referred to by opponents of biomass energy are mature trees that can be harvested for saw timber. Without a significant dislocation within the forest products market, it is simply not economical to use whole trees for bioenergy. Rather than using a feedstock-based approach that dictates to forest owners the permissible uses of their products, EPA should treat all biomass equally and allow the markets to distribute it in an efficient manner.

#### *Case-by-Case Analysis*

Finally, EPA suggested that a “case-by-case, facility-specific assessment of the net atmospheric impact of the intended biomass fuels” could be employed. First, a case-by-case analysis is unnecessary because, as discussed above, there is no basis for distinguishing among different types or sources of biomass. Any attempt to measure the net atmospheric impact of the combustion of biomass fuels would necessarily include an assessment of sequestration at the harvest site. However, individual facilities obtain biomass from a host of individual forest owners as well as logging companies and brokers who aggregate products from multiple sources. EPA would have to develop and

---

<sup>69</sup> Timber Mart-South, WoodBiomass Market Report; see also Corrected Comments of Weyerhaeuser Company on “Call for Information: Information on Greenhouse Gas Emissions Associated With Bioenergy and Other Biogenic Sources; 75 Fed. Reg. 41173 (July 15, 2010),” Docket ID: EPA-HQ-OAR-2010-0560 (Sept. 14, 2010) 21 (charting historical prices).

implement a monitoring and reporting program for all forest owners, regardless of their size. Given the sheer number of sources involved in the process, a case-by-case analysis would simply be too costly to implement in terms of both time and resources.

#### **IV. EPA Should Not Employ A “Baseline” or “Business-as-Usual” Approach to Biomass Regulation.**

EPA also suggests that it may incorporate a baseline concept into future biomass regulation. Such an approach is unnecessary, particularly if EPA continues in its established course of action and applies a categorical exclusion for CO<sub>2</sub> emissions from biomass combustion. In particular, EPA should avoid approaches such as “Business as Usual” (BAU) that are both arbitrary and difficult to apply in practice. Instead, EPA should choose a baseline that addresses the central question of whether or not biomass is a carbon-neutral energy source.

A BAU model would arbitrarily set a trajectory for the change in forest carbon stocks that must be maintained in perpetuity. In the notice EPA observes that “if sustainable forestry is practiced, then neither gains nor losses from carbon would be expected over time.”<sup>70</sup> In reality, forests, whether managed or unmanaged, continue to grow and carbon stocks increase each year with that growth, subject to natural events that may cause a temporary depletion from time to time.<sup>71</sup> This is the carbon cycle and is the basis for carbon neutrality. In contrast to this simple, straightforward, and easy to implement approach, a BAU approach selects a point in time and attempts to determine what would happen without any changes in the factors that influence carbon stocks. The choice in time makes a BAU arbitrary and the need to assess all influencing factors makes it needlessly complicated.

The first problem with a BAU approach is that it assumes that current conditions are indicative of a natural level of sequestration and emissions. Humans have actively managed forests for centuries and the current balance between sequestration and emissions is the product of a complex milieu of government regulations and market forces. It would be virtually impossible to identify and disaggregate the impact of each contributing factor and identify a true BAU that is not the product of human intervention.

---

<sup>70</sup> 76 Fed. Reg. 15258 (March 21, 2011).

<sup>71</sup> Ensuring that these carbon stocks do not fall below a minimum level may be what the Agency means by a “baseline,” which is a version of a contingent exclusion, and has the shortcomings mentioned above.

Yet, to simply define the BAU trajectory using today or any other day as the starting point would be arbitrary and unfairly create winners and losers. For example, privately owned forests currently act as a sink, removing the equivalent of 131 million metric tons of CO<sub>2</sub> from the atmosphere annually.<sup>72</sup> To set a BAU based on current trajectories would constitute a regulatory taking by requiring private forest owners to continue to sequester that level of CO<sub>2</sub> on an annual basis without providing any compensation for this carbon benefit. EPA must be careful not to set a baseline in a manner that punishes forest owners for past sequestration or mandates sequestration in the future.

A second problem with the BAU approach is the difficulty in using it as a prospective policy tool. EPA suggests that under a BAU approach, “it is necessary to determine the extent to which a policy action or activity increases or reduces CO<sub>2</sub> emissions above or below what would have occurred in comparison with the baseline.”<sup>73</sup> As noted above, forests are already subject to myriad policies that cause CO<sub>2</sub> emissions to deviate from a “natural baseline.” As a result, the U.S. forest sector is complicated and subject to a wide variety of competing and sometimes countervailing forces and it can be extremely difficult to predict *ex ante* the effects of a policy or regulation. Without a proper understanding of the forestry sector and the forest products industry and their preexisting drivers, there is a significant risk that inaccurate predictions will occur. For example, many previous commenters have suggested that increasing biomass combustion will deplete forest carbon stocks compared to a BAU model and thus have a negative carbon impact. While this may seem plausible on the surface, it ignores the primary driver of privately owned forest stocks – market demand. Policies that promote a strong demand for forest products will increase forest stocks as private owners shift land into forests; policies that discourage demand for forest products decrease forest stocks as private owner shift land into other uses. Thus increased biomass utilization will likely increase rather than decrease forest carbon stocks. Given the many factors that can influence forest carbon fluxes, a BAU approach that depends on predicting changes in carbon fluxes will be inherently inaccurate and unlikely to lead to beneficial policy choices.

---

<sup>72</sup> See Haynes, R.W., *The 2005 RPA timber assessment update*, Gen. Tech. Rep. PNW-GTR-699, USDA Forest Service, Pacific Northwest Research Station (2007); Heath, L.V. *Greenhouse Gas and Carbon Profile of the U.S. Forest Products Industry Value Chain*, Environmental Science and Technology (2010).

<sup>73</sup> 76 Fed. Reg. 15258 (March 21, 2011).

## V. Conclusion

NAFO strongly supports EPA's reconsideration of the appropriate treatment of biomass combustion, and its decision to defer permitting requirements for carbon dioxide emissions from this combustion for the next three years. NAFO strongly urges EPA to strengthen its proposal by removing the automatic reversion after three years, and replacing it with an enforceable commitment that would ensure the Agency conducts a full reconsideration. NAFO looks forward to continuing its work with EPA to meet the nation's environmental, economic, and energy independence goals.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'D. Tenny', with a long horizontal flourish extending to the right.

David P. Tenny  
President and CEO  
National Alliance of Forest Owners

# **Exhibit B**



National Alliance of Forest Owners  
*Investing in the Future of America's Forests*

September 13, 2010

Submitted via [www.regulations.gov](http://www.regulations.gov) and mail

EPA Docket Center

Mail code 2822T

1200 Pennsylvania Avenue, N.W.

Washington, D.C. 20460

Attention: Docket EPA-HQ-OAR-2010-0560

**Re: Call for Information: Information on Greenhouse Gas Emissions  
Associated With Bioenergy and Other Biogenic Sources;  
75 Fed. Reg. 41173 (July 15, 2010)**

To Whom It May Concern:

The National Alliance of Forest Owners (NAFO) respectfully submits the following comments in response to the Environmental Protection Agency's (EPA's) call for information on greenhouse gas (GHG) emissions associated with bioenergy and other biogenic sources. 75 Fed. Reg. 41173 (July 15, 2010).

NAFO's mission is to protect and enhance the economic and environmental values of private forests through targeted policy advocacy at the national level. At the time of this submission, NAFO's members represent 75 million acres of private forests in 47 states. NAFO was incorporated in March 2008 and has been working aggressively since to sustain the ecological, economic, and social values of forests and to assure an abundance of healthy and productive forest resources for present and future generations. NAFO is a solutions-oriented organization and is prepared to answer any questions EPA has regarding biomass combustion and the lifecycle of forest biomass and to assist the agency in developing a long-term policy that helps achieve the nation's renewable energy and climate change objectives.

In recent years the United States has aggressively sought to reduce its overall energy carbon footprint. The role of forests in supplying renewable feedstock to the ongoing transition to cleaner fuels and energy is of paramount importance and beyond dispute. Unfortunately, recent EPA decisions would—for the first time in any jurisdiction in the world—treat the greenhouse gas profile of renewable forest biomass identical to fossil fuels. While we strongly support fair and ongoing discussion regarding the greenhouse gas impacts of all fuels and energy, this departure from established policy needs to be undone at the earliest opportunity.

The results of well-established life cycle analyses (LCAs) demonstrate that biomass energy provides more than merely a favorable GHG profile when compared to energy produced from the combustion of fossil fuels. Net fluxes of biomass carbon to the atmosphere from the combustion of biomass in the United States are, at a minimum, “carbon neutral” in that any GHG emissions associated with the combustion of biomass are diminished by the significant role domestic forests play as the nation’s leading carbon sink. These results, combined with the fact that domestic forest carbon stocks are increasing, fully justify a regulatory distinction between bioenergy and conventional fuels. To count the GHG emissions from biomass on par with coal and other conventional fuels is a sudden and significant departure from the established treatment of biomass emissions that may fundamentally frustrate the renewable energy and low carbon policies established by both Congress and this Administration.

The Clean Air Act (CAA) permitting programs are an inappropriate regulatory mechanism for the government to address biomass emissions. However, to the extent that EPA were to address biomass emissions in these programs, it should assign biomass emissions a net emissions factor of zero because there is a neutral carbon impact of combusting forest biomass for energy.

Finally, while NAFO supports gathering information on the carbon impact of all energy sources, EPA must pursue such inquiry in a manner that will avoid irreparable harm to the nation’s renewable energy industry and the customers who rely upon it. To that end, NAFO urges EPA to grant its Petition for Reconsideration of the final Prevention of Significant Deterioration (PSD) and Title V Greenhouse Gas Tailoring Rule (Tailoring Rule) while it considers the responses to the Call for Information and any subsequent actions.

We submit the information below to further the Agency’s understanding of this issue. Given the limited comment period provided on EPA’s call for information, these comments are an initial response. NAFO will supplement its comments with further information as it becomes available.

**I. While Pursuing The Call For Information, EPA Must Restore The Long Established Policy That Carbon Dioxide Emissions From The Combustion Of Biomass Do Not Increase Atmospheric Carbon.**

EPA’s recent Tailoring Rule is a sudden and unsupportable reversal of the government’s precedent and policy regarding biomass emissions. See 75 Fed. Reg. 31,514 (Jun. 3, 2010). As described further below, there is no debate that when most

fuels are burned for energy, they emit carbon dioxide (CO<sub>2</sub>). Yet, regarding biomass, it is equally well established that carbon emitted in the combustion of forest biomass—unlike conventional fossil fuels—comes from CO<sub>2</sub> that was recently sequestered from the air by the forest, thus resulting in a “carbon neutral” cycle. This is the principal reason why governments—both in the United States and globally—historically have not counted emissions of carbon dioxide from combustion of biomass when estimating carbon dioxide emissions. EPA in the final Tailoring Rule to our knowledge became the first government body to depart from this established position, and without any prior fair notice to the public. EPA must restore the status quo as it examines this issue closer to avoid real and irreparable harm to the nation’s forest and renewable energy industry in the interim.

**A. The United States has consistently excluded CO<sub>2</sub> from combustion of biomass when assessing CO<sub>2</sub> emissions.**

EPA, along with other credible domestic and international organizations, has historically recognized and affirmed carbon neutrality in reporting and other contexts. Indeed, biomass CO<sub>2</sub> neutrality has been the foundation of American policy. As the EPA previously has concluded, there is “[s]cientific consensus . . . that the CO<sub>2</sub> emitted from burning biomass will not increase total atmospheric CO<sub>2</sub> if this consumption is done on a sustainable basis.”<sup>1</sup> Consistent with this conclusion, in its most recent GHG inventory, EPA did not include emissions from the combustion of wood biomass in its national emissions totals because it “assumed that the carbon . . . released during the consumption of biomass is recycled as U.S. forests and crops regenerate, causing no net addition of CO<sub>2</sub> to the atmosphere. The net impacts of land-use and forestry activities on the [carbon] cycle are accounted for separately within the Land Use, Land-Use Change, and Forestry chapter.”<sup>2</sup> In its Climate Leaders program, EPA also does not count biomass CO<sub>2</sub> emissions toward participants’ progress toward the program’s targets in recognition of the neutrality of the biogenic carbon cycle. Specifically, EPA’s guidance states that “biomass CO<sub>2</sub> emissions are not included in the overall CO<sub>2</sub>-

---

<sup>1</sup>Environmental Protection Agency Combined Heat and Power Partnership, *Biomass Combined Heat and Power Catalog of Technologies*, at 96 (Sept. 2007), available at [www.epa.gov/chp/documents/biomass\\_chp\\_catalog.pdf](http://www.epa.gov/chp/documents/biomass_chp_catalog.pdf).

<sup>2</sup> EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008* at 3-10 (April 15, 2010) (EPA 2010 Inventory), available at [http://www.epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010\\_Report.pdf](http://www.epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010_Report.pdf).

equivalent emissions inventory used to track Partners' progress towards their Climate Leaders reduction goal. This is because it is assumed that combustion of biofuels do not contribute to net addition of CO<sub>2</sub> to the atmosphere."<sup>3</sup> Similarly, the Department of Energy's (DOE's) Voluntary Reporting of Greenhouse Gases Program, authorized by Section 1605(b) of the Energy Policy Act of 1992, provides for exclusion of combustion of biomass fuels.<sup>4</sup>

Notably, the government's recent *Draft Federal Greenhouse Gas Accounting and Reporting Guidance*, issued by the Council on Environmental Quality (CEQ), makes clear that biogenic emissions are not subject to agency reduction targets. As part of its rationale, CEQ states that "[t]he CO<sub>2</sub> from biogenic sources is assumed to be naturally 'recycled,' since the carbon in the biofuel was in the atmosphere before the plant was grown and would have been released normally through decomposition after the plant died." See 75 Fed. Reg. 41452 (July 16, 2010). The conclusion that "biogenic" carbon cycle releases no new carbon dioxide into the atmosphere was also recently emphasized by more than 100 scientists in a letter sent to U.S. Senate and House leaders. The letter states, in part, that "carbon dioxide released from the combustion or decay of woody biomass is part of the global cycle of biogenic carbon and does not increase the amount of carbon in circulation."<sup>5</sup>

The international GHG accounting methods developed by the United Nation's Intergovernmental Panel on Climate Change also recognize that biogenic carbon is inherently part of the natural carbon balance and will not add to atmospheric concentrations of carbon dioxide as long as land-based carbon stocks remain stable.<sup>6</sup>

---

<sup>3</sup> EPA, *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance: Direct Emissions from Stationary Combustion Sources*, at 3, EPA430-K-08-003 (May 2008).

<sup>4</sup> See DOE, *Technical Guidelines: Voluntary Reporting of Greenhouse Gases (1605(b)) Program* (January 2007) at 77 ("Reporters that operate vehicles using pure biofuels within their entity should not add the carbon dioxide emissions from those fuels to their inventory of mobile source emissions because such emissions are considered biogenic and the recycling of the carbon is not credited elsewhere.").

<sup>5</sup> Letters from 113 Scientists (Lippke, B. et al.) to Sen. Boxer, et al. and Rep. Waxman, et al. (July 20, 2010) (enclosed as Attachment 1).

<sup>6</sup> See *IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Institute for Global Environmental Strategies, Hayama, Kanagawa, Japan: IPCC National Greenhouse Gas Inventories Programme (2006).

Similarly, the European Union directive on carbon trading specifies that biomass is considered to be carbon neutral.<sup>7</sup>

Therefore, a unified consensus exists that treating combustion of biomass as carbon neutral is scientifically sound where carbon stocks are stable or increasing, as they are in the United States. As described further below, because production and combustion of fuels derived from biomass does not increase atmospheric carbon dioxide levels, the greenhouse gases emitted in combustion of such fuels should be excluded from greenhouse gas regulations.

**B. The Tailoring Rule's treatment of carbon emissions from biomass combustion departs from established principles without notice or justification and the status quo must be restored as the agency considers further action.**

In a stark reversal of established policy and with no advance notice to the public, EPA issued its Tailoring Rule, which for the first time would count CO<sub>2</sub> emissions from combustion of biomass toward the rule's applicability thresholds for the PSD and Title V permitting programs of the CAA. See 75 Fed. Reg. 31,514 (Jun. 3, 2010).

The Tailoring Rule is not only contrary to established U.S. and international precedent and policy, it is also a reversal of the *proposed* Tailoring Rule. 74 Fed. Reg. 55292 (Oct. 27, 2009). EPA proposed methodology that would not count carbon dioxide emissions from combustion of biomass when assessing emissions under the Clean Air Act permitting programs. See 74 Fed. Reg. at 55351-52 (basing carbon dioxide equivalent calculation on EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks). In the preamble to the final rule, EPA misconstrued comments by NAFO and others and declared for the first time that it would instead count CO<sub>2</sub> emissions from the combustion of biomass toward the PSD and Title V thresholds.

On July 30, 2010, NAFO petitioned EPA to reconsider and stay the implementation of the Tailoring Rule. As explained in that petition, EPA's final Tailoring Rule is arbitrary and capricious for two reasons. First, EPA has not offered a reasoned explanation for reversing the position it took in the proposed Tailoring Rule, for ignoring

---

<sup>7</sup> Commission Decision of 29 January 2004 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, at Section 4.2.2.1.6, available at [http://eur-lex.europa.eu/pri/en/oj/dat/2004/l\\_059/l\\_05920040226en00010074.pdf](http://eur-lex.europa.eu/pri/en/oj/dat/2004/l_059/l_05920040226en00010074.pdf).

NAFO's comments that it should maintain that position, or for rejecting the past practice of EPA and other federal agencies regarding CO<sub>2</sub> emissions from the combustion of biomass. Second, EPA's unexpected change-of-course in the final Tailoring Rule is not a logical outgrowth of its proposed Tailoring Rule and thus is a violation of the Administrative Procedure Act. NAFO has also petitioned for review of the rule in the United States Court of Appeals for the District of Columbia Circuit. See *NAFO et al., v. EPA*, D.C. Cir. Case No. 10-1209 (filed Aug. 2, 2010).

EPA must follow the proper procedures before instituting wholesale changes as it did in the final Tailoring Rule. Indeed, although EPA acknowledges that the "Call for Information serves as a *first step* for EPA in considering options for addressing emissions of biogenic CO<sub>2</sub> under the PSD and Title V programs," 75 Fed. Reg. at 41174 (emphasis added), the Tailoring Rule has already reversed long-standing precedent and established CAA requirements for biogenic CO<sub>2</sub>, without waiting for the results of this inquiry. As NAFO has urged in its petition to EPA, the agency should reconsider the Tailoring Rule and stay the final rule pending that reconsideration. NAFO reiterates that request here.

## **II. The Carbon Neutrality Of Biomass Combustion Is Well Documented In Science And Policy.**

### **A. Increasing carbon stocks in the United States establish the carbon neutrality of forest biomass.**

Forests reduce the overall GHG concentrations in the atmosphere by sequestering carbon.<sup>8</sup> The process of sequestration and storage is a natural by-product of tree growth. Through photosynthesis, trees remove, or sequester, carbon from the atmosphere, and store it in their biomass. That carbon remains stored even if the tree is used to make much needed wood products, such as homes or furniture. The amount of atmospheric carbon transformed into forest biomass has been estimated at 25 to 30 billion metric tons per year.<sup>9</sup>

---

<sup>8</sup> See generally Heath, L., V. Maltby, R. Miner, K. Skog, J. Smith, J. Unwin, and B. Upton, *Greenhouse gas and carbon profile of the US forest products industry value chain*, Environmental Science and Technology. 44: 3999-4005 (2010).

<sup>9</sup> Field, C.B., *Primary production for the biosphere: integrating terrestrial and oceanic components*, Science, 281: 237 (1998); Sabine, C.L., Heimann, M., Artaxo, P., Bakker, D.C.E., Chen, C.T.A., Field, C.B., Gruber, N., Le Quéré, C., Prinn, R., Richey, J.E., Lankao, P.R., Sathaye, J.A. and Valentini, R.,

Through sequestration, forests in the United States, nearly 60 percent of which are privately owned,<sup>10</sup> serve as the most significant natural terrestrial sink of greenhouse gases. U.S forests capture about 10%-15% of annual U.S. greenhouse gas emissions through photosynthesis and store it in the forest and in wood products.<sup>11</sup> Notably, private forests in the United States, which supply over 90% of the wood used by the industry, are also a net sink; carbon stocks on private forests are growing at a rate equivalent to removing 131 million metric tons of CO<sub>2</sub> from the atmosphere per year.<sup>12</sup> EPA's most recent Inventory of U.S. Greenhouse Gas Emissions and Sinks found that changes in carbon stocks in U.S. forests and harvested wood were estimated to account for net sequestration of 792 million metric tons of carbon dioxide equivalents in 2008. EPA 2010 Inventory, *supra* at n. 2, at 7-13.

EPA explained that "improved forest management practices, the regeneration of previously cleared forest areas, and timber harvesting and use have resulted in net uptake (i.e., net sequestration) of [carbon] each year from 1990 through 2008." *Id.* In fact, the 2010 Inventory shows that "[n]et CO<sub>2</sub> flux from Land Use, Land-Use Change, and Forestry increased by 30.9 Tg CO<sub>2</sub> Eq. (3 percent) from 1990 through 2008. This increase was primarily due to an increase in the rate of net carbon accumulation in

---

*Current status and past trends of the carbon cycle*, In C.B. Field & M.R. Raupach, *The global carbon cycle: integrating humans, climate, and the natural world*, at 17–44, Washington, DC, USA, Island Press (2004).

<sup>10</sup> See Society of American Foresters, *The State of America's Forests* at 9 (2007), available at <http://www.sfpa.org/Environmental/StateOfAmericasForests.pdf>. "The largest carbon sink in North America (270 Mt C per year) is associated with forests." U.S. Climate Change Science Program and the Subcommittee on Global Change Research, National Oceanic and Atmospheric Administration, *The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle* (King, A.W., L. Dilling, G.P. Zimmerman, D.M. Fairman, R.A. Houghton, G. Marland, A.Z. Rose, and T.J. Wilbanks (eds.) 2007).

<sup>11</sup> Carbon sequestration in forests, trees in urban areas, agricultural soils, and landfilled yard trimmings and food scraps, offset 14.9 percent of total emissions in 2007 and 13.5 percent of total emissions in 2008. See U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007* at ES-4 (Apr. 15, 2009) (EPA 2009 Inventory), available at [http://www.epa.gov/climatechange/emissions/downloads09/GHG2007entire\\_report-508.pdf](http://www.epa.gov/climatechange/emissions/downloads09/GHG2007entire_report-508.pdf); EPA 2010 Inventory at ES-6, 7-13.

<sup>12</sup> See Haynes, R. W., *The 2005 RPA timber assessment update*, Gen. Tech. Rep. PNW-GTR-699, USDA Forest Service, Pacific Northwest Research Station (2007); Heath, L. V., *Greenhouse Gas and Carbon Profile of the U.S. Forest Products Industry Value Chain*, Environmental Science and Technology (2010).

forest carbon stocks, particularly in aboveground and belowground tree biomass, and harvested wood pools.” *Id.* at ES-9; *see also id.* at Figure 7-3 (enclosed as Attachment 2). In addition, “[b]ecause most of the timber harvested from U.S. forests is used in wood products, and many discarded wood products are disposed of in [solid waste disposal sites] rather than by incineration, significant quantities of [carbon] in harvested wood are transferred to long-term storage pools rather than being released rapidly to the atmosphere.” *Id.* at ES-9, *see also id.* at E-12 to E-13. EPA estimates and research on private forestlands have demonstrated the benefits of storing carbon in forest products.<sup>13</sup> Work by the Consortium for Research on Renewable Industrial Materials has also documented how managed forests can produce sustained, overall net GHG emission reductions when carbon is stored in enduring harvested wood products and/or when harvested wood products are substituted for products with higher energy/carbon footprints.<sup>14</sup> As explained below, EPA research and other studies have recognized that the use of biomass as an energy source can reduce overall GHG emissions.

Sequestration also comes from net forest growth. EPA found that “on average the volume of annual net growth nationwide is about 32 percent higher than the volume of annual removals.” EPA 2010 Inventory, *supra* at n. 2, at 7-13.

For these reasons, and as explained further in Section III.A below, carbon stocks are increasing in the United States, reinforcing that the combustion of forest biomass is carbon neutral. In this manner, biofuels from forest biomass are fundamentally different from conventional fuels. Once coal, natural gas, or oil is extracted and combusted, it cannot be replaced. In contrast, the forest management practiced by the United States forest products industry ensures that there is no temporal imbalance between biogenic CO<sub>2</sub> emissions and CO<sub>2</sub> sequestration and thus no effect on the atmospheric GHG inventory. Indeed, as EPA is aware, carbon stocks in United States forests have been, and continue to, increase. EPA 2010 Inventory, *supra* at n. 2. Thus, the generation of bioenergy from forest biomass is truly carbon neutral.

The remainder of this Section reviews scientific studies that show that the combustion of forest biomass has zero net emissions and reviews the benefits of

---

<sup>13</sup> See NAFO, Carbon Mitigation Benefits of Working Forests, *available at* <http://nafoalliance.org/mitigation-benefits-working-forests/>.

<sup>14</sup> See, e.g., Lippke, B., et al., CORRIM: Life-Cycle Environmental Performance of Renewable Building Materials, 54 Forest Prod. J. 8 (2004).

switching from fossil fuel to biomass as demonstrated by numerous LCA studies. Finally, it explains the flaws in certain studies that question the benefits of biomass-derived fuels as compared to fossil fuels.

**B. Scientific studies reinforce that the combustion of forest biomass is “carbon neutral.”**

The prevailing view in the science community is that carbon emissions from forest biomass are offset by the prior absorption of carbon through photosynthesis that created the biomass and, as such, the return of the carbon to the atmosphere will have a neutral effect on atmospheric carbon. In other words, the carbon that enters the atmosphere when forest biomass is combusted was previously absorbed from the atmosphere by the forest biomass. As the cycle is repeated, additional CO<sub>2</sub> will be absorbed when new biomass is grown.<sup>15</sup> As such, where forest biomass is being supplied while maintaining forest carbon stocks over the supply area, the net transfers of biogenic carbon to the atmosphere are “zero” at worst, and may be negative if some of the harvested carbon is being stored in long-lived products. The scientific basis for these conclusions is the biogenic carbon cycle.

This biogenic carbon cycle forms the basis for using a zero emission factor at the point of combustion for biomass-derived fuels (Robinson et al. 2003; Cherubini et al. 2009; Lattimore et al. 2009; Abbasi and Abbasi 2010; Cherubini 2010),<sup>16</sup> and represents

---

<sup>15</sup> See, e.g., Miner, R., National Council for Air and Stream Improvement, *Biomass Carbon Neutrality* (Apr. 15, 2010), available at <http://nafoalliance.org/wp-content/uploads/NCASI-Biomass-carbon-neutrality.pdf>.

<sup>16</sup> Robinson, A.L., Rhodes, J.S., and Keith, D.W., *Assessment of potential carbon dioxide reductions due to biomass – Coal cofiring in the United States*, *Environmental Science and Technology* 37(22):5081-5089; doi:10.1021/es034367q (2003); Cherubini, F., Bird, N.D., Cowie, A., Jungmeier, G., Schlamadinger, B., and Woess-Gallasch, S., *Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: Key issues, ranges and recommendations*, *Resources, Conservation and Recycling* 53:434-447; doi:10.1016/j.resconrec.2009.03.013 (2009); Lattimore, B., Smith, C.T., Titus, B.D., Stupak, I., and Egnell, G., *Environmental factors in woodfuel production: Opportunities, risks, and criteria and indicators for sustainable practices*, *Biomass and Energy* 33:1321-1342; doi:10.1016/j.biombioe.2009.06.005 (2009); Abbasi, T., and Abbasi, S.A., *Biomass energy and the environmental impacts associated with its production and utilization*, *Renewable and Sustainable Energy Reviews* 14:919-937; doi:10.1016/j.rser.2009.11.006 (2010); Cherubini, F., *GHG balances of bioenergy systems – Overview of key steps in the production chain and methodological concerns*, *Renewable Energy* 35:1565-1573; doi:10.1016/j.renene.2009.11.035 (2010).

an accepted benefit of using biomass-derived fuels rather than fossil fuels (Schlamadinger et al. 1997; Abbasi and Abbasi 2010; Froese et al. 2010).<sup>17</sup>

For example, Cherubini (2010)<sup>18</sup> advocates a zero CO<sub>2</sub> emission factor for biomass combustion and thus supports a conclusion that the biogenic carbon cycle is carbon neutral. The author states that “[w]hen biomass is combusted the resulting CO<sub>2</sub> is not accounted for as a GHG because C has a biological origin and combustion of biomass releases almost the same amount of CO<sub>2</sub> as was captured by the plant during its growth.” The article describes a LCA methodology to compare biomass energy to fossil fuel energy, noting that “almost all studies reveal that consistent GHG emission savings are achieved when electricity and heat from biomass displace electricity and heat produced from fossil sources.”

Gower (2003)<sup>19</sup> also supports the conclusion that carbon cycle from the combustion of forest biomass is neutral. That peer-reviewed journal article states: “The CO<sub>2</sub> emitted when wood and paper waste is burned is equivalent to the atmospheric CO<sub>2</sub> that was sequestered by the tree during growth and transformed into organic carbon compounds; hence there is no net contribution to the atmospheric CO<sub>2</sub> concentration, and the material is considered to be C neutral.”

Thus, where forest biomass is obtained without depleting carbon stocks across the supply area, these studies and other published research clearly shows large GHG benefits of using forest biomass for energy as compared to fossil fuels.

---

<sup>17</sup> Schlamadinger, B., Apps, M., Bohlin, F., Gustavsson, L., Jungmeier, G., Marland, G., Pingoud, K., and Savolainen, I., *Towards a standard methodology for greenhouse gas balances of bioenergy systems in comparison with fossil energy systems*, Biomass and Bioenergy 13(6):359-375 (1997); Abbasi, T., and Abbasi, S.A., *Biomass energy and the environmental impacts associated with its production and utilization*, Renewable and Sustainable Energy Reviews 14:919-937; doi:10.1016/j.rser.2009.11.006p (2010); Froese, R.E., Shonnard, D.R., Miller, C.A., Koers, K.P., and Johnson, D.M., *An evaluation of greenhouse gas mitigation options for coal-fired power plants in the U.S. Great Lakes States*, Biomass and Bioenergy 34:251-262; doi:10.1016/j.biombioe.2009.10.013 (2010).

<sup>18</sup> Cherubini, F., *GHG balances of bioenergy systems – Overview of key steps in the production chain and methodological concerns*, Renewable Energy 35:1565-1573; doi:10.1016/j.renene.2009.11.035 (2010).

<sup>19</sup> Gower, S., *Patterns and mechanisms of the forest carbon cycle*. Annual Review of Environment and Resources 28:169-204 (2003).

**C. Lifecycle analysis (LCA) affirms that forest biomass as a fuel source leads to lower GHG lifecycle emissions than conventional fuels.**

Wood from forests with stable or increasing carbon stocks also provides a renewable, low-carbon energy source as an alternative to fossil fuels. According to U.S. Energy Information Administration (EIA) data, biomass already supplies over 50% of the nation's renewable energy.<sup>20</sup> Forests can provide ample, sustainable, domestic supplies of biomass to produce liquid transportation fuels, electricity, thermal energy (heat and power for manufacturing and other industrial uses), and synthetic natural gas.<sup>21</sup>

Using forest biomass as a renewable fuel source has significant carbon benefits because it has a more favorable lifecycle analysis than petroleum and other fuels. The DOE has estimated that “[c]ellulosic ethanol use could reduce GHGs by as much as 86%.”<sup>22</sup> EPA, in its final rulemaking adopting changes to the Renewable Fuel Standard Program, also recognized the GHG emissions reductions of greater than 60% that would result from the use of cellulosic biofuels compared to petroleum. See 75 Fed. Reg. 14,670 (March 26, 2010). Using the “displacement index” approach, EPA determined that every BTU of gasoline replaced by cellulosic ethanol will produce lifecycle GHG emission reductions of 92.7 percent.<sup>23</sup>

In evaluating the GHG emissions associated with fuels, a lifecycle analysis incorporates all steps in a “product system” to evaluate broader environmental impacts of products and processes. Internationally-accepted LCA standards inherently recognize the unique attributes of carbon in biomass fuels by extending the accounting boundaries upstream to the point where “elementary flows” of CO<sub>2</sub> are removed from

---

<sup>20</sup> See EIA, U. S. Energy Consumption by Energy Source (July 2009), *available at* [http://www.eia.doe.gov/cneaf/alternate/page/renew\\_energy\\_consump/table1.html](http://www.eia.doe.gov/cneaf/alternate/page/renew_energy_consump/table1.html).

<sup>21</sup> See NAFO, Carbon Neutrality of Energy from Forest Biomass, *available at* <http://nafoalliance.org/carbon-neutrality-of-energy-from-forest-biomass/>.

<sup>22</sup> See DOE, Ethanol Benefits, *available at* <http://www.afdc.energy.gov/afdc/ethanol/benefits.html>.

<sup>23</sup> See EPA, EPA420-D-06-008, *Renewable Fuel Standard Program: Draft Regulatory Impact Analysis* at 191 (September 2006).

the atmosphere.<sup>24</sup> Because biomass carbon accounting in a LCA begins with the uptake of CO<sub>2</sub> from the atmosphere,<sup>25</sup> the return flows to the atmosphere result in a net zero flux to the atmosphere, equivalent to using a zero emission factor for biogenic CO<sub>2</sub> emissions. Where the returns to the atmosphere are less than the amounts removed, the difference represents increases in stocks of stored carbon (net removals from the atmosphere). In cases where stocks of stored biomass carbon are depleted by land use change, these impacts should be included in the analysis but are addressed separately from the accounting of the carbon in the fuel itself.<sup>26</sup>

**D. Recent LCAs show that energy derived from biomass has a GHG mitigation benefit when compared to energy derived from fossil fuels.**

Recent LCAs of forest biomass energy systems overwhelmingly have demonstrated significant GHG mitigation benefits compared to energy derived from fossil fuels. As explained above, because the carbon in biomass was only recently removed from the atmosphere, returning the carbon to the atmosphere as biogenic CO<sub>2</sub> merely completes a cycle – a cycle that has a net zero impact on the atmosphere as long as it remains in balance. In contrast, transfers of fossil fuel carbon to the atmosphere always result in net increase in atmospheric carbon because these transfers are one-way, not part of a cycle.<sup>27</sup> In this section, NAFO summarizes recent LCAs that demonstrate bioenergy has a more favorably environmental profile than fossil fuel energy. This summary is drawn from the following memorandum, which is included as Attachment 3 to this letter: Upton, B., National Council for Air and Stream Improvement, Inc., Memo to Reid Miner, *Summary of Literature on Life Cycle Assessments (LCA) of Forest-Derived Biomass Energy* (Aug. 27, 2010).

---

<sup>24</sup> See *Environmental management - Life cycle assessment - Requirements and guidelines: International Standard ISO 14044*, Geneva: International Organization for Standardization (2006).

<sup>25</sup> In contrast, the LCA accounting for carbon in fossil fuels begins at the point of extraction of the fuel from the ground.

<sup>26</sup> See BSI, *Specification for the assessment of the life cycle greenhouse gas emissions of goods and services: PAS 2050:2008*, London: British Standards Institution (2008).

<sup>27</sup> See Cherubini, F. N.-G., *Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: Key issues, ranges and recommendations*, Resources, Conservation and Recycling at 434-47 (2009).

Froese et al. (2010)<sup>28</sup> used LCA to investigate several options to mitigate GHG emissions from electricity generation in the U.S. Great Lakes States region, and found cofiring forestry biomass residuals (with coal reference condition) to be the most attractive option and carbon capture and storage to be the least attractive option. These researchers found that cofiring 20% biomass resulted in a 20% life cycle GHG mitigation benefit. They also noted a large potential for biomass production from underutilized resources, with land resources not a limiting factor, and that additional biomass could be provided for fuel without replacing current commodities grown on cropland or jeopardizing the sustainability of forest resources.

Mann and Spath (2001)<sup>29</sup> conducted an LCA on cofiring wood residuals such as “timber stand improvement” residues, mill residues, urban wood, and other woody materials in a coal-fired power plant and found that cofiring biomass at 15% reduced life cycle GHG emissions by 18.4%. These authors attributed the greater reduction in GHG emissions than the rate of cofiring to avoided methane emissions associated with alternative end of life management for some of the residual feedstock components.

Robinson et al. (2003)<sup>30</sup> demonstrated that displacement of coal by biomass (forestry and agricultural residuals) resulted in a net reduction of carbon emissions “because biomass carbon is in the active carbon cycle and . . . does not accumulate in the atmosphere if the biomass is used sustainably.” These researchers found that “fossil energy resources equivalent to less than 5% of the energy content of the biomass are typically consumed in its cultivation and processing” and that “cofiring [biomass with coal] can achieve significant reductions in CO<sub>2</sub> emissions in the very near term (less than 5 years).”

---

<sup>28</sup> See Froese, R.E., Shonnard, D.R., Miller, C.A., Koers, K.P., and Johnson, D.M., *An evaluation of greenhouse gas mitigation options for coal-fired power plants in the U.S. Great Lakes States*, Biomass and Bioenergy 34:251-262; doi:10.1016/j.biombioe.2009.10.013 (2010).

<sup>29</sup> Mann, M.K., and Spath, P.L., *A life cycle assessment of biomass cofiring in a coal-fired power plant*, Clean Production Processes 3:81-91; doi:10.1007/s100980100109 (2001).

<sup>30</sup> Robinson, A.L., Rhodes, J.S., and Keith, D.W., *Assessment of potential carbon dioxide reductions due to biomass – Coal cofiring in the United States*, Environmental Science and Technology 37(22):5081-5089; doi:10.1021/es034367q (2003).

Pehnt (2006)<sup>31</sup> investigated the life cycle impacts of biomass combustion for heat and electricity generation and demonstrated that GHG emissions were extremely low compared with fossil fuel-fired systems. The biomass materials investigated were forest wood, short rotation forestry wood, and “waste wood.” Life cycle GHG emission reduction over an electricity base case ranged from 85 to 95%, and reductions for a heat generation base case ranged from 88 to 93%.

Cherubini et al. (2009)<sup>32</sup> applied LCA methodology to several biomass energy systems and found that for some biomass systems (e.g., forestry residuals to electricity or heat) the entire LCA GHG emissions from bioenergy were 90 to 95% lower than those from fossil fuel based systems.

Zhang et al. (2010)<sup>33</sup> demonstrated that using wood pellets for electricity generation reduced life cycle GHG emissions by 91% relative to a coal reference case and by 78% relative to a natural gas combined cycle (NGCC) reference case. These authors examined dedicated wood harvest for energy production in which land use carbon stock changes were assumed to be zero due to biomass regrowth during the time period of the analysis.

Raymer (2006)<sup>34</sup> found significant life cycle GHG mitigation benefits with several types of wood energy (fuel wood for domestic heating substituting for electricity from coal and from domestic heating oil, sawdust and bark used for drying sawn wood substituting for oil, pellets made from sawdust and chips and briquettes used for building heat substituting for oil, and demolition wood used for district heating substituting for oil). Life cycle reductions in GHG emissions ranged from 81 to 98%

---

<sup>31</sup> Pehnt, M., *Dynamic life cycle assessment (LCA) of renewable energy technologies*, Renewable Energy 31:55-71; doi:10.1016/j.renene.2005.03.002 (2006).

<sup>32</sup> Cherubini, F., Bird, N.D., Cowie, A., Jungmeier, G., Schlamadinger, B., and Woess-Gallasch, S., *Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: Key issues, ranges and recommendations*, Resources, Conservation and Recycling 53:434-447; doi:10.1016/j.resconrec.2009.03.013 (2009).

<sup>33</sup> Zhang, Y., McKechnie, J., Cormier, D., Lyng, R., Mabee, W., Ogino, A., and Maclean, H.L., *Life cycle emissions and cost of producing electricity from coal, natural gas, and wood pellets in Ontario, Canada*, Environmental Science and Technology 44(1):538-544; doi:10.1021/es902555a (2010).

<sup>34</sup> Raymer, A.K.P., *A comparison of avoided greenhouse gas emissions when using different kinds of wood energy*, Biomass and Bioenergy 30:605-617; doi:10.1016/j.biombioe.2006.01.009 (2006).

relative to fossil fuel alternatives. The greatest benefit was found for district heating using demolition wood (substituting for oil) and the least benefit corresponded to fuel wood for home heating (substituting for coal-derived electricity).

Heller et al. (2003, 2004)<sup>35</sup> described an LCA study of production of willow (short rotation woody biomass) and cofiring this biomass with coal to generate electricity. Results included that biomass production had a net energy ratio (biomass energy output divided by fossil energy input) of 55. These researchers found that the upstream energy consumed in growing, processing, and transporting biomass roughly balanced the reduced consumption from mining, processing, and transporting less coal. At a cofiring rate of 10% biomass the system's net global warming potential decreased by 9.9% relative to a baseline of 100% coal firing.

As illustrated by the studies cited above and summarized in the following Table 1,<sup>36</sup> life cycle analyses comparing fossil fuels to forest biomass grown on land where carbon stocks are stable typically illustrate significant GHG mitigation benefits:

---

<sup>35</sup> Heller, M.C., Keoleian, G.A., Mann, M.K., and Volk, T.A., *Life cycle energy and environmental benefits of generating electricity from willow biomass*, Renewable Energy 29:1023-1042; doi:10.1016/j.renene.2003.11.018 (2004); Heller, M.C., Keoleian, G.A., and Volk, T.A., *Life cycle assessment of a willow bioenergy cropping system*, Biomass and Bioenergy 25:147-165; doi:10.1016/S0961-9534(02)00190-3 (2003).

<sup>36</sup> The Upton Memorandum (Attachment 3 at 4) also notes two papers that discuss problems with biomass fuel systems' ability to mitigate GHG emissions. Wicke, B., Dornburg, V., Junginger, M., and Faaij, A., *Different palm oil production systems for energy purposes and their greenhouse gas implications*, Biomass and Bioenergy 32:1322-1337; doi:10.1016/j.biombioe.2008.04.001 (2008); Farrell, A.E., Plevin, R.J., Turner, B.T., Jones, A.D., O'Hare, M., and Kammen, D.M., *Ethanol can contribute to energy and environmental goal*, Science 311:506-508; doi:10.1126/science.1121416 (2006). These studies, however, have involved either (a) situations where the biomass was obtained under circumstances that significantly impacted forest carbon stocks (deforestation, e.g. Wicke et al. (2008)) or (b) situations where there are large GHG emissions related to production or processing of non-forest biomass feedstocks (for example, early-generation corn ethanol systems, e.g. Farrel et al. (2006)).

**Table 1.** GHG Mitigation Benefit Summary based on LCA Results

Study	Biofuel Type	Fossil Fuel Offset	GHG Mitigation <sup>a</sup>
Froese et al. 2010	Forestry residuals	Coal (cofiring) electricity	100%
Mann and Spath 2001	Wood residuals	Coal (cofiring) electricity	123% <sup>b</sup>
Robinson et al. 2003	Forestry and agriculture residuals	Coal (cofiring) electricity	~95%
Pehnt 2006	Forest wood, woody biomass energy crops, waste wood	Energy mix in Germany for electricity generation and home heating in 2010	85-95%
Cherubini et al. 2009	Forest residuals	Various fossil fuels used for heat and electricity production	70-98%
Zhang et al. 2010	Wood pellets	Electricity from coal	91%
	Wood pellets	Electricity from natural gas combined cycle	78%
Raymer 2006	Fuel wood, sawdust, wood pellets, demolition wood, briquettes, bark	Coal fired electricity, heating oil	81-98%
Heller et al. 2004	Short rotation willow	Coal (cofiring) electricity	99%

<sup>a</sup> percent from base case; for cofire situations the mitigation pertains to the cofire rate (e.g., if 10% fossil fuel is replaced by biomass and emissions decrease by 9%, mitigation of 90% is assigned)

<sup>b</sup> mitigation greater than 100% due to avoided end of life methane emissions

Therefore, LCAs show that using forest biomass fuels in place of fossil fuels in direct combustion applications can yield substantial reductions in greenhouse gas emissions provided that forest carbon stocks are stable.

**E. Recent studies questioning the benefits of biomass energy are flawed.**

Two recent and well-publicized papers have suggested that reliance on biomass-derived fuels is misplaced and that these fuels have small or no GHG benefits relative to fossil fuels. Since EPA referenced these papers in its Call for Information, we show below why they are an unreliable basis on which to change current government policy.

In the “Manomet study,” Walker et al. (2010)<sup>37</sup> produced modeling results that confirm biomass energy systems can help reduce GHG emissions when supported by sustainable forest management. However, the authors framed their analyses and conclusions in a way that casts doubt on the GHG mitigation benefits of biomass energy. The authors suggest that emissions are always greater in the near-term for biomass than for fossil fuels and that net reductions in GHG emissions attributable to bioenergy usually do not become apparent for many years. This “carbon debt” analysis is flawed, however, because it focuses only on emissions associated with stands of trees that are harvested in any given year and ignores sequestration associated with the vast majority of forested acres where the stands are not disturbed by harvesting and continue to grow in a given year.<sup>38</sup> Notably, it is the existence of the entire system (e.g., the long-term fuel supply), that is the basis for investing in the harvest in the first place.

Forest management produces tomorrow’s fuel today, removing CO<sub>2</sub> from the atmosphere that offsets the biogenic CO<sub>2</sub> emissions associated with the combustion of biomass removals on one part of the supply area. Indeed, the Manomet study itself showed that carbon stocks within the Massachusetts study area are increasing. By doing the accounting on one plot at a time, the system is improperly being defined as the plot rather than the complete energy supply system. Plot-level analyses are simply insufficient to estimate effects of forest management options on carbon stocks. In fact, active forest management can have a positive affect on carbon stocks.<sup>39</sup> The Manomet

---

<sup>37</sup> Walker, T., P. Cardellicchio, A. Colnes, J. Gunn, B. Kittler, B. Perschel, C. Recchia, and D. Saah., *Biomass Sustainability and Carbon Policy Study*, Manomet Center for Conservation Sciences, Brunswick, ME (2010).

<sup>38</sup> See Lucier, A., *NCASI Review of Manomet Biomass Study*, National Council for Air and Stream Improvement, Inc. (2010), available at <http://www.mass.gov/Eoeea/docs/doer/renewables/biomass/study-comments/lucier.pdf>.

<sup>39</sup> See, e.g., Nechodom, M. PhD, USDA Forest Service, Pacific Southwest Research Station, CEC-500-2009-080, *Biomass To Energy: Forest Management For Wildfire Reduction, Energy Production, And Other Benefits* at 77-83, Prepared for Public Interest Energy Research, California Energy Commission (January 2010) (showing transition from passive to active forest management can occur without creating a “carbon debt” as active management of forests in the study landscape would reduce carbon losses to wildfire), available at <http://www.energy.ca.gov/2009publications/CEC-500-2009-080/>; see also Zhang, J., Powers, R. and Skinner, C., *To Manage or Not to Manage: The Role of Silviculture in Sequestering Carbon in the Specter of Climate Change*, USDA Forest Service, Pacific Southwest Research Station (pending publication) (showing active forest management increased carbon sequestration and decreased fires-caused tree mortality).

study's model thus creates a false impression that forest carbon stocks are always depleted by harvesting and that carbon stock depletion is reversed only gradually as the harvested stands are re-grown.<sup>40</sup>

The study also set an arbitrary cut off for the repayment of the "carbon debt" at the year 2050. Yet another aspect of the Manomet study that renders its results questionable is its assumption that whole trees would be harvested for energy, even though some areas have a viable forest products industry and trees are often harvested for wood products first. Finally, in considering the value of the Manomet study, it is important to recognize that its findings have frequently been misconstrued by certain groups and in the press. In fact, to address press coverage that oversimplified the study's results, the Manomet study authors issued a statement of clarification: "One commonly used press headline has been 'wood worse than coal' for GHG emissions or for 'the environment.' *This is an inaccurate interpretation of our findings, which paint a much more complex picture.*"<sup>41</sup>

In the United States, the concept of "carbon debt" is not relevant; because forest carbon stocks are increasing, there is no "carbon debt" to repay. Moreover, in a hypothetical scenario involving a future decline in forest carbon stocks, it is not clear how the concept of "carbon debt" could be applied in a practical accounting system in the context of EPA's permitting programs. Any observed reductions in forest carbon stocks would have multiple causes and it would be problematic at best to attribute a specific fraction of the reductions to use of biomass for energy production at any particular facility or facilities.

---

<sup>40</sup> The understanding of the importance of time in carbon stock assessments goes back at least to the early 1990s. See, e.g., Marland, G. and S. Marland, "Should we store carbon in trees?" *Water, Air and Soil Pollution* (64), 1992: 181-195. As explained above, the analytical framework used in the Manomet study yields results that overstate the length of time needed to experience net benefits from using forest biomass fuels compared to fossil fuels because it improperly assumes that modeling harvested stands in isolation is equivalent to modeling forests comprising a diverse population of stands.

<sup>41</sup> See Statement from Manomet on the Biomass Study (June 21, 2010) (emphasis added), available at <http://www.manomet.org/sites/manomet.org/files/Manomet%20Statement%20062110b.pdf>.

Another recent study, Searchinger et. al. (2009),<sup>42</sup> raised important questions about the perverse incentives that can be created by carbon accounting systems used for biomass energy that fail to account for losses of forest carbon. The study suggests that the solution is to use an accounting system that treats biogenic CO<sub>2</sub> emissions and fossil fuel CO<sub>2</sub> emissions equally. The researchers identify two potential issues, neither of which are relevant to a national accounting in the United States.

First, the researchers observe that coverage of the carbon accounting system being used under the Kyoto Protocol is not comprehensive. Countries outside of the Protocol can harvest wood without accounting for the impacts and send the wood to countries inside of the Protocol where the wood can be burned as a substitute for fossil fuels, reducing fossil fuel CO<sub>2</sub> emissions. If the carbon accounting was comprehensive, including both the producing and consuming countries, this problem would not exist because the impacts of burning the biomass would be accounted for in the forest carbon accounting (as called for in IPCC national inventory guidelines). Because carbon accounting in the United States is comprehensive, including the forests that supply the biomass, this problem does not exist at the national scale.

Second, Searchinger et. al. makes the implicit assumption that carbon accounting is the best policy instrument for ensuring that forests are not overharvested, causing the forest carbon cycle to result in net emissions to the atmosphere. This is not the case. While carbon accounting is needed to select and track the effectiveness of policies, these policies can involve many different approaches to ensuring that the forest carbon cycle remains in balance. Indeed, in virtually all developed countries that have limits on CO<sub>2</sub> emissions, an emission factor of zero is used for biogenic CO<sub>2</sub> emissions and a range of national forest monitoring activities and public policies are in place that have the practical effect of ensuring that the emissions of biogenic CO<sub>2</sub> are matched by uptake.

---

<sup>42</sup> Searchinger, T., S. Hamburg, J. Melillo, W. Chameides, P. Havlik, D. Kammen, G. Likens, R. Lubowski, M. Obersteiner, M. Oppenheimer, G. Robertson, W. Schlesinger, and G. Tilman. *Fixing a critical climate accounting error*, Science, 326: 527-528 (2009).

### **III. National-Scale Accounting Approaches Are Appropriate For Assessing The Net Impact Of GHG Emissions From Biogenic Sources, Facilities, Fuels Or Practices.**

In its call for information, EPA asks for input on which accounting approach should be used. At the outset, while some accepted accounting approaches for biogenic carbon may vary depending on the objective of the specific analysis, they always differentiate biogenic carbon from fossil fuel carbon. As explained below, in the context of considering regulatory ramifications of biomass combustion in the United States, a national-scale accounting approach focused on maintaining forest carbon stocks nationwide is appropriate for important policy reasons. NAFO believes that the objective of keeping the forest biomass carbon cycle in balance can be achieved with a framework that recognizes zero emissions from biogenic CO<sub>2</sub> combustion while employing a range of tools to ensure that the use of biomass does not cause the forest carbon cycle to cause net emissions of carbon to the atmosphere.

#### **A. Determining net emissions from forest biomass combustion through national-scale forest carbon stocks accounting is appropriate.**

In the United States, data demonstrate that forest biomass is being used for a range of purposes while allowing forest carbon stocks to increase. The IPCC employs exactly such a national accounting approach as an appropriate basis for determining the net transfers of biogenic carbon to or from the atmosphere. Applying an IPCC derived national accounting method in the United States reveals that the situation is even more favorable than carbon neutral as forest stocks are increasing in the United States.

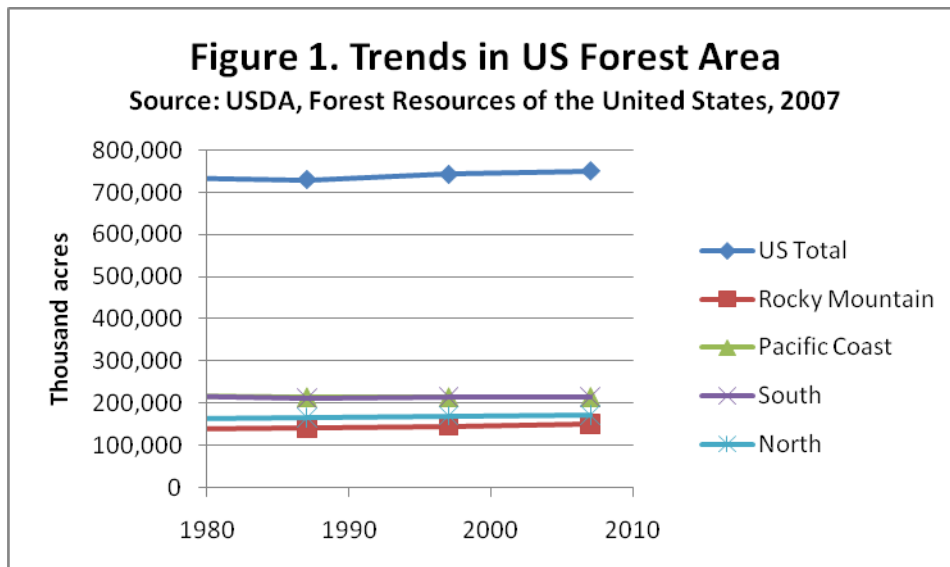
In the accounting for national inventories of greenhouse gases and sinks, IPCC guidelines account for releases of biogenic CO<sub>2</sub> from combustion through the accounting of forest carbon. Under the IPCC guidelines used by the United States to prepare greenhouse gas inventories, biogenic carbon emissions are not counted in the emissions inventory at the point of combustion but instead are counted in the calculations as equivalent stock changes. In this way, releases of combustion-related biogenic CO<sub>2</sub> are addressed in the context of the overall net fluxes of forest carbon to/from the atmosphere (reflecting both uptake and release).<sup>43</sup> As a result, combustion-

---

<sup>43</sup> See *IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Institute for Global Environmental Strategies, Hayama, Kanagawa, Japan: IPCC National Greenhouse Gas Inventories Programme (2006).

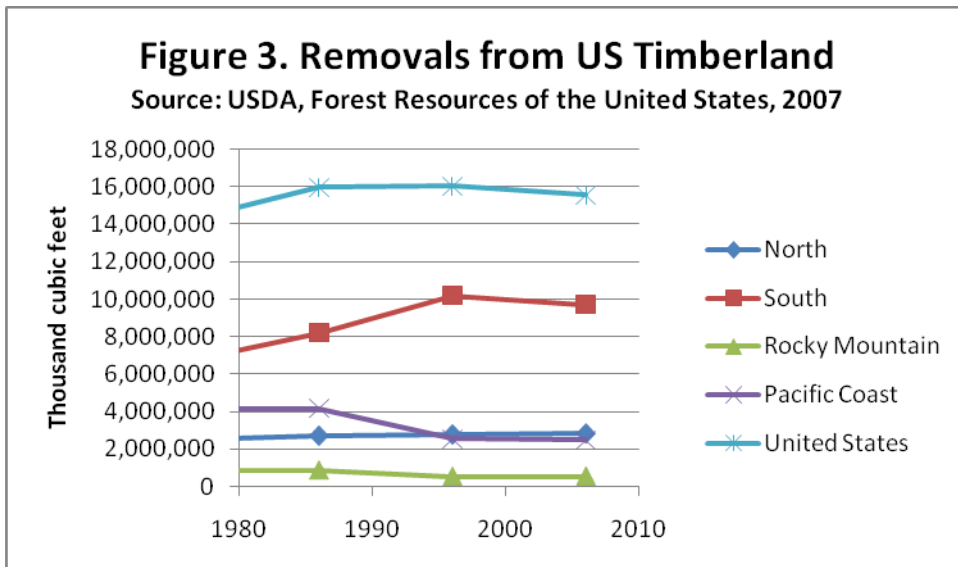
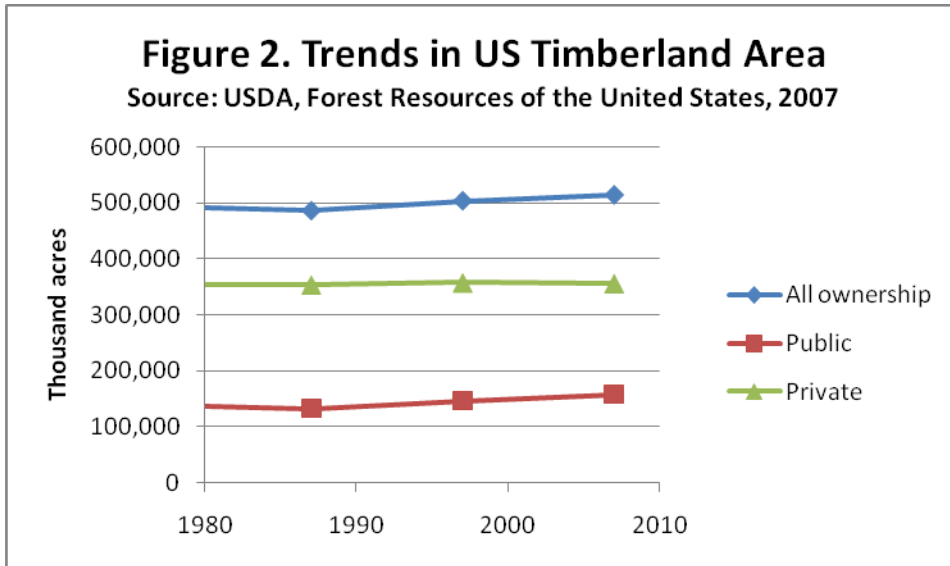
related emissions of biogenic carbon are not included in emissions totals since this would be double counting. The IPCC thus recognizes an emission factor of zero for biogenic CO<sub>2</sub> (i.e., biogenic CO<sub>2</sub> is not counted at the point of combustion) because biogenic CO<sub>2</sub> emissions are measured as carbon stock changes in the forest.

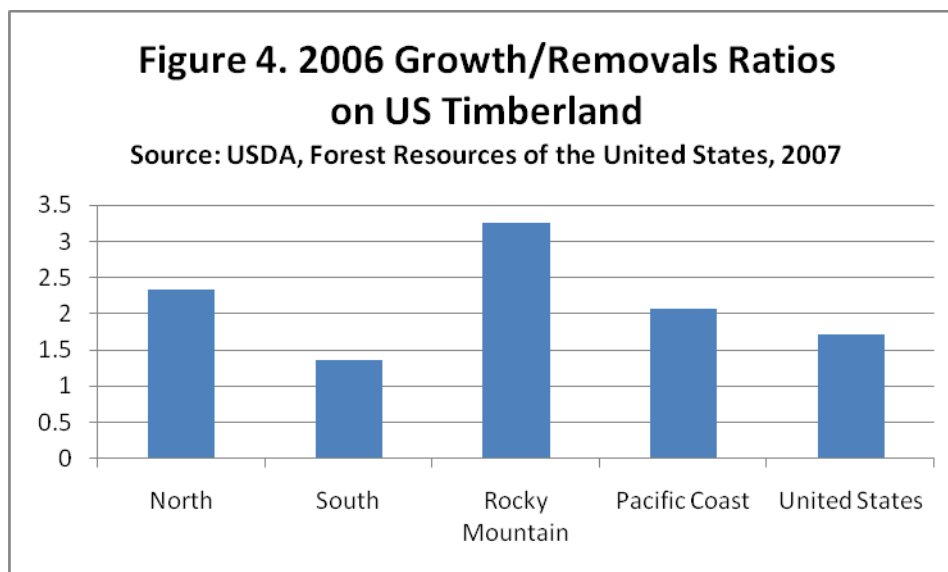
The situation in the United States is thus clear. As demonstrated by the Forest Inventory and Analysis (FIA) Program of the U.S. Forest Service, *see generally* <http://fia.fs.fed.us/>, carbon stocks in U.S. forests continue to grow, meaning that the flux of CO<sub>2</sub> into forest biomass is greater than the flux returning to the atmosphere due to respiration, decay and combustion. This better-than-neutral balance is not limited to public forests. See Section II.A *supra*. Moreover, the sustainability of current harvest and regeneration practices can be demonstrated using data from the USDA's 2007 report on "Forest Resources of the United States" (Smith 2007).<sup>44</sup> It is clear from Figures 1 and 2, below, that forested area, including the subset of forest that is classified as timberland, has been stable or growing slightly. Removals of wood from U.S. forests have also remained relatively stable since 1980 (see Figure 3.). Even in the South, which has experienced an increase in removals since 1980, the ratio of growth to removals was above 1.3 in 2006 (see Figure 4).



---

<sup>44</sup> Smith, W., P. Miles, C. Perry, S. Pugh, *Forest Resources of the United States, 2007 - General Technical Report WO-78*, U.S. Department of Agriculture, Forest Service (2007).





The available data on forest carbon stocks, forested land area and growth to removals, therefore suggest that additional wood could be removed from the nation's forests and the net flux of carbon to the atmosphere would still be better-than-neutral.

Notably, in international climate talks over the climate policy known as Reducing Emissions from Deforestation and Forest Degradation (REDD), the United States has endorsed a national-level accounting approach. It would be unfair to enforce a smaller-scale and more difficult accounting regime for forest landowners in the United States, where carbon stocks are increasing, than what the international community has accepted for countries where deforestation is an issue.

IPCC national guidelines work well at the national level because the accounting boundaries are clear. All forests within national boundaries are included. They also work well because the United States has invested considerable effort in developing a forest inventory system (the FIA program) that generates good quality data for use in the inventory calculations. As explained in the following section, these two circumstances do not often apply when examining smaller (sub-national) scales.

**B. Smaller-scale and alternative accounting approaches should not be used to determine the net impact of CO<sub>2</sub> associated with bioenergy.**

EPA has asked for input on the appropriate approach for assessing the net impact (i.e. accounting for both emissions and sequestration) on the atmosphere of GHG emissions from specific biogenic sources, facilities, fuels, or practice. As

explained above, NAFO recommends that a national-scale accounting approach be utilized. Smaller-scale and alternative accounting approaches are not appropriate.

Some may suggest using an inventory approach analogous to the IPCC accounting framework, described above, but applied to a sub-national area. Under such an approach, net fluxes of biogenic CO<sub>2</sub> would be determined by following forest carbon stocks, and biogenic CO<sub>2</sub> emissions from combustion would receive an emissions factor of zero. There are several reasons, however, that an IPCC-style approach should not be applied at a sub-national scale. At smaller scales, there are fewer FIA plots available to establish carbon stock estimates and thus there is higher uncertainty. The quality of estimates of carbon stocks decline and become more volatile as the geographic scale at which they are measured gets smaller. The impacts of factors beyond the control of an individual wood user (e.g., natural disturbances, other users, etc.) can have enormous impacts on the accounting results for individual users of wood. Attributing stock changes to these multiple factors is extremely complex, and essentially impossible in many cases. As such, it is extremely difficult to ascertain the significance of any short-term changes in carbon stocks. In the hypothetical situation where monitoring indicated a decline in carbon stocks for a particular sub-national area, it would be impossible to accurately assess whether the combustion of biomass by any facility or facilities was at all relevant to such a decline. Most likely, any decline would be attributable to multiple factors and would not warrant any regulatory response directed at any particular facility or facilities.

The problems would be especially acute if EPA were to attempt to apply the IPCC guidelines to individual combustion facilities. In all but the simplest situations, it is essentially impossible to trace the impacts of a combustion facility back to specific plots of land for which the facility has complete control and responsibility. This means that one must sort out the impacts attributable to one particular entity when there are likely multiple entities using wood from the same area, and also when there are natural factors that will impact carbon stocks. The forest products industry obtains approximately 60% of its wood from non-industrial private landowners.<sup>45</sup> These non-industrial landowners may sell to multiple companies or may sell to wood brokers who sell to multiple companies. Attributing forest carbon stock changes to specific land areas under such a complex wood procurement system is essentially impossible. In

---

<sup>45</sup> See Haynes, R. W., *The 2005 RPA timber assessment update*, Gen. Tech. Rep. PNW-GTR-699, USDA Forest Service, Pacific Northwest Research Station (2007).

addition, even if it were possible, the forest inventory systems used by companies for planning and scheduling harvests are usually not adequate for detailed carbon accounting, meaning that additional, and likely costly, monitoring would be required, especially on non-industrial timberland.

Using LCA to assess the impact of biogenic emissions from particular facilities or areas would also be severely flawed. While it is possible, via a site-specific LCA, to estimate the net impact on the atmosphere of GHG emissions from specific biogenic sources, this is not something that can be done on a routine basis. While comparative LCAs are useful in measuring the relative GHG emissions of energy technology options, LCA is not an appropriate tool for routine use in a site-specific analysis, such as a best available control technology determination. An LCA considers not only factors that are under the control of the facilities that combust biomass, but also other aspects of the carbon lifecycle that are entirely outside the control of such facilities.

Any attempt to use LCA as the method to evaluate the impacts of biogenic emissions from particular facilities would likely yield inconsistent results. The methods for including land use change impacts in LCA analyses have not yet been standardized.<sup>46</sup> The results of LCA analyses can be heavily influenced by the particular methods, assumptions, and procedures for establishing boundary conditions that are applied by the analyst. It would therefore be extremely difficult to consistently conduct LCAs on a facility-by-facility basis. The results of such LCAs would vary greatly based on the analyst's subjective and arbitrary judgments about what was considered within the scope of the LCA. For example, in an LCA of a wood-burning facility, there is no direct way to measure how that facility's activities affect carbon stocks, and the affect could vary by region. In addition, even if it were possible to trace biomass combustion back to specific impacts on carbon stocks, on a site-by-site basis, which it is not, a rational landowner would not likely incur the cost of doing so. Using forest biomass for energy is currently the lowest-value product from the forest. Such onerous requirements would likely cause forest landowners to look for more profitable uses of

---

<sup>46</sup> Standards are now being developed under the auspices of the International Organization for Standardization and the WRI/WBCSD GHG Protocol. The GHG Protocol standard is currently expected to be finalized by the end of 2010. See WRI, *Companies complete road testing of new global greenhouse gas accounting standards* (2010), available at <http://www.ghgprotocol.org/companies-complete-road-testing-of-new-global-greenhouse-gas-accounting-standards>.

their land than producing biomass for energy. It would also likely be prohibitively expensive to routinely conduct LCAs on a facility-by-facility basis.

Finally, the “carbon debt” approach could not be appropriately applied to a facility-level analysis of biogenic emissions. See *also* Section II.E. Even if carbon stocks were to hypothetically decline in the future, it would be impossible to connect any such “debt” to a particular facility or facilities. However, such an approach would be especially unnecessary here because the United States simply does not have a carbon debt. See Sections II.A & III.A.

In sum, if the objective is to characterize the actual net transfers of carbon to the atmosphere associated with a given entity or area, the carbon stock inventory approach is the correct analytical framework. As explained above, such an approach is most appropriately applied at the national level.

#### **IV. Recognizing The Carbon Neutrality Of Forest Biomass Combustion For Energy Is Essential To Realizing Our Nation’s Renewable Energy And Climate Change Objectives.**

As explained previously, forest biomass is an important renewable fuel source leading to lower GHG lifecycle emissions than conventional fuels. As such, forests play an important role in reducing and managing greenhouse gas emissions. President Obama has emphasized that renewable energy derived from feedstocks such as forest biomass holds the key to transitioning the nation to a “sustainable, low carbon energy future.”<sup>47</sup> The EPA, in considering approaches to address climate change, has also recognized that responsibly managed forests are considered one of five key “groups of strategies that could substantially reduce emissions between now and 2030.” See *Regulating Greenhouse Gas Emissions Under the CAA*, 73 Fed. Reg. 44,354, 44,405 (July 30, 2008). Similarly, the United Nation’s Intergovernmental Panel on Climate

---

<sup>47</sup> Letter from President Barack Obama to Governors John Hoeven and Chet Culver (May 27, 2009), available at <http://www.governorsbiofuelscoalition.org/assets/files/President%20Obama's%20Response5-27-09.pdf>; see also President Barack Obama, *Memorandum for the Secretary of Agriculture, the Secretary of Energy, and the Administrator of the Environmental Protection Agency*, 74 Fed. Reg. 21531-32 (May 5, 2009).

Change (IPCC) report on mitigation technologies highlights forest management as a primary tool to reduce GHG emissions. *Id.* at 44,405-06.<sup>48</sup>

As reflected in the chart in Attachment 4, EIA data demonstrate the importance of biomass energy to the overall renewable energy portfolio. Under a Renewable Electricity Standard, wood and other biomass are projected to account for about one-third of all renewable energy combusted in the United States. See Att. 4. Biomass is also distinct from other types of renewable energy in ways that make it particularly valuable as an energy source. For instance, biomass “is unique among renewable energy resources in that it can be converted to carbon-based fuels and chemicals, in addition to electric power.”<sup>49</sup> Because biomass can be converted into liquid fuels, it can help reduce the United States’ dependence on imported oil.

Some other types of renewable energy, such as solar and wind power, “have variable and uncertain (sometimes referred to as intermittent) output.”<sup>50</sup> In contrast, biomass power is “dispatchable.” In other words, utilities can count on biomass power being available when it is needed. As the Biomass Power Association has explained, because biomass is not affected by changes in weather or environmental conditions, it is an extremely reliable renewable energy source: “The reliability of biomass power allows local utility companies to easily and efficiently add biomass to their baseload supply to meet growing energy demands. Currently, the biomass industry generates 15 million mega-watt hours of electricity annually.”<sup>51</sup>

---

<sup>48</sup> See also NAFO, Carbon Mitigation Benefits of Working Forests (identifying trading platforms and registries that recognize forest management), available at <http://nafoalliance.org/mitigation-benefits-working-forests/>.

<sup>49</sup> See DOE, Energy Efficiency and Renewable Energy, Office of the Biomass Program, *Biomass Multiyear Program Plan* at 1-1 (March 2010) available at <http://www1.eere.energy.gov/biomass/pdfs/mypp.pdf>.

<sup>50</sup> See Denholm, P. Ela, E., Kirby, B., and Milligan, M., DOE, National Renewable Energy Laboratory, Technical Report NREL/TP-6A2-47187, *Role of Energy Storage with Renewable Electricity Generation* at 1 (January 2010), available at [http://nrelpubs.nrel.gov/Webtop/ws/nich/www/anpublic/Record?upp=0&m=2&w=NATIVE\('TOPIC+%3D'+ANDER'\)&order=native\('pubyear%2FDescend'\)](http://nrelpubs.nrel.gov/Webtop/ws/nich/www/anpublic/Record?upp=0&m=2&w=NATIVE('TOPIC+%3D'+ANDER')&order=native('pubyear%2FDescend')).

<sup>51</sup> Biomass Power Association, About Biomass, available at <http://www.usabiomass.org/pages/facts.php>.

Unfortunately, because EPA's Tailoring Rule failed to recognize the carbon neutrality of forest biomass combustion for energy, it is threatening to frustrate industry efforts to develop the use of biomass as renewable energy source. For example, as the senior vice president of The Collins Cos., a Portland-based wood products company, stated, "[m]ost facilities that process forest products burn waste wood and convert that to electricity to offset energy costs . . . . If those facilities are subject to new permits or required to purchase expensive emissions control equipment in the future, . . . job losses could result."<sup>52</sup>

#### **V. EPA Has The Authority And Discretion To Distinguish GHG Emissions Associated With Biogenic Sources.**

Treating emissions from combustion of biomass fuels differently than emissions from other sources is supported by sound science and wise policy. Making such appropriate distinctions is also well within EPA's authority and discretion.<sup>53</sup>

EPA already has been exercising its authority and discretion to distinguish GHG emissions associated with biogenic sources from other sources for years in its Inventory of U.S. Greenhouse Gas Emissions and Sinks. In addition, EPA's recent Mandatory Reporting of Greenhouse Gases Rule distinguishes biogenic CO<sub>2</sub> from other emissions. See *generally* 75 Fed. Reg. 56,260 (Oct. 30, 2009). EPA has also claimed to have discretion within the PSD permitting program. For example, in the Tailoring Rule, EPA asserted its authority and discretion to define "greenhouse gasses" that will be "subject to regulation" as set forth in that rulemaking. See 75 Fed. Reg. at 31606. This definition limits "greenhouse gases" to "the aggregate group of six" chemicals and no other chemicals that might have climate impacts. *Id.* EPA certainly could assert similar authority and discretion to make clear that the PSD permitting program is limited to non-biogenic CO<sub>2</sub>. Notably, the regulation of biomass emissions does not comport with the CAA's stated goals for stationary sources, which are clearly aimed at reducing industrial

---

<sup>52</sup> See Weinstein, N., *EPA Rule Worries Oregon Timber Industry*, Daily Journal of Commerce (June 23, 2010).

<sup>53</sup> The legislative history shows that Congress did not have "details of regulatory implementation in mind when it imposed PSD requirements on modified sources." *Env'tl. Defense v. Duke Energy Corp.*, 127 S. Ct. 1423, 1433-34 (2007).

source emissions through evolving pollution control technologies while minimizing economic harm.<sup>54</sup>

Differentiating between sources of GHG emissions would also be similar to EPA's longstanding regulatory exclusion of certain volatile organic compounds (VOCs) from the otherwise applicable statutory definition. 40 C.F.R. § 51.100(s); see *also* 40 C.F.R. §§ 52.21(b)(2)(ii) and 52.21(b)(3). Specifically, EPA's PSD regulations exclude certain compounds from the definition of VOCs even though they are technically "volatile" and "organic," because such compounds would have negligible environmental impact. See 40 C.F.R. § 51.100(s). A similar approach is warranted for biomass emissions as such emissions will not increase atmospheric levels of CO<sub>2</sub>.

The regulation of biogenic CO<sub>2</sub>, as provided in the Tailoring Rule, would lead to unwarranted, and unprecedented cost burdens on biomass power producers that would be more onerous in application than required for fossil fuels. The burden on biomass power producers would be especially great if EPA were to propose requiring sources to certify that emissions are produced from biomass that meets certain criteria (e.g. related to sustainability). Such onerous requirements would in many cases create an incentive for energy producers to move from using renewable biomass fuel sources to more BTU efficient and cost-effective fossil fuel sources in order to realize cost savings. To avoid such results, EPA should exercise its discretion and recognize the neutral carbon effects of biogenic emissions as compared to fossil fuel emissions within CAA permitting programs.

## **VI. Established Tools Enable EPA To Evaluate The Carbon Neutrality Of Forest Biomass Both Now And In The Future.**

Existing data clearly demonstrate that the combustion of forest biomass in the United States is carbon neutral at a minimum. Given the trends in carbon stocks in the United States, this is likely to continue into the foreseeable future. This provides EPA a solid basis for restoring the status quo treatment of forest biomass as having zero net emissions.

To the extent EPA may have concerns about the carbon footprint of forest biomass combustion emissions in the future, existing and well utilized tools will enable the Agency and stakeholders to constantly monitor carbon stocks for any change in the

---

<sup>54</sup> See, e.g., H. Rep. No. 95-294 at 184-86 (1977).

GHG balance associated with the forest carbon pool. The Forest Inventory and Analysis Program (FIA) administered by the U.S. Forest Service is, perhaps, the most comprehensive forest inventory survey in the world, providing the data used to determine the state of carbon stocks on both public and private lands. FIA data have been used to inform federal agencies and the public on forest extent, growing stock volume, and other key indicators for eight decades. Going forward, this data, along with supplemental data provided either by advanced technologies (e.g. remote sensing), other programs or further investment into FIA, can provide increasingly robust information on changes in forest carbon stocks. This information provides a very empirical basis for maintaining that forest biomass combustion has zero net emissions or pursuing alternative approaches should the nation begin to realize a persistent and significant decline in forest carbon stocks over time.

Through the use of FIA data and other existing analytical tools, NAFO is confident that EPA monitoring would verify the continued stability of forest carbon stocks used to produce biomass energy into the future. Historical data and sophisticated modeling suggest that new markets for forest products, including renewable energy, stimulate increases in forest productivity over time. For example, notwithstanding the nearly four-fold increase in the U.S. population over the past century accompanied by an unprecedented surge in demand for housing and consumer products produced from forests, forest volume and carbon stocks during the past 50 years have continued to increase annually, demonstrating a positive correlation between market demand and forest productivity.

Today many U.S. forestlands are not as productive as they could be, because decreased market demand caused by declining manufacturing capacity and corresponding drops in raw material prices has depressed investment in forest productivity. However, as demonstrated by Clutter, et al. (2010),<sup>55</sup> forest owners can significantly increase forest productivity—particularly in plantations in the Pacific Coast and Southern regions of the United States—when the marketplace signals greater demand for raw materials such as biomass. Intensively managed timberlands can increase productivity by as much as 150 percent, while less intensively managed

---

<sup>55</sup> Clutter, M., Abt, R., Greene, W.D., Siry, J., and Mei, R., *A Developing Bioenergy Market and Its Implications on Forests and Forest Products Markets in the United States*, Prepared for NAFO (2010), available at <http://nafoalliance.org/wp-content/uploads/NAFO-Executive-Summary-Clutter-Et-Al-Final.pdf> (executive summary).

timberlands can increase productivity by as much as 75 percent. While emerging renewable energy markets may constrain supply in the near term, in the medium and long-run supply catches up with demand resulting in increased forest volume and extent.

### **Conclusion**

To conclude, NAFO appreciates the opportunity to provide input on the treatment of forest biomass carbon emissions in the context of the Title V and PSD programs. For the reasons cited in this document, NAFO maintains that the EPA already has the data, the analytical tools, the established methodologies, and the statutory authority needed to properly account for such emissions. When measured at the appropriate scale, emissions from the combustion of forest biomass will not increase carbon in the atmosphere as the forest carbon pool remains stable or increasing. This convention is recognized internationally, is supported by the prevailing science, and forms an important cornerstone of renewable energy and climate change policy both in the United States and among other developed nations.

EPA should recognize that biomass combustion has an emissions factor of zero and therefore not include biomass in its CAA regulatory framework. Empirical data collection tools already exist that enable ongoing monitoring of carbon stocks to identify changes in carbon flux that could trigger modifications to current approaches, if necessary. NAFO urges the EPA to use the significant information and resources at its disposal, which provide a rational basis for recognizing the full carbon benefits of biomass energy sources and stands ready to assist EPA in finalizing a policy that will enable forest biomass to make a significant and necessary contribution toward meeting our nation's renewable energy goals.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'D. Tenny', with a long horizontal stroke extending to the right.

David P. Tenny  
President and CEO  
National Alliance of Forest Owners

Enclosures:

List Of Key References

Attachment 1: Letters from 113 Scientists (Lippke, B. et al.) to Sen. Boxer, et al. and Rep. Waxman, et al. (July 20, 2010).

Attachment 2: Figure 7-3 from EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008* (April 15, 2010).

Attachment 3: Upton, B., National Council for Air and Stream Improvement, Inc., Memo to Reid Miner, *Summary of Literature on Life Cycle Assessments (LCA) of Forest-Derived Biomass Energy* (Aug. 27, 2010).

Attachment 4: NAFO, Working Forests in National Energy Policy, *Wood Matters – Renewable Electricity Standard* (source: Energy Information Administration).

## List Of Key References

Abbasi, T., and Abbasi, S.A., *Biomass energy and the environmental impacts associated with its production and utilization*, *Renewable and Sustainable Energy Reviews* 14:919-937; doi:10.1016/j.rser.2009.11.006 (2010).

BSI, *Specification for the assessment of the life cycle greenhouse gas emissions of goods and services: PAS 2050:2008*, London: British Standards Institution (2008).

Cherubini, F., Bird, N.D., Cowie, A., Jungmeier, G., Schlamadinger, B., and Woess-Gallasch, S., *Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: Key issues, ranges and recommendations*, *Resources, Conservation and Recycling* 53:434-447; doi:10.1016/j.resconrec.2009.03.013 (2009).

Cherubini, F., *GHG balances of bioenergy systems – Overview of key steps in the production chain and methodological concerns*, *Renewable Energy* 35:1565-1573; doi:10.1016/j.renene.2009.11.035 (2010).

Clutter, M., Abt, R., Greene, W.D., Siry, J., and Mei, R., *A Developing Bioenergy Market and Its Implications on Forests and Forest Products Markets in the United States*, Prepared for NAFO (2010), available at <http://nafoalliance.org/wp-content/uploads/NAFO-Executive-Summary-Clutter-Et-Al-Final.pdf> (executive summary).

Commission of the European Communities, Commission Decision of 29 January 2004 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, at Section 4.2.2.1.6, available at [http://eur-lex.europa.eu/pri/en/oj/dat/2004/l\\_059/l\\_05920040226en00010074.pdf](http://eur-lex.europa.eu/pri/en/oj/dat/2004/l_059/l_05920040226en00010074.pdf)

DOE, Ethanol Benefits, available at <http://www.afdc.energy.gov/afdc/ethanol/benefits.html>.

DOE, *Technical Guidelines: Voluntary Reporting of Greenhouse Gases (1605(b)) Program* (January 2007).

EIA, U.S. Energy Consumption by Energy Source (July 2009), available at [http://www.eia.doe.gov/cneaf/alternate/page/renew\\_energy\\_consump/table1.html](http://www.eia.doe.gov/cneaf/alternate/page/renew_energy_consump/table1.html).

*Environmental management - Life cycle assessment - Requirements and guidelines: International Standard ISO 14044*, Geneva: International Organization for Standardization (2006).

Environmental Protection Agency Combined Heat and Power Partnership, *Biomass Combined Heat and Power Catalog of Technologies* (Sept. 2007), available at [www.epa.gov/chp/documents/biomass\\_chp\\_catalog.pdf](http://www.epa.gov/chp/documents/biomass_chp_catalog.pdf).

EPA, *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance: Direct Emissions from Stationary Combustion Sources*, EPA430-K-08-003 (May 2008).

EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007* at ES-4 (Apr. 15, 2009) (EPA 2009 Inventory), available at [http://www.epa.gov/climatechange/emissions/downloads09/GHG2007entire\\_report-508.pdf](http://www.epa.gov/climatechange/emissions/downloads09/GHG2007entire_report-508.pdf).

EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008* at 3-10 (April 15, 2010) (EPA 2010 Inventory), available at [http://www.epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010\\_Report.pdf](http://www.epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010_Report.pdf).

EPA, *Renewable Fuel Standard Program: Draft Regulatory Impact Analysis*, at 191, EPA420-D-06-008 (September 2006).

Field, C.B., *Primary production for the biosphere: integrating terrestrial and oceanic components*. *Science*, 281: 237 (1998).

Froese, R.E., Shonnard, D.R., Miller, C.A., Koers, K.P., and Johnson, D.M., *An evaluation of greenhouse gas mitigation options for coal-fired power plants in the U.S. Great Lakes States*, *Biomass and Bioenergy* 34:251-262; doi:10.1016/j.biombioe.2009.10.013 (2010).

Gower, S., *Patterns and mechanisms of the forest carbon cycle*. *Annual Review of Environment and Resources* 28:169-204 (2003).

Haynes, R. W., *The 2005 RPA timber assessment update*, Gen. Tech. Rep. PNW-GTR-699, USDA Forest Service, Pacific Northwest Research Station (2007).

Heath, L., V. Maltby, R. Miner, K. Skog, J. Smith, J. Unwin, and B. Upton, *Greenhouse gas and carbon profile of the US forest products industry value chain*, *Environmental Science and Technology*. 44: 3999-4005 (2010).

Heller, M.C., Keoleian, G.A., and Volk, T.A., *Life cycle assessment of a willow bioenergy cropping system*, *Biomass and Bioenergy* 25:147-165; doi:10.1016/S0961-9534(02)00190-3 (2003).

Heller, M.C., Keoleian, G.A., Mann, M.K., and Volk, T.A., *Life cycle energy and environmental benefits of generating electricity from willow biomass*, *Renewable Energy* 29:1023-1042; doi:10.1016/j.renene.2003.11.018 (2004).

*IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Institute for Global Environmental Strategies, Hayama, Kanagawa, Japan: IPCC National Greenhouse Gas Inventories Programme (2006).

Lattimore, B., Smith, C.T., Titus, B.D., Stupak, I., and Egnell, G., *Environmental factors in woodfuel production: Opportunities, risks, and criteria and indicators for sustainable practices*, *Biomass and Energy* 33:1321-1342; doi:10.1016/j.biombioe.2009.06.005 (2009).

Letters from 113 Scientists (Lippke, B. et al.) to Sen. Boxer, et al. and Rep. Waxman, et al. (July 20, 2010).

Lippke, B., et al., CORRIM: Life-Cycle Environmental Performance of Renewable Building Materials, *54 Forest Prod. J.* 8 (2004).

Lucier, A., *NCASI Review of Manomet Biomass Study*, National Council for Air and Stream Improvement, Inc. (2010), available at <http://www.mass.gov/Eoeea/docs/doer/renewables/biomass/study-comments/lucier.pdf>.

Mann, M.K., and Spath, P.L., *A life cycle assessment of biomass cofiring in a coal-fired power plant*, *Clean Production Processes* 3:81-91; doi:10.1007/s100980100109 (2001).

Marland, G. and S. Marland, "Should we store carbon in trees?" *Water, Air and Soil Pollution* (64), 1992: 181-195.

Miner, Reid, National Council for Air and Stream Improvement, *Biomass Carbon Neutrality* (Apr. 15, 2010), available at <http://nafoalliance.org/wp-content/uploads/NCASI-Biomass-carbon-neutrality.pdf>.

NAFO, Carbon Mitigation Benefits of Working Forests, available at <http://nafoalliance.org/mitigation-benefits-working-forests/>.

NAFO, Carbon Neutrality of Energy from Forest Biomass, available at <http://nafoalliance.org/carbon-neutrality-of-energy-from-forest-biomass/>.

NAFO, NAFO Advocacy Position on Sustainability, available at [www.nafoalliance.org/sustainability-advocacy-position](http://www.nafoalliance.org/sustainability-advocacy-position).

Nechodom, M. PhD, USDA Forest Service, Pacific Southwest Research Station, CEC-500-2009-080, *Biomass To Energy: Forest Management For Wildfire Reduction, Energy Production, And Other Benefits* at 77-83, Prepared for Public Interest Energy Research, California Energy Commission (January 2010), available at <http://www.energy.ca.gov/2009publications/CEC-500-2009-080/>.

Obama, Letter from President Barack Obama to Governors John Hoeven and Chet Culver (May 27, 2009), *available at* <http://www.governorsbiofuelscoalition.org/assets/files/President%20Obama's%20Response5-27-09.pdf>.

Pehnt, M., *Dynamic life cycle assessment (LCA) of renewable energy technologies*, *Renewable Energy* 31:55-71; doi:10.1016/j.renene.2005.03.002 (2006).

Raymer, A.K.P., *A comparison of avoided greenhouse gas emissions when using different kinds of wood energy*, *Biomass and Bioenergy* 30:605-617; doi:10.1016/j.biombioe.2006.01.009 (2006).

Robinson, A.L., Rhodes, J.S., and Keith, D.W., *Assessment of potential carbon dioxide reductions due to biomass – Coal cofiring in the United States*, *Environmental Science and Technology* 37(22):5081-5089; doi:10.1021/es034367q (2003).

Sabine, C.L., Heimann, M., Artaxo, P., Bakker, D.C.E., Chen, C.T.A., Field, C.B., Gruber, N., Le Quéré, C., Prinn, R., Richey, J.E., Lankao, P.R., Sathaye, J.A. and Valentini, R., *Current status and past trends of the carbon cycle*, In C.B. Field & M.R. Raupach, *The global carbon cycle: integrating humans, climate, and the natural world*, at 17–44, Washington, DC, USA, Island Press (2004).

Schlamadinger, B., Apps, M., Bohlin, F., Gustavsson, L., Jungmeier, G., Marland, G., Pingoud, K., and Savolainen, I., *Towards a standard methodology for greenhouse gas balances of bioenergy systems in comparison with fossil energy systems*, *Biomass and Bioenergy* 13(6):359-375 (1997).

Smith, W., P. Miles, C. Perry, S. Pugh, *Forest Resources of the United States, 2007 - General Technical Report WO-78*, U.S. Department of Agriculture, Forest Service (2007).

Society of American Foresters, *The State of America's Forests* at 9 (2007), *available at* <http://www.sfpa.org/Environmental/StateOfAmericasForests.pdf>.

U.S. Climate Change Science Program and the Subcommittee on Global Change Research, National Oceanic and Atmospheric Administration, *The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle* (King, A.W., L. Dilling, G.P. Zimmerman, D.M. Fairman, R.A. Houghton, G. Marland, A.Z. Rose, and T.J. Wilbanks (eds.) 2007).

Upton, B., National Council for Air and Stream Improvement, Inc., Memo to Reid Miner, *Summary of Literature on Life Cycle Assessments (LCA) of Forest-Derived Biomass Energy* (Aug. 27, 2010).

WRI, Companies complete road testing of new global greenhouse gas accounting standards (2010), available at <http://www.ghgprotocol.org/companies-complete-road-testing-of-new-global-greenhouse-gas-accounting-standards>.

Zhang, J., Powers, R. and Skinner, C., *To Manage or Not to Manage: The Role of Silviculture in Sequestering Carbon in the Specter of Climate Change*, USDA Forest Service, Pacific Southwest Research Station (pending publication).

Zhang, Y., McKechnie, J., Cormier, D., Lyng, R., Mabee, W., Ogino, A., and Maclean, H.L., *Life cycle emissions and cost of producing electricity from coal, natural gas, and wood pellets in Ontario, Canada*, *Environmental Science and Technology* 44(1):538-544; doi:10.1021/es902555a (2010).

# **Attachment 1**

July 20, 2010

The Honorable Barbara Boxer  
Senate Environment and Public Works Committee  
Washington, DC

The Honorable James Inhofe  
Senate Environment and Public Works Committee  
Washington, DC

The Honorable Jeff Bingaman  
Senate Energy & Natural Resources Committee  
Washington, DC

The Honorable Lisa Murkowski  
Senate Energy & Natural Resources Committee  
Washington, DC

The Honorable Blanche Lincoln  
Senate Agriculture Committee  
Washington, DC

The Honorable Saxby Chambliss  
Senate Agriculture Committee  
Washington, DC

Dear Chairmen Boxer, Bingaman, and Lincoln and Ranking Members Inhofe, Murkowski, and Chambliss:

We write to express our concern that equating biogenic carbon emissions with fossil fuel emissions, such as contemplated in the EPA Tailoring Rule and other policies, is not consistent with good science and, if not corrected, could stop the development of new emission reducing biomass energy facilities. It could also encourage existing biomass energy facilities to convert to fossil fuels or cease producing renewable energy. This is counter to our country's renewable energy and climate mitigation goals.

The carbon dioxide released from the combustion or decay of woody biomass is part of the global cycle of biogenic carbon and does not increase the amount of carbon in circulation. In contrast, carbon dioxide released from fossil fuels increases the amount of carbon in the cycle.

The EPA's final Tailoring Rule defines what stationary sources will be subject to greenhouse gas (GHG) emission controls and regulations during a phase-in process beginning on January 2, 2011. In the draft Tailoring Rule, the EPA proposed to calculate GHG emissions relying on the EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks. In the final rule, EPA ignored its own inventory methods and equated biogenic GHG emissions with fossil fuel emissions, which is incorrect and will impede the development of renewable biomass energy sources.

The carbon released from fossil fuels has been long separated from the global carbon cycle and adds to the total amount of carbon in active circulation between the atmosphere and biosphere. In contrast, the CO<sub>2</sub> released from burning woody biomass was absorbed as part of the "biogenic" carbon cycle where plants absorb CO<sub>2</sub> as they grow (through photosynthesis), and release carbon dioxide as they decay or are burned. This cycle releases no new carbon dioxide into the atmosphere, which is why it is termed "carbon neutral". It is unrelated to the GHG emissions produced from extracting and burning fossil fuels, except insofar as it can be used to offset or avoid the introduction of new carbon dioxide into the atmosphere from fossil fuel sources. Biogenic GHG emissions will occur through tree mortality and decay whether or not the biomass is used as an energy source. Some regions of the United States have rampant wildfires contributing pulses of greenhouse gases to the atmosphere. Capturing the energy value of these materials thereby offsetting fossil fuel emissions generates a net effect from burning biomass that is better than carbon neutral.

In terms of their greenhouse gas properties, there is no difference between biogenic and fossil fuel carbon dioxide. The difference derives from where the carbon was sourced. Burning fossil fuels that are mined from millennia-old deposits of carbon produces an addition to carbon in the atmosphere, whereas burning woody biomass recycles renewable plant growth in a sustainable carbon equilibrium producing carbon neutral energy. Fossil fuels also produce other greenhouse gases and pollutants with more negative environmental impacts than woody biomass.

Though biogenic carbon is part of the natural carbon cycle, to be considered "absolutely carbon neutral" in the short term, biomass must be re-grown at the same rate it is consumed. Because forests and trees are changing constantly,

this does not happen everywhere at once. For example, the current bark beetle epidemic in the western United States has killed 17 million acres of forests. This will result in an unavoidable 'pulse' of carbon dioxide over several years and decades unless that material is used for products or energy that can offset the emissions from fossil fuels. Humans can mitigate some natural disturbances, but cannot stop them. As a result, the only way to ensure biomass is being replaced at the rate its removed is through sustainable forest management. The regeneration of the forest along with setting the volume of removals to be no greater than new growth less mortality results in stable levels of carbon in the forest and sustainable removals as a carbon neutral source for energy or other products.

While avoiding deforestation is important in developing countries and is of some concern around urban growth areas in the United States, reforestation, certification systems and programs promoting sustainable management of our working forests have resulted in forest increases exceeding losses. Currently, there are 750 million acres of forest land in the United States and this number is largely stable even as some forest land has been converted for development.<sup>1</sup> Forest growth nationally has exceeded harvest resulting in the average standing volume of wood per acre nation-wide increasing about 50% since 1952; in the eastern United States, average volume per acre has almost doubled. In the southeast, net volume of all trees increased 12% from 1997 to 2007 and forests are reforested and growing well.<sup>2</sup>

Forests are our nation's primary source of renewable materials and second largest source of renewable energy after hydropower. Sustainable development of new and traditional uses of our forests helps reduce GHG emissions<sup>3</sup> and has the important benefit of providing economic incentives for keeping lands in forests and reducing the motivation for land conversion.

A consortium of research institutions has, over the last decade, developed life cycle measures of all inputs and all outputs associated with the ways that we use wood: a thorough environmental footprint of not just managing the forest, but harvesting, transportation, producing products or biofuels, buildings or other products, maintenance and their ultimate disposal.<sup>4</sup> Results of this research are clear. When looking across the carbon life cycle, biomass burning does produce some fossil fuel emissions from harvesting, transportation, feedstock preparation and processing. These impacts, however, are substantially more than offset by eliminating the emissions from using a fossil fuel. Sustainable removals of biomass feedstocks used for energy produce a reduction in carbon emissions year after year through a reduction in fossil fuel emissions far greater than all of the emissions from feedstock collection and processing. When wood removals are used to produce both renewable materials as well as bio-energy, the carbon stored in forest products continues to grow year after year, more than off-setting any processing emissions while at the same time permanently substituting for fossil fuel intensive materials displacing their emissions.

Finally, biomass power facilities generally contribute to a reduction of greenhouse gases beyond just the displacement of fossil fuels. The use of forest fuels in a modern boiler also eliminates the methane (CH<sub>4</sub>) emissions from incomplete oxidation following open burning, land filling, or decomposition which occurs in the absence of a higher and better use for this material. Methane is a 25 times more powerful greenhouse gas than CO<sub>2</sub>. In contrast, the mining of coal and exploration for oil and gas release significant amounts of methane and other harmful pollutants into the environment. Any modeling to examine the impact of carbon-based fuel sources must account for all of these impacts.

We thank you for the opportunity to share our concern with the EPA's Tailoring Rule and other pending policies.

Sincerely,

---

<sup>1</sup> Mila Alvarez, *The State of America's Forests* (2007), 5.

<sup>2</sup> Smith, W.B., P.D. Miles, C.H. Perry and S.A. Pugh. 2009. *Forest Resources of the United States, 2007*. General Technical Report WO-78. U.S. Department of Agriculture, Forest Service. Washington, DC.

<sup>3</sup> CORRIM, "Maximizing Forest Contributions to Carbon Mitigation: The Science of Life Cycle Analysis – a Summary of CORRIM's Research Findings." CORRIM Fact Sheets #5, #6, #7 (2009).

<sup>4</sup> IPCC Fourth Assessment Report: *Climate Change 2007*. Working Group III: *Mitigation of Climate Change*. Chapter 9. Forestry

Bruce Lippke  
Past President of the Consortium for Research on  
Renewable Industrial Materials (CORRIM)  
Professor Emeritus  
School of Forest Resources  
University of Washington  
Seattle, WA

Elaine Oneil, PhD, RPF  
Executive Director of CORRIM and  
Research Scientist  
School of Forestry  
College of Forest Resources  
University of Washington  
Seattle, WA

Paul M. Winistorfer, PhD  
Dean  
College of Natural Resources and Environment  
Virginia Tech  
Blacksburg, VA

John A. Helms, PhD  
Professor Emeritus of Forestry  
University of California, Berkeley  
Berkeley, CA

Robert D. Brown, PhD  
Dean  
College of Natural Resources  
North Carolina State University  
Raleigh, NC

Mike Clutter, PhD  
Dean  
The Warnell School of Forestry and Natural Resources  
The University of Georgia  
Athens, GA

Cornelius B. Murphy, Jr., PhD  
President  
The State University of New York  
College of Environmental Science and Forestry  
1 Forestry Drive  
Syracuse, NY

Richard W. Brinker, PhD  
Dean & Professor  
School of Forestry & Wildlife Sciences  
Auburn University  
Auburn, AL

Janaki Alavalapati, PhD  
Professor and Head  
Department of Forest Resources and Environmental  
Conservation  
College of Natural Resources, Virginia Tech  
Blacksburg, VA

B. Bruce Bare, PhD  
Dean Emeritus and Professor  
College of Forest Resources  
University of Washington  
Seattle, WA

Emmett Thompson, PhD  
Dean Emeritus  
School of Forestry  
Auburn University  
Auburn, AL

James Burchfield, PhD  
Associate Dean  
College of Forestry and Conservation  
University of Montana  
Missoula, MT

Alan R. Ek, PhD  
Professor and Department Head  
Department of Forest Resources  
University of Minnesota  
St Paul, MN

Chadwick Dearing Oliver, PhD  
Pinchot Professor of Forestry and Environmental  
Studies, and Director, Global Institute of Sustainable  
Forestry  
School of Forestry and Environmental Studies  
Yale University  
New Haven, CT

Gary M. Scott, PhD  
Professor and Chair, Paper & Bioprocess  
Engineering  
Director, Division of Engineering  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Mark McLellan, PhD  
Dean for Research, Inst. of Food & Agricultural Sciences  
Director, Florida Agricultural Experiment Station  
University of Florida  
Gainesville, FL

Said AbuBakr, PhD  
Professor and Chair  
Department of Paper Engineering, Chemical  
Engineering, and Imaging  
Western Michigan University  
Kalamazoo, MI

Gerry Ring, PhD  
Professor and Chair  
UWSP Dept. of Paper Science and Engineering  
Director of Education  
Wisconsin Institute for Sustainable Technology  
Associate Director for Education  
Wisconsin Bioenergy Initiative  
Stevens Point, WI

John M. Calhoun, Director  
Olympic Natural Resources Center  
School of Forest Resources  
College of the Environment  
University of Washington  
Seattle, WA

Jody Jellison, PhD  
Director  
School of Biology and Ecology  
University of Maine  
Orono, ME

Douglas D. Piirto, PhD, RPF  
Professor and Department Head  
Natural Resources Management Department  
California Polytechnic State University  
San Luis Obispo, CA

David Briggs, PhD  
Corkery Family Chair  
Director, Precision Forestry Cooperative  
& Stand Management Cooperative  
School of Forest Resources  
University of Washington  
Seattle, WA

David R. Larsen, PhD  
Department Chair and Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Ivan Eastin, PhD  
Director and Professor  
Center for International Trade in Forest Products  
School of Forest Resources  
University of Washington  
Seattle, WA

E. Dale Threadgill, PE, PhD  
Director, Faculty of Engineering and  
Head, Department of Biological and Agricultural  
Engineering  
University of Georgia  
Athens, GA

Barry Goldfarb, PhD  
Professor and Head  
Department of Forestry and Environmental Resources  
North Carolina State University  
Raleigh, NC

David Newman, PhD  
Professor and Chair, Department of Forest and Natural  
Resource Management  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Patricia A. Layton, PhD  
Professor and Chair  
Department of Forestry and Natural Resources  
Clemson University  
Clemson, SC

Lew P. Christopher, PE, PhD  
Professor and Director  
Center for Bioprocessing Research & Development  
South Dakota School of Mines and Technology  
Rapid City, SD

Jeff Hsieh, PhD  
Director  
Pulp and Paper Engineering  
School of Chemical and Biomolecular Engineering  
Georgia Institute of Technology  
Atlanta, GA

Thomas E. McLain, PhD  
Professor and Head  
Department of Wood Science & Engineering  
Oregon State University  
Corvallis, OR

Scott Bove, PhD  
Associate Professor & Wood Products Specialist  
Department of Forest and Wildlife Ecology  
University of Wisconsin  
Madison, WI

Stephen S. Kelley, PhD  
Professor and Department Head  
Department of Forest Biomaterials  
North Carolina State University  
Raleigh, NC

Eric J. Jokela, PhD  
UF/IFAS School of Forest Resources and Conservation  
University of Florida  
Professor of Silviculture & Forest Nutrition  
Co-Director, Forest Biology Research Cooperative  
Founding Editor-in-Chief -- *Forests*  
Gainesville, FL

Timothy L. White, PhD  
Director, School of Forest Resources and Conservation  
University of Florida  
Gainesville, FL

Michael J. Mortimer, JD, PhD  
Director, Graduate Programs  
Virginia Tech College of Natural Resources National  
Capital Region  
Falls Church, VA

Donald A. Bender, PE, PhD  
Weyerhaeuser Professor of Civil & Environmental  
Engineering  
Director, Composite Materials & Engineering Center  
Washington State University  
Pullman, WA

Timothy A. Martin, PhD  
Director, Carbon Resources Science Center  
University of Florida  
Gainesville, FL

Bob Izlar  
Director, Center for Forest Business  
Warnell School of Forestry and Natural Resources  
University of Georgia  
Athens, GA

John Carlson, PhD  
Professor of Molecular Genetics  
Director of the Schatz Center  
Penn State University  
University Park, PA

John Harrington, PhD  
Director, Mora Research Center  
New Mexico State University  
Mora, NM

Susan E. Anagnost, PhD  
Department Chair, Sustainable Construction  
Management and Engineering  
Associate Professor  
Assistant Director, N.C. Brown Center for Ultrastructure  
Studies  
President-Elect, Society of Wood Science and  
Technology  
Syracuse, NY

Thomas E. Hamilton, PhD  
Retired Director  
Forest Products Laboratory  
USDA Forest Service

Alain Cloutier, PhD  
Professor & Director  
Centre de recherche sur le bois  
Département des sciences du bois et de la forêt  
Faculté de foresterie, de géographie et de géomatique  
Université Laval  
Québec, QC

William W. Rice, PhD  
Professor Emeritus  
Wood Science and Technology  
Department of Natural Resources Conservation  
University of Massachusetts  
Amherst, MA

Frederick W. Cabbage, PhD  
Professor of Forest Policy Economics & Certification  
North Carolina State University  
Department of Forestry and Environmental Resources  
Raleigh, NC

John W Moser, PhD  
Professor Emeritus  
Department of Forestry and Natural Resources  
Purdue University  
West Lafayette, IN

Jim Bowyer, Director, PhD  
Responsible Materials Program  
Dovetail Partners, Inc.  
Minneapolis, MN

Lloyd C. Irland, PhD  
Lecturer and Senior Scientist  
Yale School of Forestry & Environmental Studies  
New Haven, CT

Robert Malsheimer, PhD  
Associate Professor of Forest Policy and Law  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Kevin L. O'Hara, PhD  
Professor of Silviculture  
University of California  
Berkeley, CA

Peter Kolb, PhD  
Montana State Extension Forestry Specialist  
Associate Professor Forest Ecology & Management  
University of Montana  
Missoula, MT

Larry Leefers, PhD  
Associate Professor  
Department of Forestry  
Michigan State University  
East Lansing, MI

Donald P. Hanley, PhD, CF  
Washington State University  
Extension Emeritus  
Kirkland, WA

Robert E. Froese, PhD  
Associate Professor  
School of Forest Resources and Environmental Science  
Michigan Technological University  
Houghton, MI

David R. Shonnard, PhD  
Robbins Professor  
Department of Chemical Engineering  
Michigan Technological University  
Houghton, MI

Walter R. Mark, PhD, CF  
Natural Resources Management Department  
California Polytechnic State University  
San Luis Obispo, CA

William Stewart, PhD  
Forestry Specialist  
University of California  
Berkeley, CA

William Boehner, PhD  
Affiliate Faculty Member  
Oregon State University  
Corvallis, OR

Barry Goodell, PhD  
Wood Science and Technology Program  
University of Maine  
Orono, ME

Robert L. Alverts  
Associate Research Scientist  
Desert Research Institute  
Tigard, OR

D. Steven Keller, PhD  
Associate Professor  
Miami University  
Paper and Chemical Engineering  
Oxford, OH

Michael R. Milota, PhD  
Oregon Wood Innovation Center  
Department of Wood Science and Engineering  
Oregon State University  
Corvallis, OR

Thomas M. Gorman, PE, PhD  
Professor, Forest Products  
University of Idaho  
Moscow, ID

Joseph P. Roise, PhD  
Professor of Forestry and Operations Research  
Department of Forestry and Environmental Resources  
North Carolina State University  
Raleigh, NC

Valerie Barber, PhD  
University of Alaska Fairbanks  
Forest Products Program  
Palmer Research & Extension  
Palmer, AK

Timothy A. Volk, PhD  
Senior Research Associate  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Norman Pillsbury, PhD, RPF  
Professor Emeritus  
Natural Resources Management Department  
California Polytechnic State University  
San Luis Obispo, CA

Richard B. Phillips, PhD  
Adjunct Professor of Forest Biomaterials Executive - in -  
Residence College of Natural Resources  
North Carolina State University  
Raleigh, NC

Dennis R. Becker, PhD  
Assistant Professor  
Department of Forest Resources  
University of Minnesota  
St. Paul, MN

Douglas Carter, PhD  
UF/IFAS School of Forest Resources and Conservation  
University of Florida  
Professor of Forest Economics  
Gainesville, FL

Zhu H. Ning, PhD  
Professor, Urban Forestry  
Southern University  
Baton Rouge, LA

Rob Harrison, PhD  
Professor of Soil & Environmental Sciences  
College of Forest Resources  
University of Washington  
Seattle, WA

Anthony D'Amato, PhD  
Assistant Professor  
Department of Forest Resources  
University of Minnesota  
St. Paul, MN

Bob Tjaden, PhD  
Specialist, Environmental/Natural Resource  
Management & Policy  
Environmental Science & Technology Department  
University of Maryland  
College Park, MD

P.K. Ramachandran Nair, PhD  
Distinguished Professor  
Agroforestry International & Forestry  
Director, Center for Subtropical Agroforestry  
School of Forest Resources and Conservation  
University of Florida  
Gainesville, FL

Wayne Smith, PhD  
Director Emeritus  
School of Forest Resources and Conservation  
University of Florida  
Gainesville, FL

Rick Gustafson, PhD  
Denman Professor of Bioresource Science and  
Engineering  
School of Forest Resources  
University of Washington  
Seattle, WA

Stephen Shaler, PhD  
Professor of Wood Science  
Associate Director Advanced Engineered Wood  
Composites (AECWC) Center  
Program Coordinator, Wood Science & Technology  
University of Maine  
Orono, ME

H. Michael Barnes, PhD  
W. S. Thompson Professor of Wood Science &  
Technology  
Department of Forest Products  
Mississippi State University  
Mississippi State, MS

Dale Greene, PhD  
Professor  
Center for Forest Business  
University of Georgia  
Athens, GA

Michael G. Messina, PhD  
Director, School of Forest Resources  
Penn State University  
University Park, PA

J. Michael Vasievich, PhD  
Adjunct Associate Professor  
Michigan State University  
Retired, USDA Forest Service  
East Lansing, MI

Kris Arvid Berglund, PhD  
University Distinguished Professor of Forestry and  
Chemical Engineering  
Michigan State University  
East Lansing, MI

Francisco X. Aguilar, PhD  
Assistant Professor of Forest Economics and Policy  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Bruce Cutter, PhD  
Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

John P. Dwyer, PhD  
Associate Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Harold "Gene" Garrett, PhD  
Endowed Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Richard P. Guyette, PhD  
Research Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Jason A. Hubbart, PhD  
Assistant Professor of Hydrologic Processes & Water  
Quality  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Shibu Jose, PhD  
H.E. Garrett Endowed Professor and Director, Center for  
Agroforestry  
University of Missouri  
Columbia, MO

Chung-Ho Lin, PhD  
Research Assistant Professor  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

William B. Smith, PhD  
Professor, Wood Products Engineering  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Hank Stelzer, PhD  
State Forestry Extension Specialist  
Department of Forestry  
University of Missouri  
Columbia, MO

Milagros Alvarez, PhD  
Adjunct Professor  
Virginia Tech College of Natural Resources  
National Capital Region  
Fairfax, VA

Michael R. Wagner, PhD  
Regents' Professor  
Northern Arizona University  
College of Engineering, Forestry & Natural Sciences  
Flagstaff, AZ

René Germain, PhD  
Associate Professor  
Forest and Natural Resources Management  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Charles Strauss, PhD  
Professor Emeritus  
School of Forest Resources  
College of Agricultural Sciences  
Penn State University  
University Park, PA

Harry Wiant, PhD  
Professor Emeritus  
Chair in Forest Resources Management  
School of Forest Resources  
College of Agricultural Sciences  
Penn State University  
University Park, PA

David Wm. Smith, CF, PhD  
Professor Emeritus of Forestry  
College of Natural Resources  
Virginia Tech  
Blacksburg, VA

Michael A. Kilgore, PhD  
Associate Professor and Director of Graduate Studies  
Department of Forest Resources  
University of Minnesota  
St. Paul, MN

Kaushlendra Singh, PhD  
Assistant Professor of Wood Science and Technology  
(Bioenergy and Biofuels)  
Division of Forestry and Natural Resources  
West Virginia University  
Morgantown, WV

Jeffrey Benjamin, PhD  
Assistant Professor of Forest Operations  
School of Forest Resources  
University of Maine  
Orono, ME

David W. Patterson, PhD  
Research Professor  
School of Forest Resources  
University of Arkansas at Monticello  
Monticello, AR

Frederick A. Kamke, PhD  
JELD-WEN Professor of Wood-Based Composite Science  
Department of Wood Science & Engineering  
Oregon State University  
Corvallis, Oregon

Sudipta Dasmohapatra, PhD  
Assistant Professor  
Department of Forest Biomaterials  
North Carolina State University  
Raleigh, NC

Robert L. Youngs, PhD  
Professor Emeritus  
College of Natural Resources  
Virginia Tech  
Blacksburg, VA

Charles D. Ray, PhD  
Associate Professor, Wood Operations Research  
The Pennsylvania State University  
University Park, PA

Maureen Puettmann, PhD  
LCA Consultant,  
Environmental Product Analysis  
WoodLife  
Corvallis, OR

Jerrold E. Winandy, PhD  
Adjunct Professor  
University of Minnesota and  
Retired Project Leader of Engineered Composite Science  
USDA Forest Products Laboratory  
St. Paul, MN

Dr. Róbert Németh  
Associate Professor  
University of West Hungary  
Faculty of Wood Sciences  
Institute of Wood Sciences  
Sopron, Hungary

Craig E. Shuler, PhD  
Associate Professor Emeritus  
Dept. of Forest, Rangeland and Watershed Stewardship  
Warner College of Natural Resources  
Colorado State University  
Fort Collins, CO

Jae-Woo Kim, PhD  
Post-Doctoral Research Associate  
Forest Products Center  
Dept. Forestry, Wildlife and Fisheries  
University of Tennessee  
Knoxville, TN

cc: Lisa Jackson, Administrator, Environmental  
Protection Agency

July 20, 2010

The Honorable Henry Waxman  
House Energy & Commerce Committee  
Washington, DC

The Honorable Joe Barton  
House Energy & Commerce Committee  
Washington, DC

The Honorable Colin Peterson  
House Agriculture Committee  
Washington, DC

The Honorable Frank Lucas  
House Agriculture Committee  
Washington, DC

The Honorable Nick Rahall  
House Natural Resources Committee  
Washington, DC

The Honorable Doc Hastings  
House Natural Resources Committee  
Washington, DC

Dear Chairmen Waxman, Peterson, and Rahall and Ranking Members Barton, Lucas, and Hastings:

We write to express our concern that equating biogenic carbon emissions with fossil fuel emissions, such as contemplated in the EPA Tailoring Rule and other policies, is not consistent with good science and, if not corrected, could stop the development of new emission reducing biomass energy facilities. It could also encourage existing biomass energy facilities to convert to fossil fuels or cease producing renewable energy. This is counter to our country's renewable energy and climate mitigation goals.

The carbon dioxide released from the combustion or decay of woody biomass is part of the global cycle of biogenic carbon and does not increase the amount of carbon in circulation. In contrast, carbon dioxide released from fossil fuels increases the amount of carbon in the cycle.

The EPA's final Tailoring Rule defines what stationary sources will be subject to greenhouse gas (GHG) emission controls and regulations during a phase-in process beginning on January 2, 2011. In the draft Tailoring Rule, the EPA proposed to calculate GHG emissions relying on the EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks. In the final rule, EPA ignored its own inventory methods and equated biogenic GHG emissions with fossil fuel emissions, which is incorrect and will impede the development of renewable biomass energy sources.

The carbon released from fossil fuels has been long separated from the global carbon cycle and adds to the total amount of carbon in active circulation between the atmosphere and biosphere. In contrast, the CO<sub>2</sub> released from burning woody biomass was absorbed as part of the "biogenic" carbon cycle where plants absorb CO<sub>2</sub> as they grow (through photosynthesis), and release carbon dioxide as they decay or are burned. This cycle releases no new carbon dioxide into the atmosphere, which is why it is termed "carbon neutral". It is unrelated to the GHG emissions produced from extracting and burning fossil fuels, except insofar as it can be used to offset or avoid the introduction of new carbon dioxide into the atmosphere from fossil fuel sources. Biogenic GHG emissions will occur through tree mortality and decay whether or not the biomass is used as an energy source. Some regions of the United States have rampant wildfires contributing pulses of greenhouse gases to the atmosphere. Capturing the energy value of these materials thereby offsetting fossil fuel emissions generates a net effect from burning biomass that is better than carbon neutral.

In terms of their greenhouse gas properties, there is no difference between biogenic and fossil fuel carbon dioxide. The difference derives from where the carbon was sourced. Burning fossil fuels that are mined from millennia-old deposits of carbon produces an addition to carbon in the atmosphere, whereas burning woody biomass recycles renewable plant growth in a sustainable carbon equilibrium producing carbon neutral energy. Fossil fuels also produce other greenhouse gases and pollutants with more negative environmental impacts than woody biomass.

Though biogenic carbon is part of the natural carbon cycle, to be considered "absolutely carbon neutral" in the short term, biomass must be re-grown at the same rate it is consumed. Because forests and trees are changing constantly,

this does not happen everywhere at once. For example, the current bark beetle epidemic in the western United States has killed 17 million acres of forests. This will result in an unavoidable 'pulse' of carbon dioxide over several years and decades unless that material is used for products or energy that can offset the emissions from fossil fuels. Humans can mitigate some natural disturbances, but cannot stop them. As a result, the only way to ensure biomass is being replaced at the rate its removed is through sustainable forest management. The regeneration of the forest along with setting the volume of removals to be no greater than new growth less mortality results in stable levels of carbon in the forest and sustainable removals as a carbon neutral source for energy or other products.

While avoiding deforestation is important in developing countries and is of some concern around urban growth areas in the United States, reforestation, certification systems and programs promoting sustainable management of our working forests have resulted in forest increases exceeding losses. Currently, there are 750 million acres of forest land in the United States and this number is largely stable even as some forest land has been converted for development.<sup>1</sup> Forest growth nationally has exceeded harvest resulting in the average standing volume of wood per acre nation-wide increasing about 50% since 1952; in the eastern United States, average volume per acre has almost doubled. In the southeast, net volume of all trees increased 12% from 1997 to 2007 and forests are reforested and growing well.<sup>2</sup>

Forests are our nation's primary source of renewable materials and second largest source of renewable energy after hydropower. Sustainable development of new and traditional uses of our forests helps reduce GHG emissions<sup>3</sup> and has the important benefit of providing economic incentives for keeping lands in forests and reducing the motivation for land conversion.

A consortium of research institutions has, over the last decade, developed life cycle measures of all inputs and all outputs associated with the ways that we use wood: a thorough environmental footprint of not just managing the forest, but harvesting, transportation, producing products or biofuels, buildings or other products, maintenance and their ultimate disposal.<sup>4</sup> Results of this research are clear. When looking across the carbon life cycle, biomass burning does produce some fossil fuel emissions from harvesting, transportation, feedstock preparation and processing. These impacts, however, are substantially more than offset by eliminating the emissions from using a fossil fuel. Sustainable removals of biomass feedstocks used for energy produce a reduction in carbon emissions year after year through a reduction in fossil fuel emissions far greater than all of the emissions from feedstock collection and processing. When wood removals are used to produce both renewable materials as well as bio-energy, the carbon stored in forest products continues to grow year after year, more than off-setting any processing emissions while at the same time permanently substituting for fossil fuel intensive materials displacing their emissions.

Finally, biomass power facilities generally contribute to a reduction of greenhouse gases beyond just the displacement of fossil fuels. The use of forest fuels in a modern boiler also eliminates the methane (CH<sub>4</sub>) emissions from incomplete oxidation following open burning, land filling, or decomposition which occurs in the absence of a higher and better use for this material. Methane is a 25 times more powerful greenhouse gas than CO<sub>2</sub>. In contrast, the mining of coal and exploration for oil and gas release significant amounts of methane and other harmful pollutants into the environment. Any modeling to examine the impact of carbon-based fuel sources must account for all of these impacts.

We thank you for the opportunity to share our concern with the EPA's Tailoring Rule and other pending policies.

Sincerely,

---

<sup>1</sup> Mila Alvarez, *The State of America's Forests* (2007), 5.

<sup>2</sup> Smith, W.B., P.D. Miles, C.H. Perry and S.A. Pugh. 2009. *Forest Resources of the United States, 2007*. General Technical Report WO-78. U.S. Department of Agriculture, Forest Service. Washington, DC.

<sup>3</sup> CORRIM, "Maximizing Forest Contributions to Carbon Mitigation: The Science of Life Cycle Analysis – a Summary of CORRIM's Research Findings." CORRIM Fact Sheets #5, #6, #7 (2009).

<sup>4</sup> IPCC Fourth Assessment Report: *Climate Change 2007*. Working Group III: *Mitigation of Climate Change*. Chapter 9. Forestry

Bruce Lippke  
Past President of the Consortium for Research on  
Renewable Industrial Materials (CORRIM)  
Professor Emeritus  
School of Forest Resources  
University of Washington  
Seattle, WA

Elaine Oneil, PhD, RPF  
Executive Director of CORRIM and  
Research Scientist  
School of Forestry  
College of Forest Resources  
University of Washington  
Seattle, WA

Paul M. Winistorfer, PhD  
Dean  
College of Natural Resources and Environment  
Virginia Tech  
Blacksburg, VA

John A. Helms, PhD  
Professor Emeritus of Forestry  
University of California, Berkeley  
Berkeley, CA

Robert D. Brown, PhD  
Dean  
College of Natural Resources  
North Carolina State University  
Raleigh, NC

Mike Clutter, PhD  
Dean  
The Warnell School of Forestry and Natural Resources  
The University of Georgia  
Athens, GA

Cornelius B. Murphy, Jr., PhD  
President  
The State University of New York  
College of Environmental Science and Forestry  
1 Forestry Drive  
Syracuse, NY

Richard W. Brinker, PhD  
Dean & Professor  
School of Forestry & Wildlife Sciences  
Auburn University  
Auburn, AL

Mark McLellan, PhD  
Dean for Research, Institute of Food and Agricultural  
Sciences  
Director, Florida Agricultural Experiment Station  
University of Florida  
Gainesville, FL

Janaki Alavalapati, PhD  
Professor and Head  
Department of Forest Resources and Environmental  
Conservation  
College of Natural Resources, Virginia Tech  
Blacksburg, VA

B. Bruce Bare, PhD  
Dean Emeritus and Professor  
College of Forest Resources  
University of Washington  
Seattle, WA

Emmett Thompson, PhD  
Dean Emeritus  
School of Forestry  
Auburn University  
Auburn, AL

James Burchfield, PhD  
Associate Dean  
College of Forestry and Conservation  
University of Montana  
Missoula, MT

Alan R. Ek, PhD  
Professor and Department Head  
Department of Forest Resources  
University of Minnesota  
St Paul, MN

Chadwick Dearing Oliver, PhD  
Pinchot Professor of Forestry and Environmental  
Studies, and Director, Global Institute of Sustainable  
Forestry  
School of Forestry and Environmental Studies  
Yale University  
New Haven, CT

Gary M. Scott, PhD  
Professor and Chair, Paper and Bioprocess  
Engineering  
Director, Division of Engineering  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Said AbuBakr, PhD  
Professor and Chair  
Department of Paper Engineering, Chemical  
Engineering, and Imaging  
Western Michigan University  
Kalamazoo, MI

Gerry Ring, PhD  
Professor and Chair  
UWSP Dept. of Paper Science and Engineering  
Director of Education  
Wisconsin Institute for Sustainable Technology  
Associate Director for Education  
Wisconsin Bioenergy Initiative  
Stevens Point, WI

John M. Calhoun, Director  
Olympic Natural Resources Center  
School of Forest Resources  
College of the Environment  
University of Washington  
Seattle, WA

Jody Jellison, PhD  
Director  
School of Biology and Ecology  
University of Maine  
Orono, ME

Douglas D. Piirto, PhD, RPF  
Professor and Department Head  
Natural Resources Management Department  
California Polytechnic State University  
San Luis Obispo, CA

David Briggs, PhD  
Corkery Family Chair  
Director, Precision Forestry Cooperative  
and Stand Management Cooperative  
School of Forest Resources  
University of Washington  
Seattle, WA

David R. Larsen, PhD  
Department Chair and Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Ivan Eastin, PhD  
Director and Professor  
Center for International Trade in Forest Products  
School of Forest Resources  
University of Washington  
Seattle, WA

E. Dale Threadgill, PE, PhD  
Director, Faculty of Engineering and  
Head, Department of Biological and Agricultural  
Engineering  
University of Georgia  
Athens, GA

Barry Goldfarb, PhD  
Professor and Head  
Department of Forestry and Environmental Resources  
North Carolina State University  
Raleigh, NC

David Newman, PhD  
Professor and Chair, Department of Forest and Natural  
Resource Management  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Patricia A. Layton, PhD  
Professor and Chair  
Department of Forestry and Natural Resources  
Clemson University  
Clemson, SC

Lew P. Christopher, PE, PhD  
Professor and Director  
Center for Bioprocessing Research & Development  
South Dakota School of Mines and Technology  
Rapid City, SD

Jeff Hsieh, PhD  
Director  
Pulp and Paper Engineering  
School of Chemical and Biomolecular Engineering  
Georgia Institute of Technology  
Atlanta, GA

Thomas E. McLain, PhD  
Professor and Head  
Department of Wood Science & Engineering  
Oregon State University  
Corvallis, OR

Scott Bove, PhD  
Associate Professor & Wood Products Specialist  
Department of Forest and Wildlife Ecology  
University of Wisconsin  
Madison, WI

Stephen S. Kelley, PhD  
Professor and Department Head  
Department of Forest Biomaterials  
North Carolina State University  
Raleigh, NC

Eric J. Jokela, PhD  
UF/IFAS School of Forest Resources and Conservation  
University of Florida  
Professor of Silviculture & Forest Nutrition  
Co-Director, Forest Biology Research Cooperative  
Founding Editor-in-Chief -- *Forests*  
Gainesville, FL

Timothy L. White, PhD  
Director, School of Forest Resources and Conservation  
University of Florida  
Gainesville, FL

Michael J. Mortimer, JD, PhD  
Director, Graduate Programs  
Virginia Tech College of Natural Resources National  
Capital Region  
Falls Church, VA

Donald A. Bender, PE, PhD  
Weyerhaeuser Professor of Civil & Environmental  
Engineering  
Director, Composite Materials & Engineering Center  
Washington State University  
Pullman, WA

Timothy A. Martin, PhD  
Director, Carbon Resources Science Center  
University of Florida  
Gainesville, FL

Bob Izlar  
Director, Center for Forest Business  
Warnell School of Forestry and Natural Resources  
University of Georgia  
Athens, GA

John Carlson, PhD  
Professor of Molecular Genetics  
Director of the Schatz Center  
Penn State University  
University Park, PA

John Harrington, PhD  
Director, Mora Research Center  
New Mexico State University  
Mora, NM

Susan E. Anagnost, PhD  
Department Chair, Sustainable Construction  
Management and Engineering  
Associate Professor  
Assistant Director, N.C. Brown Center for Ultrastructure  
Studies  
President-Elect, Society of Wood Science and  
Technology  
Syracuse, NY

Thomas E. Hamilton, PhD  
Retired Director  
Forest Products Laboratory  
USDA Forest Service

Alain Cloutier, PhD  
Professor & Director  
Centre de recherche sur le bois  
Département des sciences du bois et de la forêt  
Faculté de foresterie, de géographie et de géomatique  
Université Laval  
Québec, QC

William W. Rice, PhD  
Professor Emeritus  
Wood Science and Technology  
Department of Natural Resources Conservation  
University of Massachusetts  
Amherst, MA

Frederick W. Cabbage, PhD  
Professor of Forest Policy Economics & Certification  
North Carolina State University  
Department of Forestry and Environmental Resources  
Raleigh, NC

John W Moser, PhD  
Professor Emeritus  
Department of Forestry and Natural Resources  
Purdue University  
West Lafayette, IN

Jim Bowyer, Director, PhD  
Responsible Materials Program  
Dovetail Partners, Inc.  
Minneapolis, MN

Lloyd C. Irland, PhD  
Lecturer and Senior Scientist  
Yale School of Forestry & Environmental Studies  
New Haven, CT

Robert Malsheimer, PhD  
Associate Professor of Forest Policy and Law  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Kevin L. O'Hara, PhD  
Professor of Silviculture  
University of California  
Berkeley, CA

Peter Kolb, PhD  
Montana State Extension Forestry Specialist  
Associate Professor Forest Ecology & Management  
University of Montana  
Missoula, MT

Larry Leefers, PhD  
Associate Professor  
Department of Forestry  
Michigan State University  
East Lansing, MI

Donald P. Hanley, PhD, CF  
Washington State University  
Extension Emeritus  
Kirkland, WA

Robert E. Froese, PhD  
Associate Professor  
School of Forest Resources and Environmental Science  
Michigan Technological University  
Houghton, MI

David R. Shonnard, PhD  
Robbins Professor  
Department of Chemical Engineering  
Michigan Technological University  
Houghton, MI

Walter R. Mark, PhD, CF  
Natural Resources Management Department  
California Polytechnic State University  
San Luis Obispo, CA

William Stewart, PhD  
Forestry Specialist  
University of California  
Berkeley, CA

William Boehner, PhD  
Affiliate Faculty Member  
Oregon State University  
Corvallis, OR

Barry Goodell, PhD  
Wood Science and Technology Program  
University of Maine  
Orono, ME

Robert L. Alverts  
Associate Research Scientist  
Desert Research Institute  
Tigard, OR

D. Steven Keller, PhD  
Associate Professor  
Miami University  
Paper and Chemical Engineering  
Oxford, OH

Michael R. Milota, PhD  
Oregon Wood Innovation Center  
Department of Wood Science and Engineering  
Oregon State University  
Corvallis, OR

Thomas M. Gorman, PE, PhD  
Professor, Forest Products  
University of Idaho  
Moscow, ID

Joseph P. Roise, PhD  
Professor of Forestry and Operations Research  
Department of Forestry and Environmental Resources  
North Carolina State University  
Raleigh, NC

Valerie Barber, PhD  
University of Alaska Fairbanks  
Forest Products Program  
Palmer Research & Extension  
Palmer, AK

Timothy A. Volk, PhD  
Senior Research Associate  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Norman Pillsbury, PhD, RPF  
Professor Emeritus  
Natural Resources Management Department  
California Polytechnic State University  
San Luis Obispo, CA

Richard B. Phillips, PhD  
Adjunct Professor of Forest Biomaterials Executive - in -  
Residence College of Natural Resources  
North Carolina State University  
Raleigh, NC

Dennis R. Becker, PhD  
Assistant Professor  
Department of Forest Resources  
University of Minnesota  
St. Paul, MN

Douglas Carter, PhD  
UF/IFAS School of Forest Resources and Conservation  
University of Florida  
Professor of Forest Economics  
Gainesville, FL

Zhu H. Ning, PhD  
Professor, Urban Forestry  
Southern University  
Baton Rouge, LA

Rob Harrison, PhD  
Professor of Soil & Environmental Sciences  
College of Forest Resources  
University of Washington  
Seattle, WA

Anthony D'Amato, PhD  
Assistant Professor  
Department of Forest Resources  
University of Minnesota  
St. Paul, MN

Bob Tjaden, PhD  
Specialist, Environmental/Natural Resource  
Management & Policy  
Environmental Science & Technology Department  
University of Maryland  
College Park, MD

P.K. Ramachandran Nair, PhD  
Distinguished Professor  
Agroforestry International & Forestry  
Director, Center for Subtropical Agroforestry  
School of Forest Resources and Conservation  
University of Florida  
Gainesville, FL

Wayne Smith, PhD  
Director Emeritus  
School of Forest Resources and Conservation  
University of Florida  
Gainesville, FL

Rick Gustafson, PhD  
Denman Professor of Bioresource Science and  
Engineering  
School of Forest Resources  
University of Washington  
Seattle, WA

Stephen Shaler, PhD  
Professor of Wood Science  
Associate Director Advanced Engineered Wood  
Composites (AEWC) Center  
Program Coordinator, Wood Science & Technology  
University of Maine  
Orono, ME

H. Michael Barnes, PhD  
W. S. Thompson Professor of Wood Science &  
Technology  
Department of Forest Products  
Mississippi State University  
Mississippi State, MS

Dale Greene, PhD  
Professor  
Center for Forest Business  
University of Georgia  
Athens, GA

Michael G. Messina, PhD  
Director, School of Forest Resources  
Penn State University  
University Park, PA

J. Michael Vasievich, PhD  
Adjunct Associate Professor  
Michigan State University  
Retired, USDA Forest Service  
East Lansing, MI

Kris Arvid Berglund, PhD  
University Distinguished Professor of Forestry and  
Chemical Engineering  
Michigan State University  
East Lansing, MI

Francisco X. Aguilar, PhD  
Assistant Professor of Forest Economics and Policy  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Bruce Cutter, PhD  
Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

John P. Dwyer, PhD  
Associate Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Harold "Gene" Garrett, PhD  
Endowed Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Richard P. Guyette, PhD  
Research Professor of Forestry  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Jason A. Hubbart, PhD  
Assistant Professor of Hydrologic Processes & Water  
Quality  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

Shibu Jose, PhD  
H.E. Garrett Endowed Professor and Director, Center for  
Agroforestry  
University of Missouri  
Columbia, MO

Chung-Ho Lin, PhD  
Research Assistant Professor  
Department of Forestry  
The School of Natural Resources  
University of Missouri  
Columbia, MO

William B. Smith, PhD  
Professor, Wood Products Engineering  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Hank Stelzer, PhD  
State Forestry Extension Specialist  
Department of Forestry  
University of Missouri  
Columbia, MO

Milagros Alvarez, PhD  
Adjunct Professor  
Virginia Tech College of Natural Resources  
National Capital Region  
Fairfax, VA

Michael R. Wagner, PhD  
Regents' Professor  
Northern Arizona University  
College of Engineering, Forestry & Natural Sciences  
Flagstaff, AZ

René Germain, PhD  
Associate Professor  
Forest and Natural Resources Management  
The State University of New York  
College of Environmental Science and Forestry  
Syracuse, NY

Charles Strauss, PhD  
Professor Emeritus  
School of Forest Resources  
College of Agricultural Sciences  
Penn State University  
University Park, PA

Harry Wiant, PhD  
Professor Emeritus  
Chair in Forest Resources Management  
School of Forest Resources  
College of Agricultural Sciences  
Penn State University  
University Park, PA

David Wm. Smith, CF, PhD  
Professor Emeritus of Forestry  
College of Natural Resources  
Virginia Tech  
Blacksburg, VA

Michael A. Kilgore, PhD  
Associate Professor and Director of Graduate Studies  
Department of Forest Resources  
University of Minnesota  
St. Paul, MN

Kaushlendra Singh, PhD  
Assistant Professor of Wood Science and Technology  
(Bioenergy and Biofuels)  
Division of Forestry and Natural Resources  
West Virginia University  
Morgantown, WV

Jeffrey Benjamin, PhD  
Assistant Professor of Forest Operations  
School of Forest Resources  
University of Maine  
Orono, ME

David W. Patterson, PhD  
Research Professor  
School of Forest Resources  
University of Arkansas at Monticello  
Monticello, AR

Frederick A. Kamke, PhD  
JELD-WEN Professor of Wood-Based Composite Science  
Department of Wood Science & Engineering  
Oregon State University  
Corvallis, Oregon

Sudipta Dasmohapatra, PhD  
Assistant Professor  
Department of Forest Biomaterials  
North Carolina State University  
Raleigh, NC

Robert L. Youngs, PhD  
Professor Emeritus  
College of Natural Resources  
Virginia Tech  
Blacksburg, VA

Charles D. Ray, PhD  
Associate Professor, Wood Operations Research  
The Pennsylvania State University  
University Park, PA

Maureen Puettmann, PhD  
LCA Consultant,  
Environmental Product Analysis  
WoodLife  
Corvallis, OR

Jerrold E. Winandy, PhD  
Adjunct Professor  
University of Minnesota and  
Retired Project Leader of Engineered Composite Science  
USDA Forest Products Laboratory  
St. Paul, MN

Dr. Róbert Németh  
Associate Professor  
University of West Hungary  
Faculty of Wood Sciences  
Institute of Wood Sciences  
Sopron, Hungary

Craig E. Shuler, PhD  
Associate Professor Emeritus  
Dept. of Forest, Rangeland and Watershed Stewardship  
Warner College of Natural Resources  
Colorado State University  
Fort Collins, CO

Jae-Woo Kim, PhD  
Post-Doctoral Research Associate  
Forest Products Center  
Dept. Forestry, Wildlife and Fisheries  
University of Tennessee  
Knoxville, TN

cc: Lisa Jackson, Administrator, Environmental  
Protection Agency

# **Attachment 2**

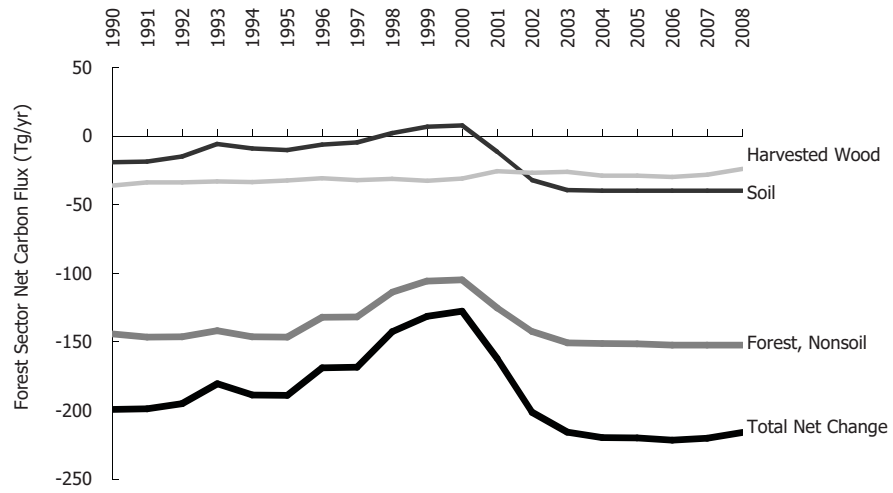


Figure 7-3: Estimates of Net Annual Changes in C Stocks for Major C Pools

# **Attachment 3**



**NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT, INC.**  
**West Coast Regional Center**  
**Mailing address: PO Box 458, Corvallis OR 97339**  
**Street address: 720 SW Fourth Street, Corvallis OR 97333**  
**Phone: (541)752-8801 Fax: (541)752-8806**

**Dr. Brad Upton**  
**Principal Research Engineer**  
**BUpton@wcrc-ncasi.org**

August 27, 2010

**MEMO TO:** Reid Miner

**SUBJECT:** Summary of Literature on Life Cycle Assessments (LCA) of Forest-Derived Biomass Energy

**FROM:** Brad Upton

**COPY:** Al Lucier, Steve Stratton

You requested a summary of the recently published life cycle assessment (LCA) literature with regard to forest-derived biomass energy. A literature search focusing on research published within the past 15 years addressing energy derived from forest biomass was conducted. The resulting summary is provided below.

The carbon in biomass-derived fuels was only recently removed from the atmosphere, which is an important distinction between biomass carbon and the carbon in fossil fuels. When biomass is burned, decays, or is otherwise oxidized the CO<sub>2</sub> is returned to the atmosphere. This biogenic carbon cycle forms the basis for using a zero emission factor at the point of combustion for biomass-derived fuels (Robinson et al. 2003; Cherubini et al. 2009; Lattimore et al. 2009; Abbasi and Abbasi 2010; Cherubini 2010), and represents an accepted benefit of using biomass-derived fuels rather than fossil fuels (Schlamadinger et al. 1997; Abbasi and Abbasi 2010; Froese et al. 2010).

There is a difference between the LCA impacts (i.e., “footprint”) of a biomass fuel and the emission factor (for an emissions inventory) of a biomass fuel. The emission factor of a biomass fuel pertains only to emissions that occur at the point of combustion. LCA impacts include these point of combustion emissions in combination with “upstream” (e.g., land use change, silvicultural/harvesting, transport, processing) and “downstream” (e.g., end of life) emissions (Lattimore et al. 2009; Cherubini 2010; Zhang et al. 2010). It is relevant to note that upstream emissions associated with wood-based biomass fuels (e.g., extraction, processing, transport) are approximately equivalent to those of fossil fuels (Zhang et al. 2010). Because of these upstream, non-combustion emissions, life cycle impacts assigned to biomass fuel use are non-zero even where the release of biogenic CO<sub>2</sub> upon combustion is in balance with carbon uptake via regrowth (Abbasi and Abbasi 2010; Cherubini 2010).

Internationally accepted LCA standards indicate that accounting boundaries should extend upstream to the point where “elementary flows” enter the system from the environment (ISO 2006). This accounting approach inherently recognizes the unique attributes of the carbon in biomass fuels by extending the accounting boundaries upstream to the point where elementary flows of CO<sub>2</sub> are removed from the atmosphere by biomass. By comparison, LCA accounting for carbon in fossil fuels begins at the point of extraction of the fuel from the ground. Because biomass carbon accounting in LCA begins with the uptake of CO<sub>2</sub> from the atmosphere, the return flows to the atmosphere result in a net zero flux to the atmosphere, equivalent to using a zero emission factor for biogenic CO<sub>2</sub> emissions (Cherubini et al. 2009; Zhang et al. 2010). Where returns to the atmosphere are less than amounts removed, the difference represents increases in stocks of stored carbon (net removals from the atmosphere), and where net returns are greater than amounts removed the difference represents depleted stocks of stored carbon. In cases where stored carbon stocks are increased or depleted by land use change, these impacts should be included in the analysis but are addressed separately from the accounting of carbon in the fuel itself (e.g., see BSI 2008; Cherubini et al. 2009; Searchinger et al. 2009).

There are different types of biomass used for energy and different regimes of land use/carbon stock changes associated with them (Cherubini et al. 2009; Cherubini 2010). Biomass fuels obtained from residuals (agricultural, manufacturing, forestry residuals, etc.) are typically not associated with land use/carbon stock changes (Schlamadinger et al. 1997; Mann and Spath 2001; Cherubini 2010). Production of dedicated energy crops (e.g., annuals such as corn or rapeseed, perennial grasses such as switchgrass, or short rotation woody crops such as willow or hybrid poplar), however, may be associated with significant land use change when native or managed forests, agricultural lands, or fallow/underutilized lands are converted from existing uses to growing the energy crop. Some conversions can result in increases in carbon stocks (agricultural or fallow lands to energy crops), whereas some can decrease carbon stocks (native or managed forests to energy crops, or in some cases native forests to managed forests) (Schlamadinger et al. 1997; Cherubini et al. 2009; Cherubini 2010).

Traditional forestry, associated with harvesting trees from native or managed forests accompanied by replanting, supports lumber, panel, and the pulp and paper industries and generates biomass that can be used as fuel. When the carbon removed through harvesting is offset by that captured during tree growth the result is low or zero net carbon losses. For example, if biomass stocks on the land base from which harvest occurs are growing at 2% per year and only 2% of the standing biomass in the land base is harvested in that year (with remaining area not harvested), the net change in carbon stocks during the year is zero because the harvest (negative change) is balanced by the regrowth (positive change) that both occur on the land base. The literature suggests that soil organic matter (and carbon content) is not significantly affected by timber harvesting at intervals exceeding ten years, although short rotation woody crop plantations can sometimes experience soil carbon loss over multiple rotations if the land is not treated with sludge or manure (Lattimore et al. 2009).

In performing a life cycle assessment it is critical to establish appropriate system boundaries (Schlamadinger et al. 1997; Cherubini 2010), and when LCA is applied to biomass energy products these boundaries should include the land base representing the entire area that supplies

biomass to the activity (Schlamadinger et al. 1997; Froese et al. 2010). Additionally, carbon stock changes should be integrated over time, considering multiple harvest cycles rather than one harvest event in isolation (Schlamadinger et al. 1997; Johnson 2009).

Recent publications indicate that at both regional and national levels forest carbon growth rates on U.S. forest lands are higher than harvest rates; thus, carbon is accumulating while biomass is extracted for producing material goods and energy (Froese et al. 2010; Heath et al. 2010). At the national level, even industry-owned timberlands are maintaining stable stocks of carbon, a finding consistent with the widespread use of sustainable forest management practices in the U.S. (Heath et al. 2010). Therefore, the benefits of using forest biomass currently grown in the U.S. can be examined within a framework that assumes that combustion-related emissions of biogenic CO<sub>2</sub> are offset by uptake in new growth.

Recent life cycle analyses of forest biomass energy systems, summarized below, typically demonstrate significant greenhouse gas (GHG) mitigation benefits compared to energy derived from fossil fuels.

Froese et al. (2010) used LCA to investigate several options to mitigate GHG emissions from electricity generation in the U.S. Great Lakes States region, and found cofiring forestry biomass residuals (with coal reference condition) to be the most attractive option and carbon capture and storage (CCS) to be the least attractive option. These researchers found that cofiring 20% biomass resulted in a 20% life cycle GHG mitigation benefit. They also noted a large potential for biomass production from underutilized resources, with land resources not a limiting factor, and that additional biomass could be provided for fuel without replacing current commodities grown on cropland or jeopardizing the sustainability of forest resources.

Mann and Spath (2001) conducted an LCA on cofiring wood residuals such as “timber stand improvement” residues, mill residues, urban wood, and so on in a coal-fired power plant and found that cofiring biomass at 15% reduced life cycle GHG emissions by 18.4%. These authors attributed the greater reduction in GHG emissions than the rate of cofiring to avoided methane emissions associated with alternative end of life management for some of the residual feedstock components.

Robinson et al. (2003) demonstrated that displacement of coal by biomass (forestry and agricultural residuals) resulted in a net reduction of carbon emissions “because biomass carbon is in the active carbon cycle and ... does not accumulate in the atmosphere if the biomass is used sustainably.” These researchers found that “fossil energy resources equivalent to less than 5% of the energy content of the biomass are typically consumed in its cultivation and processing” and that “cofiring [biomass with coal] can achieve significant reductions in CO<sub>2</sub> emissions in the very near term (less than 5 years).”

Pehnt (2006) investigated the life cycle impacts of biomass combustion for heat and electricity generation and demonstrated that GHG emissions were extremely low compared with fossil fuel-fired systems. The biomass materials investigated were forest wood, short rotation forestry wood, and “waste wood.” Life cycle GHG emission reduction over an electricity base case ranged from 85 to 95%, and reductions for a heat generation base case ranged from 88 to 93%.

Cherubini et al. (2009) applied LCA methodology to several biomass energy systems and found that for some biomass systems (e.g., forestry residuals to electricity or heat) the entire LCA GHG emissions from bioenergy were 90 to 95% lower than those from fossil fuel based systems.

Zhang et al. (2010) demonstrated that using wood pellets for electricity generation reduced life cycle GHG emissions by 91% relative to a coal reference case and by 78% relative to a natural gas combined cycle (NGCC) reference case. These authors examined dedicated wood harvest for energy production in which land use carbon stock changes were assumed to be zero due to biomass regrowth during the time period of the analysis.

Raymer (2006) found significant life cycle GHG mitigation benefits with several types of wood energy (fuel wood for domestic heating substituting for electricity from coal and from domestic heating oil, sawdust and bark used for drying sawn wood substituting for oil, pellets made from sawdust and chips and briquettes used for building heat substituting for oil, and demolition wood used for district heating substituting for oil). Life cycle reductions in GHG emissions ranged from 81 to 98% relative to fossil fuel alternatives. The greatest benefit was found for district heating using demolition wood (substituting for oil) and the least benefit corresponded to fuel wood for home heating (substituting for coal-derived electricity).

Heller et al. (2003, 2004) described an LCA study of production of willow (short rotation woody biomass) and cofiring this biomass with coal to generate electricity. Results included that biomass production had a net energy ratio (biomass energy output divided by fossil energy input) of 55. These researchers found that the upstream energy consumed in growing, processing, and transporting biomass roughly balanced the reduced consumption from mining, processing, and transporting less coal. At a cofiring rate of 10% biomass the system's net global warming potential decreased by 9.9% relative to a baseline of 100% coal firing.

Studies that have received attention for demonstrating failure of biomass fuel systems to mitigate GHG emissions have, for the most part, fallen into two broad categories: those that focus on biomass systems associated with a significant impact to land use due to deforestation (loss of carbon stocks; e.g., Wicke et al. 2008) and are not representative of the situation in the U.S.; and those in which there are large GHG emissions related to production or processing of non-forest biomass feedstocks (e.g., Farrel et al. 2006). Life cycle analyses comparing fossil fuels to forest biomass grown on land where carbon stocks are stable, on the other hand, typically illustrate significant GHG mitigation benefits, as illustrated by the studies cited above and summarized in Table 1.

**Table 1.** GHG Mitigation Benefit Summary based on LCA Results

Study	Biofuel Type	Fossil Fuel Offset	GHG Mitigation <sup>a</sup>
Froese et al. 2010	Forestry residuals	Coal (cofiring) electricity	100%
Mann and Spath 2001	Wood residuals	Coal (cofiring) electricity	123% <sup>b</sup>
Robinson et al. 2003	Forestry and agriculture residuals	Coal (cofiring) electricity	~95%
Pehnt 2006	Forest wood, woody biomass energy crops, waste wood	Energy mix in Germany for electricity generation and home heating in 2010	85-95%
Cherubini et al. 2009	Forest residuals	Various fossil fuels used for heat and electricity production	70-98%
Zhang et al. 2010	Wood pellets	Electricity from coal	91%
	Wood pellets	Electricity from natural gas combined cycle	78%
Raymer 2006	Fuel wood, sawdust, wood pellets, demolition wood, briquettes, bark	Coal fired electricity, heating oil	81-98%
Heller et al. 2004	Short rotation willow	Coal (cofiring) electricity	99%

<sup>a</sup> percent from base case; for cofire situations the mitigation pertains to the cofire rate (e.g., if 10% fossil fuel is replaced by biomass and emissions decrease by 9%, mitigation of 90% is assigned)

<sup>b</sup> mitigation greater than 100% due to avoided end of life methane emissions

## References Cited

- Abbasi, T., and Abbasi, S.A. 2010. Biomass energy and the environmental impacts associated with its production and utilization. *Renewable and Sustainable Energy Reviews* 14:919-937; doi:10.1016/j.rser.2009.11.006.
- British Standards Institute (BSI). 2008. *Specification for the assessment of the life cycle greenhouse gas emissions of goods and services*. Publicly Available Specification PAS 2050:2008. British Standards Institute.
- Cherubini, F. 2010. GHG balances of bioenergy systems – Overview of key steps in the production chain and methodological concerns. *Renewable Energy* 35:1565-1573; doi:10.1016/j.renene.2009.11.035.
- Cherubini, F., Bird, N.D., Cowie, A., Jungmeier, G., Schlamadinger, B., and Woess-Gallasch, S. 2009. Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: Key issues, ranges and recommendations. *Resources, Conservation and Recycling* 53:434-447; doi:10.1016/j.resconrec.2009.03.013.

- Farrell, A.E., Plevin, R.J., Turner, B.T., Jones, A.D., O'Hare, M., and Kammen, D.M. 2006. Ethanol can contribute to energy and environmental goals. *Science* 311:506-508; doi:10.1126/science.1121416.
- Froese, R.E., Shonnard, D.R., Miller, C.A., Koers, K.P., and Johnson, D.M. 2010. An evaluation of greenhouse gas mitigation options for coal-fired power plants in the U.S. Great Lakes States. *Biomass and Bioenergy* 34:251-262; doi:10.1016/j.biombioe.2009.10.013.
- Heath, L.S., Maltby, V., Miner, R., Skog, K.E., Smith, J.E., Unwin, J., and Upton, B. 2010. Greenhouse gas and carbon profile of the U.S., forest products industry value chain. *Environmental Science and Technology* 44:3999-4005; doi:10.1021/es902723x.
- Heller, M.C., Keoleian, G.A., Mann, M.K., and Volk, T.A. 2004. Life cycle energy and environmental benefits of generating electricity from willow biomass. *Renewable Energy* 29:1023-1042; doi:10.1016/j.renene.2003.11.018.
- Heller, M.C., Keoleian, G.A., and Volk, T.A. 2003. Life cycle assessment of a willow bioenergy cropping system. *Biomass and Bioenergy* 25:147-165; doi:10.1016/S0961-9534(02)00190-3.
- International Organization for Standardization (ISO). 2006. *Environmental management – Life cycle assessment – Requirements and guidelines*. ISO 14044:2006(E). Geneva: International Organization for Standardization.
- Johnson, E. 2009. Goodbye to carbon neutral: Getting biomass footprints right. *Environmental Impact Assessment Review* 29:165-168; doi:10.1016/j.eiar.2008.11.002.
- Lattimore, B., Smith, C.T., Titus, B.D., Stupak, I., and Egnell, G. 2009. Environmental factors in woodfuel production: Opportunities, risks, and criteria and indicators for sustainable practices. *Biomass and Energy* 33:1321-1342; doi:10.1016/j.biombioe.2009.06.005.
- Mann, M.K., and Spath, P.L. 2001. A life cycle assessment of biomass cofiring in a coal-fired power plant. *Clean Production Processes* 3:81-91; doi:10.1007/s100980100109.
- Pehnt, M. 2006. Dynamic life cycle assessment (LCA) of renewable energy technologies. *Renewable Energy* 31:55-71; doi:10.1016/j.renene.2005.03.002.
- Raymer, A.K.P. 2006. A comparison of avoided greenhouse gas emissions when using different kinds of wood energy. *Biomass and Bioenergy* 30:605-617; doi:10.1016/j.biombioe.2006.01.009.
- Robinson, A.L., Rhodes, J.S., and Keith, D.W. 2003. Assessment of potential carbon dioxide reductions due to biomass – Coal cofiring in the United States. *Environmental Science and Technology* 37(22):5081-5089; doi:10.1021/es034367q.
- Schlamadinger, B., Apps, M., Bohlin, F., Gustavsson, L., Jungmeier, G., Marland, G., Pingoud, K., and Savolainen, I. 1997. Towards a standard methodology for greenhouse gas balances

of bioenergy systems in comparison with fossil energy systems. *Biomass and Bioenergy* 13(6):359-375.

Searchinger, T.D., Hamburg, S.P., Melillo, J., Chameides, W., Havlik, P., Kammen, D.M., Likens, G.E., Lubowski, R.N., Obersteiner, M., Oppenheimer, M., Robertson, G.P., Schlesinger, W.H., and Tilman, G.D. 2009. Fixing a critical climate accounting error. *Science* 326:527-528; doi:10.1126/Science.1178797.

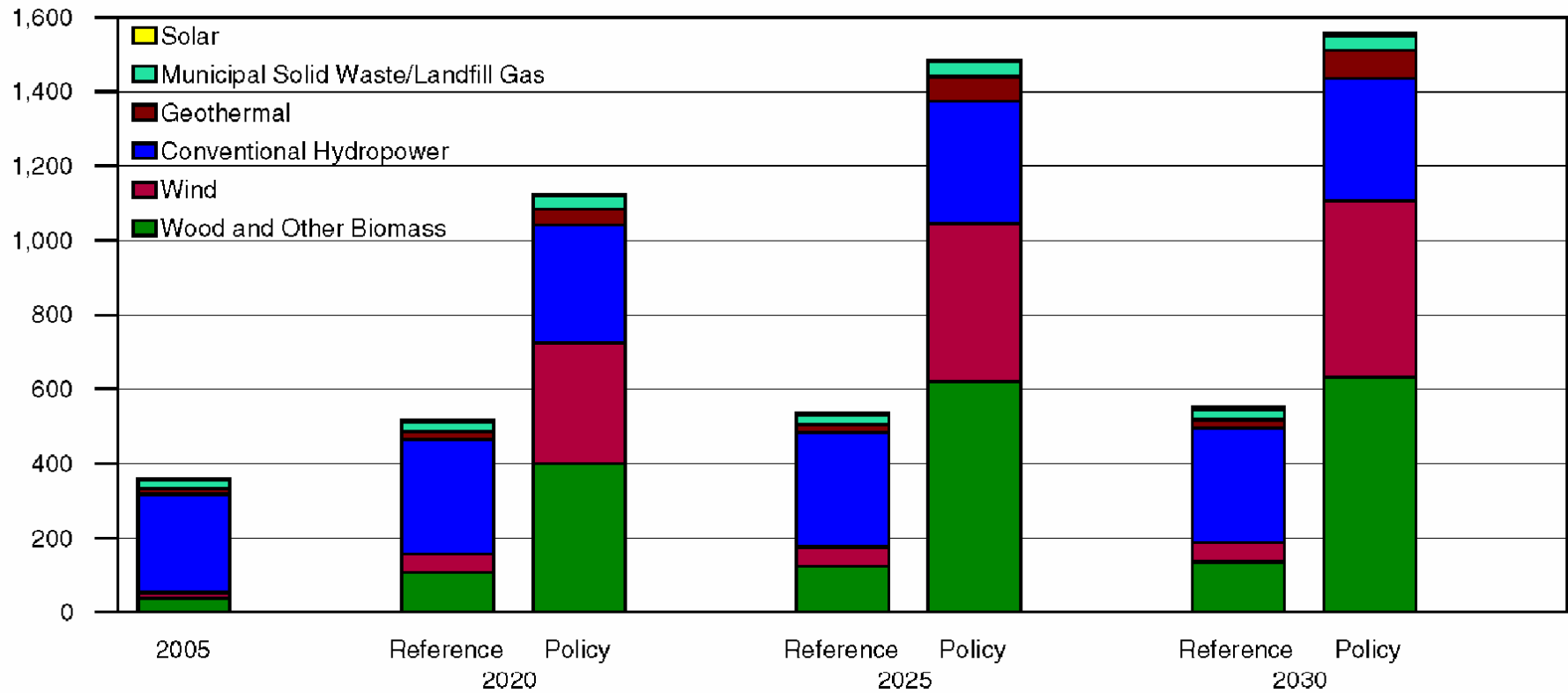
Wicke, B., Dornburg, V., Junginger, M., and Faaij, A. 2008. Different palm oil production systems for energy purposes and their greenhouse gas implications. *Biomass and Bioenergy* 32:1322-1337; doi:10.1016/j.biombioe.2008.04.001.

Zhang, Y., McKechnie, J., Cormier, D., Lyng, R., Mabee, W., Ogino, A., and Maclean, H.L. 2010. Life cycle emissions and cost of producing electricity from coal, natural gas, and wood pellets in Ontario, Canada. *Environmental Science and Technology* 44(1):538-544; doi:10.1021/es902555a.

# **Attachment 4**

## Working Forests in National Energy Policy

### Wood Matters – Renewable Electricity Standard



Source: Energy Information Administration