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

September 23, 2010

<u>Submitted by electronic mail</u>
Information Quality Guidelines Staff
U.S. EPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
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Re: National Alliance of Forest Owners' Response to Center for Biological Diversity's *Request for Correction of Information Disseminated by the Environmental Protection Agency Regarding Emissions from Biomass Combustion in the Inventory of U.S. Greenhouse Gas Emissions and Sinks* (July 28, 2010)

Dear Information Quality Guidelines Staff:

The Center for Biological Diversity recently submitted a Request for Correction (RFC) of Information Disseminated by the Environmental Protection Agency (EPA) Regarding Emissions from Biomass Combustion in the Inventory of U.S. Greenhouse Gas Emissions and Sinks, dated July 28, 2010. In considering CBD's request, the National Alliance of Forest Owners (NAFO) respectfully requests that EPA consider its September 13, 2010 response to EPA's Call for Information on Greenhouse Gas Emissions Associated With Bioenergy and Other Biogenic Sources, 75 Fed. Reg. 41173 (July 15, 2010), which is attached to this letter as Exhibit 1. As demonstrated by NAFO's comments on EPA's Call for Information, CBD's assertions are entirely without merit.

CBD argues that in the Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2008 (Inventory), EPA improperly declined to include biogenic emissions in the annual calculations of greenhouse gas emissions. CBD asserts that "EPA's blanket assumption that biomass combustion is 'carbon neutral' is unsupported by credible science." RFC at 1. However, as demonstrated by NAFO's comments on the call for information, the Inventory's treatment of emissions from biomass combustion is accurate, reliable, and based upon sound science. It is well established that carbon dioxide emitted in the combustion of forest biomass—unlike conventional fossil fuels—comes from carbon dioxide that was recently sequestered from the air by the forest, thus resulting in a "carbon neutral" cycle. Not only are forests the United States' leading carbon sink, domestic carbon stocks are also consistently increasing. Life cycle analyses further demonstrate that biomass energy provides a more favorable GHG profile than energy produced from the combustion of fossil fuels. As explained in the enclosed comments, and the referenced scientific studies, these facts fully justify the Inventory’s distinction between bioenergy and fossil fuels.

NAFO thus urges that the EPA deny CBD’s request for corrective action. NAFO also respectfully requests that EPA include and consider this letter and the attached Call for Information comments in the docket for the CBD Request for Correction.

Respectfully Submitted,

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

Enclosures

Exhibit 1

September 13, 2010

Submitted via 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_2). Yet, regarding biomass, it is equally well established that carbon emitted in the combustion of forest biomass—unlike conventional fossil fuels—comes from CO_2 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_2 from combustion of biomass when assessing CO_2 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_2 neutrality has been the foundation of American policy. As the EPA previously has concluded, there is "[s]cientific consensus . . . that the CO_2 emitted from burning biomass will not increase total atmospheric CO_2 if this consumption is done on a sustainable basis."[1] 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_2 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."[2] In its Climate Leaders program, EPA also does not count biomass CO_2 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_2 emissions are not included in the overall CO_2-

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[1] 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.

[2] 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.

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_2 to the atmosphere."[3] 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.[4]

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 CO2 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."[5]

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.[6]

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

[4] *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.").

[5] 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).

[6] *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.[7]

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_2 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_2 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

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[7] 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.

NAFO's comments that it should maintain that position, or for rejecting the past practice of EPA and other federal agencies regarding CO_2 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_2 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_2, 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.[8] 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.[9]

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[8] *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).

[9] 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,[10] 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.[11] 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_2 from the atmosphere per year.[12] 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_2 flux from Land Use, Land-Use Change, and Forestry increased by 30.9 Tg CO_2 Eq. (3 percent) from 1990 through 2008. This increase was primarily due to an increase in the rate of net carbon accumulation in

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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).

[10] *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).

[11] 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; EPA 2010 Inventory at ES-6, 7-13.

[12] *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.[13] 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.[14] 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_2 emissions and CO_2 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

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

[14] *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_2 will be absorbed when new biomass is grown.[15] 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),[16] and represents

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[15] *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.

[16] 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).[17]

For example, Cherubini (2010)[18] advocates a zero CO_2 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_2 is not accounted for as a GHG because C has a biological origin and combustion of biomass releases almost the same amount of CO_2 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)[19] also supports the conclusion that carbon cycle from the combustion of forest biomass is neutral. That peer-reviewed journal article states: "The CO2 emitted when wood and paper waste is burned is equivalent to the atmospheric CO2 that was sequestered by the tree during growth and transformed into organic carbon compounds; hence there is no net contribution to the atmospheric CO2 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.

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[17] 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).

[18] 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).

[19] 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.[20] 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.[21]

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%."[22] 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.[23]

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_2 are removed from

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[20] *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.

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

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

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

the atmosphere.[24] Because biomass carbon accounting in a LCA begins with the uptake of CO_2 from the atmosphere,[25] 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_2 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.[26]

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_2 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.[27] 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).

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

[25] In contrast, the LCA accounting for carbon in fossil fuels begins at the point of extraction of the fuel from the ground.

[26] *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).

[27] *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)[28] 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)[29] 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)[30] 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 CO2 emissions in the very near term (less than 5 years).”

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[28] *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).

[29] 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).

[30] 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)[31] 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)[32] 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)[33] 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)[34] 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%

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[31] 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).

[32] 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).

[33] 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).

[34] 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)[35] 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,[36] life cycle analyses comparing fossil fuels to forest biomass grown on land where carbon stocks are stable typically illustrate significant GHG mitigation benefits:

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[35] 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).

[36] 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[a]
Froese et al. 2010	Forestry residuals	Coal (cofiring) electricity	100%
Mann and Spath 2001	Wood residuals	Coal (cofiring) electricity	123%[b]
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%

[a] 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)
[b] 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)[37] 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.[38] 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_2 from the atmosphere that offsets the biogenic CO_2 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.[39] The Manomet

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[37] Walker, T., P. Cardellichio, 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).

[38] *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.

[39] *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.[40]

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.*"[41]

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.

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[40] 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.

[41] *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),[42] 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_2 emissions and fossil fuel CO_2 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_2 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_2 emissions, an emission factor of zero is used for biogenic CO_2 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_2 are matched by uptake.

[42] 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. Tilma*n. 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_2 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 Untied States.

In the accounting for national inventories of greenhouse gases and sinks, IPCC guidelines account for releases of biogenic CO_2 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_2 are addressed in the context of the overall net fluxes of forest carbon to/from the atmosphere (reflecting both uptake and release).[43] As a result, combustion-

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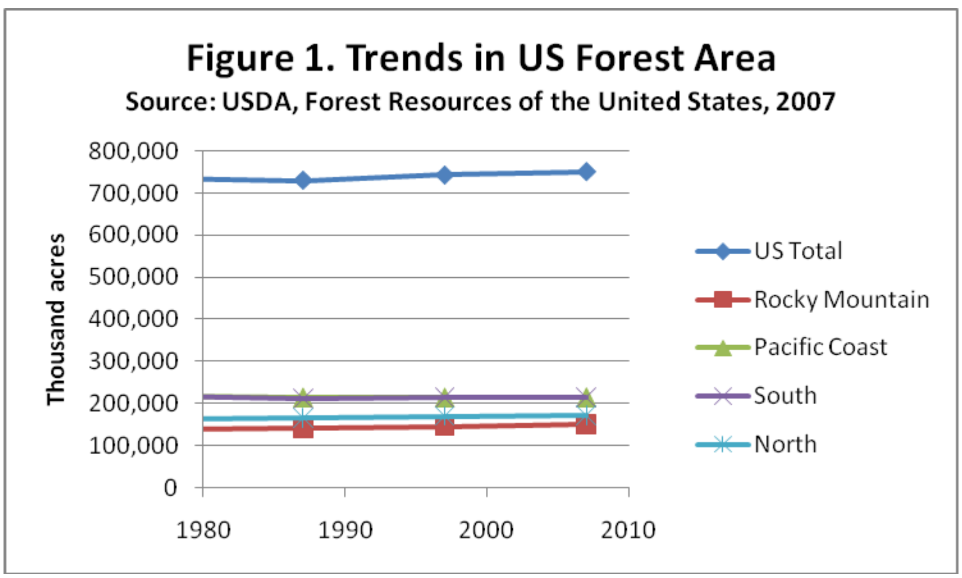
[43] *See IPCC Guidelines for National Greenhouse Gas Inventories,* Prepared by the National Greenhouse Gas Inventories Programme, Institute for Global Environmental Strategies, Hayama, Kanagawa, Japan: IPCC National Greenhouse Gas Inventories Programme (2006).

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_2 (i.e., biogenic CO_2 is not counted at the point of combustion) because biogenic CO_2 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_2 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).[44] 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).



[44] 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).

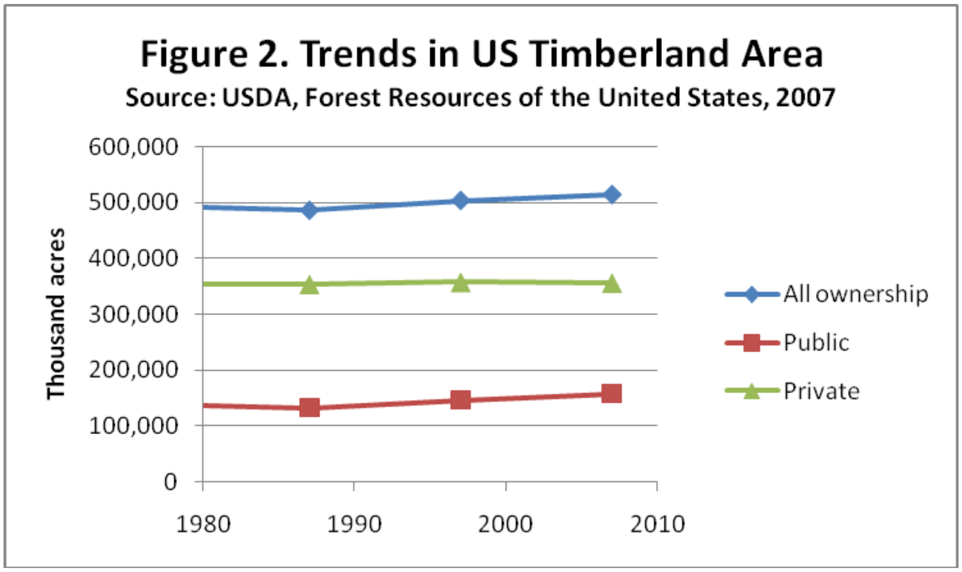


Figure 2. Trends in US Timberland Area
Source: USDA, Forest Resources of the United States, 2007
Thousand acres
600,000
500,000
400,000
300,000
200,000
100,000
0
1980
1990
2000
2010
All ownership
Public
Private

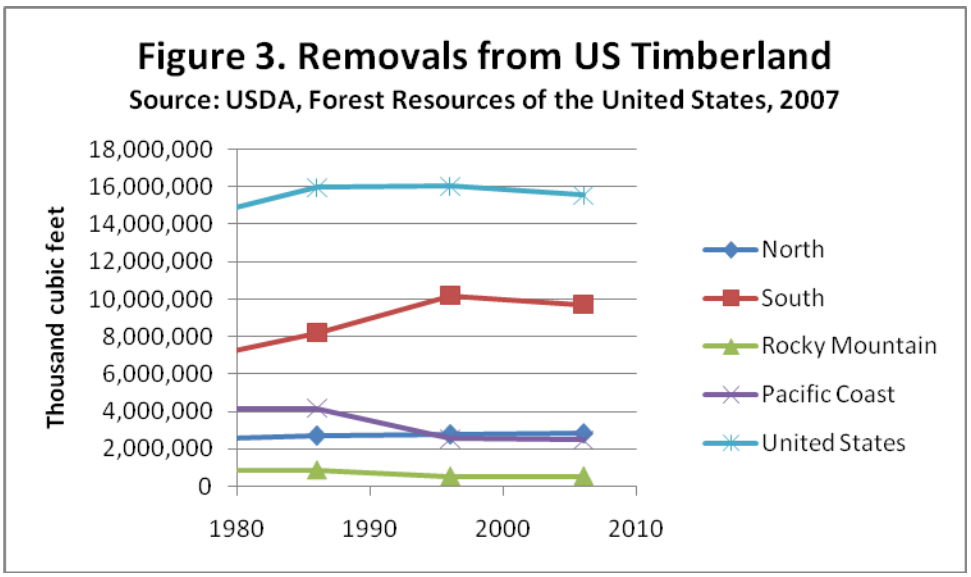
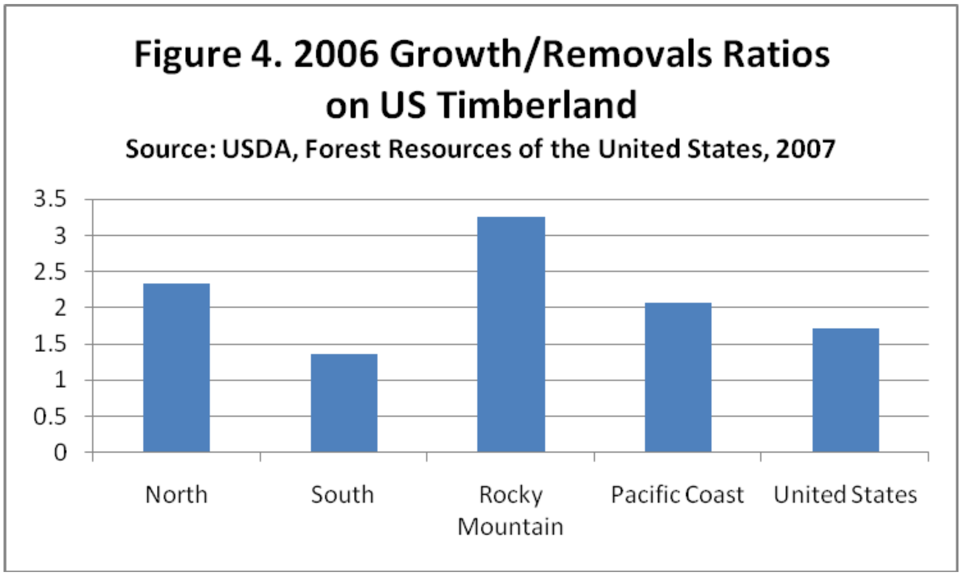


Figure 3. Removals from US Timberland
Source: USDA, Forest Resources of the United States, 2007
Thousand cubic feet
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
1980
1990
2000
2010
North
South
Rocky Mountain
Pacific Coast
United States



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 Untied 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_2 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_2 would be determined by following forest carbon stocks, and biogenic CO_2 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.[45] 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

[45] *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.[46] 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

[46] 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."[47] 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

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[47] 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.[48]

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."[49] 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."[50] 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."[51]

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[48] *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/.

[49] *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.

[50] *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').

[51] 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."[52]

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.[53]

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_2 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_2. 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

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[52] *See* Weinstein, N., *EPA Rule Worries Oregon Timber Industry*, Daily Journal of Commerce (June 23, 2010).

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

source emissions through evolving pollution control technologies while minimizing economic harm.[54]

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); s*ee 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_2.

The regulation of biogenic CO_2, 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

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[54] *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),[55] 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 as150 percent, while less intensively managed

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[55] 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,

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<u>Enclosures:</u>

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).

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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_2 released from burning woody biomass was absorbed as part of the "biogenic" carbon cycle where plants absorb CO_2 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.[1] 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.[2]

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[3] 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.[4] 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_4) 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_2. 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,

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[1] Mila Alvarez, The State of America's Forests (2007), 5.
[2] 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.
[3] 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).
[4] IPCC Fourth Assessment Report: Climate Change 2007. Working Group III: Mitigation of Climate Change. Chapter 9. Forestry

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cc: Lisa Jackson, Administrator, Environmental
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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_2 released from burning woody biomass was absorbed as part of the "biogenic" carbon cycle where plants absorb CO_2 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.[1] 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.[2]

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[3] 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.[4] 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_4) 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_2. 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,

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[1] Mila Alvarez, The State of America's Forests (2007), 5.

[2] 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.

[3] 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).

[4] IPCC Fourth Assessment Report: Climate Change 2007. Working Group III: Mitigation of Climate Change. Chapter 9. Forestry

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Attachment 2

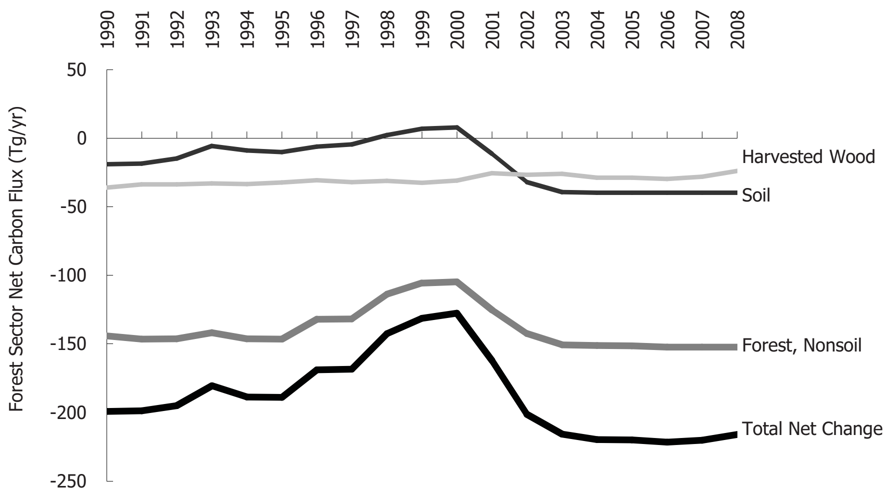

Figure 7-3: Estimates of Net Annual Changes in C Stocks for Major C Pools

Attachment 3

ncasi

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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_2 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_2 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_2 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_2 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_2 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_2 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_2 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[a]
Froese et al. 2010	Forestry residuals	Coal (cofiring) electricity	100%
Mann and Spath 2001	Wood residuals	Coal (cofiring) electricity	123%[b]
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%

[a] 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)
[b] mitigation greater than 100% due to avoided end of life methane emissions

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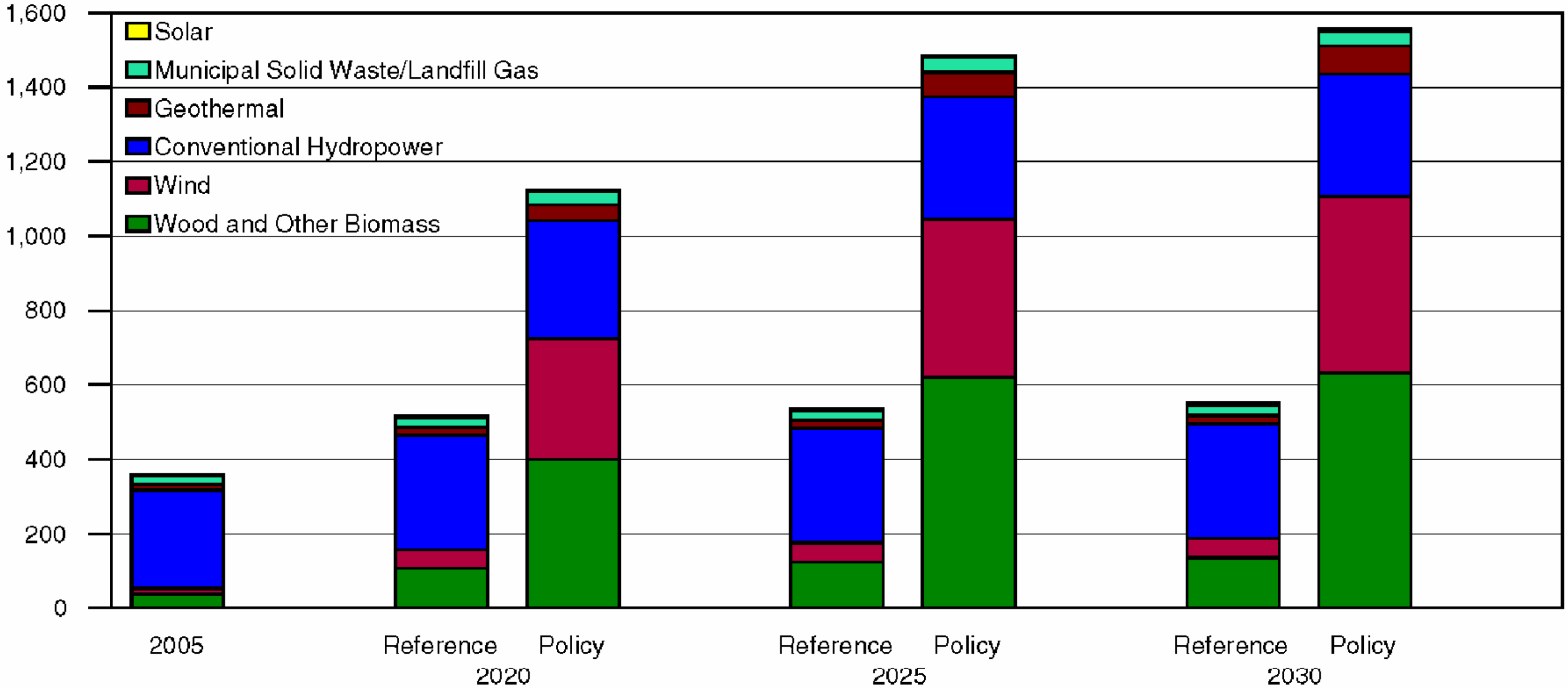
Attachment 4

Working Forests in National Energy Policy

Wood Matters – Renewable Electricity Standard



Source: Energy Information Administration

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