CENTER for BIOLOGICAL DIVERSITY

September 13, 2010

Via www.regulations.gov

EPA Docket Center
Attn: Docket No. OAR-2010-0560
Mail Code 2822T
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: Call for Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources (EPA-HQ-OAR-2010-0560)

Dear Sir or Madam:

The Center for Biological Diversity ("Center") appreciates the opportunity to respond to EPA's call for information on how emissions of greenhouse gases ("GHGs") associated with combustion of biomass should be treated for purposes of Prevention of Significant Deterioration ("PSD") and Title V permitting under the Clean Air Act.[1]

The Center is a non-profit organization with more than 255,000 members and online activists, and offices throughout the United States. The Center's mission is to ensure the preservation, protection, and restoration of biodiversity, native species, ecosystems, public lands and waters, and public health. The Center also has worked for many years to protect the biodiversity and ecological integrity of the nation's forests. In furtherance of these goals, the Center's Climate Law Institute seeks to reduce U.S. greenhouse gas emissions and other air pollution to protect biological diversity, the environment, and human health and welfare. One of the Center's top priorities is ensuring that the Clean Air Act is implemented in an expeditious and effective manner to reduce emissions of the pollutants causing global warming.

The unchecked expansion of biomass energy—particularly the use of woody biomass to generate electricity—represents a double threat to these interests, and to the health and welfare of the environment as a whole. Although scientists and policy-makers have now thoroughly debunked the long-standing myth that biomass combustion is "carbon neutral," industry proponents continue to seek special treatment for biomass projects based on the dangerously false contention that biogenic GHG emissions do not affect the climate. Public incentives for biomass, embodied in renewable energy

[1] Call for Information: Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources, 75 Fed. Reg. 41,173 (July 15, 2010) ("Call for Information").

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standards and other policies, are both threatening to exacerbate greenhouse pollution and putting increased pressure on the nation's forests by increasing the demand for woody fuel. In the absence of strong regulatory standards—including those mandated by the Clean Air Act—the increased use of woody biomass for energy generation will undermine the nation's climate goals and damage its ecosystems.

For these reasons, the Center supports EPA's recent decision not to exempt biogenic GHG emissions from regulation under the Clean Air Act's PSD and Title V permitting programs. *See* Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule; Final Rule, 75 Fed. Reg. 31,514 (June 3, 2010) ("Tailoring Rule"). EPA correctly determined that the legal doctrines advanced in support of the Tailoring Rule[2] do not provide a sufficient basis for exempting sources of biogenic emissions from PSD and Title V permit requirements. *Id.* at 31,591. Nonetheless, EPA indicated that it might be willing to consider exempting biogenic emissions from those requirements, or at least treating those emissions differently, upon consideration of further information and public comment. *Id.*

EPA has no good reason to change course. As set forth below, there is no basis in law, science, or sound policy for exempting sources of biogenic GHG emissions from Clean Air Act permitting requirements. EPA cannot assume that biogenic GHG emissions are "carbon neutral," much less "climate neutral," under any of the theories advanced by biomass proponents. Accordingly, EPA must treat biogenic GHGs as "pollutants"—and must require biomass facilities to obtain PSD and Title V permits, and to adopt Best Available Control Technology ("BACT")—in accordance with the plain language and precautionary purpose of the Clean Air Act.

Moreover, the climate impacts of any particular biomass facility will vary greatly, depending on fuel characteristics and sources, secondary emissions associated with harvesting and processing, land use impacts, and effects on future sequestration. In effect, the degree to which a particular biomass project might plausibly claim to be

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[2] As EPA is aware, the Center is challenging certain aspects of the Tailoring Rule in litigation currently pending before the D.C. Circuit Court of Appeals. *Center for Biological Diversity v. EPA* (D.C. Cir. No. 10-1205). The Center also has been granted leave to intervene on EPA's behalf in consolidated cases challenging the Tailoring Rule, with the express purpose of supporting EPA's decision not to exempt biogenic GHG emissions from permitting requirements. Order, Document No. 1265460, *Southeastern Legal Found. v. EPA* (D.C. Cir. No. 10-1131 and consolidated cases) (Sept. 13, 2010); Motion of the Center for Biological Diversity for Leave to Intervene in Support of Respondent, Document No. 1263216, *Georgia Coalition for Sound Environmental Policy v. EPA* (D.C. Cir. No. 10-1200 and consolidated cases) (August 30, 2010). Nothing in the instant comment letter is intended to address the merits of the general legal justifications advanced by EPA in support of the Tailoring Rule, and the Center expressly does not waive any argument it might raise in pending proceedings regarding those justifications.

"carbon neutral," and the time it might take to achieve neutrality, cannot be known absent a complete lifecycle analysis considering all of these factors and variables. It is not clear, however, that EPA has authority under the PSD program to include lifecycle analysis in BACT determinations. Accordingly, if EPA chooses at some point to address biogenic GHG emissions by way of lifecycle analysis, EPA should explain clearly—in future notice and comment rulemaking proceedings—the source and parameters of its authority to do so. In the meantime, EPA must implement BACT requirements for biomass facilities in the traditional matter, without reliance on unfounded carbon neutrality assumptions or unscientific proxies such as those often sought in legislative "renewability" or "sustainability" standards.

I. The PSD and Title V Programs Must Cover Biogenic GHG Emissions.

Although EPA's original Call for Information sought comment primarily on *how* biomass fuels might be treated differently for purposes of implementing BACT, 75 Fed. Reg. at 41,175, a subsequent "correction" to the Call for Information appears to call into question *whether* the PSD program should even cover sources of biogenic GHGs. *See* 75 Fed. Reg. 45,112 (Aug. 2, 2010). Under the plain text of the Clean Air Act, the PSD and Title V programs must cover these emissions.

A. Biogenic GHG Emissions Are "Pollutants" Under the Clean Air Act.

In *Massachusetts v. EPA*, 549 U.S. 497 (2007), the Supreme Court held that GHGs fit within the Clean Air Act's definition of "air pollutant" and confirmed EPA's authority to regulate sources of greenhouse pollution. Following that decision, EPA issued a finding that six long-lived GHGs, including carbon dioxide, together endanger public health and welfare. *See generally* Endangerment and Cause and Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496 (Dec. 15, 2009) ("Endangerment Finding"). In the Endangerment Finding, EPA defined these GHGs, taken together, as the relevant "pollutant" for Clean Air Act purposes, based on their common physical properties; all six GHGs are long-lived, globally well-mixed, and known to exert a warming effect on the climate by trapping infrared radiation in the atmosphere. *See id.* at 66,516-17, 66,536-37. In the Tailoring Rule, EPA employed the same definition of the relevant "pollutant" for purposes of the PSD and Title V programs. Tailoring Rule, 75 Fed. Reg. at 31,522.

The PSD program "protect[s] public health and welfare" and safeguards air quality by requiring every "major emitting facility"—i.e., every "stationary source of air pollutants" emitted in amounts above certain numeric thresholds—to obtain a permit prior to construction or modification. *See* 42 U.S.C. §§ 7470(1), 7475, 7479; *Alabama Power Co. v. Costle*, 636 F.2d 323, 346-52 (D.C. Cir. 1980) (per curiam) (describing the history of the program). In keeping with the Act's nature as a "technology-forcing" statute, *see Union Elec. Co. v. EPA*, 427 U.S. 246, 256-57 (1976), the program requires these sources to install BACT "for each pollutant subject to regulation under this chapter emitted from, or which results from, such facility." 42 U.S.C. § 7475(a)(4). Such sources typically also must obtain permits to operate under Title V of the Clean Air Act.

See 42 U.S.C. § 7661a. Title V does not generally add additional pollution control requirements, but rather requires that each operating permit contain all emissions, monitoring, and reporting requirements applicable to a source under the PSD program and other provisions of law.

EPA has determined that the six GHGs comprising the "air pollutant" for climate change purposes will become "subject to regulation," and thus will trigger PSD and Title V permitting requirements, as of January 2, 2011. *See* Tailoring Rule, 75 Fed. Reg. at 31,521-23.[3] Under the plain text of the Clean Air Act, therefore, the PSD and Title V programs must apply to *all* major sources of GHGs.

Biomass-burning facilities must be classed among these major sources. Biomass combustion causes GHG emissions, particularly of CO_2. Indeed, CO_2 emissions from electrical generating units burning woody biomass rival or exceed those of coal-burning facilities, and are nearly double those of facilities burning natural gas.[4] CO_2 from fossil sources shares the same physical characteristics and same climate-forcing properties as CO_2 from biogenic sources. There is no physical, chemical, or climate-forcing difference between fossil CO_2 and biogenic CO_2. Put simply, CO_2 is CO_2. Infrared radiation does not and cannot discriminate among the identical molecules of CO_2 circulating in the atmosphere. Biogenic CO_2, therefore, must be considered a "pollutant" subject to regulation under the Clean Air Act, and major sources of biogenic CO_2 must be required to obtain PSD and Title V permits.

B. Industry Arguments for Treating Biogenic CO2 As "Carbon Neutral" Lack Scientific Merit.

Biomass industry proponents have advanced several theories under which they argue that biogenic GHG emissions are "carbon neutral," have no effect on the global climate, and should not be regulated as "pollutants" under the Clean Air Act. Each of these theories lacks merit.

[3] The Center disagrees with EPA's conclusion that GHGs are not already "subject to regulation" for purposes of the PSD and Title V programs, and has challenged EPA's interpretation of the "triggering date" for regulation in two petitions currently pending before the D.C. Circuit. *Center for Biological Diversity v. EPA* (D.C. Cir. No. 10-1115); *Center for Biological Diversity v. EPA* (D.C. Cir. No. 10-1205). Again, nothing in this letter should be taken as waiving any argument the Center might raise in these proceedings as to the proper "trigger" for PSD and Title V applicability.

[4] *See, e.g.*, Manomet Center for Conservation Sciences, Massachusetts Biomass Sustainability and Carbon Policy Study: Report to the Commonwealth of Massachusetts Department of Energy Resources (2010), EPA Docket No. EPA-HQ-OAR-2010-0560-0004 ("Manomet Report") at 129.

1. Biogenic Emissions Are Not Automatically Climate-Neutral.

Perhaps the boldest argument advanced by industry is that all biogenic GHG emissions are part of a "natural" carbon cycle that by definition cannot have any effect on the climate. Under this theory, burning biomass releases carbon that was removed from the atmosphere by the fuels as they were growing, and thus completes a "natural" cycle by returning that carbon to the atmosphere.[5]

This theory is facially—and dangerously—incorrect. Taken to its logical conclusion, this theory would hold that deforestation has no effect on climate change. Indeed, under a literal application of this theory, every single tree, shrub, and blade of grass on Earth could be burned tomorrow and converted into CO_2 with no discernible effect on the climate.

Scientists and policy-makers agree, however, that deforestation—which necessarily entails conversion of sequestered biogenic carbon into atmospheric CO_2—does contribute to climate change. Ten to 15 percent of global carbon emissions result from deforestation and forest degradation, primarily in the tropics.[6] These emissions are estimated at between 1,400 and 2,000 Tg per year.[7] Although U.S. forests are generally considered a net carbon sink, this may be true only due to significant global leakage related to domestic demand for wood and agricultural products.[8] The United States has also experienced the greatest loss of forest cover, as a proportion of forest cover in the year 2000, of any country with more than one million square kilometers of forest.[9] GHG emissions associated with these losses are significant contributors to climate change notwithstanding their "biogenic" character.[10] By the same token, a wide-scale shift to

[5] *See, e.g.*, Am. Forest & Paper Ass'n, Comments on Proposed Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, EPA Docket No. EPA-HQ-OAR-2009-0517-4903.1 (Dec. 28, 2009) at 24.

[6] *See* Gregory P. Asner, et al., *High-Resolution Forest Carbon Stocks and Emissions in the Amazon*, PROC. NAT'L ACADEMY OF SCI. EARLY EDITION, *available at* http://www.pnas.org/content/early/2010/08/30/1004875107 (last visited Sept. 12, 2010) (attached as Ex. 1).

[7] Michael G. Ryan, et al., *A Synthesis of the Science on Forests and Carbon for U.S. Forests*, Ecological Society of America: Issues in Ecology, Report No. 13 (Spring 2010) at 5 (attached as Ex. 2).

[8] *Id.* at 5-6.

[9] Matthew C. Hansen, et al., *Quantification of Global Gross Forest Cover Loss*, 107 PROC. NAT'L ACADEMY OF SCI. 8650 (May 11, 2010) (attached as Ex. 3).

[10] *See* Eric Johnson, *Goodbye to Carbon Neutral: Getting Biomass Footprints Right*, 29 ENVTL. IMPACT ASSESSMENT R. 165 (2008) (attached as Ex. 4). Other studies have identified significant emissions associated with changes in land use and productivity in response to demand for biofuels. *See, e.g.*, Jerry M. Melillo, et al., *Indirect Emissions from Biofuels: How Important?* SCIENCEEXPRESS 10.1126/science.1180251 (Oct. 22, 2009) (attached as Ex. 5).

woody biomass energy generation could result conversion of nearly all of the world's unmanaged forests and much of its pastureland to energy plantations.[11]

The "natural carbon cycle" theory also ignores the fact that a tremendous amount of primary forest, representing a huge proportion of historic biogenic carbon stores, has been lost during the last few centuries. According to recent maps compiled by the World Resources Institute, only 21 percent of the world's forests are "intact," and 47 percent have been lost entirely.[12] Between 1850 and 2000, global land use change caused emissions of 156,000 Tg of carbon, mostly from deforestation.[13] Recent studies indicate that the density of remaining forest cover may be lower and far more variable than previously thought.[14] This historic and continuing loss of forest biomass—much of which has been burned or otherwise converted into atmospheric carbon pollution—represents a tremendous existing carbon debt, one that further emissions of biogenic carbon can only increase. To extend the metaphor, continuing to burn trees for energy isn't like balancing a checkbook. It's like taking out another mortgage on a house that's already far underwater.

Furthermore, it makes no sense to assume that all currently existing trees and other plants are composed solely of "biogenic" carbon. More than two centuries of increasing fossil GHG emissions have accumulated in the atmosphere. Given these pollutants' atmospheric lifetimes, and considering the lifespan of many trees and plants, it is safe to assume that some considerable portion of this fossil carbon has been resequestered in currently existing biomass. Technically, therefore, burning that biomass may be returning *fossil* carbon to the atmosphere, again increasing the overall planetary carbon imbalance relative to pre-industrial conditions. Above all, this example demonstrates that it makes little scientific sense to divide carbon into theoretical "fossil" and "biogenic" pools for the purpose of assuming simplistically that biogenic carbon is part of some natural cycle that cannot affect the climate. Whatever natural biogenic carbon cycle existed prior to the industrial revolution has been radically altered by deforestation, land use change, and fossil carbon emissions.

In regulating GHGs, therefore, EPA cannot avail itself of simplistic assumptions. The extent and duration of the effects of global warming will be determined largely by the degree to which anthropogenic sources of GHGs, particularly CO_2, continue to exceed the capacity of the Earth's carbon sinks for reabsorption—in other words, by the

[11] *See* Marshall Wise, et al., *Implications of Limiting CO_2 Concentrations for Land Use and Energy*, 324 SCIENCE 1183 (2009) (attached as Ex. 6).
[12] World Res. Inst., State of the World's Forests (Jan. 8, 2009), *at* http://www.wri.org/map/state-worlds-forests (last visited Sept. 12, 2010) (attached as Ex. 7).
[13] Ryan 2010 (Ex. 2) at 6.
[14] *See* Asner 2010 (Ex. 1).

cumulative total of anthropogenic greenhouse pollutants in the atmosphere.[15] Every ton of CO_2 counts toward this total, regardless of what was burned to produce it. Accordingly, EPA must use the Clean Air Act's regulatory programs to control present GHG emissions from *all* sources, including biogenic sources, in light of current atmospheric concentrations and the future emissions reductions necessary to avoid the worst impacts of climate change.

2. Biomass Combustion Creates a "Carbon Debt" that Can Last for Decades or Even Centuries.

Under another common theory advanced by proponents of biomass energy, biomass burning should be considered carbon neutral because any GHG emissions will be reabsorbed by future plant growth that replaces the harvested fuel. Yet carbon emitted during biomass combustion may remain in the atmosphere for decades or centuries before being resequestered. The theory thus ignores the critical temporal relationships between present carbon emissions and the future effects of global warming and climate change.

In other words, because meeting (or exceeding) atmospheric CO_2 targets has a strong temporal element, the time that it takes for CO_2 released into the atmosphere today to be reabsorbed is of critical importance in assessing the climate impacts of carbon emissions. This time lag has been identified in several recent studies as the source of a "carbon debt" that varies by fuel source, technology, and comparison to the fossil fuels assumed to be displaced by bioenergy generation.[16]

The biomass carbon debt is especially pronounced when trees are burned for energy. Scientists agree that "[t]he amount of carbon sequestered by forest ecosystems plays an important role in regulating atmospheric levels of carbon dioxide."[17] The removal and processing of forest biomass reduces storage in forest carbon pools and results in short-term emissions of greenhouse gases, even when some of that biomass remains sequestered for a period of time in commercial forest products.[18] According to

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[15] *See* COMMITTEE ON STABILIZATION TARGETS FOR ATMOSPHERIC GREENHOUSE GAS CONCENTRATIONS; NATIONAL RESEARCH COUNCIL, STABILIZATION TARGETS FOR ATMOSPHERIC GREENHOUSE GAS CONCENTRATIONS (National Acadamies Press 2010) at 15 ("NRC Report"), *available at* http://www.nap.edu/catalog.php?record_id=12877 (last visited Sept. 13, 2010) (prepublication excerpts attached as Ex. 8).

[16] *See, e.g.*, Manomet Report at 7. Subsequent researchers have concluded that the assumptions in the Manomet Report are excessively generous toward biomass and that bioenergy emissions (and resulting carbon debts) may be larger than the study estimated. Mary S. Booth, Review of the Manomet Biomass Sustainability and Carbon Policy Study (July 2010) (attached as Ex. 9).

[17] Tara Hudiburg, et al., *Carbon Dynamics of Oregon and Northern California Forests and Potential Land-Based Carbon Storage*, 19 ECOLOGICAL APPLICATIONS 163, 163 (2009) (attached as Ex. 10).

[18] *See id.* at 176-77 (discussing carbon storage reductions associated with shorter rotations and emissions caused by logging).

recent studies, "[t]ypically 30–50% of the harvested C is lost in manufacturing and initial use, a loss that is larger than could be expected from even the most extreme forest fire."[19] Where harvested biomass is combusted for energy, rather than processed into wood products, short-term emissions are necessarily far greater, and long-term sequestration in forest products is eliminated altogether.

In addition to converting woody biomass into CO_2, thinning and post-fire salvage operations for bioenergy production also reduce the future carbon sequestration potential of the affected forest stand by removing trees that otherwise would have continued to draw CO_2 from the atmosphere.[20] Surveys of the world's most carbon-dense forests, including the moist temperate conifer forests of North America, have confirmed that the greatest accumulations of biological carbon occur in the absence of human land-use disturbance.[21]

Removal of forest biomass also affects long-term carbon storage in forest soils. Thinning and harvesting operations can reduce carbon inputs to soils and stimulate soil respiration, resulting in both reduced soil sequestration and near-term emissions.[22] A recent meta-analysis of logging impacts in temperate forests showed that harvesting reduced soil carbon by an average of eight percent; depending on soil type, forest composition, and harvest method, some losses were as high as 36 percent.[23] Other studies have shown that forests remain net sources of carbon emissions for more than a decade after logging operations, primarily due to increased soil respiration.[24] Fuel treatments that change the amount and composition of decomposing forest biomass can influence long-term below-ground carbon storage.[25]

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[19] Mark E. Harmon, et al., *Effects of Partial Harvest on the Carbon Stores in Douglas-fir/Western Hemlock Forests: A Simulation Study*, 12 ECOSYSTEMS 777, 778 (2009) (attached as Ex. 11).

[20] *See* Brooks M. Depro, et al., *Public Land, Timber Harvests, and Climate Mitigation: Quantifying Carbon Sequestration Potential on U.S. Public Timberlands*, 255 FOREST ECOLOGY & MGMT. 1122 (2008) (attached as Ex. 12) (concluding that eliminating timber harvest on public lands would increase forest carbon storage capacity by roughly 40-50% over "business as usual").

[21] *See* Heather Keith, et al., *Re-evaluation of Forest Biomass Carbon Stocks and Lessons from the World's Most Carbon-Dense Forests*, 106 PROC. NAT'L ACADEMY OF SCI. 11,635 (2009) (attached as Ex. 13).

[22] Robert Jandl, et al., *How Strongly Can Forest Management Influence Soil Carbon Sequestration?*, 137 GEODERMA 253, 257-58 (2007) (attached as Ex. 14).

[23] Lucas E. Nave, et al., *Harvest Impacts on Soil Carbon Storage in Temperate Forests*, 259 FOREST ECOLOGY & MGMT. 857 (2010) (attached as Ex. 15).

[24] Jandl 2007 (Ex. 14) at 258.

[25] Stephen R. Mitchell, et al., *Forest Fuel Reduction Alters Fire Severity and Long-Term Carbon Storage in Three Pacific Northwest Ecosystems*, 19 ECOLOGICAL APPLICATIONS 643, 652 (2009) (attached as Ex. 16); *see also* CHAD HANSON, THE MYTH OF

The time between harvest and complete reabsorption of all this lost carbon by a forest stand—the duration of the "carbon debt"—can span decades or even centuries.[26] For example, one recent study concluded that even assuming perfect conversion of biomass to energy and a one-to-one displacement of fossil-fired generation, it still took from 34 to 228 years for forests in the western U.S. to reach carbon neutrality for biomass used directly for energy generation, and between 201 and 459 years if the biomass was converted to biofuels (the ranges depending upon the characteristics of the trees, forests and fire return intervals).[27] Accordingly, because forest biomass utilization is not carbon neutral in the near term, the near-term effects of carbon emissions associated with biomass combustion must be considered.

This is especially important because near-term GHG emissions run the risk of increasing atmospheric concentrations of greenhouse pollutants to the point where severe impacts are unavoidable—the so-called climate "tipping point." It is well established as a matter of science and policy that in order to avoid the worst impacts of global warming and climate change, global temperatures must not be allowed to exceed 2°C over pre-industrial levels.[28] Whether we exceed the 2°C threshold depends on the level at which atmospheric CO_2 levels are eventually stabilized, which in turn depends on total cumulative anthropogenic GHG emissions. The greater the CO_2 levels, the greater the risk of exceeding this threshold and triggering likely catastrophic climate changes. The probability of overshooting 2°C is as follows according to Hare and Meinshausen (2006):

85% (68-99%) at 550 ppm CO_2 eq (= 475 ppm CO_2)
47% (26-76%) at 450 ppm CO_2 eq (=400 ppm CO_2)
27% (2-57%) at 400 ppm CO_2 eq (= 350 ppm CO_2)
8% (0-31%) at 350 ppm CO_2 eq[29]

"CATASTROPHIC" WILDFIRE: A NEW ECOLOGICAL PARADIGM OF FOREST HEALTH (2010) (attached as Ex. 17).

[26] *See* Giuliana Zanchi et al., *The Upfront Carbon Debt of Bioenergy* (May 2010) at 16 (attached as Ex. 18).

[27] Mitchell 2009 (Ex. 16) at 651.

[28] James Hansen, et al., *Target Atmospheric CO_2: Where Should Humanity Aim?*, 2 OPEN ATMOS. SCI. J. 217 (2008) (attached as Ex. 19). Even the 2°C target may be inadequate to prevent serious impacts. Recognizing this fact, the Alliance of Small Island States—a group of island nations whose very existence is threatened by climate change-related sea level rise—has declared that average global temperature increases must be limited to "well below 1.5°C above pre-industrial levels." Alliance of Small Island States, *Declaration on Climate Change 2009* (Sept. 21, 2009), available at http://www.sidsnet.org/aosis/documents/AOSIS%20Summit%20Declaration%20Sept%2021%20FINAL.pdf (last visited Sept. 13, 2010) (attached as Ex. 20).

[29] B. Hare & M. Meinshausen, *How Much Warming Are We Committed To and How Much Can Be Avoided?*, 75 CLIMATIC CHANGE 111 (2006) (attached as Ex. 21).

According to these scientists, "[o]nly scenarios that aim at stabilization levels at or below 400 ppm CO_2 equivalence (~350 ppm CO_2) can limit the probability of exceeding 2°C to reasonable levels."[30] But in order to achieve stabilization levels that avert the worst impacts of climate change, emissions must peak by about 2015, and must decline very rapidly thereafter.[31]

In short, minimizing CO_2 emissions in the *next few years* is critically important to meeting climate targets, even if some of all of that CO_2 might in theory be reabsorbed from the atmosphere in the decades or centuries to come. The science makes clear that the time frame for resequestration of CO_2 emitted from forest biomass combustion is on the order of decades or centuries, not years. Indeed, in evaluating carbon emissions from other biofuels, independent scientists have begun to develop strategies for evaluating the carbon impacts of biofuels in relation to the high social and environmental cost of short-term emissions.[32] Even EPA has begun to recognize the importance of this temporal analysis in other contexts.[33] Short-term CO_2 emissions from woody biomass combustion are thus *significant*—not "neutral"—in the context of efforts to avoid the worst impacts of climate change, and should be treated as such for purposes of the PSD and Title V programs.

Finally, it is important for EPA to bear in mind that even if regeneration of a biomass fuel may one day repay the carbon debt incurred when it was first burned, the greenhouse pollution emitted upon combustion will act to warm the atmosphere for however many years, decades, or centuries it takes to do so. Put another way, even if a particular biomass fuel may one day arguably become *carbon* neutral, its emissions are not *climate* neutral in the interim. Rather, they exert a warming effect on the climate and contribute to the total cumulative accumulation of GHGs in the atmosphere that will determine humanity's success or failure in heading off the worst impacts of climate change. Once again, therefore, biogenic GHG emissions have the essential characteristics of the "pollutant" that EPA has found to endanger health and welfare, and that EPA must regulate through the PSD and Title V programs.

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[30] *Id.* at 137.

[31] *See* IAN ALLISON, ET AL., THE COPENHAGEN DIAGNOSIS: UPDATING THE WORLD ON THE LATEST CLIMATE SCIENCE 9 (2009) (attached as Ex. 22); *see also* NRC Report (Ex. 8) at 46-57; M. den Elzen & N. Höhne, *Reductions of Greenhouse Gas Emissions in Annex I and Non-Annex I Countries for Meeting Concentration Stabilisation Targets*, 91 CLIMATIC CHANGE 249 (2008) (attached as Ex. 23).

[32] *See* M. O'Hare et al., *Proper Accounting for Time Increases Crop-Based Biofuels' Greenhouse Gas Deficit Versus Petroleum*, 4 ENVTL. RESEARCH LETT. 024001 (2009) (attached as Ex. 24) (applying discount rate to account for importance of early emissions).

[33] *See* U.S. EPA, *EPA Lifecycle Analysis of Greenhouse Gas Emissions from Renewable Fuels* (2009) (attached as Ex. 25) ("[T]he time horizon over which emissions are analyzed and the application of a discount rate to value near-term versus longer-term emissions are critical factors").

3. National-Level Reporting and Inventory Programs Provide No Basis for Exemptions at the Facility Scale.

Industry proponents also often claim that counting and regulating biomass emissions at the facility level would contradict GHG reporting and inventory methodologies adopted by the Intergovernmental Panel on Climate Change ("IPCC") and EPA, both of which treat biomass emissions as carbon neutral. The comparison is inapt for two main reasons.

First, the claim presents a classic apples-to-oranges comparison, and one that provides no guidance to EPA in determining whether and how to regulate biomass emissions under the PSD and Title V programs. IPCC and EPA inventory guidance are intended to provide national-scale accounting for aggregate GHG emissions. The PSD and Title V programs, on the other hand, are governed by specific statutory requirements for analysis and control of emissions from particular facilities. The concerns over double counting that inform accounting for biomass emissions in the inventory guidance are simply not present in the PSD and Title V context, because the Clean Air Act concerns itself only with facility-scale emissions. By the same token, EPA's development of guidance for reporting and inventorying greenhouse gases at the national scale cannot even meaningfully inform, much less supplant, EPA's specific statutory duty to implement the PSD and Title V programs in accordance with the plain text and precautionary purpose of the Clean Air Act.

Second, and more fundamentally, scientists have called into question whether biomass emissions should be considered carbon neutral even at the national inventory scale.[34] As explained in a recent Environmental Working Group report,

> The "accounting error" that assumes carbon neutrality for biomass power is based on a misreading of internationally accepted carbon accounting standards promulgated by the Intergovernmental Panel on Climate Change (IPCC). These rules count any harvesting of wood as a direct and immediate emission of carbon dioxide to the atmosphere *at the time of harvesting*. These emissions are only considered to be re-sequestered following the slow, often multi-decade regrowth of cut forests. Emissions released when biomass power plants actually burn this fuel are *not* counted under IPCC rules in order to avoid double counting.

[34] The Center and several other organizations submitted detailed comments to EPA in April 2010 regarding the current national greenhouse gas inventory document, explaining these shortcomings in detail and objecting to EPA's treatment of biomass as "carbon neutral" for inventory purposes. To our knowledge, EPA has not yet addressed these comments. The Center also has filed a petition with EPA pursuant to the Data Quality Act seeking correction of the errors and inaccuracies in the inventory methodology with respect to biomass emissions; we are currently awaiting a formal response from the agency to our petition.

> The U.S. Environmental Protection Agency (EPA) and other institutions that track carbon emissions have misinterpreted this accounting rule. The EPA does not count stack emissions when biomass is burned for power generation, but it also does not account for emissions at the time of harvesting. *The result is that emissions from biomass power are never counted.*[35]

As one leading scientist put it, EPA's accounting "erroneously treats all bioenergy as carbon neutral regardless of the source of the biomass, which may cause large differences in net emissions. For example, the clearing of long-established forests to burn wood or grow energy crops is counted as a 100% reduction in energy emissions despite causing large releases of carbon."[36] Energy generated from biomass thus reduces greenhouse gas emissions "only if the growth and harvesting of the biomass for energy captures carbon above and beyond what would be sequestered anyway."[37] Accordingly, the better solution is to focus first on carbon emissions from the smokestack, and then to factor in emissions and reductions associated with land use change and other relevant considerations.

These scientific critiques of the IPCC and EPA inventory methodology dovetail nicely with EPA's statutory authority and responsibilities under the PSD and Title V programs. In this context, biogenic GHG emissions must be counted, and BACT imposed, at the facility level. The assumption that biomass combustion is carbon neutral for national reporting inventory purposes is not only wrong, but also entirely irrelevant.

4. Bioenergy Emissions Cannot Necessarily Be Assumed to Displace Fossil Fuel Emissions.

Another common assumption of carbon neutrality proponents is that bioenergy generation by definition displaces fossil-fired generation on a megawatt-for-megawatt basis. In other words, the carbon neutrality theory hinges on the belief that for each ton of biomass burned, an equivalent amount of fossil fuel is not burned, and any resulting fossil GHG emissions are therefore completely avoided.

Like other assumptions underlying the carbon neutrality argument, this assumption lacks a sound basis in fact. First, the assumption of one-to-one displacement

[35] MARY S. BOOTH AND RICHARD WILES, CLEARCUT DISASTER: CARBON LOOPHOLE THREATENS U.S. FORESTS (Environmental Working Group 2010) at 12 (emphasis in original) (attached as Ex. 26).
[36] Timothy Searchinger, et al., *Fixing a Critical Climate Accounting Error*, 326 SCIENCE 527, 527 (2009), EPA Docket No. EPA-HQ-OAR-2010-0560-0011. As described above, this error is not limited to situations where forests are cleared entirely or converted to energy crops or other uses; rather, this error also infects analysis of the carbon impacts of thinning existing forests for biomass fuels, because thinning both removes stored carbon and can slow the rate and amount of future potential sequestration.
[37] *Id.* at 528.

does not account for growth in demand for energy, but rather seems to assume a flat demand curve. Population and economic growth, however, will generally cause increases in energy demand, even as energy use becomes more efficient.[38] As a result, bioenergy generation may simply be adding capacity rather than displacing capacity currently satisfied by fossil-fired generation.

Second, it cannot be assumed that future energy demand will automatically be satisfied by fossil-fired, carbon-intensive generation. Rightly or wrongly, biomass energy is widely considered to be renewable energy, and thus competes with other renewables for subsidies, incentives, and market share within renewable portfolio standards. Accordingly, to the extent that biomass generation adds capacity to serve future demand, it may well displace other renewables (such as wind and solar) rather than fossil fuels, resulting in dramatically increased carbon emissions per megawatt of energy produced.[39] Determining whether and to what extent biomass generation replaces fossil-fired generation thus requires a facility-specific analysis of energy market characteristics and conditions. It cannot simply be assumed that every ton of biogenic carbon replaces a ton of fossil carbon that would otherwise enter the atmosphere.

II. Options for Regulating Biogenic Emissions Under the PSD and Title V Programs

As the above discussion indicates, and as EPA itself acknowledges, meaningful analysis of the climate impacts of bioenergy production is complex and difficult. GHG emissions, relative carbon debt periods, land use impacts, effects on potential future sequestration, and fuel displacement vary considerably depending upon the source and characteristics of the biomass fuels (including their forests or croplands of origin), combustion technology, emissions from harvest, transportation, and processing, and regional energy markets. This variation clearly precludes any assumption that all biomass combustion is "carbon neutral"—but it also complicates implementation of the PSD and Title V programs at the facility level.

EPA cannot avoid this complexity, but rather must address it in a transparent and scientifically defensible manner. The Center recognizes that EPA is currently at the stage

[38] Demand in California, for example, is expected to continue to grow, even under current economic conditions. *See* Cal. Energy Comm'n, California Energy Demand 2010-2020: Adopted Forecast, Report No. CEC-200-2009-012-CMF (Dec. 2009) (Executive Summary attached as Ex. 27).

[39] Some biomass proponents might argue that biomass generation provides reliable baseload power, while renewable energy from solar and wind generation is intermittent. Yet even existing biomass plants do not run reliably, and are vulnerable to complete and unexpected shutdowns, due to fluctuations in fuel supply and energy prices. *See, e.g.*, Sierra Pacific Indus., Media Release, *Sierra Pacific Industries to Close its Loyalton, CA Power Plant* (Aug. 20, 2010) (attached as Ex. 28). Moreover, as cost-effective storage technologies continue to develop, solar and wind energy may become more competitive with baseload generation.

of collecting an initial round of information, and thus strongly urges EPA to involve the public and the scientific community in further notice and comment proceedings before adopting any particular approach to addressing these issues. The following discussion identifies some preliminary opportunities and concerns related to two possible avenues for dealing with this complexity: lifecycle analysis and sustainability standards.

A. EPA Lacks Obvious Authority to Conduct Lifecycle Analysis in the Context of Determining BACT for Biomass Facilities.

Ultimately, some kind of lifecycle analysis is essential to any accurate understanding of a particular biomass facility's GHG emissions and climate impacts. The scale and duration of a facility's contribution to climate change will depend on the type of fuel burned, secondary emissions from harvesting, transportation, processing, and soil disturbance, direct and indirect land use changes, lost sequestration capacity, and any fossil-fuel use actually displaced—in other words, all of the components of the biomass "carbon debt."

In the Tailoring Rule, EPA obliquely suggested that lifecycle analysis could be incorporated into BACT determinations for biomass facilities, referencing the preliminary recommendations of the Clean Air Act Advisory Committee workgroup on BACT. Tailoring Rule, 75 Fed. Reg. at 31,591. The workgroup's report, however, does not identify any obvious legal basis for conducting lifecycle analysis in connection with BACT for any particular facility; indeed, the report betrays a fundamental lack of consensus as to whether BACT should apply to biomass facilities at all.[40] EPA thus must more fully explain both the legal and the factual rationale for conducting lifecycle analysis in biomass BACT determinations in the course of further notice and comment rulemaking.[41]

[40] Clean Air Act Advisory Comm., Interim Phase I Report of the Climate Change Work Group of the Permits, New Source Review and Toxics Subcommittee (Feb. 3, 2010) at 20, *available at* www.epa.gov/air/caaac/climate/2010_02_InterimPhaseIReport.pdf (last visited Sept. 13, 2010).

[41] We are aware of the suggestion made by Clean Air Task Force and other organizations that EPA might be able to employ lifecycle analysis in determining whether biomass fuels constitute "clean fuels" for BACT purposes. *See* 42 U.S.C. § 7479(3). Such an approach would be defensible, however, only to the extent that it tailors lifecycle analysis to the specific characteristics of any new or modified biomass combustion facility, including combustion technologies, fuel sources, secondary emissions, actual fossil fuel displacements, and potential land use changes. For the numerous reasons outlined in this letter, EPA cannot simply rely on blanket assumptions or programmatic determinations in finding that biomass fuels are "clean fuels" for BACT purposes. Moreover, any attempt by EPA to conduct lifecycle analysis through the "clean fuels" provision should be preceded by adoption of transparent guidelines and standards through a notice-and-comment rulemaking process.

EPA's biomass BACT determinations also will need to cover at least two basic types of facilities: biomass-fired facilities required to impose BACT for their own GHG emissions, and fossil-fired facilities that propose to co-fire with biomass *as* BACT. The latter category raises troubling questions in that it appears to rely on indefensible assumptions regarding the carbon neutrality of biomass fuels. Accordingly, EPA should not allow fossil-fired facilities to use biomass co-firing as BACT unless and until each facility can demonstrate that co-firing of a particular feedstock is in fact the best available technology for reducing carbon emissions. Again, some type of lifecycle analysis will be essential to this demonstration; in the absence of clear authority to conduct this analysis, however, EPA cannot assume that co-firing will satisfy BACT requirements.

B. Renewability and Sustainability Standards Do Not Necessarily Provide Good Proxies for Climate Analysis.

EPA also has requested comment on whether it is appropriate to distinguish between biomass fuels that are, and are not, classified as "renewable" or "sustainable." For several reasons, existing renewability and sustainability standards are not good proxies for specific analysis of a biomass facility's climate impacts.

For the most part, existing sustainability and renewability standards exist primarily to incentivize particular forms of energy generation. They therefore typically reflect political and economic rather than primarily scientific or technology-based considerations, and thus may not provide adequate support for the specific analysis that must underlie a BACT determination. Such standards also may create perverse incentives that lead to other unacceptable environmental effects; as discussed in the Manomet Report and elsewhere, increased demand for biomass fuels can result in vastly increased levels of whole-tree harvest and even large-scale forest conversion.[42] Moreover, existing sustainability standards tend to ignore critically relevant time-scale and carbon debt questions; as previously discussed, a biomass harvesting regime that is technically "sustainable" or "renewable" on a scale of decades or centuries will still contribute significantly to climate impacts in the meantime.

Renewable biomass standards adopted in the 2008 Farm Bill provide an excellent illustration of this problem. For purposes of the Farm Bill, "renewable biomass" includes all "materials" that are "byproducts" of "preventive treatments" designed to "reduce hazardous fuels," contain insect infestations, or "restore ecosystem health." 7 U.S.C. § 8101(12)(A). Labeling these categories of treatments and fuels "renewable," however desirable they may or may not be from a forest management perspective, says absolutely nothing about how the treatments will affect GHG emissions or future carbon sequestration capacity in treated stands. In other words, the "renewable biomass" label does not even provide any relevant information, much less an adequate proxy for BACT review.

[42] *See, e.g.*, Manomet Report at 8; Wise et al. 2010 (Ex. 6).

Furthermore, even to the extent that removal of "hazardous fuels" or insect-infested stands might be intended to prevent emissions associated with wildfire or widespread forest decay, it is not accurate to assume that removal and combustion of these fuels simply avoids identical emissions that would have occurred anyway. It is true that combustion of trees, brush, and litter in forest fires releases carbon emissions. Yet the emissions from fires may be far lower (and far fewer live trees may be killed) than previously believed, depending upon forest type and fire intensity.[43] Indeed, significant amounts of carbon remain sequestered in forest pools following even high-intensity wildfires.[44] Carbon lost in fires also may rapidly be resequestered by early successional species following disturbance.[45]

In fact, recent scientific studies call into question the entire enterprise of removing (and burning) biomass in order to avoid carbon emissions associated with wildfire:

> [F]uel removal almost always reduces C storage more than the additional C that a stand is able to store when made more resistant to wildfire. Leaves and leaf litter can and do have the majority of their biomass consumed in a high-severity wildfire, but most of the C stored in forest biomass (stem wood, branches, coarse woody debris) remains unconsumed even by high-severity wildfires. For this reason, it is inefficient to remove large amounts of biomass to reduce the fraction by which other biomass components are consumed via combustion.[46]

Accordingly, it is not accurate to assume that the carbon emissions associated with biomass energy production would have occurred in the forest anyway, on the same time scales and to the same degree, as a result of fire.[47] In reality, biomass energy generation ensures that forest biomass is converted into carbon dioxide on a very short time scale, whether or not similar emissions would have occurred as a result of fire, and regardless of whether logging is as effective as natural succession in facilitating sequestration of those emissions. Current scientific work also indicates that fire, even the high-intensity variety, is a natural event that we should accept and encourage, not attempt to forestall through speculative, intensive, and destructive logging projects aimed at

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[43] *See, e.g.*, Garrett W. Meigs, et al., *Forest Fire Impacts on Carbon Uptake, Storage, and Emission: The Role of Burn Severity in the Eastern Cascades, Oregon*, 12 ECOSYSTEMS 1246 (2009) (attached as Ex. 29).
[44] *Id.*
[45] *See id.* at 1260-61.
[46] Mitchell 2009 (Ex. 16) at 652.
[47] As one researcher has pointed out, the effective use of fuel treatments to avoid potential wildfire emissions would require foreknowledge of exactly where and when forest fires will occur. Garrett W. Meigs and John L. Campbell, *Comment on "Prescribed Fire As a Means of Reducing Forest Carbon Emissions in the Western United States"* 44 ENVTL. SCI. & TECH. 6250 (2010) (prepublication version attached as Ex. 30).

"forest cleaning" or "fuel reduction."[48] The dead trees left standing after a high-intensity fire provide critical wildlife habitat as well as soil nutrients that encourage rapid growth of early successional species. Moreover, unlike emissions produced in biomass energy facilities, carbon in standing dead trees and forest floor pools may remain sequestered for a long time following even a high-intensity fire, and decays slowly into the atmosphere even as new plant growth recolonizes a burned area.

Put simply, carbon neutrality cannot be assumed because Congress has classified certain categories of forest treatments as "renewable." This example illustrates that "renewability" and "sustainability" standards in and of themselves do not necessarily serve as good proxies for BACT analysis. In this context, there is no easy substitute for the real thing.

III. Conclusion

We appreciate the opportunity to respond to EPA's call for information concerning these critical questions. We strongly support EPA's initial decision in the Tailoring Rule to decline industry's invitation to create an exemption from PSD and Title V permitting requirements—an exemption that would be arbitrary, capricious, and without foundation in either law or fact. We further urge EPA to implement BACT requirements for biomass combustion in the facility-specific, technology-based manner that the Clean Air Act requires. The appropriate precautionary approach here, pending further identification of legal authority that allows for lifecycle analysis, is to treat biomass GHG emissions the same as other stationary source GHG emissions, and to apply the BACT requirement in the traditional, technologically based manner. Finally, to the extent EPA determines that it has authority (through the BACT "clean fuels" provision or some other provision of the Clean Air Act) to conduct lifecycle analysis as part of a BACT determination for a biomass facility, we request that EPA publish notice and receive comment on its determination in the context of a formal rulemaking setting forth transparent and scientifically defensible standards for this analysis.

Thank you for your consideration of these comments and the attached references. Please feel free to contact me at (415) 436-9682 x313, or by email at kbundy@biologicaldiversity.org, with any questions or concerns.

Sincerely,

Kevin P. Bundy
Senior Attorney

Attachments

[48] *See generally* Hanson 2010 (Ex. 17).

APPENDIX A
Exhibits to Center for Biological Diversity Comments
EPA Call for Information on Greenhouse Gas Emissions
Associated with Bioenergy and Other Biogenic Sources
Docket No. EPA-HQ-OAR-2010-0560
September 13, 2010

All files uploaded to www.regulations.gov in PDF format

Exhibit	Title
1	Gregory P. Asner, et al., *High-Resolution Forest Carbon Stocks and Emissions in the Amazon*, PROC. NAT'L ACADEMY OF SCI. EARLY EDITION, *available at* http://www.pnas.org/content/early/2010/08/30/1004875107 (last visited Sept. 12, 2010).
2	Michael G. Ryan, et al., *A Synthesis of the Science on Forests and Carbon for U.S. Forests*, Ecological Society of America: Issues in Ecology, Report No. 13 (Spring 2010).
3	Matthew C. Hansen, et al., *Quantification of Global Gross Forest Cover Loss*, 107 PROC. NAT'L ACADEMY OF SCI. 8650 (May 11, 2010).
4	Eric Johnson, *Goodbye to Carbon Neutral: Getting Biomass Footprints Right*, 29 ENVTL. IMPACT ASSESSMENT R. 165 (2008).
5	Jerry M. Melillo, et al., *Indirect Emissions from Biofuels: How Important?* SCIENCEEXPRESS 10.1126/science.1180251 (Oct. 22, 2009).
6	Marshall Wise, et al., *Implications of Limiting CO_2 Concentrations for Land Use and Energy*, 324 SCIENCE 1183 (2009).
7	World Res. Inst., State of the World's Forests (Jan. 8, 2009), *at* http://www.wri.org/map/state-worlds-forests (last visited Sept. 12, 2010).
8	COMMITTEE ON STABILIZATION TARGETS FOR ATMOSPHERIC GREENHOUSE GAS CONCENTRATIONS; NATIONAL RESEARCH COUNCIL, STABILIZATION TARGETS FOR ATMOSPHERIC GREENHOUSE GAS CONCENTRATIONS (National Acadamies Press 2010) (excerpts).
9	Mary S. Booth, Review of the Manomet Biomass Sustainability and Carbon Policy Study (July 2010).
10	Tara Hudiburg, et al., *Carbon Dynamics of Oregon and Northern California Forests and Potential Land-Based Carbon Storage*, 19 ECOLOGICAL APPLICATIONS 163 (2009).
11	Mark E. Harmon, et al., *Effects of Partial Harvest on the Carbon Stores in Douglas-fir/Western Hemlock Forests: A Simulation Study*, 12 ECOSYSTEMS 777 (2009).
12	Brooks M. Depro, et al., *Public Land, Timber Harvests, and Climate Mitigation: Quantifying Carbon Sequestration Potential on U.S. Public Timberlands*, 255 FOREST ECOLOGY & MGMT. 1122 (2008).
13	Heather Keith, et al., *Re-evaluation of Forest Biomass Carbon Stocks and Lessons from the World's Most Carbon-Dense Forests*, 106 PROC. NAT'L ACADEMY OF SCI. 11,635 (2009).

14	Robert Jandl, et al., *How Strongly Can Forest Management Influence Soil Carbon Sequestration?*, 137 GEODERMA 253 (2007).
15	Lucas E. Nave, et al., *Harvest Impacts on Soil Carbon Storage in Temperate Forests*, 259 FOREST ECOLOGY & MGMT. 857 (2010).
16	Stephen R. Mitchell, et al., *Forest Fuel Reduction Alters Fire Severity and Long-Term Carbon Storage in Three Pacific Northwest Ecosystems*, 19 ECOLOGICAL APPLICATIONS 643 (2009).
17	CHAD HANSON, THE MYTH OF "CATASTROPHIC" WILDFIRE: A NEW ECOLOGICAL PARADIGM OF FOREST HEALTH (2010).
18	Giuliana Zanchi et al., *The Upfront Carbon Debt of Bioenergy* (May 2010).
19	James Hansen, et al., *Target Atmospheric CO_2: Where Should Humanity Aim?*, 2 OPEN ATMOS. SCI. J. 217 (2008).
20	Alliance of Small Island States, *Declaration on Climate Change 2009* (Sept. 21, 2009).
21	B. Hare & M. Meinshausen, *How Much Warming Are We Committed To and How Much Can Be Avoided?*, 75 CLIMATIC CHANGE 111 (2006).
22	IAN ALLISON, ET AL., THE COPENHAGEN DIAGNOSIS: UPDATING THE WORLD ON THE LATEST CLIMATE SCIENCE (2009).
23	M. den Elzen & N. Höhne, *Reductions of Greenhouse Gas Emissions in Annex I and Non-Annex I Countries for Meeting Concentration Stabilisation Targets*, 91 CLIMATIC CHANGE 249 (2008).
24	M. O'Hare et al., *Proper Accounting for Time Increases Crop-Based Biofuels' Greenhouse Gas Deficit Versus Petroleum*, 4 ENVTL. RESEARCH LETT. 024001 (2009).
25	U.S. EPA, *EPA Lifecycle Analysis of Greenhouse Gas Emissions from Renewable Fuels* (2009).
26	MARY S. BOOTH AND RICHARD WILES, CLEARCUT DISASTER: CARBON LOOPHOLE THREATENS U.S. FORESTS (Environmental Working Group 2010).
27	Cal. Energy Comm'n, California Energy Demand 2010-2020: Adopted Forecast, Report No. CEC-200-2009-012-CMF (Dec. 2009) (Exec. Summ.).
28	Sierra Pacific Indus., Media Release, *Sierra Pacific Industries to Close its Loyalton, CA Power Plant* (Aug. 20, 2010).
29	Garrett W. Meigs, et al., *Forest Fire Impacts on Carbon Uptake, Storage, and Emission: The Role of Burn Severity in the Eastern Cascades, Oregon*, 12 ECOSYSTEMS 1246 (2009).
30	Garrett W. Meigs and John L. Campbell, *Comment on "Prescribed Fire As a Means of Reducing Forest Carbon Emissions in the Western United States"* 44 ENVTL. SCI. & TECH. 6250 (2010) (prepublication version).