Comment to EPA: Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources. Docket ID No. EPA-HQ-OAR-2010-0560

EPA must recognize that the current policy of assuming biomass burning is carbon neutral, in concert with mandates to reduce emissions and provisions of hefty subsidies for renewable energy developments, is creating a massive expansion of industrial scale biomass electricity and heat. This in turn is a rapidly escalating looming disaster for forests, soils, and climate and public health. Biomass burning is moving more rapidly – and receiving more subsidies than other forms of renewable energy because it is generally less expensive, and can provide base load electricity. Retrofittiing already existing coal fired utilities, for example, is considerably easier than building wind farms and reforming grids. The very serious problem is that this has created entirely unsustainable new demand for biomass and is resulting in more rather than less greenhouse gas emissions (detailed further below), creating unsustainable additional demand for biomass, and contributing to air pollution that harms public health.

EPA could significantly improve this dangerous situation by "fixing the accounting error", and requiring that biomass burning facilities properly account for and meet regulatory standards for their emissions. The science is very clear at this point, with numerous studies outlining the "carbon debt" incurred by even the more benign biomass harvest practices. The "Manomet Report, for example, reported that when whole trees are used as fuel, carbon debts of more than 40 years would be required relative to coal at utility-scale electricity generating plants, and more than 90 years when compared to natural gas.[1] (Similar results are highlighted in numerous other reports.[2])

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[1] Manomet Biomass Sustainability and Carbon Policy Report, 2010

[2] a. Bioenergy: A Carbon Accounting Time Bomb. Birdlife Intl, Transport and Environment and EU Environmental Bureau

b. Bird N., Pena N. & Zanchi J., The upfront carbon debt of bioenergy, Graz, Joanneum Research, June 2010 can be found at: http://www.birdlife.org/eu/EU_policy/Biofuels/carbon_bomb.html

Even these are vastly underestimated. The Manomet study did not take into consideration a variety of factors that would have resulted in even longer carbon debts. Most notably, they assumed all biomass was harvested as a byproduct of harvesting for other purposes, which is clearly not the case already, even at this early stage in the development of the industry.[3] Harvesting solely for biomass is already occurring and will certainly expand as the industry expands. Definitions of "waste and residues" will also likely be expanded to include a wider and wider array of materials from more lands.

The low energy density of biomass, in combination with the inefficiency of most facilities, results in very large quantities of greenhouse gas emissions. In fact, analyses indicate that wood burning releases near 1.5 times as much CO2 per unit of energy produced than coal. In a letter from Ecolaw and others to Congressional Research Service in October 2009, it was pointed out that supports for biomass in the American Clean Energy and Security Act would undermine the stated target of reducing emissions from 17% below 2005 levels by 2020, to less than 11% below 2005 levels as a result of over 700,000,000 tons per year of CO2 that would be released from biomass burning, and yet uncounted.[4] A report by Environmental Working Group reanalyzed EIA analysis of future CO2 trends from the Energy sector. EIA predicts a dramatic decline by 2025, but this is almost entirely an artifact of their failure to count emissions from biomass burning.[5]

In sum, given the large amounts of CO2 emitted from biomass burning and the very long "carbon debts", switching over from fossil fuels to biomass burning will result in a massive ***increase*** in greenhouse gas emissions over the coming decades (depending on the time frame of the carbon debt).

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3 Booth, M. Review of the Manomet Biomass Sustainability and Carbon Policy Report, Clean Air Task Force, July 2010

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c. Searchinger et al

October 2009 EcoLaw Letter to Congressional Research Service.

5 Booth, M., and Wiles, R. 2010. Clearcut Disaster: Carbon Loophole Threatens U.S. Forests. Environmental Working Group.

Global warming clearly must be addressed immediately.

Furthermore:

1) EPA has no legal basis in Clean Air Act to exempt biomass emissions.

EPA acted appropriately when it did not exclude emissions from biomass burning from regulation under the tailoring rule. First, there is no legal basis for EPA to exclude emissions from particular sources. All emissions sources should be regulated and this is based not only in the law but also on sound science. Neither the complexity of permitting processes, nor the vociferousness of industry should be used as an excuse to undermine the mandate and protocol of the CAA.

2) GHG emissions have the same warming effect no matter the source

$CO_2$ emissions to the atmosphere contribute to warming, regardless of their source. If the earth's systems were in equilibrium, the argument that biogenic emissions will be resequestered might apply. However the earth's systems are no longer in equilibrium. C02 concentrations now are far in excess of what biological systems can resorb into above ground carbon cycles. This is evident from the fact that forests and other ecosystems have switched from being sinks to sources, from the declining carbon holding capacity of oceans, and other indications.[6] Under current conditions, greenhouse gas emissions, no matter their source, contribute to the ***excess*** burden in the atmosphere above and beyond what can be resequestered.

3) Fossil and biological C pools are not altogether separate and distinguishable:

Differentiating between biogenic and fossil carbon sources is not as straightforward as industry would suggest. For example, peat moss is considered a precursor to coal formation, and yet is also considered biological carbon. Peat is burned for bioenergy in some places. In Europe, there was a push to classify peat as a "slow renewable" even though peat can take thousands of years to form. Should coal be considered a "very slow

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6 Drought drives decade long decline in plant growth (and see other links at this location) http://www.physorg.com/news201451698.html

renewable", as it is derived from plant materials? This example clearly illustrates the importance of time dimension in defining "renewable". Given the urgency of global warming, scientists urge that CO2 emissions be reduced by 40% by 2020 (arguably a serious underestimate), a goal that is not compatible with assumptions that regrowth over tens of years will – eventually – negate emissions occurring at burning.

4) Many other sources of emissions from bioenergy occur and must be considered:

The ethanol/biofuel industries have come under fire as attempts have been made to quantify the full lifecyle impacts of their production. Direct and indirect land use changes resulting from shifting crop production as well as increased demand for fertilizer, have been revealed as especially pernicious factors. Most assessments concur that emissions from transport biofuels are actually higher even that the petroleum they are intended to replace.[7] Biomass burning should be held to similar standards, and if it were, would very likely be revealed as a "non solution." Following are some insights into the associated emissions from biomass.

**Harvest Operations. The "wastes and residues" left behind after logging operations are considered one of the most plentiful and reliable sources of biomass. Note however, that there are many indications the availability of these materials is overstated[8], and in fact whole trees are being harvested specifically for bioenergy, and also that the wastes and residues are unsuitable in many cases because they are generally too dirty and impure, and cannot meet air emission standards when burned). Whether emissions from operating equipment to collect and truck these materials are specifically for biomass harvests or as a byproduct of harvests for other purposes, the emissions are likely very significant. As reference, wood harvesting processes emit large amounts of greenhouse gases from

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7 http://www.biofuelwatch.org.uk/docs/lca_assessments.pdf

8 "[F]ederal and state mandates, if fully implemented, would lead to over-harvesting of forests in the United States and are therefore unrealistic. "
2008 Wood Fiber Industry finding, as reported at risiinfo.com
http://www.risiinfo.com/technologyarchives/powerenergy/RISI-biomass-study-finds-government-mandates-could-lead-to-over-harvesting-of-forests.html

machinery operations. Sonne reported that fuel consumption by harvesting equipment emits 8.3 kg CO2-eq./m3 for harvested wood. [9] Looking at harvests for round wood, Heath et al calculate that in 1990, approximately 427.20 Mm3 of industrial round wood were harvested and in 2005 approximately 423.46 Mm3 were harvested, which suggesting that approximately 3.5 TgCO2-eq. were emitted during harvest processes for roundwood alone, in 1990 and 2005.[10]

***Trucking: Wood is bulky and transporting large quantities adds enormously to the emissions associated with biomass energy. For example: EIA has modeled scenarios for future biomass energy production up to 2025. Based on that scenario, transportation of biomass will, at minimum, require over a billion miles of travel every year, over the cumulative time period consuming over 2 billion gallons of diesel fuels. [11]

***Impacts of harvesting on soils: Much of the carbon sequestered in forests is held in soils. Harvest operations result in degradation of forest soils and release of CO2. It is recommended that, at the very least, debris be retained on site to recycle nutrients and also protect soils from erosion, compaction and drying.[12]

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9 Sonne, E. Greenhouse gas emissions from forestry operations: A life cycle assessment. Journal of Environmental Quality 2006, 35: 1439-1450.

10 Supporting Information for: Heath et al. 2010. Greenhouse Gas and Carbon Profile of the U.S. Forest Industry Value Chain. Environmental Science and Technology http://www.fs.fed.us/nrs/pubs/jrnl/2010/nrs_2010_heath_001_supplemental.pdf

11 FROM: Booth and Wiles "Clearcut Disaster".

"The EIA NEMS model assumes that 50 miles is the maximum distance over which most biomass residues can be transported economically and that the cost of transport within a 50-mile radius is $12/ton. Urban wood waste is assumed to be economically transported over distances of up to 100 miles. (Energy Information Administration,Office of Integrated Analysis and Forecasting. Model documentation: Renewable fuels module of the National EnergyModeling System. DOE/EIA-M069 (2009). July, 2009. Washington, DC.) Our estimate of transport costs also assumedthat 50 miles is the maximum distance that biomass would be transported, but this is clearly a dramatic underestimate of even current transport distances, which can be much higher. In addition to domestic transport, the growing international demand for biomass means that wood from the United States is currently being shipped to Europe.

12 Berthrong, ST, EG Jobbágy, RB Jackson. 2009. A global meta-analysis of soil

Industry argues that such residues can be removed, that they are widely available and that removing them prevents the release of methane from decomposition. However, methane releases from natural decomposition of forest residues is likely negligible (except in water logged locations). Further, decomposition processes are responsible for the recycling of nutrients back into soils to support future growth. Removal and burning of "waste and residues" from forest or agricultural soils results in the decline and destruction of nutrients. Further, recent studies indicate that downed wood influences the temperature and moisture levels of underlying soils,[13] and provides habitat for biodiversity.[14] Declining fertility resulting from excess removals will result in compromised regrowth and increased demand for synthetic fertilizers. Pine plantations in the Southeastern U.S. provide an indication: over 10 million acres of plantations are fertilized regularly to sustain rapid growth and repeated harvests.[15]

***Increasing demand for fertilizer:
Synthetic fertilizers are produced with fossil fuels, further contributing to the

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exchangeable cations, pH, carbon, and nitrogen with afforestation. Ecological Applications19: 2228-2241.

13 Haskell, D. . E., Flaspohler, D. . J., Webster, C. . R. & Meyer, M.. W. 2010, 'Variation in Soil Temperature, Moisture, and Plant Growth with the Addition of Downed Woody Material on Lakeshore Restoration Sites', Restoration Ecology.

14 Deadwood, Living Forests. WWF 2004

15 http://www.srs.fs.usda.gov/sustain/report//timbr2/timbr2-06.htm

Nearly 1.6 million acres of planted pine were fertilized in 1999 (North Carolina State Forest Nutrition Cooperative 2000). The increase from 1990 is nearly 800 percent. Nearly 10 million acres were fertilized in the South since 1969. This area is estimated to exceed the sum of forest fertilization in the rest of the World taken together. While the exact distribution of fertilized land among forest owner groups is not available, the Forest Nutrition Cooperative data indicate that fertilization is primarily the domain of FI and TIMOS. Fertilization will likely become even more popular in the future as new, more intensive silvicultural systems are introduced. Assuming that we have about 34 million acres of planted pine that will be fertilized at least twice during the rotation, fertilized area could at least double from today's levels.

greenhouse gas impacts of bioenergy. Fertilizers are expensive and largely imported.[16] Applying them requires further use of fossil fuels. Use of synthetic fertilizers contributes to N20 emissions. EPA has estimated that N20 emissions from fertilizer applications in U.S. forests (mostly industrial tree farms which are not "forests") were 0.1 TgCO2-eq. in 1990 and 0.3 TgCO2-eq./yr from 2004 to 2006.[17]

***Other: Biomass facilities have other impacts that can directly or indirectly effect greenhouse gas emissions. Replacing natural forests with plantations of fast growing trees for example, will be supported by increased demand for biomass. Tree plantations sequester far less carbon than natural forests and cause soil carbon loss.[18]

5) What are the indicators of "renewable" and "sustainable" feedstocks.?

The answer depends on perspective of course, which is why these terms remain subjective and are oft abused. Defining these terms should be done from the perspective that global assessments indicate that the majority of ecosystems are in serious decline, that forests such as the Boreal and Amazon are turning from sinks to sources, that biodiversity losses are escalating beyond anything experienced in human history, or recent geological history,and that soils and freshwater resources are dwindling precariously. Introducing massive new demands for biomass to fuel electricity and heat demands will unlikely be truly sustainable in this context other than at very small scale – including traditional uses already in place.

6) Impacts of bioenergy emissions on other pollutants?

In addition to CO2 emissions from biomass burning, there are many associated co-pollutants of serious concern. These include high levels of PM

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16 USDA: Economic Research Service data

17 U.S. Environmental Protection Agency (EPA). Inventory of U.S. greenhouse gas emissions and sinks: 1990–2006. Washington DC: U.S. EPA. 2008, 394 pp.

18 Will Tree Plantations Spur The Release of Carbon Locked in Soils? Scientific American, Aug 5 2009 http://www.scientificamerican.com/article.cfm?id=tree-plantations

10 and PM 2.5, as well as Sox, NOx, mercury (redistributed), VOCs and other.

EPA should look into the impacts of biomass burning as potentially significant contributor to soot, and the very large quantities of ash produced from biomass burning must also be addressed – these are piled high in the yards of some facilities (McNeil, in Burlington, Vermont, for example). Although not greenhouse gases per se, they could significantly contribute to warming impacts of bioenergy. Handling, transport and ultimate fate of these materials must be fully considered.

7) What should EPA do?

EPA should take into consideration that terms like "sustainable harvest" and "wastes and residues" are ill-defined and when inserted into policy as safeguards, are virtually impossible to enforce or monitor. Likewise, conducting valid lifecycle assessments has proven extremely contentious, most especially because of the difficulties with assessing and monitoring indirect land use changes, which often comprise the lions share of negative greenhouse gas impacts. A far more streamlined approach would be to regulate biomass emissions from the energy sector – based on CO2 per unit of energy produced. The reference may be coal or natural gas – EPA aks for information about this comparison and the results are clear from Manomet and other. However – given that policy supports are under the rubric of renewable energy – the reference should properly be other renewables such as wind and solar. Clearly this would put a very large damper on the industry and result in serious political fallout. However, the realities of climate change, the very critical importance of forests in mitigating those realities, and the science all point in this direction.


1) Manomet Biomass Sustainability and Carbon Policy Report, 2010

2) a. Bioenergy: A Carbon Accounting Time Bomb. Birdlife Intl, Transport and Environment and EU Environmental Bureau

b. Bird N., Pena N. & Zanchi J., The upfront carbon debt of bioenergy, Graz, Joanneum Research, June 2010 can be found at: http://www.birdlife.org/eu/EU_policy/Biofuels/carbon_bomb.html

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c. Searchinger et al

3) October 2009 EcoLaw Letter to Congressional Research Service.

4) Booth, M., and Wiles, R. 2010. Clearcut Disaster: Carbon Loophole Threatens U.S. Forests. Environmental Working Group.

5) Drought drives decade long decline in plant growth (and see other links at this location) http://www.physorg.com/news201451698.html

6) http://www.biofuelwatch.org.uk/docs/lca_assessments.pdf

7) "[F]ederal and state mandates, if fully implemented, would lead to over-harvesting of forests in the United States and are therefore unrealistic. "
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8) Sonne, E. Greenhouse gas emissions from forestry operations: A life cycle assessment. Journal of Environmental Quality 2006, 35: 1439-1450.
Supporting Information for: Heath et al. 2010. Greenhouse Gas and Carbon Profile of the U.S. Forest Industry Value Chain. Environmental Science and Technology
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10) Berthrong, ST, EG Jobbágy, RB Jackson. 2009. A global meta-analysis of soil exchangeable cations, pH, carbon, and nitrogen with afforestation. Ecological Applications19: 2228-2241.

11) Haskell, D. . E., Flaspohler, D. . J., Webster, C. . R. & Meyer, M.. W. 2010, 'Variation in Soil Temperature, Moisture, and Plant Growth with the Addition of Downed

Woody Material on Lakeshore Restoration Sites', Restoration Ecology.

12) Deadwood, Living Forests. WWF 2004

13) http://www.srs.fs.usda.gov/sustain/report//timbr2/timbr2-06.htm
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14) USDA: Economic Research Service data

15) U.S. Environmental Protection Agency (EPA). Inventory of U.S. greenhouse gas emissions and sinks: 1990–2006. Washington DC: U.S. EPA. 2008, 394 pp.

16) Will Tree Plantations Spur The Release of Carbon Locked in Soils? Scientific American, Aug 5 2009
http://www.scientificamerican.com/article.cfm?id=tree-plantations