

Due Diligence on Biomass Combustion

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Misinformation or Lack of Information?

- For nearly a year and a half, the Industrial Authority has provided ample evidence that this plant will ... operate safely and produce a much needed green/renewable energy product for Georgia
- This is well known, universally accepted, state of the art, green energy supported by every single level of government and even the Sierra Club....
- Unfortunately, there remains a mountain of misinformation still out there.” (Brad Lofton, August 11, 2010)

Data shows the following is true

- Power from biomass combustion is expensive
- Biomass combustion is “dirtier” than burning coal
- Health care effects and secondary increase in costs are significant
- Biomass combustion is unequivocally not carbon neutral within any useful time frame
- Forest management science is interesting

What's Driving the System

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- Federal \$ -- 100's of billions
- Important dates
 - Begin construction by 12/31/2010
 - Operational 2013

EMISSIONS COMPARISON DATA
BURNING WOOD IS “DIRTIER” THAN BURNING COAL

PLANT	FUEL	CO ₂ /MW (tpy)	NO _x /MW (tpy)	PM/MW (tpy)
Boardman (PGE)	Coal	9067	3.38	0.59
PVEC	NG	3130	0.23	0.12
<i><u>BIOMASS PLANTS IN MASSACHUSETTS</u></i>				
RUSSELL BIOMASS	WOOD	12,644	3.9	1.69
Re: Coal		(+39%)	(+15%)	(+186%)
Re: NG		(+304%)	(+1596%)	(+1309%)
PRE BIOMASS	WOOD	11,312	3.49	1.15
Re: Coal		(+25%)	(+3%)	(+95%)
Re: NG		(+262%)	(+1417%)	(+858%)
PALMER	C&D	12,415	3.53	0.71
Re: Coal		(+37%)	(+4%)	(+20%)
Re: NG		(+297%)	(+1435%)	(+492%)

Multiple Pollutants with known Negative Health Effects

- NO_x
- Ozone
- Heavy Metals
- VOC
- Dioxin
- Furans
- CO

Particulates

- Particulates are produced by combustion– at very high levels by diesel truck engines and biomass combustion.
 - More than burning coal per unit of power produced
- Particulates come in multiple types:
 - PM 10 – a relatively minor health hazard
 - PM 2.5 & PM ultrafine & PM nano– major health hazards, especially for children, as reported in literally thousands of medical articles in the last four years
 - Other smaller particles

DANGER

- The latest draft of the US EPA Air Quality Criteria for Particulate Matter has confirmed the presence of an apparent linear dose-response relationship between PM and adverse events.

<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=58003>

- Data from all North American studies demonstrate that this curve is without a discernible threshold below which PM concentrations pose no health risk to the general population.

<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=58003>,

<http://circ.ahajournals.org/cgi/content/full/109/21/2655>

DANGER

- The most dangerous particulates are not regulated or accounted for in the permitting process— so permits are not “protective of human health”.
- “Although the dangers to 1 individual at any single time point may be small, the public health burden derived from this ubiquitous risk is enormous. Short-term increases in PM_{2.5} levels lead to the early mortality of tens of thousands of individuals per year in the United States alone.”

<http://circ.ahajournals.org/cgi/content/full/109/21/2655> p 116.

The Assumption

- “Combustion of biomass emits greenhouse gases....[but] the CO₂ emissions from these activities are not included in the national emissions totals. It is assumed that the C released during the consumption of biomass ...causes no net addition of CO₂ to the atmosphere.”

<http://epa.gov/climatechange/emissions/downloads09/Energy.pdf>

This was the opinion of experts that has now been discredited

The FOIA– The discovery!

- EcoLaw asked EPA for data to support the assumption of carbon neutrality
 - 1.6 GB of material received
 - More than 80 repetitions of the word “assumed” or “assumption”
- The data, the papers, the meeting notes, the substantive e-mails: **THE RESULTS >>>>>**

The Paradox— VOODOO REPORTING

- EPA HAS UNTIL NOW EXEMPTED POWER PLANTS WHICH USE BIOMASS AS A FUEL SOURCE TO GENERATE ELECTRICAL ENERGY FROM ACCOUNTING FOR THEIR CARBON EMISSIONS AND ALLOWED REPORTING THOSE EMISSIONS AS A ZERO. THAT'S RIGHT— **ZERO**
- *Tailoring rule: Goes into effect January 2, 2011*

CLIMATE NEUTRAL

- *CARBON NEUTRAL*

IS NOT THE SAME AS

- *CLIMATE NEUTRAL*

Biomass Burning is not Carbon Neutral

- Burning [regardless of the type of combustion process] releases CO₂ in minutes but the CO₂ won't be re-sequestered for centuries so burning biomass will accelerate climate change not help.
- EPA's proposed endangerment and cause or contribute findings stated:
 - “Indeed, for a given amount of CO₂ released today, about half will be taken up by the oceans and terrestrial vegetation over the next 30 years, a further 30 percent will be removed over a few centuries, and the remaining 20 percent will only slowly decay over time such that it will take many thousands of years to remove from the atmosphere.

74. Fed Reg.18886, 18899

The truth and the facts

- Searchinger/Hamburg— *Science*, 325:529, October 23, 2009
 - “Exempting emissions from bio-energy use is improper for greenhouse gas regulations. Replacing fossil fuels with bio- energy does not by itself reduce carbon emissions, because the CO₂ released by tail- pipes and smokestacks is roughly the same per unit of energy regardless of the source ”
 - “Maintaining the exemption for CO₂ emitted by bioenergy use under the protocol (IPCC) wrongly treats bioenergy from all biomass sources as carbon neutral. For example, the clearing of long-established forests to burn wood or to grow energy crops is counted as a 100% reduction in energy emissions despite causing large releases of carbon.”

The truth and the facts II

The lifecycle argument

- EPA Proposed Endangerment Finding on CO₂—
If there is a lifecycle it exceeds a hundred years
- Beebe—Tongass Forest Roundtable Feb 2009
 - “It has also been shown the carbon uptake accrued over a given harvest rotation would not make up for the amount of carbon stored in the originally logged old-growth. Managed stands on 80 year rotations stored only *half* the carbon of old growth forests.”
- Ingerson— April 2009
 - “But timing still matters. If the source forest regenerated instantly, biomass would earn its “carbon-neutral” label, but the longer it takes to regenerate forest carbon after a biomass harvest, the longer that carbon dioxide remains in the atmosphere exerting its heating effect.”

The truth and the facts III

“Biogenic is a red herring”

- The total amount of carbon in the biosphere is fixed.
 - What will matter is the total amount of carbon in the atmosphere in the next 2-3 decades.
- Every molecule of CO₂ is created equal
 - CO₂ (biomass smokestack)=CO₂ (car)=CO₂(industrial). Each molecule is equally “dirty”
 - CO₂ (biomass smokestack)=CO₂ (car)=CO₂(industrial). Each molecule has an equivalent effect in terms of climate change

Canard– Biogenic carbon is “safe”

- If all 392 ppm were biogenic CO₂ molecules would the current climate effects be any different?
- If all 392 ppm were biogenic CO₂ molecules would it be sequestered at a faster rate?
- If we filled this room with biogenic CO₂ molecules rather than CO₂ molecules derived from burning fossil fuel, would the survival rate of the participants be higher?

Emissions from biomass combustion

THE TRUTH

- Not carbon neutral
- Not climate neutral
- Not human health benign

EPA response

- EPA Tailoring rule 40 CFR Parts 51, 52, 70, 71
 - May 2010
 - “...does not provide sufficient basis to exclude emissions of CO2 from biogenic sources in determining permitting applicability provisions at this time.” P420
- Comments on exemption rather than applying current BACT standards that are applied to other power plants
- 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.*

All CO₂ Is Equal

- CO₂ is CO₂
- There is no physical or chemical difference between CO₂ derived from the combustion of fossil fuel and CO₂ derived from the combustion of biomass.
- So called “biogenic CO₂” is indistinguishable to UV radiation, therefore it has all the same climate forcing effects as derived from the combustion of fossil fuel
- Therefore biogenic carbon is a “pollutant” under PSD and the Title V programs [see Clean Air Act and *Massachusetts v. EPA*, 549 U.S. 497 (2007)]

Forestry Practices

- Wood supply
- Whole tree burning
- Total storage capacity
- Thinning
- Waste Wood
- Wildfires
- Replanting
- Carbon balance

Where's the wood?

- Each 50 MW plant burns about 1 ton of wood per minute, or requires clearing about 5,000 acres per year.
- GA policy is based on a policy where deforestation has no effect on climate change because it is part of a “natural cycle”.
 - For example, the clearing of long-established forests to burn wood or to grow energy crops is counted as a 100% reduction in energy emissions despite causing large releases of carbon.
 - Searchinger, Hamburg et. al. *Science* 326: 527, 2009 [Oct 23].
 - 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.
 - Matthew C. Hansen, et al., *Quantification of Global Gross Forest Cover Loss*, 107 *PROC. NAT'L ACADEMY OF SCI.* 8650 (May 11, 2010)

Whole Trees

- *“The most likely initial fuel will be woody biomass produced by whole tree chipping” from a 50-mile radius of a coal loading terminal on the Big Sandy River. Beckjord application to the Ohio Public Utilities Commission - 2009*
- On Wednesday, July 14 the NC Utilities Commission held an all day evidentiary hearing on Duke Energy’s proposal to receive credit toward fulfilling the Renewable Energy Portfolio Standard (REPS) by burning wood derived from whole trees in preexisting coal plants that have been upgraded to co-fire wood. Duke experts testified to the need of an “expansive definition” in order for the Utility to meet the REPS without hitting the cost cap. In addition, Duke called an expert consultant who testified that whole trees must be included because of the cost of “wood waste” and transportation of fuel would make the resource unviable.

Whole trees

- Duke had argued that the state green-energy law allowed any type of wood to be burned, including whole trees chipped into fuel. Limiting it to the "wood waste" referred to in the law would not provide enough fuel for power plants, the utility said. The commission agreed, ruling that whole trees could be used to help fuel Duke's coal-fired Buck power plant in Rowan County and its Lee plant in Williamston, S.C. Wood would be mixed with coal.

<http://www.charlotteobserver.com/2010/10/13/v-print/1757813/duke-can-use-trees-for-power-plant.html>

Total storage

- It estimated that as long as the forests are not logged or burned, they have the potential to double the amount of carbon stored
 - Law, Nature, 455:213, 2008
- The one part of the contiguous USA that experienced the most forest loss was the Southeast, a large chunk of which lost more than 10% of its forest cover from 2000 to 2005. <http://lake.typepad.com/on-the-lake-front/2010/04/south-losing-trees.html>

Thinning

- Study concluded that so many trees and brush have to be removed to significantly reduce the carbon lost to wildfires, that even more carbon is released into the atmosphere by thinning than when the forests burn. "If you wanted to save one unit of carbon going up in the atmosphere in a fire, you had to remove 10 to 20 units of carbon to achieve that result," said co-author Mark E. Harmon, professor of ecology at OSU. The reason is that even in severe fires, the bulk of the carbon in the trunks, branches and roots of trees do not burn, so continue to be stored as carbon for many years, Harmon said. The study suggested that forests where carbon storage is the primary purpose should not be thinned over the next 100 years.
 - Harmon, et. al. *Ecosystems* 12:777, 2009
- Thinning reduces completion, opens up the forest floor to more light, thus new plant growth, leading to creation of even more of the flashy fine fuels that sustain forest fires. Unless these thinned stands are repeatedly treated, they can actually acerbate fire hazard by increasing the overall abundance of the very fuels which are most problematic—the smaller shrubs, grasses, and small trees that sustain fire spread. In addition, thinning can increase solar penetration leading to more rapid drying and greater penetration of wind—both factors that aid fire spread.
 - http://www.newwest.net/topic/article/greater_caution_needed_before_supporting_thinning_biomass_projects/C564/L564/

“Waste Wood”

An industry term not a category recognized by Mother Nature

- Debris remaining on the ground after logging may actually suppress competing vegetation resulting in a positive effect on the survival of Douglas-fir seedlings
- Debris decays, releases nutrients, adds to soil productivity.
- Mineral soil is exposed when debris is piled or removed, allowing native plants to be squeezed out while invasive plants grow rapidly.
- Removal of debris also removes a good source of carbon and nitrogen needed for forest productivity. The problem is especially severe on low-productivity sites having gravelly or sandy soils.
- Waste wood and snags are important habitat for flora and fauna
 - Harrington & Schoenholtz, *Effects of logging debris treatments on five-year development of competing vegetation and planted Douglas-fir*, Canadian Journal of Forest Research, <http://pubs.nrc-cnrc.gc.ca/rp-ps/journalDetail.jsp?jcode=cjfr&lang=eng>
 - <http://www.fs.fed.us/pnw/sciencef/scifi121.pdf>.

Wildfires

- Research was done in the central Oregon Cascade Range, where about 100,000 acres burned in four fires in 2002-03. Although some previous studies assumed that 30 percent of the mass of living trees was consumed during forest fires, this study found that only 1-3 percent was consumed.
 - Law et. al. *Ecosystems*, 2009
- "A severe fire does turn a forest from a carbon sink into an atmospheric carbon source in the near-term," Law said. "It might take 20-30 years in eastern Oregon, where trees grow and decay more slowly, for the forest to begin absorbing more carbon than it gives off, and 5-10 years on the west side of the Cascades."
- "The trees are not vaporized even during a very intense fire. In a low-severity fire many of them are not even killed. And in the Pacific Northwest, the majority of burned area is not stand-replacement fire."
Beverly Law bev.law@oregonstate.edu
- Long needle pine forests in the South depend on cycles of fire and regrowth

Replanting

Time to Net Positive Sequestration

- Replanting trees:
 - Sequestration from rapid growth
 - Emissions from soil disturbance and transpiration
- “A replanted clear-cut gives off more CO₂ than it absorbs for as much as 20 years.... Resprouting clear-cuts, on the other hand, often emit carbon for years, despite the rapid growth rate of young trees. ”
 - Lussayert, Law, et. al. Nature 405:1038, 2008
- The misleading assertions of the incinerator industry about the "carbon neutrality" of trees are paralleled by the misleading assertions of the timber industry "that stands of young, fast-growing trees capture carbon more efficiently than do older forests." This assertion has been proven incorrect by Beverly Law, a global forest science professor at Oregon State University, and her colleagues in the AmeriFlux Network across the country using a very precise technique called "eddy flux measurement [which tracks] the exchange of CO₂ and water vapor between forest and air over large swaths of landscape." Resprouting clear-cuts, on the other hand, often emit carbon for years, despite the rapid growth rate of young trees.
 - On Earth Magazine, NRDC, Spring 2008

Balance

- The industry maintains that carbon balance is achieved when the tonnage of wood removed is equal to the estimated volume of new growth. This ignores the carbon density of the wood.
- “However, it has also been shown the carbon uptake accrued over a given harvest rotation would not make up for the amount of carbon stored in the originally logged old-growth. Managed stands on 80 year rotations stored only *half* the carbon of old growth forests. The point of this being, once those “warehouses” storing carbon are destroyed, it takes centuries to rebuild the lost carbon capture capacity.
 - **Harmon, Mark. 2007.** Letter to California Air Resources Board. Comment on Forest Protocols. Online at: http://www.arb.ca.gov/lispub/comm/bccomdisp.php?listname=forestghg07&comment_num=22&virt_num=22.
 - **Janisch, J. E., and M. E. Harmon. 2002.** Successional changes in live and dead wood carbon stores: implications for net ecosystem productivity. *Tree Physiology* 22 (2-3):77-89.

Manomet Study

[June 2010 www.manomet.org]

- Manomet Center for Conservation Sciences
 - “combustion of forest biomass generally emits more greenhouse gases than fossil fuels per unit of energy produced.”
- Response of state of Massachusetts Sect. of Energy and Environmental Affairs:
 - “biomass harvested from New England forests is not 'carbon neutral' in a timeframe that makes sense given our legal mandate to cut greenhouse gas emissions, we need to re-evaluate our incentives for biomass," Bowles said.

Additional studies in last month

- http://www.birdlife.org/eu/pdfs/carbon_bomb_21_06_2010.pdf
- http://www.birdlife.org/eu/pdfs/Bioenergy_Joanneum_Research.pdf

Solutions should be sustained.
Solutions will be good investments

BIOMASS COMBUSTION IS NOT A SOLUTION

- Biomass combustion is dirtier than coal
- Biomass combustion is not carbon neutral
- Definition of sustainability not established

**CURRENT MEDICAL RESEARCH INDICATES THAT
THE PARTICULATE EMISSIONS FROM BIOMASS
COMBUSTION AND FROM THE TRUCK TRAVEL
[WHICH IS NOT COUNTED IN THE PERMIT]
ARE A HEALTH HAZARD FOR WHICH THERE IS
NO SAFE LEVEL OF EXPOSURE**

Solutions

- In Georgia:
 - Valdosta gets about 70% more sunlight [solar energy] than any city in Germany
 - Germany now leads the world in solar installations