

Biomass Reality Check: Lessons Learned in Massachusetts

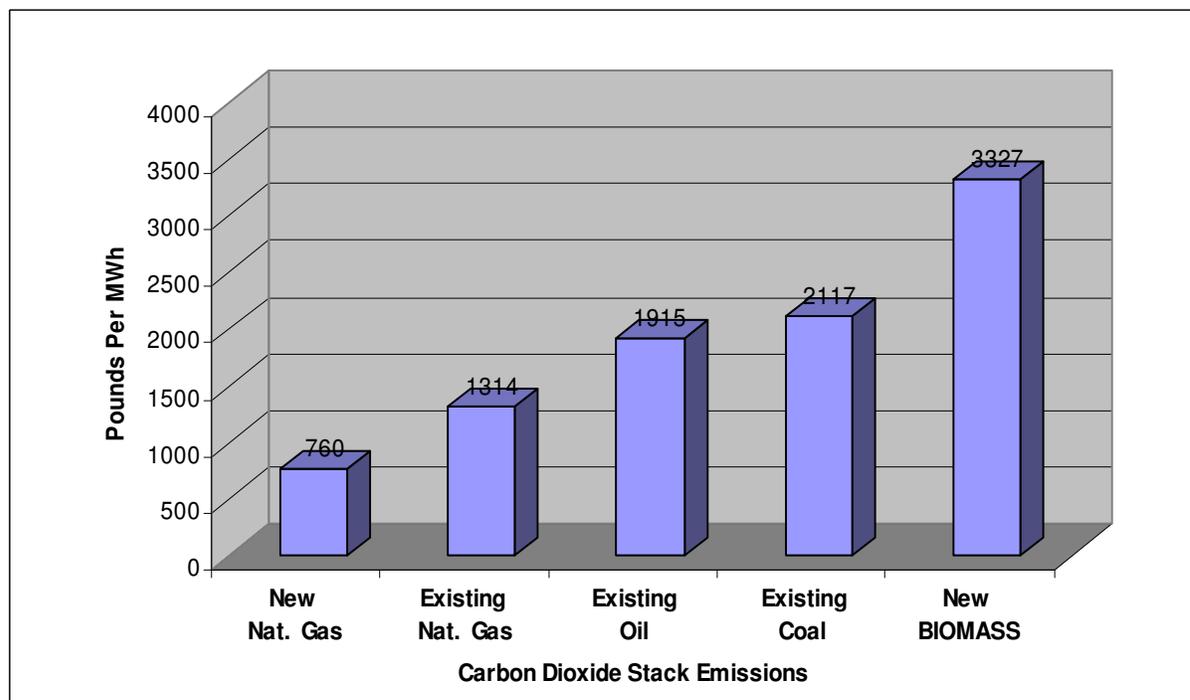
Biomass Energy and Claims of “Clean and Green”

Wood-fueled “biomass” energy has been heavily marketed by industry as “green” energy, but calling this polluting technology “clean” or “green” is more accurately called “greenwashing” of one of the dirtiest forms of energy that exists (even with pollution controls) to gain lucrative taxpayer subsidies.

The following data demonstrates that tree-fueled biomass energy is neither “green”, nor “clean”, and does not belong in the same category as genuinely green energy solutions such as solar, geothermal, appropriately scaled and located wind and hydro, and importantly, conservation and efficiency.

Biomass Reality Check: *Carbon Dioxide Emissions*

Contrary to industry claims, biomass energy fueled by trees does not reduce carbon dioxide emissions, it increases them. Based on the developers own reports, wood fueled biomass power plants emit about 50% more CO₂ than existing coal plants and 330% more CO₂ than new natural gas plants. Brand new electric biomass power plants emit about 3,300 pounds per megawatt hour of carbon dioxide, while existing coal plants emit 2,100 pounds per megawatt hour, existing oil plants 1,900 pounds per megawatt hour, existing natural gas plants 1,300 pounds per megawatt hour and new natural gas plants 760 pounds per megawatt hour. See: www.maforests.org/MFWCarb.pdf



Even “small” efficient combined heat and power (CHP) biomass burners emit more CO₂ than fossil fuels. Brand new CHP wood burning biomass burners emit about 287 lbs/MMBtu of carbon dioxide, while oil burners emit 232 lbs/MMBtu and natural gas burners about 146 lbs/MMBtu. See page 22 in: [www.manomet.org/sites/manomet.org/files/Manomet Biomass Report Chapter2.pdf](http://www.manomet.org/sites/manomet.org/files/Manomet_Biomass_Report_Chapter2.pdf)

Biomass Reality Check: Carbon Dioxide Emissions

It is often incorrectly assumed that forest growth automatically offsets the carbon emissions from biomass burning, but unless *increased* forest cutting for biomass *increases* overall forest growth over “business as usual” forest growth (not likely), the “carbon debt” from higher biomass stack emissions will *never* be paid back and compounds perpetually. When overall forest growth decreases due to increased cutting for biomass (quite possible), the additional forest removals create a double whammy where stack carbon emissions are higher and carbon sequestration rates are lower.

A recent letter from 90 respected scientists asks congress not to “cook the books” when accounting for CO2 from bio-energy stating “*clearing or cutting forests for energy, either to burn trees directly in power plants or to replace forests with bio-energy crops, has the net effect of releasing otherwise sequestered carbon into the atmosphere, just like the extraction and burning of fossil fuels. That creates a carbon debt, may reduce ongoing carbon uptake by the forest, and as a result may increase net greenhouse gas emissions for an extended time period and thereby undercut greenhouse gas reductions needed over the next several decades.*” <http://216.250.243.12/90scientistsletter.pdf>

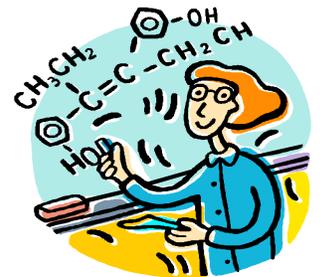
This “critical accounting error” identified by Princeton University scientists, of ignoring carbon emissions from tree burning is leading to a false reduction of carbon levels on paper but an actual increase in atmospheric carbon levels (www.maforests.org/SCIENCE.pdf) and igniting a “carbon time bomb” according to European scientists. (www.birdlife.org/eu/pdfs/carbon_bomb_21_06_2010.pdf)

The European Environment Agency identified the same accounting error, stating, “*It is widely assumed that biomass combustion would be inherently “carbon neutral” because it only releases carbon taken from the atmosphere during plant growth. This assumption is not correct... If bio-energy production replaces forests, reduces forest stocks or reduces forest growth, which would otherwise sequester more carbon, it can increase the atmospheric carbon concentration. The potential consequences of this bio-energy accounting error are immense.*” www.eea.europa.eu/about-us/governance/scientific-committee/sc-opinions/opinions-on-scientific-issues/sc-opinion-on-greenhouse-gas

The recently released “Manomet” study used overtly biomass friendly forest cutting assumptions and the results still demonstrated that life cycle carbon dioxide emissions of tree burning biomass electric facilities are worse than coal for 45-75 years, and are worse than natural gas for at least a century.

Manomet also demonstrated that tree burning biomass heat facilities are worse than oil for 15-30 years and worse than natural gas for 60-90 years.²⁰

See slide 13: www.maforests.org/SUMMARY%20mass_biomass_sustainable_study.pdf



National Public Radio reported the Manomet study results, “*A new study has found that wood-burning power plants using trees and other “biomass” from New England forests releases more greenhouse gases into the atmosphere than coal over time.*” www.wbur.org/2010/06/11/wood-power-plants

As bad as the carbon profile for tree-burning biomass is, the Manomet study has *underestimated* the carbon impacts of tree-fueled biomass by using biomass friendly modeling assumptions that are unlikely to occur on the ground. With realistic models, the carbon profile of tree-fueled bio-energy would be even worse than shown in Manomet. See: www.catf.us/resources/whitepapers/files/201007-Review_of_the_Manomet_Biomass_Sustainability_and_Carbon_Policy_Study.pdf

Biomass Reality Check: Wood burning is not “clean”

Not only is wood burning biomass energy worse than fossil fuels for CO2 emissions, but it also usually emits higher rates of conventional pollutants such as particulates, CO, NOx, and VOC’s than fossil fuels. The McNeil biomass plant near Burlington, and touted by biomass proponents, is the number one air-pollution source in the entire state of Vermont and emits 79 pollutants including dioxin. See: www.planethazard.com/phmapenv.aspx?mode=topiten&area=state&state=VT



The following are the pollution rates for modern institutional or commercial-scale wood burning technologies, particularly school-sized woodchip boilers compared to fossil fuels provided by the **Biomass Energy Resource Center** (who promote biomass) for the MA Department of Energy: (lbs/MMBtu, page 14) http://www.maforests.org/doer_pellet_guidebook.pdf

	Wood	Oil	Natural Gas	Propane
Particulates	.100	.014	.007	.004
Carbon Monoxide	.730	.350	.080	.021
Nitrogen Oxides	.165	.143	.090	.154
Sulphur Dioxide	.008	.500	.001	.016

The particulate emissions from wood burning data above are 7 times worse than oil, 14 times worse than natural gas and 25 times worse than propane. Even if better pollution controls are used, the wood emission profile remains worse than other fuels that use similar pollution control technologies. Usually, “small” biomass facilities do not use the more advanced control technologies.

Due to high particulate pollution rates, the Massachusetts Medical Society (www.maforests.org/MassMed.pdf), the Hampshire Medical Society (www.maforests.org/HDMS.pdf) and the Physicians for Social Responsibility (www.maforests.org/PSR.pdf) are opposed to wood-burning biomass proposals.

The American Lung Association opposes biomass: *“The American Lung Association does not support biomass combustion for electricity production, a category that includes wood, wood products, agricultural residues or forest wastes, and potentially highly toxic feed-stocks, such as construction and demolition waste”.* *“The American Lung Association recognizes that pollution from the combustion of wood and other biomass sources poses a significant threat to human health, and supports measures to transition away from using these products for heat production.”* www.pfpi.net/wp-content/uploads/2011/06/ala-energy-policy-position.pdf

The Environmental Protection Agency states: *“Particle pollution contains microscopic solids or liquid droplets that so small that they can get deep into the lungs and cause serious health problems.”* www.epa.gov/particles/health.html
New England asthma rates are already the worst in the country and aggravated by particulates: www.boston.com/news/health/articles/2010/04/26/scourge_of_asthma_is_acute_in_ne/



The American Heart Association: says *“Short-term exposure to particulate matter (PM) air pollution contributes to acute cardiovascular morbidity and mortality and exposure to elevated PM levels over the long term can reduce life expectancy by a few years.* <http://circ.ahajournals.org/cgi/content/full/121/21/2331>

Considering the increase in particulate pollution that biomass burners can bring, installing them in hospitals and schools does not seem a logical idea considering the at-risk populations they serve.

BIOMASS “CLEAN” AND “GREEN”? - HEAD TO HEAD AIR POLLUTION COMPARISON

POUNDS OF POLLUTION PER MEGAWATT HOUR OF ENERGY PRODUCED

Proposed Springfield, MA Wood Fueled Biomass vs. 50 Year Old Mt Tom Coal Plant

Pollution Rate - LBS per MWh	1960 MT TOM COAL	PROPOSED SPRINGFIELD BIOMASS	BIOMASS POLLUTION DIFFERENCE %
Carbon Dioxide (CO ₂)	1,963	2,612	+ 33%
Carbon Monoxide (CO)	1.07	0.49	-54%
Volatile Organic Compounds (VOC)	0.03	0.07	+ 145%
Particulate Matter (PM)	0.05	0.20	+ 321%
Nitrogen Oxides (NO _x)	1.08	0.23	-79%
Sulfur Dioxide (SO ₂)	2.07	0.16	-92%
Ammonia (NH ₃)	0.002	0.08	+ 3362%

www.maforests.org/Springfield%20MA%20vs%20Coal.xls

Proposed Springfield, MA Wood Fueled Biomass vs. Proposed PVEC Natural Gas Plant

Pollution Rate - LBS per MWh	PROPOSED PVEC NATURAL GAS	PROPOSED SPRINGFIELD BIOMASS	BIOMASS POLLUTION DIFFERENCE %
Carbon Dioxide (CO ₂)	816	2612	+ 220 %
Carbon Monoxide (CO)	0.31	0.49	+ 57 %
Volatile Organic Compounds (VOC)	0.01	0.07	+ 378 %
Particulate Matter (PM)	0.03	0.20	+ 608 %
Nitrogen Oxides (NO _x)	0.06	0.23	+ 264 %
Sulfur Dioxide (SO ₂)	0.01	0.16	+ 1484 %
Ammonia (NH ₃)	0.02	0.08	+ 395 %
Hazardous Air Pollutants (HAPS)	0.003	0.08	+ 2549 %

www.maforests.org/Springfield%20MA%20vs%20Nat%20Gas.xls

Proposed Russell, MA Wood Fueled Biomass vs. 50 Year Old Mt Tom Coal Plant

Pollution Rate - LBS per MWh	1960 MT TOM COAL	PROPOSED RUSSELL BIOMASS	BIOMASS POLLUTION DIFFERENCE %
Carbon Dioxide (CO ₂)	1,963	3,025	+ 54%
Carbon Monoxide (CO)	1.07	1.01	-6%
Volatile Organic Compounds (VOC)	0.03	0.13	+ 392%
Particulate Matter (PM)	0.05	0.35	+ 633%
Nitrogen Oxides (NO _x)	1.08	0.81	-25%
Sulfur Dioxide (SO ₂)	2.07	0.34	-84%
Ammonia (NH ₃)	0.002	0.134	+ 5683%

www.maforests.org/Russell%20MA%20vs%20Coal.xls

Proposed Russell, MA Wood Fueled Biomass vs. Proposed PVEC Natural Gas Plant

Pollution Rate - LBS per MWh	PROPOSED PVEC NATURAL GAS	PROPOSED RUSSELL BIOMASS	BIOMASS POLLUTION DIFFERENCE %
Carbon Dioxide (CO ₂)	816	3025	+ 271 %
Carbon Monoxide (CO)	0.31	1.01	+ 225 %
Volatile Organic Compounds (VOC)	0.01	0.13	+ 861 %
Particulate Matter (PM)	0.03	0.35	+ 1131 %
Nitrogen Oxides (NO _x)	0.06	0.81	+ 1195 %
Sulfur Dioxide (SO ₂)	0.01	0.34	+ 3207 %
Ammonia (NH ₃)	0.02	0.13	+ 727 %
Hazardous Air Pollutants (HAPS)	0.003	0.204	+ 6708 %

www.maforests.org/Russell%20MA%20vs%20Nat%20Gas.xls

Biomass Reality Check: *Increased Forest Cutting is not “Green”*

Wood burning power production is extremely inefficient, a typical power plant burns at about 25% efficiency, so 75% of the trees cut go up in smoke and without producing any energy. This means enormous amounts of forest need to be cut to provide tiny amounts of power. This large fuel demand will lead to increased clearcutting of forests which even biomass consultants have admitted.

It is very important to realize that the vast majority of the fuel for wood fueled biomass energy in New England would come from living trees, not “waste” wood as sold to the public. See:

www.ewg.org/agmag/2010/06/did-they-really-say-that-see-for-yourself/ and
www.risiinfo.com/technologyarchives/risi-wood-biomass-market-report-woodfiber-supply.html

The biomass industry includes trees that they call “low grade” in their definition of “waste” or “residues” simply because they are a species, or have characteristics, that do not provide high commercial market value. However, to the rest of us, and to nature, these are important trees that filter the air and water, sequester carbon, maintain the soil, attract tourists, and provide wildlife habitat.

McNeil biomass near Burlington Vermont, showing trees, not “waste” used for fuel.

At the following link are more photos demonstrating that McNeil uses whole trees as fuel:
www.pfpi.net/the-biomass-industry-burns-whole-trees-for-fuel-%E2%80%93-here%E2%80%99s-proof



Forests are already stressed and increased wood demands would add further ecological pressure, and reduce or eliminate the carbon sequestration benefits that we receive from forests. A recent report by the Environmental Working Group documents the dramatic increase in logging and clearcutting that will occur with increased biomass wood demands. See: www.ewg.org/clearcut-disaster

Biomass Reality Check: *Increased Forest Cutting is not “Green”*

Large biomass incinerators require so much wood for fuel that they draw supplies from hundreds of miles away from the facility which can help accelerate the spread of destructive pests and pathogens. They can also require so much wood that they take away and/or drive up the cost of wood for other wood based businesses. They can even drive up the cost of firewood for the general public.

<http://biomassmagazine.com/articles/5021/nh-plants-petition-for-intervention-in-laidlaw-ppa>

Additionally, when green wood becomes difficult to obtain or more expensive, the large facilities sometimes switch to burning construction and demolition debris which is even more polluting.

Increased wood demands for biomass do not “improve” forests as often claimed, they of course add to the impacts upon them. Clearcutting is defended and practiced today by many in industry, and will only accelerate with increased wood demands from new facilities. In Maine, where there are already many biomass plants, forests are routinely clearcut, including for biomass, debunking the myth that increased wood demands will “help” forests.. See: www.maforests.org/MAINE_CC.pdf

Below is a clearcut in Maine near Moosehead Lake to fuel a wood burning biomass facility.



Is increased wood burning worth the global warming, air pollution, forest and wildlife impacts?

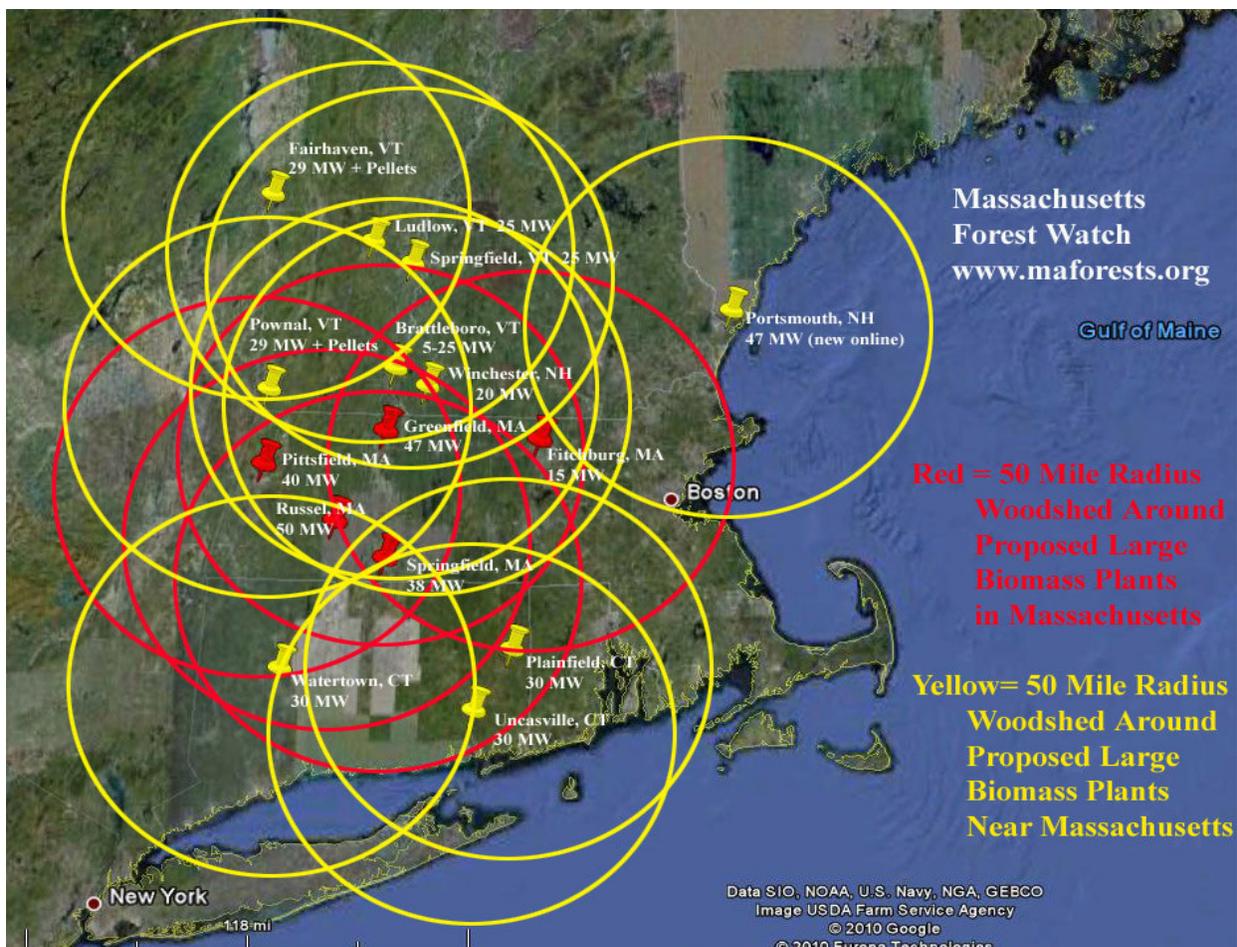
While the exact amounts depend on the state, drastic increases in forest cutting are needed to provide tiny amounts of energy. In Vermont, logging would need to increase by 1,000,000 tons, or 62%, to provide just 1 to 2% of its heat and electric. In Massachusetts, logging would need to increase more than 300% to provide just 1% more electric. See www.maforests.org/Biomess.pdf and page 28 www.leg.state.vt.us/workgroups/biomass/BioE_draft_interim_2011_report_for_public_review.pdf

Instead, achievable and economical conservation and efficiency measures could reduce our energy use by 30%. “Phantom” loads alone, for example when our TV is plugged in but not on, account for 5% of our electric use, which could easily be prevented by using power strips. Conservation and efficiency measures cost 0.03 cents per kw versus 0.09 cents per kw for new production. Solar, geothermal, appropriately scaled and located wind and hydro produce genuinely clean new energy.

Biomass Reality Check: *Biomass Subsidies Creating a Bio-Monster*

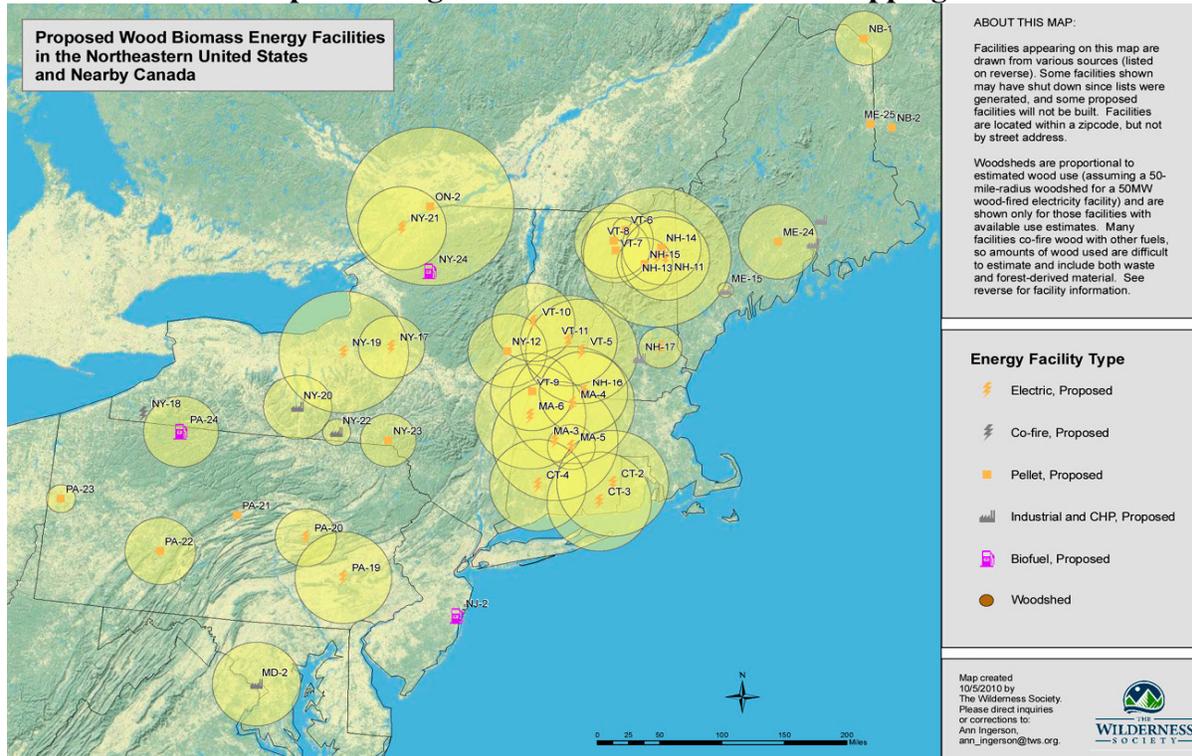
The reason biomass proposals are proliferating is because of the enormous public subsidies being directed at them. A typical 50 MW facility is eligible for about \$75 million dollars from a federal cash grant and about \$25 million dollars in annual public subsidies. Imagine all the genuinely clean jobs and energy that could instead be created with that money by installing solar panels and insulating homes. Rather than 25-50 or so destructive jobs cutting and burning forests, the \$25 million dollar annual subsidy alone could instead be used to support 500 clean and green jobs at \$50,000 per year.

Map of Proposed Large Biomass Plants in Southern New England



Tourists and recreationists come from around the world to visit our “Golden Goose” forests, which supports a large tourist industry in New England. They will not come to see forests cut, chipped, burned and belched into the atmosphere in industrial burners.

Northeast Proposed Large Biomass Facilities and Overlapping Woodsheds



Summary:

At this time of global warming, polluted air, stressed forests and bankrupt governments, there is no reasonable argument for forcing taxpayers to subsidize the construction of new dirty, carbon belching, forest degrading biomass incinerators, for minimal amounts of power that we don't need, often just to further enrich a handful of wealthy developers.

These policies will lead to increased greenhouse gas emissions, air pollution and clearcutting while draining our public coffers. This is the exact opposite of what we need to be doing right now.

“Green” tax-payer subsidies and other incentives should be directed toward genuinely green technologies that produce clean, non-carbon emitting energy and local jobs.

“Clean” Energy Does Not Come Out Of A Smokestack.

Chris Matera, P.E.
christoforest@maforests.org
 413-341-3878
 September 7, 2011

Massachusetts Forest Watch, is an all volunteer citizen watchdog group formed to protect public forests and promote genuinely “clean” and “green” energy solutions. See: www.maforests.org

For a powerpoint presentation about biomass and clearcutting of public forests, see: www.maforests.org/Biomess.ppt (40 MB) For other forest and biomass links, see: www.maforests.org/Links.pdf

This report with live internet links can be found at: www.maforests.org/BioCheck.pdf