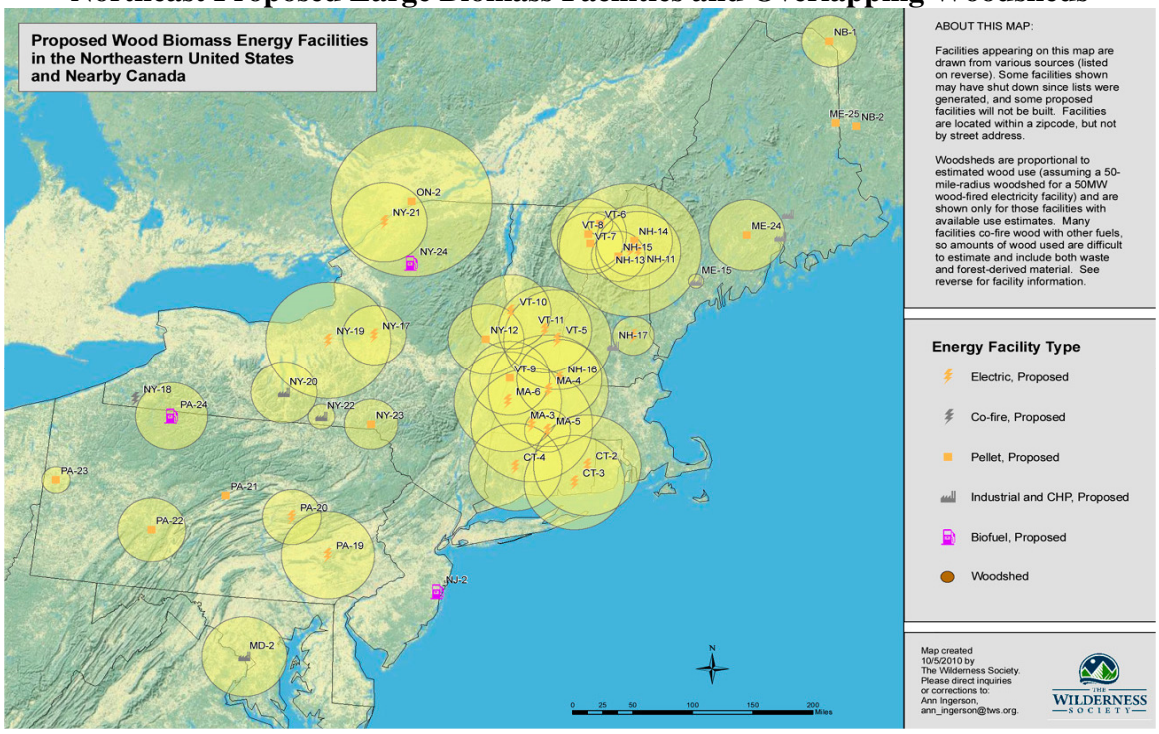
THE VERMONT BIOMESS

Vermont Forests, Air Quality, Carbon Emissions, Communities, Economy and Quality of Life Threatened By New Tree-Fueled Biomass Energy Proposals

Northeast Proposed Large Biomass Facilities and Overlapping Woodsheds



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

McNeil Biomass, the biggest air polluter in Vermont[1]

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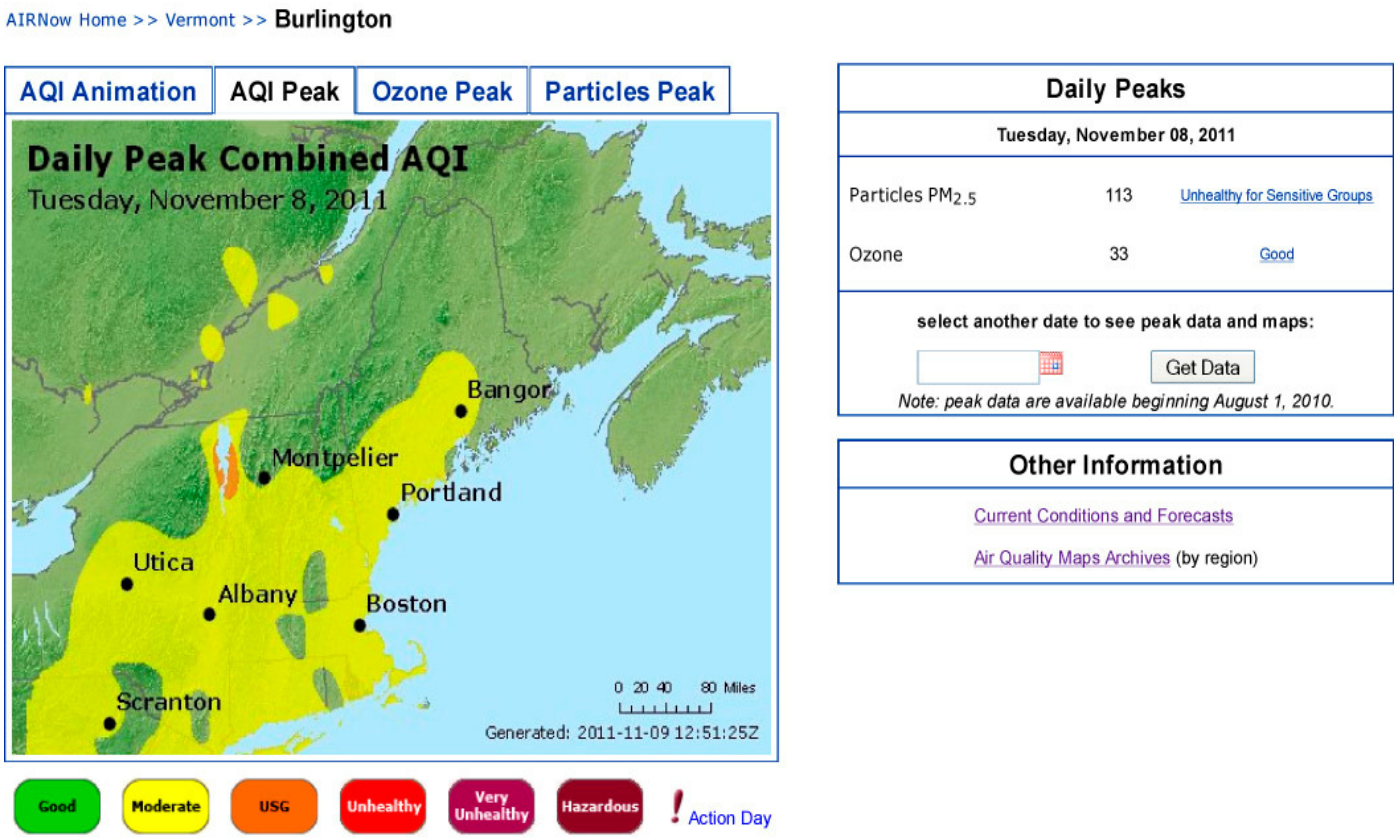
Air Pollution

Below is an Environmental Protection Agency air pollution map for Vermont. Some days are better, some days are worse, but Vermont's air quality is already compromised. Increased cutting and burning of Vermont's "golden goose" forests would only worsen Vermont's air quality.



According to the Center For Disease Control (CDC) data, **Vermont already has the highest rate of asthma in the country.**[2] Rutland, Vt already has the highest asthma rate in the country of any metropolitan area and the Burlington area is worse than 157 out of 192 metropolitan areas, worse than even Los Angeles.[3]

The draft Vermont Comprehensive Energy Plan (CEP) includes proposals that would increase cutting and burning of Vermont's "golden goose" forests by 300,000 tons for electric, 400,000 tons for CHP [4] and 900,000 tons for thermal biomass[5] which would **increase wood burning in VT by more than 100%.**

Biomass developers make unfounded claims that biomass energy is "clean" and "green", and often state that their biomass project will be one of the "cleanest biomass plants in the country". What they don't say is that even the "cleanest" wood fueled biomass energy, is still one of the dirtiest forms of energy that exists, even worse in many important respects than dirty coal energy.

The tables on the next page compare air pollution rates for proposed wood biomass power plants in Fairhaven, VT and Springfield, VT to a 50 year old coal plant in Holyoke, MA and a proposed natural gas electric plant in Westfield, MA. Massachusetts Forest Watch does NOT support coal energy, but comparing biomass to coal is useful to demonstrate just how dirty wood burning biomass really is.

The data is taken from state issued air permits and the biomass developers own reports, and is normalized for pollution emitted per megawatt hour of electric produced. All facilities have modern air pollution controls.

BIOMASS "CLEAN" AND "GREEN"? - HEAD TO HEAD AIR POLLUTION COMPARISON

POUNDS OF POLLUTION PER MEGAWATT HOUR OF ENERGY PRODUCED

Proposed Fairhaven, Vt Wood Fueled Biomass vs. 50 Year Old Mt Tom Coal Plant

Pollution Rate - LBS per MWh	1960 MT TOM COAL	PROPOSED FAIRHAVEN BIOMASS	BIOMASS POLLUTION DIFFERENCE %
Carbon Dioxide (CO2)	1,963	2,993	+ 52%
Carbon Monoxide (CO)	1.07	1.06	~ Equivalent
Volatile Organic Compounds (VOC)	0.03	0.07	+ 158%
Particulate Matter (PM)	0.05	0.27	+ 457%
Nitrogen Oxides (NOx)	1.08	0.43	-61%
Sulfur Dioxide (SO2)	2.07	0.28	-86%
Ammonia (NH3)	0.002	0.083	+ 3479%

www.maforests.org/Fairhaven%20VT%20vs%20Coal.xls

Proposed Fairhaven, Vt Wood Fueled Biomass vs. Proposed PVEC Natural Gas Plant

Pollution Rate - LBS per MWh	PROPOSED PVEC NATURAL GAS	PROPOSED FAIRHAVEN BIOMASS	BIOMASS POLLUTION DIFFERENCE %
Carbon Dioxide (CO2)	816	2993	+ 267 %
Carbon Monoxide (CO)	0.31	1.06	+ 242 %
Volatile Organic Compounds (VOC)	0.01	0.07	+ 404 %
Particulate Matter (PM)	0.03	0.27	+ 835 %
Nitrogen Oxides (NOx)	0.06	0.43	+ 579 %
Sulfur Dioxide (SO2)	0.01	0.28	+ 2686 %
Ammonia (NH3)	0.02	0.08	+ 412 %
Hazardous Air Pollutants (HAPS)	0.003	0.076	+ 2423 %

www.maforests.org/Fairhaven%20VT%20vs%20Nat%20Gas.xls

Proposed Springfield, Vt 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 (CO2)	1,963	2,800	+ 43%
Carbon Monoxide (CO)	1.07	0.92	-14%
Volatile Organic Compounds (VOC)	0.03	0.06	+ 124%
Particulate Matter (PM)	0.05	0.23	+ 385%
Nitrogen Oxides (NOx)	1.08	0.38	-65%
Sulfur Dioxide (SO2)	2.07	0.24	-88%
Ammonia (NH3)	0.002	0.073	+ 3052%

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

Proposed Springfield, Vt 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 (CO2)	816	2,800	+ 243%
Carbon Monoxide (CO)	0.31	0.92	+ 197%
Volatile Organic Compounds (VOC)	0.01	0.06	+ 338%
Particulate Matter (PM)	0.03	0.23	+ 715%
Nitrogen Oxides (NOx)	0.06	0.38	+ 499%
Sulfur Dioxide (SO2)	0.01	0.24	+ 2305%
Ammonia (NH3)	0.02	0.07	+ 351%
Hazardous Air Pollutants (HAPS)	0.003	0.092	+ 2971 %

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

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Air Pollution

As mentioned earlier, the McNeil biomass plant near Burlington is the number one air-pollution source in the entire state of Vermont and emits 79 pollutants including carcinogens such as dioxin.[6]

"Small" biomass facilities have high pollution rates, so the combined impacts of "small" facilities can create a "big" problem. 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.[7] (lbs/MMBtu)

	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

Note: 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.

The American Heart Association: says "S*hort-term exposure to particulate matter air pollution contributes to acute cardiovascular morbidity and mortality and exposure to elevated particulate levels over the long term* ***can reduce life expectancy by a few years***.[8]

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."***[9]

Considering the increase in 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.

Since we seem to be forgetting how bad pollution was when wood was historically a primary fuel, maybe we could learn from present day Europeans.

"Health experts are raising alarms about the impact that bio-energy has on air quality, particularly in Northern and Central Europe where the popularity of wood and timber products for home heating is soaring*. European Environment Agency officials warned that rising levels of biomass in home heating poses a threat to air quality. Wood smoke contains fine particulates and toxins such as nitrogen and sulphur oxides, carbon monoxide and dioxins with implications for both indoor and outdoor air."*

Juha Pekkanen, a physician and research professor at the National Institute for Health and Welfare in Finland, says the popularity of wood stoves in his country and others in Europe poses a public health threat. ***"We're going back to the old days when everyone was warming up their house with their own furnace and we're going to go back to the really bad pollution days we had then"***[10]

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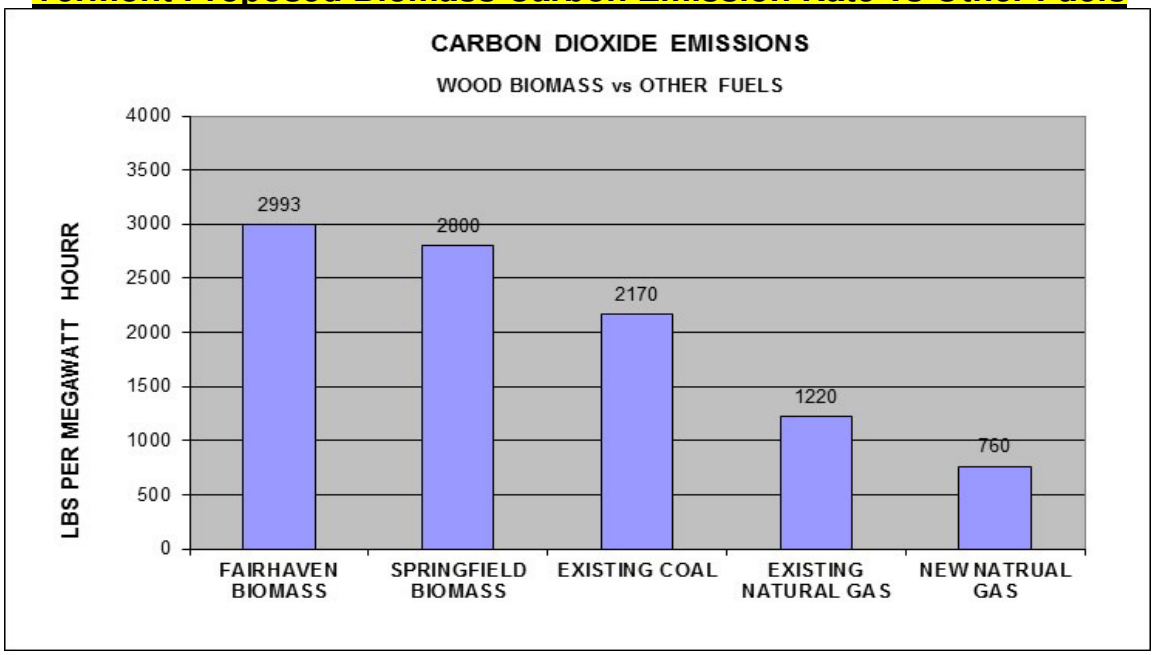
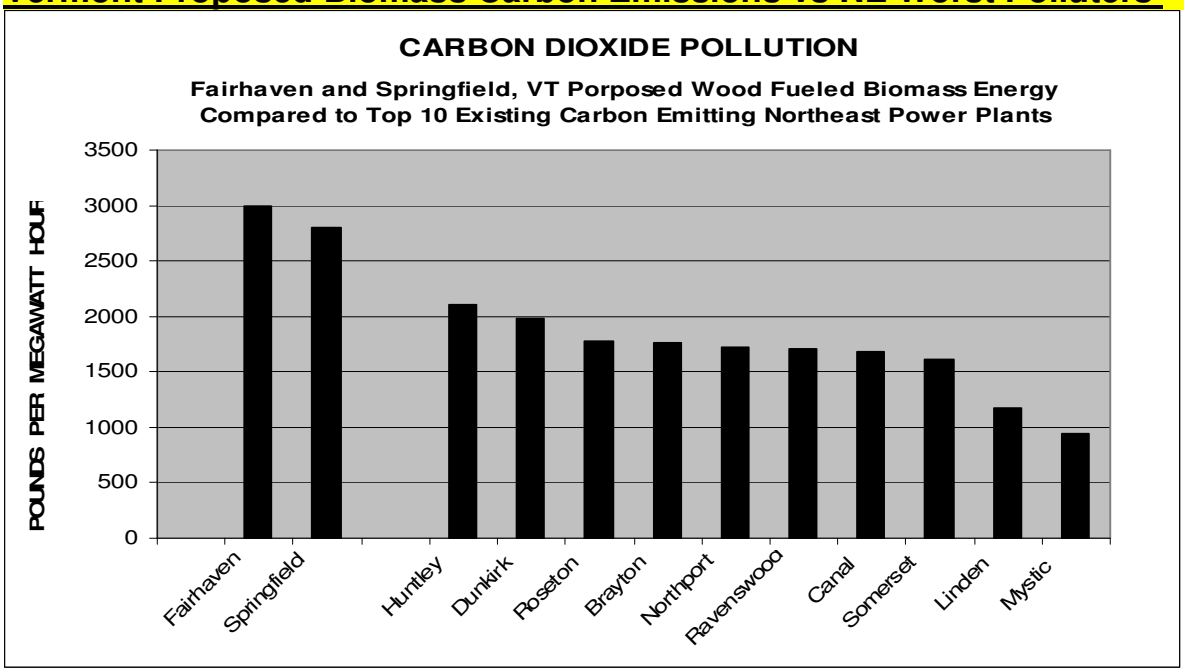
Carbon Emissions

Fairhaven/Springfield, VT biomass developers state that they will emit 2,993 / 2,800 pounds respectively of carbon dioxide per megawatt hour of energy produced.[11] This compares to 2,170 lbs per MWh for existing coal, 1,220 lbs per MWh for existing natural gas and 760 lbs per MWh for new natural gas power plants.[12]

Vermont Proposed Biomass Carbon Emission Rate vs Other Fuels



Vermont Proposed Biomass Carbon Emissions vs NE Worst Polluters [13]



Even combined heat and power (CHP) wood biomass facilities, which some consider "less bad" than biomass electric production, still emit carbon dioxide at a rate 24% higher than oil and 97% higher than natural gas. 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.[14] These CHP biomass emissions are based on 75% efficiency but the draft Vermont CEP suggests weakening the efficiency standards to less than 50% which would increase the biomass carbon dioxide emission rate.[15]

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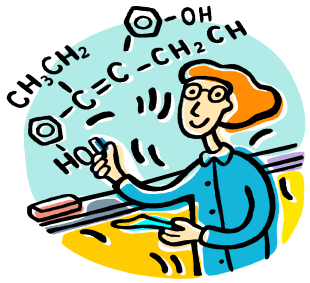
Carbon Emissions

It is often incorrectly assumed that forest growth over time will re-sequester the carbon emissions from tree-fueled biomass burning, but unless ***increased*** forest cutting to fuel biomass burning ***increases*** overall forest growth over "business as usual" forest growth rates (not very likely), the "carbon debt" from higher biomass stack emissions will *never* be paid back and compounds perpetually. When overall forest growth rates decrease due to increased cutting for biomass (very possible), the additional forest removals create a double whammy where stack carbon emissions are higher and carbon sequestration rates are lower.

90 scientists wrote congress asking them not to "cook the books" when counting CO2 from bio-energy: *"**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."*[16]

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[17] and igniting a "carbon time bomb" according to European scientists.[18]

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.***[19]



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]

National Public Radio reported the Manomet study results in June 2010, ***"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."***[21]

As bad as the carbon profile for tree-burning biomass was shown to be in the Manomet study, the report has likely *underestimated* the carbon impacts of tree-fueled biomass due to using biomass friendly modeling assumptions that are unlikely to occur on the ground.[22]

The biomass friendly modeling assumptions are not surprising considering many of the Manomet consultants were biomass proponents, including the Biomass Energy Resource Center. If realistic models were used, the carbon profile of tree-fueled bio-energy would be even worse than shown in Manomet.

IMPORTANT NOTE: This report compares CO2 pollution between wood fueled biomass and fossil fuels in order to demonstrate how bad the biomass carbon footprint is in order to encourage switching to genuinely clean energy sources. It is NOT an endorsement of ongoing use of fossil fuels.

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Forest Impacts

New biomass energy would be fueled mostly by cutting standing trees, not by using "forest residues" as often sold to the public. Vermont is already cutting 67% of net forest growth, and about at the "sustainable" cutting limit when taking into account public lands and inaccessible areas such as steep slopes.[23]

Fairhaven's own wood supply report states they will use 350,000 green tons of wood for biomass fuel and 220,000 green tons of round-wood for pellets = 570,000 green tons of wood.[24] The same report demonstrates that "residues" would only provide about 15% of their wood demand. It takes about 13,000 tons of wood per MW, so the 35 MW Springfield biomass proposal would require another 450,000 tons of wood each year. Consequently, about 860,000 tons required for just these two proposals (15% from "residues") would come from cutting an additional 3,400,000 trees per year.

To understand how Fairhaven would get fuel, it is useful to look at how the existing McNeil biomass plant in Burlington, VT obtains its wood. McNeil already cuts standing trees in Vermont, New Hampshire, New York and as far away as Massachusetts to fuel its annual wood burning of about 400,000 green tons.

Trees are used as fuel for McNeil biomass in Burlington, VT, see photos below

This clear-cut in Worcester provided fuel for McNeil Biomass in Burlington. Hunger Mt. in background 2010

McNeil Showing Trees Before Chipping 2010

Trees stacked at Swanton transfer station. Wood is trucked to Swanton, then taken by train to McNeil 2011

According to the Vermont Biomass Energy Working Group (which was heavily stacked with vested timber & biomass interests), **it would require one million additional tons of cutting (a 62% increase in logging of Vermont's forests) to provide just *1* to *2*% of Vermont's heat and electric.[25]**

The draft Vermont Comprehensive Energy Plan includes proposals that would increase cutting and burning of Vermont's "Golden Goose" forests by 300,000 tons for electric, 400,000 tons for CHP[26] and 900,000 tons for thermal biomass[27] which would mean a <u>92% increase</u> in commercial logging in VT.[28]

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Public Subsidies

As bad as the proposed Vermont wood burning biomass proposals are for air quality, global warming emissions and forest impacts, another very counterproductive aspect is that by re-branding this dirty technology "green", biomass is eligible for literally hundreds of millions of dollars in taxpayer funded public subsidies. Considering how scarce public funds are, and how dirty wood burning is, it is irrational that the public is being forced to pay "clean" energy subsidies for tree-fueled biomass projects which can arguably be called one of the dirtiest forms of energy that exists.

Here are some, but not all, of the potentially available subsidies for wood fueled biomass energy projects. The exact amount of the subsidies are a moving target based on the mood of congress, energy rates, project size, the state where the facility is built, etc. but they help to give an idea of the public funds at stake. Fairhaven is used as an example.

Federal Cash Grant:
Congress is currently debating extending a bill that will pay a 30% grant for the cost of constructing a biomass facility.[29] Fairhaven biomass would cost about $200 million x .3 = **$60 million.** If the grant is not extended, tax credits are potentially available instead of an up-front grant.

Annual Subsidies:
The USDA will pay matching payments up to $45 per dry ton for biomass fuel.[30] 1 dry ton=1.9 green tons so $45/1.9 = $24 per green ton. Fairhaven uses 570,000 green tons annually x $24 per green ton = **$13,680,000**

The proposed energy production is about 285,000 MWh annually[31] If the facility qualifies, it can receive Renewable Energy Credits which average about $25 per MWh[32] x 285,000 MWh = **$7,125,000**

Potential Annual subsidies = **$13,680,000 + $7,125,000 = ~$20,800,000 = ~ $620 million** for 30 years of pollution, carbon emissions and deforestation**, OR**, instead, how about **$620 million** worth of solar panels?

In Summary:

Tree-fueled biomass energy, including CHP and thermal is not "Clean" nor "Green"and is a waste of taxpayer money. Tree-fueled biomass should be removed from the Draft Vermont Comprehensive Energy Plan and replaced with more locally produced solar, geothermal, appropriately scaled and located wind and hydro energy, along with conservation and efficiency.

For more biomass information, see: www.maforests.org/BioCheck.pdf and www.pfpi.net/biomass-basics-2

This report is available on-line with live links at: www.maforests.org/VermontBiomassBiomess.pdf

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MASSACHUSETTS FOREST WATCH
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Massachusetts Forest Watch is an all volunteer citizen watchdog group focused on protecting public forests and promoting genuinely "clean" and "green" energy solutions in New England.

Footnotes:

[1] http://vtdigger.org/2013/05/29/facing-climate-change-vermonts-biggest-polluters/

[2] http://www.cdc.gov/asthma/brfss/2010/current/tableC1.htm

[3] http://www.cdc.gov/mmwr/preview/mmwrhtml/ss6201a1.htm#tab53 Table 53

[4] http://www.maforests.org/Vol%202%20Public%20Review%20Draft%202011.pdf (vol 2, page 99)

[5] http://www.maforests.org/Vol%202%20Public%20Review%20Draft%202011.pdf (vol 2, page 233)

[6] http://www.pfpi.net/air-pollution-2

[7] page 14 http://www.maforests.org/doer_pellet_guidebook.pdf

[8] http://circ.ahajournals.org/cgi/content/full/121/21/2331

[9] pages 4 and 5 www.pfpi.net/wp-content/uploads/2011/06/ala-energy-policy-position.pdf

[10] http://www.euractiv.com/section/agriculture-food/news/doubts-cast-on-biofuels-air-quality-claims/

[11] page 4-14 : http://www.maforests.org/NoSag%20ConstructionPermitApplication.pdf

[12] Department of Energy, Existing power plants: http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11
(Note: DOE chart is in lbs per kwh, multiply by 1000 for lbs per MWh)
New power plants average 760 lbs CO2 per MWh, see page 2:
www.conedsolutions.com/Libraries/Content_Label_PDFs/MA_Greenfield.sflb.ashx

[13] http://www.maforests.org/More%20Heat%20than%20Light%20summary.pdf

[14] page 22: http://www.mass.gov/eea/docs/doer/renewables/biomass/manomet-biomass-report-chapter2.pdf

[15] http://www.maforests.org/Vol%202%20Public%20Review%20Draft%202011.pdf (vol 2, page 164)

[16] http://www.maforests.org/90scientistsletter.pdf

[17] www.maforests.org/SCIENCE.pdf

[18] http://www.maforests.org/Birdlife%20-%20Bioenergy%20Carbon%20Time%20Bomb.pdf

[19] page 1 www.eea.europa.eu/about-us/governance/scientific-committee/sc-opinions/opinions-on-scientific-issues/sc-opinion-on-greenhouse-gas

[20] slide 13: http://www.maforests.org/SUMMARY%20mass_biomass_sustainable_study.pdf

[21] www.wbur.org/2010/06/11/wood-power-plants

[22] www.catf.us/resources/whitepapers/files/201007-Review_of_the_Manomet_Biomass_Sustainability_and_Carbon_Policy_Study.pdf

[23] page 20 http://www.maforests.org/Cary%20Institute_report_biomass_2011.pdf

[24] page 4 http://www.maforests.org/Fair%20Haven%20Fuel%20Supply%20Study.pdf

[25] page 28 : www.leg.state.vt.us/workgroups/biomass/BioE_draft_interim_2011_report_for_public_review.pdf

[26] http://www.maforests.org/Vol%202%20Public%20Review%20Draft%202011.pdf (vol 2, page 99)

[27] http://www.maforests.org/Vol%202%20Public%20Review%20Draft%202011.pdf (vol 2, page 233)

[28] 2009 Commercial Harvest http://www.maforests.org/Vermont-rpt09.pdf
→ Sawlogs and Veneer Log Harvest = 192,633 mmbf x 5 = 963,165 green tons
→ Pulpwood harvest = 161, 214 cords x 2.5 = 403, 103 green tons
→ Whole Chip Harvest = 365,767 green tons
→ Total Harvest = 1,732,000 green tons
→ New logging = 300,000 green tons + 400,000 green tons + 900,000 green tons = 1,600,000 green tons
→ New logging = 1,600,000 / 1,732,000 = 92% increase

[29] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US53F

[30] www.fsa.usda.gov/FSA/newsReleases?area=newsroom&subject=landing&topic=pfs&newstype=prfactsheet&type=detail&item=pf_20110503_energ_en_bcap1.html

[31] www.maforests.org/PVECNaturalGasvsFairhavenBiomass_PW.xls

[32] page 13: http://www.mass.gov/eea/docs/doer/renewables/biomass/manomet-biomass-report-chapter1.pdf