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December 1, 2009

Rep. William Straus, Chair  
Sen. Anthony Petrucci, Chair  
Members  
Joint Committee on Environment, Natural Resources, and Agriculture  
State House  
Boston, Massachusetts

**RE: House Bill 759, An Act Relative to Biomass Combustion Facilities**

Dear Chairs Straus and Petrucci and Members of the Joint Committee:

I am a registered environmental engineer with an M.S. in Environmental Engineering, a Ph.D. in Civil Engineering, and approximately 28 years of professional experience. I am writing in support of House Bill 759, but believe it should be broadened to include all wood-burning power plants regardless of their cooling method. In addition, the act should be amended to remove all public subsidies for all wood-burning power plants due to their damaging impacts, whether they use construction and demolition (C&D) wood or forest biomass for fuel. Also, the excessive carbon dioxide emissions from all wood-burning biomass plants should absolutely be counted in estimating carbon dioxide emissions; there is no scientific support for the unfortunate myth that wood burning biomass plants are “carbon neutral.” Nothing could be farther from the truth. Finally, hearings on the impacts of wood-burning power plants are definitely needed, because environmental impact analyses to date have been inadequate, or more commonly, not even required.

**Living trees are a solution. Wood-burning power plants are a problem.**

There is growing public concern about the damaging climate impacts of wood-burning power plants, as evidenced by the collection of enough signatures to put the issue on the ballot next November, just announced today. The ballot initiative calls for removing subsidies for wood-burning power plants unless they significantly reduce their climate damaging carbon dioxide emissions.

I would like to see us go even further and not allow wood-burning power plants -- period. Their negative impacts grossly outweigh the benefits of the meager amount of power that they supply, an amount that could easily be made up for through conservation and efficiency at a far lower economic cost. Wood-burning power plants, whether they burn C&D wood or forest biomass, emit at least 1.5 times as much carbon dioxide for each unit of electricity generated than any other combustible fuel.

At the root of their many problems, of which excessive carbon dioxide emissions is just one, is their intrinsic inefficiency, which is worse than any other combustible fuel source. They are the Hummers of the combustion world, converting only 15 to 25 of the energy in the wood to electricity, as opposed to 45 percent for coal and 60 percent for natural gas -- this at the same time that they destroy trees that remove damaging carbon dioxide from the atmosphere. The 75 to 85 percent of the energy in the wood that they don't convert to electricity is released as heat, for a direct warming effect. In addition, large amounts of petroleum are used to cut, chip, and haul wood; to haul ash; for incinerator startups;

and to construct the \$200 million incinerators. Wood-burning power plants are the epitome of destruction and inefficiency. In fact, it is difficult to identify an activity that is more harmful to the climate than burning wood to generate electricity. What the world needs now is live trees and energy conservation and efficiency.

Climate change is not just a hypothetical future scenario. People are being impacted now (and predominantly people who played no part in creating the problem). A recent report by the Kofi Annan Foundation estimates that climate change today accounts for over 300,000 deaths throughout the world each year, the equivalent of an Indian Ocean Tsunami every single year. In addition, climate change today seriously impacts on the lives of 325 million people. The report predicts that by 2030, the annual death toll from climate change will reach 500,000 people a year, and climate change will seriously impact on the lives of 660 million people, making it the biggest emerging humanitarian challenge in the world, impacting on the lives of 10% of the world's population (<http://ghfgenewa.org/Media/News/tabid/248/EntryId/42/Default.aspx>).

In the face of what we know now about wood-burning power plant carbon dioxide impacts -- and what we know now about the consequences of carbon dioxide emissions -- and considering that we in the U.S. emit far more carbon dioxide per capita than anyone else in the world and are most responsible for the carbon dioxide that has accumulated in the atmosphere to date, it is unconscionable for us to consider the use of wood-burning power plants.

The stakes are high. We can't afford to indulge in false solutions like wood-burning power plants, to look the other way and not count the very significant carbon dioxide emissions from wood-burning power plants, to cut down the trees, to pretend that if we cut trees down they'll grow right back, to pretend that incinerators can be fueled sustainably. We can't afford to believe that the rest of the world won't notice us cut down our forests as we admonish others to protect theirs. We need to get real now. This is a basic IQ test for the human species. Can we change course and stop relying on combustion for energy, or not?

We shouldn't allow wood-burning biomass plants at all. But at the very least, we should not subsidize them from the public coffer with subsidies like renewable energy credits that are not deserved.

More detailed information is appended. Please call if you have any questions. I would be very pleased to discuss these matters with you.

Very truly yours,



Ellen Moyer, Ph.D., P.E.

### Appendix

The discussion below will focus on just one of the many problems with biomass incinerators, namely that they worsen climate change problems. This is not to downplay any of the many other negative impacts relative to air quality, water supply, water quality, wildlife habitat, noise, odors, traffic, local property values, cordwood prices, and tourism. However, I focus on climate change because the very reason for rewarding biomass incinerators with subsidies is because they are thought to provide clean and renewable energy that lowers greenhouse gas emissions relative to fossil fuels. This letter lays out why biomass incineration is not clean, carbon neutral, or even renewable. In summary, biomass incinerators:

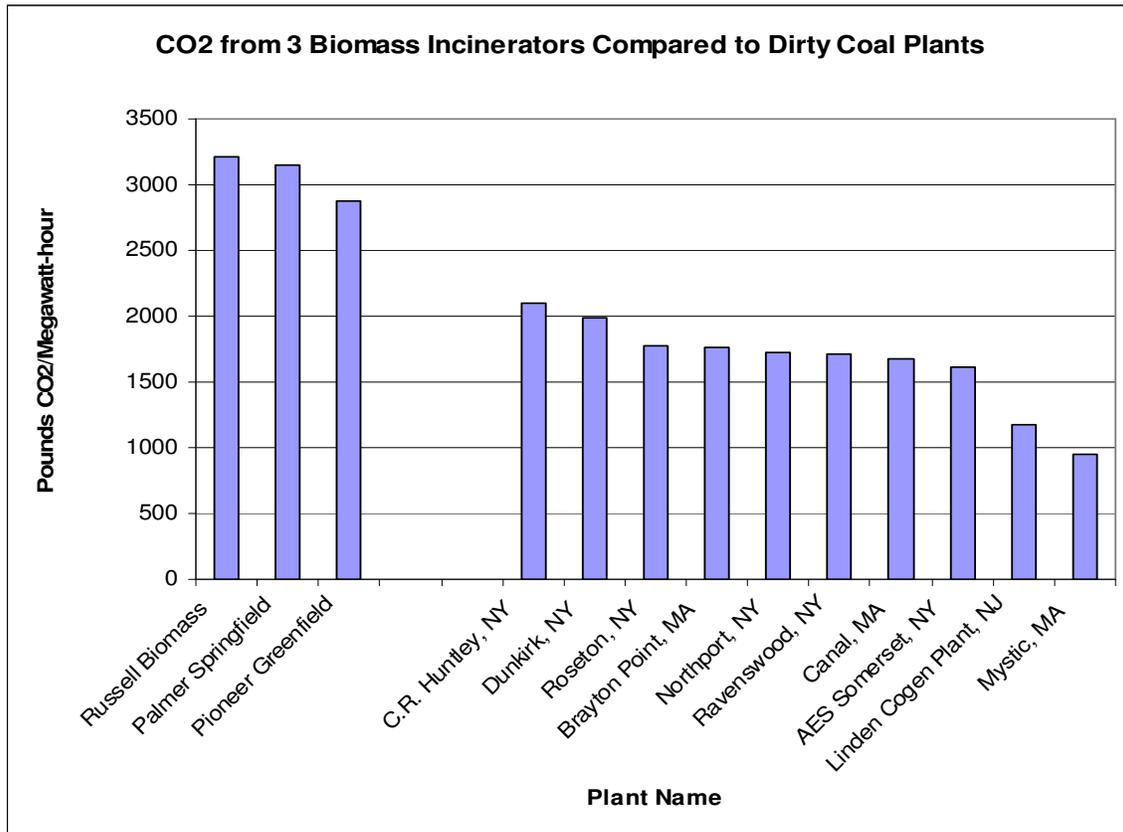
- Emit more carbon dioxide than any other energy source
- Are not carbon neutral (even biomass incinerator developers say so)
- Are less energy-efficient than any other energy source
- Are not fueled sustainably
- Destroy valuable carbon sequestration capacity provided by forests
- Set a bad example
- Are subsidized by rate-payers and tax-payers under false pretenses
- Should not be subsidized and their climate impacts should not be ignored

#### **Large-Scale Wood Burning Biomass Incinerators Emit More Carbon Dioxide per Unit of Electricity Generated than Any Other Energy Source.**

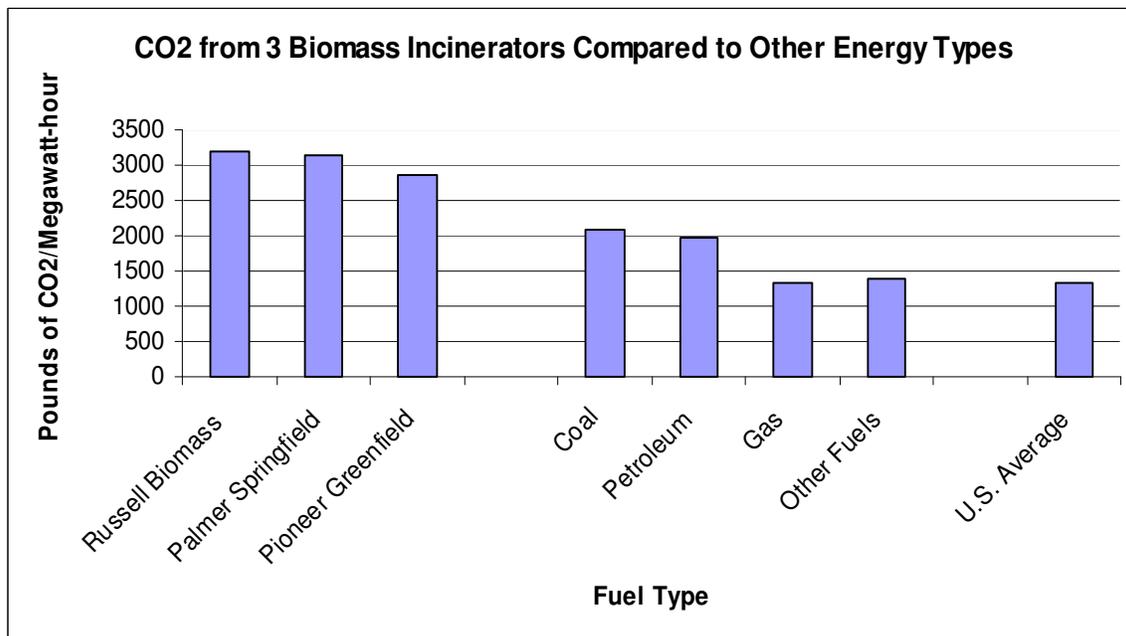
The first graph below compares carbon dioxide emissions from three typical proposed biomass incinerators in Massachusetts (Russell Biomass, Palmer-Springfield, and Pioneer-Greenfield) to those of the ten highest carbon dioxide-emitting power plants in the Northeast region. A capacity factor of 0.90 is assumed (i.e., biomass incinerators are running 90% of the time). The Russell and Greenfield incinerator developers say they plan to burn mostly forest biomass, and the Springfield incinerator proposes to burn mostly construction and demolition (C&D) wood, but their carbon dioxide emissions would be similar to one another.

As the graph shows, the biomass incinerators would each emit 1.4 to 3.4 times as much carbon dioxide per unit of electricity generated as any of the ten highest carbon dioxide-emitting power plants in the Northeast. Comparisons with cleaner burning coal plants would be even more dramatic.

The next graph compares carbon dioxide emissions from the three biomass incinerators to average values for various combustible fuel types. It shows that carbon dioxide emissions from biomass would be at least 1.4 times those of coal, at least 2.2 times those of natural gas, and at least 2.1 times the national average.



Sources: <http://www.massenvironmentalenergy.org/plantdata.html> and MassPIRG 2005 *More Heat than Light*. A capacity factor of 0.90 is assumed (i.e., biomass incinerators are running 90% of the time).



Sources: <http://www.massenvironmentalenergy.org/plantdata.html> and U.S. Department of Energy and U.S. Environmental Protection Agency, 2000, *Carbon Dioxide Emissions from the Generation of Electric Power in the U.S.*

**Biomass Incinerators are Not Carbon Neutral.** Last month, a ground-breaking article debunking the carbon neutrality myth of biomass burning was published in one of the most prestigious, peer-reviewed journals in the world, *Science* ( <http://www.sciencemag.org/cgi/content/short/326/5952/527> ). Authors included researchers from Princeton University, Environmental Defense Fund, Woods Hole Marine Biological Laboratory, Duke University, University of California at Berkeley, Michigan State University, and University of Minnesota. The article, “Fixing a Critical Climate Accounting Error,” clearly states “harvesting existing forests for electricity adds net carbon to the air.” An accounting error that does not count carbon dioxide emissions from biomass burning was made in the Kyoto protocol and then was carried forward into other government policies, including the European Union’s cap-and-trade law and the climate bill passed by the U.S. House of Representatives earlier this year. This error also was incorporated into state laws, including those of Massachusetts. The error can be corrected.

Biomass incineration is not carbon neutral, for several reasons. First, the fuel supply is unsustainable (i.e., wood is used up faster than it regenerates/regrows, see analysis below). Second, petroleum is needed to cut and process wood into small chips, haul the wood long distances in trucks that get less than 10 miles to the gallon, and haul the ash to a disposal/reuse location. Each incinerator costs several hundred million dollars to build, representing significant embodied energy, fuel oil is used for incinerator startups, and natural gas is used for co-firing, in some cases. All this petroleum use emits correspondingly more carbon dioxide.

Third, according to the U.S. Environmental Protection Agency’s (USEPA) proposed endangerment finding on carbon dioxide, (Federal Register, April 24, 2009), carbon dioxide emitted today (by a biomass burner or any other source) will not be reabsorbed for hundreds to thousands of years. The reason we are in a climate crisis is that the atmosphere is already overloaded with carbon dioxide, but biomass burners are emitting more carbon dioxide. The USEPA writes: “Indeed, for a given amount of carbon dioxide 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.”

Even biomass incinerator developers are starting to admit that the process is not carbon neutral. Listen to Bob Saul of GMO Renewable Resources about halfway through this audio say “I’m not going to claim that biomass is carbon neutral. We have very heavy equipment that it takes to get these trees out of the woods. They use fuel. It is not carbon neutral. No one is making that claim.” (Sea Change Radio, July, 29, 2009;

<http://www.cchange.net/2009/07/29/biomass-or-biomess-a-debate/>).

In fact, biomass incineration is the least carbon neutral and most climate-damaging electricity producing option available. This is because not only does it have the highest carbon dioxide emission rates of any energy technology but it also destroys the carbon sequestration capacity of the forests at a rate that exceeds that of any other any energy technology.

The USEPA, under the Clean Air Act, erroneously considers the carbon the dioxide emissions from biomass incinerators “carbon neutral.” These emissions are not reported on USEPA’s E-GRID reporting system for power plant emissions, and are excluded from state cap and trade programs. The result is the “large biomass loophole” that National Resource Defense Council (NRDC) scientist David Hawkins spoke of in his July 7, 2009 testimony before the U.S. Senate on the climate change bill (posted at [www.nobiomassburning.org](http://www.nobiomassburning.org) and on NRDC’s website). Mr. Hawkins testified that any Senate climate bill must close this loophole.

**Biomass Incinerators are the Least Efficient Energy Source.** The main reason that wood-burning biomass emits more carbon dioxide per unit of electricity than other combustibles is that wood is a low-density fuel, thus the biomass combustion process is significantly less efficient. Whereas up to 60 percent of the energy in some fuels is converted into electricity upon combustion, no more than 25 percent of the energy in wood is converted into electricity upon combustion in a large-scale biomass incinerator. More fuel must be burned to provide a unit of electricity, and correspondingly more carbon dioxide is therefore emitted.

#### **Combustion Efficiency of Several Types of Power Plants**

Combined Cycle Power Plant (Natural Gas):	60%
Conventional Coal Plant:	45%
Biomass Stoker Power Incinerator:	<b>15% - 25%</b>

*Source: Professor Curt Freeman, Western New England College, July 2009.*

This fundamental inefficiency results not only in excessive carbon dioxide emissions compared to other fuels, but also excessive emissions of other air pollutants and waste heat, excessive generation of ash, and excessive needs for cooling and petroleum for processing and delivering fuel and removing ash. Biomass incinerators are clunkers in the true sense of the word, and we should not be giving them our hard-earned cash.

**Biomass Incinerators Are Not Fueled Sustainably.** Another consequence of their low efficiency is that large-scale wood-burning incinerators require huge quantities of wood. Five biomass incinerators are proposed in Massachusetts, and if they were to be built, forests would be devastated. The link below shows that land throughout central and western Massachusetts with more than 50% tree canopy, even small residential lots, would be logged in only 9 to 16 years, depending on whether any sensitive forest lands were spared the axe (<http://www.maforests.org/Impacts.htm>). It is foolish for the State to be promoting these biomass incinerators given that supplying them with fuel is not only obviously unsustainable, but also totally unrealistic.

Our neighbor, Maine, has had wood burning biomass incinerators since the 1980s and provides an excellent case study for what happens when incinerators outpace their fuel supply. Approximately 12 biomass (or waste to energy) incinerators in Maine are connected to the energy grid (though they may not all be operational at the current time). All started out burning only forest biomass. Eight have had their licenses modified to allow them to burn a mix of 50% forest biomass and 50% C&D wood. It is well documented that central and northern Maine has been ravaged by liquidation cuttings by paper

companies in advance of their departure from Maine, and from “cut and run” logging by other parties (Mitch Lansky, 1992, *Beyond the Beauty Strip*, and [http://credibleforestcertification.org/fileadmin/materials/old\\_growth/dont\\_buy\\_sfi/sfi\\_facts/factsheets/factsheets/NRCM\\_Report\\_on\\_Plum\\_Creek\\_Violations.pdf](http://credibleforestcertification.org/fileadmin/materials/old_growth/dont_buy_sfi/sfi_facts/factsheets/factsheets/NRCM_Report_on_Plum_Creek_Violations.pdf)). Incinerators must go farther and farther afield for forest biomass. They also go to increasingly more difficult locations for wood, such as steep slopes and areas surrounded by wetlands. Biomass in Europe is in such short supply that wood is being imported from North America (<http://news.mongabay.com/bioenergy/2007/04/us-wood-pellet-industry-eyes-exports-to.html>). In reality, large-scale biomass incinerators are not fueled sustainably. Their need for wood is simply too great and hauling wood long distances is not economical.

Contrary to industry propaganda, whole trees are burned in biomass incinerators. The former plant manager at the Pine Tree biomass incinerator in Westminister, Massachusetts, said at a public meeting in Russell on August 26, 2009, that that biomass incinerator burns mostly whole trees. A case study profile of the Burlington, Vermont, biomass incinerator says “clear-cutting is limited to 25-acre parcels” (<http://edis.ifas.ufl.edu/pdffiles/FR/FR20900.pdf>). Whole tree logging is becoming prevalent in parts of the northeast (<http://www.wvhighlands.org/VoicePast/VoiceApr99/WhTreeLog.htm>).

**Biomass Incinerators Destroy Carbon Sequestration Capacity.** Forests are one of the few means available to us to reduce concentrations of carbon dioxide in the atmosphere, a primary cause of global warming. “U.S. forests today soak up an impressive 13 percent of our annual carbon emissions, and Eastern forests are an important part of the equation.” (Emily Bateson, *The Boston Globe*, August 31, 2009). Trees are not absorbing all the carbon dioxide we need them to today, as evidenced by increasing carbon dioxide concentrations in the atmosphere. Atmospheric carbon dioxide concentrations are currently 387 parts per million (ppm) and increasing 2 ppm per year, whereas the red line that should not be crossed, but has been crossed, is 350 ppm (Bill McKibben, “Climate Change: Tipping Point,” speech given at Mount Holyoke College, April 2, 2009, and aired on the show, *Alternative Radio*). We need to reduce carbon dioxide concentrations in the atmosphere immediately. All carbon dioxide in the atmosphere counts, regardless of its source. And we need more trees! The damage to carbon sequestration services is an added insult of biomass incinerators. Biomass incinerators thus deliver a “triple whammy” when it comes to worsening climate problems – by emitting more carbon dioxide per unit of electricity generated than any other source, by uniquely destroying trees that take up carbon dioxide, and by requiring significant petroleum inputs (and thereby emitting carbon dioxide) to acquire fuel.

The world’s forests are being destroyed at a rapid rate. A 2008 study commissioned by the European Union and conducted by a Deutsche Bank economist concluded that the annual global cost of forest loss is between \$2 trillion and \$5 trillion (and it’s not just rain forests that are the issue). This figure comes from adding the value of the various services that forests perform, such as providing clean water and absorbing carbon dioxide. The study concluded that forest loss dwarfs the banking crisis that was underway at the time of the study and that we continue to reel from today. “It’s not only greater but it’s also continuous, it’s been happening every year, year after year,” said the study leader. The greatest cost to western nations would initially come through losing a natural absorber of the most important greenhouse gas (BBC News, October 10, 2008, Richard Black, “Nature Loss Dwarfs Bank Crisis”).

Deforestation is a major contributor to greenhouse gas emissions. In fact, the United Nations Food and Agriculture Organization reported in October 2006 that deforestation accounts for 25 to 30 percent of the release of greenhouse gases globally. The report states: “Most people assume that global warming is caused by burning oil and gas. But in fact between 25 and 30 percent of the greenhouse gases released into the atmosphere each year – 1.6 billion tonnes – is caused by deforestation.”

(<http://www.fao.org/newsroom/en/news/2006/1000385/index.html>)

**Biomass Incinerators Set a Bad Example.** At a time when we need to reduce carbon dioxide emissions and atmospheric carbon dioxide concentrations immediately, and we are urging other countries to stop destroying their forests and curb their own carbon dioxide emissions, it is absurd to allow even one of these biomass clunkers to be built. What kind of example does it set for the United States, the energy glutton of the planet with 4% of the global population that emits 25% of the global carbon dioxide (Bill McKibben, April 2, 2009), to burn up its trees and convert them to atmospheric carbon dioxide? And all for a miniscule amount of energy, about 1% of the total for Massachusetts if all five incinerators are built. This 1% would generate a 10% increase in carbon dioxide emissions from the Massachusetts electrical power generation sector (<http://www.maforests.org/Biomess.pdf>). Conservation and efficiency could easily make up for this energy. China last week proposed to plant trees in an area the size of Norway as part of its contribution to mitigating climate change, while we plan to cut down our trees.

**Biomass Incinerators Are Subsidized by American Rate-Payers and Tax-Payers Under False Pretenses.** Not only could conservation and efficiency make up for the energy biomass incinerators would generate, conservation and efficiency would do so much less expensively. According to the Massachusetts Department of Energy Resources, energy from conservation and efficiency costs only about 3.2 cents per kilowatt hour, compared to about three times as much for new generation, and vast opportunities exist for expanded conservation and efficiency ([http://www.mass.gov/Eoeea/docs/doer/electric\\_deregulation/ee03-05.pdf](http://www.mass.gov/Eoeea/docs/doer/electric_deregulation/ee03-05.pdf)).

However, biomass incinerator developers/owners can do quite well, thanks to public subsidies. Consider Russell Biomass’ profits on its 50 megawatt incinerator. Over a 30-year period, Russell Biomass expects to make \$1,070 million in profits. Of this, \$399 million is RECs and \$38 million is production tax credits (May 4, 2007 letter prepared by Tighe & Bond for Russell Biomass to the Massachusetts Department of Environmental Protection regarding Water Management Act Order to Complete Response). Thus, 41% of Russell Biomass’ generous profit would be paid for directly by the American public in the form of taxes that we pay to the government, which then are distributed to biomass incinerator owners.

Subsidies are provided based on the false notion that biomass incinerators provide clean, renewable energy. Citizens pay for biomass in many financial ways in addition to direct cash payments (e.g., RECs, other subsidies, and charges for kilowatt-hours). Other economic impacts are related to depressed local property values, damaged tourism economy, increased cordwood prices, diminished value of RECs (making it harder for clean forms of energy like solar to compete), and the economic value of lost forest services and other negative environmental impacts.

People often say we need an array of energy technologies to meet our needs. This is true, but we don't need to include obsolete and inferior technologies like burning wood for electricity in the energy portfolio any more than we need slide rules in modern computing, typewriters in modern word-processing, blood letting in modern medicine, celestial spheres in modern astronomy, spontaneous generation in modern biology, or horses and buggies in modern transportation. The time has come to move to energy technologies that do not involve smokestacks. At some point, we need to admit to new information that refutes past mistaken beliefs and say "Just as the earth is not flat and the sun does not revolve around the earth, biomass incineration is not carbon neutral, clean, or renewable. At first, biomass incinerators sounded like a partial solution to our carbon problems, but new information shows that biomass incinerators would only make the carbon problems worse."

Biomass incinerators are masquerading as clean and green so they can scoop up lucrative RECs, and they were first to arrive full-blown at the REC table because they are nothing new. They threaten to dominate the RECs market and deprive truly clean technologies like conservation, efficiency, and solar from being fully developed. The attached cartoon summarizes the situation.

The biomass industry has been quite effective in convincing the environmental community that large-scale biomass incinerators should be "part of the energy mix," which has allowed these proposals to go forward largely unchallenged. Now that the potential impacts are known, we need to say no.