CalettaRenewableEnergy

Judith Judson, Commissioner
Department of Energy Resources
100 Cambridge Street, Suite 1020
Boston, MA 02114

RE: Rulemaking on 225 CMR 14.00 and 225 CMR 15.00

Dear Commissioner Judson,

Caletta Renewable Energy strongly supports the Department of Energy Resources's (DOER's) proposed amendments to 225 CMR 14.00 and 225 CMR 15.00. We believe that these proposed changes accurately reflect the clear and proven science on the use of Non-Forest Derived Residues for power generation. We appreciate the Department's strengthened focus on fuel source, and commend the continued stringency of sustainable forest requirements for forest-derived fuels. These proposed amendments will assist the Commonwealth's efforts to combat greenhouse gas emissions and climate change, and we thank both DOER and the Baker administration for their leadership on this important issue.

By way of background: In 2008, Palmer Renewable Energy (PRE) responded to the Green Communities Act and the call by then Governor Deval Patrick for a balanced renewable energy portfolio that included biomass. PRE did so by proposing a $150 million 35 MW biomass-to-power project in Springfield. Over the next four years, PRE invested millions of dollars in developing the world's cleanest and most advanced biomass facility, only to have the project's economic viability threatened in 2012 with the creation of new RPS efficiency standards for biomass. These existing efficiency standards, imposed on biomass alone out of all qualifying fuel sources, make RPS qualification impossible for biomass for electricity generation facilities. We support the changes being proposed by DOER because they rightfully reflect that environmental impacts differ greatly by type of woody biomass: under the proposed amendments, facilities utilizing Forest Derived Thinnings or Forest Derived Residues would still be subject to the efficiency standard under the proposed amendments, while the standard would be lifted for facilities utilizing Forest Salvage or Non-Forest Derived Residues.

As scientific studies have demonstrated, the use of Non-Forest Derived Residues for electricity generation is significantly carbon negative over the life of the power plant (see Appendix A). In Massachusetts, we have significant quantities of tree-trimming wood available. Tree-trimming wood is classified as a Non-Forest Derived Residue; it is created from the maintenance activities required to maintain safe corridors around power transmission lines. This is a year-round activity for utilities and municipalities. A study performed for Bank of America Securities puts the availability of tree-trimming wood in Massachusetts at more than 4000 tons per day. In addition, we anticipate that a recent ruling from Federal Energy Regulatory Commission, mandating an increase in the size of safety corridors around main transmission lines from 50 feet to 100 feet, will further substantially increase the supply of tree-trimming wood here in the Commonwealth. As a point of reference, the proposed Palmer Renewable Energy plant in Springfield will utilize 1,200 tons per day.

This tree-trimming wood presents an environmental conundrum. Tree-trimming wood has no current use (a small amount gets made into mulch, but supply far, far outstrips demand in the mulch market). The largest tree-trimmers in MA have testified that their practice is to simply trim the trees, run the limbs, tops, etc. through a chipper in the field and leave the chips on the ground to decompose. The scientific consensus is clear: using these wood chips to generate power, rather than allowing the chips to remain in place and decompose, reduces greenhouse gas emissions over time (see Appendix A). Finally, it is also important to compare the use of woody biomass to the fossil fuel sources commonly in use. Studies show a GHG savings of 81% to 84% when using woody biomass as opposed to even natural gas (see Appendix B).

Some critics of biomass for electric generation ground their objections to the technology in the study performed for DOER by the Manomet Center for Conservation Sciences in 2010. This criticism rests on a misunderstanding of the study, which never considered non-forest sources of woody biomass. By the study authors' own admission, the study does not address fuel sources like tree-trimming wood: "We do not consider non-forest sources of wood biomass (e.g., tree care and landscaping, mill residues, construction debris), which are potentially available in significant quantities but which have very different greenhouse gas (GHG) implications". Please see the documents attached in Appendices C, D, and E for further discussion of this point.

We do harbor concerns on one proposed regulatory change: to no longer allow fuel sourced from land clearings related to development to qualify for the RPS. From a practical perspective, this will only increase the greenhouse gas burden on the Commonwealth. We would advocate that DOER retain the category of "Land Use Change – Non-agricultural" under the definition of Non-Forest Derived Residues, found in the current regulations at 224 14.02.

Thank you for your attention to these important issues for the Commonwealth's interest in reducing greenhouse gas and for your continuing commitment to grappling with the real issues of climate change.

Sincerely, Victor Gatto

Victor Gatto, Chief Operating Officer
Caletta Renewable Energy

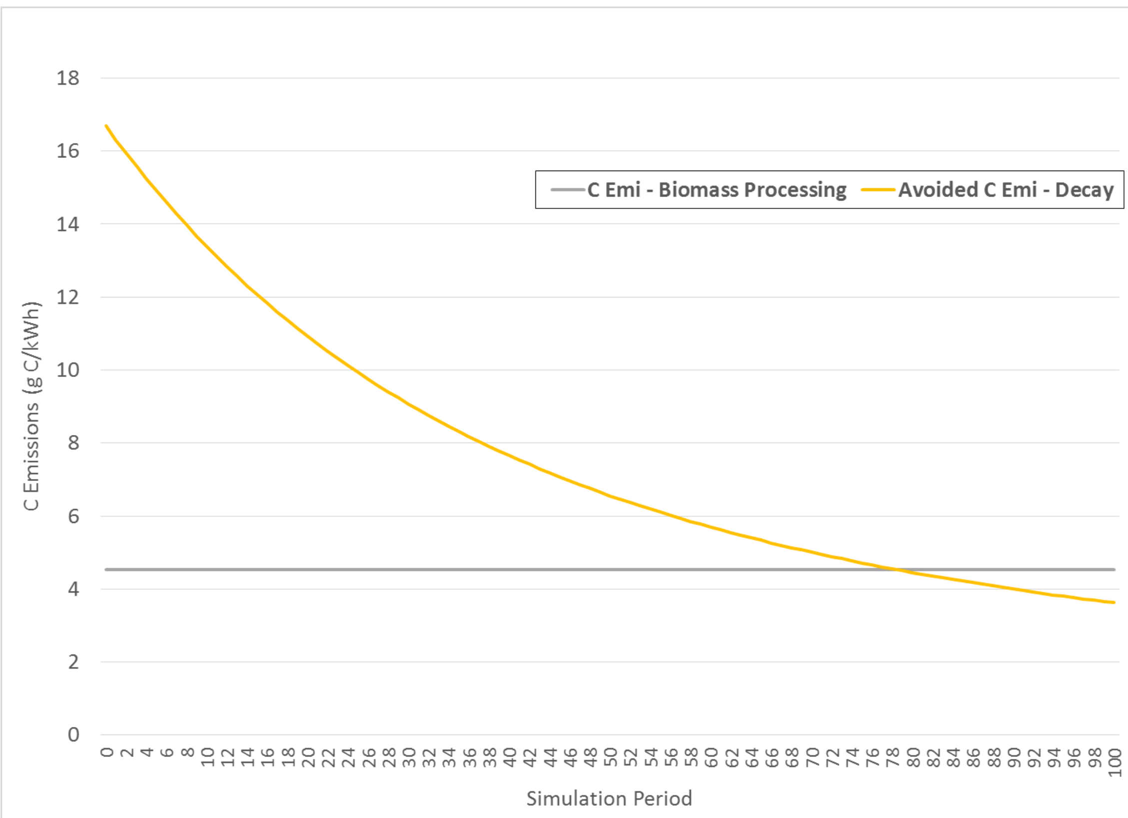
APPENDIX A

Biomass Wood – Net Negative GHG Profile

Multiple studies, referenced below, show significant GHG savings from the use of biomass wood chips for power generation compared to letting the same wood decompose in the field or on the forest floor:

In a study authored by Madhu Khanna, Department of Agricultural and Consumer Economics, University of Illinois at Champaign-Urbana and Puneet Dwivedi, Warnell School of Forestry and Natural Resources, University of Georgia for the Biomass Power Association, the following chart illustrated the net negative greenhouse gas profile of the use of tree-trimming wood chips for the generation of power:

Figure: Carbon emissions due to biomass processing and transportation & avoided C emissions due to decay of harvesting residues:



As illustrated in the Khanna-Dwivedi study above, for example in Year 4 of a plant operation:

- The processing and transportation of the wood and its use in the power plant produces 4.5 grams of carbon per kWh;
- The decomposition of the same amount of wood on the forest floor in the same time period produces 15 grams of carbon using the same per kWh metric;

- Therefore, the use of biomass wood chips for power generation saves 3.3 times the GHG compared to allowing the same wood to decompose in the field or on the forest floor.

Every year of PRE plant operations, as compared to leaving the wood to decompose in the forest, yields an annual GHG savings of 3,181.8 tonnes carbon per year or 11,677 tonnes of CO_2 per year. For the total of 15 years for the Plant, on a life-cycle basis, a total GHG savings of 47,726 tonnes carbon. This savings represents a savings of 175,154 tonnes of CO_2 equivalent that is, in turn, equivalent to removing 38,000 cars off the road annually.

As Khanna-Dwivedi state in the study:

"Our study compared the generation of greenhouse gases from the decomposition of the slash wood in the forest with the greenhouse gases produced from the use of the slash for power generation. In confirmation of the conclusions of other studies, including one from the European Climate Foundation, our study shows clearly the greenhouse gas saving of using the slash for power generation.

"Avoided carbon emissions per hectare (from decomposition) grow over time since cumulative residues per hectare increase over time. However, they grow at a declining rate because of the negative exponential decay function.… Thus, the savings from avoided carbon emissions per unit of electricity (from decomposition) are largest in the first year and decline over time and then stabilize around 100th simulation year. The life-cycle emissions from producing harvesting residues for use in a power plant are the same each year.

"Thus, the use of residues for electricity generation is significantly carbon negative over the life of the power plant."

The Khanna-Dwivedi analysis is confirmed by multiple studies, including the following:

Environmental assessments of woody biomass based jet-fuel - By Indroneil Ganguly, Ivan L. Eastin, Tait Bowers, Mike Huisenga and Francecsa Pierobon, University of Washington School of Environmental and Forest Sciences, December 25, 2013.

LIFE CYCLE ANALYSIS OF RESIDUAL WOODY BIOMASS-BASED BIOFUEL – by Indroneil Ganguly, Francesca Pierobon and 7 other authors, University of Washington School of Environmental and Forest Sciences, 2016.

Life cycle impacts of forest management and wood utilization on carbon mitigation: knowns and unknowns*.* Lippke et al. 2011. *Carbon Management2 (3), 303-333.*

Massachusetts Biomass Sustainability and Carbon Policy Study: Report to the Commonwealth of Massachusetts Department of Energy Resources. Manomet Center for Conservation Sciences. 2010. Walker, T. (Ed.). Contributors: Cardellichio, P., Colnes, A., Gunn, J., Kittler, B., Perschel, R.,

Recchia, C., Saah, D., and Walker, T. Natural Capital Initiative Report NCI-201003. Brunswick, Maine.
(Note: all of the studies confirm the intuitive sense of all participants in the Manomet Study. Namely, “non-forest sources of wood biomass (e.g., tree care and landscaping, mill residues, construction debris), which are potentially available in significant quantities…, have very different greenhouse gas (GHG) implications than forest wood.”)

Report from the Commission to the Council and the European Parliament on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling. European Commission (2010). Michael Hogan, et.al.
Conclusion: “The most common types of biomass energy applications reduce carbon dioxide emissions 55 to 98 percent compared to fossil fuels, even when transported long distances, as long as the biomass production does not cause any land-use change.”

APPENDIX B

GHG Efficiency – Biomass Wood Plant Compared to High Efficiency NG

A foundation study of GHG emissions was done by R. Dones, C. Bauer, et. al., for the Paul Scherrer Institut, Villigen, and Swiss Centre for Life Cycle Inventories, entitled "Life Cycle Inventories of Energy Systems: Results for Current Systems in Switzerland and other UCTE Countries." This study established the greenhouse gas benefits of wood to power systems by comparison with other systems. The synthesizing table from the study of greenhouse gas emissions by technology is as follows:

Table 2: Ranges of GHG Emissions per kWh Electricity Production from European and Country-Specific Energy Sources, using a GWP of 100 years.

	Minimum (kg CO2-equiv./kWh)	Maximum (kg CO2-equiv./kWh)
Lignite	1.060	1.690
Hard coal	0.949	1.280
Oil	0.519	1.190
Industrial gas	0.865	2.410
Natural gas	0.485	0.991
Nuclear power	0.008	0.011
Hydropower	0.003	0.027
Wind power	0.014	0.021
PV (mix mc & pc)	0.079	-
Wood cogeneration	0.092	0.156

These results show GHG saving of 81% to 84% by the use of woody biomass as opposed to the fossil fuel, natural gas.

APPENDIX C

STATEMENT FROM MANOMET ON THE BIOMASS STUDY 21 June 2010

There has been much press coverage of our study about using forest biomass for energy in Massachusetts. This study was commissioned and funded by the Massachusetts Department of Energy Resources (DOER). Many of the resulting press articles have oversimplified the results. Indeed, a key lesson of the study is that understanding the greenhouse gas (GHG) impacts and benefits of using wood for energy is more complex than most people have assumed, and that a lifecycle assessment is needed in order to assess these GHG costs and benefits. Here Manomet seeks to provide some additional clarifying comments about the study given the substantial press coverage that followed the release of our report on June 10, 2010. The study can be downloaded from www.manomet.org. Manomet encourages interested parties to read the report, or at least the Executive Summary, to understand first-hand what the study concludes.

One commonly used press headline has been 'wood worse than coal' for GHG emissions or for 'the environment.' This is an inaccurate interpretation of our findings, which paint a much more complex picture. While burning wood does emit more GHGs initially than fossil fuels, these emissions are removed from the atmosphere as harvested forests re-grow. As discussed in more detail below, the timing and magnitude of the recovery is a function of forest productivity, land management choices, and technology and fuel characteristics.

To help stakeholders and policy makers gain a more accurate and complete understanding of the study results, some of the key points found in the report are listed below.

- **First, the study addresses only the carbon cycle implications of biomass harvested from actively managed, natural forests. The study did not analyze woody biomass from other sources, for example biomass plantations, land clearing, tree work and landscaping wastes, or construction waste. These materials can be important potential sources of biomass—ones that likely have very different carbon cycle implications than biomass from natural forests—and merit careful and separate consideration in biomass policy development.** (emphasis added)
- Second, the study did not analyze the impacts of non-GHG pollutants emitted from energy generation facilities (e.g., particulate matter, NOx, SO2, or other hazardous air pollutants such as mercury). Emissions of these pollutants vary considerably between wood and fossil fuel energy systems, and are an important consideration in determining the relative merits of biomass and fossil fuels.
- Third, the study clearly states that it focuses on the forest and energy situation in Massachusetts. While the study methodology is transferable to other regions of the country, the specific results of our analyses, particularly the carbon cycle implications, cannot be readily applied to states where the

biophysical characteristics of forests, forest management practices and energy sector differ significantly from Massachusetts.

- Fourth, based on the results of our economic analysis of potentially available wood supplies, the report concluded that, overall, biomass harvests in the state would include a mix of logging residues (tops and limbs) and low-quality whole trees or logs (pulpwood and low-grade sawlogs). The relative proportions of these materials in the biomass feedstock have an important effect on the timing of GHG impacts and benefits to the atmosphere. The report further stated that these proportions will be different in other situations or states, and that conclusions about the impacts on the atmosphere will necessarily be different. Each state or situation (or even specific biomass facility) would need to do its own analysis to properly evaluate the GHG costs or benefits.
- Fifth, there has been some confusion about whether our assessments of GHG implications are based on a 'lifecycle' analysis of biomass and fossil fuel carbon emissions. In fact, the study considers the 'upstream' costs of producing and transporting both biomass and fossil fuels, and the stack emissions from burning these fuels. Capture of carbon in growing forests is also part of our lifecycle framework.
- Sixth, the study makes no recommendations regarding the development of specific policies to address GHG emissions from biomass. The intent of the study is simply to provide the best possible information and analysis of the carbon cycle implications to Massachusetts decision makers as they develop biomass energy policies for the state. These decision makers will need to carefully weigh the relative importance of nearer term increases in GHG emissions against longer-term benefits.

The study did show that using wood for energy generally results in greater emissions of GHGs per unit of energy than using fossil fuel. These differences are a function of the lower embedded energy content of wood relative to fossil fuels, inclusion of emissions from upstream production and transportation of fuels, as well as differences in the efficiency of the various energy generation technologies. The report called the excess emissions from burning biomass for energy the carbon debt. But because trees can grow back, this debt can be paid off and a carbon dividend can be achieved as GHG levels are reduced to levels lower than they would have been had only fossil fuels been burned.

The length of time it takes to pay down the debt and realize dividends depends on four factors:

1. The lifecycle of the wood (e.g., logging debris, whole trees, trees vulnerable to catastrophic events) in the absence of the biomass energy opportunity.
2. The type of energy that will be generated (heat, electricity, combined heat and electricity), because different types have different efficiencies and thus different CO_2 emissions profiles.

3. The type of fossil fuel being displaced (coal, oil, or natural gas), because different fuels have different emissions profiles.
4. The management of the forest—management can either slow or accelerate forest growth, and therefore recovery of carbon from the atmosphere.

Unless these factors have been assessed, as they have in our report for Massachusetts, it is not possible to estimate the time it would take to pay off the debt or the magnitude of the carbon dividends—making it difficult to draw conclusions about GHG implications of using wood. **For example, when the wood used to fuel an energy facility is all, or nearly all, logging debris that would have decomposed in the forest anyway, the debt period can be relatively short, even for large-scale electricity generation where biomass replaces coal.** Conversely, fueling an electricity generating facility with mostly whole (live) trees will likely incur a longer carbon debt period (up to several decades) before GHG benefits are realized. Thermal uses of wood generally have a shorter debt period than electricity generation with wood. Renewable energy policy makers who seek to reduce GHG emissions by using wood for energy will be well served by assessing these four factors for the specific energy and forestry contexts of their state or region.

Finally, there are many other considerations besides GHG emissions when making energy policy—these include energy security, air quality, forest recreation values, local economics, other environmental impacts besides just GHG emissions, and quality of place, among others.

Manomet hopes these comments help to more accurately present the major findings of this study and to better inform policy makers and stakeholders. Manomet welcomes and invites feedback on the study, as well as improvements or corrections to our approach.

APPENDIX D

Biomass Energy Resource Center on Manomet

Manomet Team Releases Study of Woody Biomass in Massachusetts

The Biomass Energy Resource Center (BERC) was a partner on the study performed for the Massachusetts Department of Energy Resources, led by the Manomet Center for Conservation Sciences (Manomet) along with other organizations and partners, including the Pinchot Institute for Conservation, the Forest Guild, and consulting forest and resource economists.

BERC's role included the following:

Analysis of the technology scenarios and direct carbon emissions for various biomass energy technologies and their fossil fuel equivalents (Chapter 2).

Analysis of existing public policy at the state and federal levels (Chapter 1).

Review of the wood supply analysis (Chapter 3), although BERC did not have a role in selecting the methodology used.

The policy actions and recommendations as expressed by the Commonwealth of Massachusetts come entirely from the Commonwealth, not the study. The study was commissioned only to provide information and analysis, not policy recommendations.

At the highest level, the study supports three important conclusions regarding the carbon and sustainable forestry implications of biomass:

There is a carbon "debt" when biomass is burned for energy, i.e., burning carbon often releases more carbon at the time of combustion than an equivalent amount of fossil fuel and it takes a certain amount of time (specific to both the type of fuel used and the energy technology) to "recover" that debt by re-sequestering that additional carbon. Beyond this point, the continued sequestration of carbon makes the combustion of biomass carbon-beneficial as compared to fossil fuels.

It is not accurate to simply consider biomass energy "carbon neutral." The carbon implications and/or benefits of biomass energy depend entirely on several factors, including: where the wood comes from, applied forest management practices, how harvesting and management are distributed over the landscape and over time, and the types of technology used. **The study clarifies that, when biomass is sustainably harvested and forest lands are well managed overtime, biomass can be a source of low carbon energy, especially when compared to fossil fuels.**

In using biomass, biomass for heat and cogeneration is the use that is most efficient in reducing greenhouse gas emissions over time compared to fossil fuels. Using biomass for electric generation has a slower payback period, taking longer to show carbon-emission benefits.

- The use of sustainably harvested biomass to replace oil heat would begin to yield benefits in as little as five years, with a 25 percent net benefit over oil by the year 2050. Use of biomass to make electricity takes longer—about 42 years—to begin to create a net dividend compared to coal, but with a positive carbon dividend of 19 percent by the year 2100.

IMPORTANT NOTE: The Associated Press (AP) story by Steve LeBlanc, and subsequent reporting by much of the media, stated: "A new study has found that wood-burning power plants using trees and other 'biomass' from New England forests release more greenhouse gases into the atmosphere than coal over time." This statement is incorrect. The study shows that woody biomass for energy initially has higher CO_2 emissions than the fossil fuel equivalent, but, as noted above, over time this carbon "debt" is recovered and becomes a carbon "dividend" in all scenarios analyzed. **As noted below, the study also only looked at green woody biomass from forests. It did not look at "other biomass" as suggested by AP, much of which may add no new carbon to the equation (example: forest residues or other wood that would decompose quickly anyway).** Finally, the headline associated with the AP report: "Mass. Study: Wood Power Worse Polluter than Coal" is not a conclusion that can be gleaned from this study, and is entirely inaccurate. Pollution includes other emissions of concern present in coal and absent in wood, such as mercury, arsenic, and sulfur dioxides that were not considered in this study.

As with any study of this kind, there are key assumptions that must be understood that affect how the study should be used and interpreted. For the most part, these are explicitly described in the study, but include:

The study makes no distinction between carbon already in the atmospheric cycle and geologic carbon currently sequestered, and the study does not attempt to address the implications of loading the atmospheric system with new additive carbon from geologically sequestered sources (e.g., fossil fuels).

The wood supply analysis is an ***economic and social analysis*** of how much wood is likely to be available in Massachusetts. It does not provide an assessment of how much wood is actually available on an ***ecological basis*** in Massachusetts, which is considerably more.

Forest harvesting and carbon recovery rates are specific to Massachusetts' land base and are not applicable elsewhere.

All harvesting examples assume "business as usual (BAU)" continues, with biomass harvesting added to the BAU case, so there is no analysis about what biomass harvesting alone might look like and no change in harvesting methods for biomass relative to other harvesting. In other words, there was no attempt to optimize the harvesting of biomass and forest management relative to CO_2.

This study addresses CO_2 only. Mercury, arsenic, sulfur dioxide, particulates, etc. were not evaluated.

A key assumption in calculating the relative benefits of burning wood versus fossil fuel is that in the fossil fuel examples, forests must remain forests for the fossil fuel debt to be as low as it is. When burning fossil fuels, those forests are assumed to be there storing carbon on behalf of the fossil fuels.

APPENDIX E

Pinchot Institute on Manomet

Jun 10, 2010

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FOR IMMEDIATE RELEASE

Massachusetts Releases Study of Environmental Effects of Wood Biomass Electricity Proposals

Washington DC, June 11, 2010 – "Bioenergy technologies, even biomass electric power compared to natural gas electric, look favorable when biomass waste-wood is compared to fossil fuel alternatives." Thus concludes a study released this week by the Manomet Center for Conservation Sciences, and by the Massachusetts Department of Energy Resources, which funded the study.

The 6-month study, entitled "Biomass Sustainability and Carbon Policy Study," addresses a wide array of social, scientific, economic and technical issues related to the use of forest biomass for generating energy in Massachusetts. Key components of the study include a full analysis of existing domestic and international biomass policies; a supply analysis of forest biomass availability based on competitive pricing for energy generation; and the atmospheric greenhouse gas implications of combusting forest biomass instead of fossil fuels for energy. The Pinchot Institute provided a review of regulations and standards needed to ensure the sustainability of forest resources in light of potential increases in wood consumption for bioenergy.

Determining the sustainability of forest-based bioenergy is complex and requires evaluating a number of interrelated social, economic, and environmental values that people expect from forests. The analysis and recommendations within the study are specific to current policy issues in Massachusetts, particularly whether expanded use of wood biomass in place of fossil fuels in electricity generation is an effective means to reduce the Commonwealth's carbon emissions. In 1997, Massachusetts adopted a Renewable Portfolio Standard requiring electric utilities to generate at least 15 percent of their electricity from renewable sources by 2020.

In addressing the specific question of whether wood biomass electricity can reduce carbon emissions relative to fossil fuels, the study concluded that carbon emissions per unit of electricity generated can be higher with wood, based on the more concentrated energy content of fossil fuels such as coal or natural gas. **However, this conclusion is not meant to address the additional significant environmental, economic, and social effects of fossil fuel use, nor does it reflect that electric power generation from forest residuals and waste wood results in minimal if any net carbon emissions.** Both of these factors are important to consider in policymaking relating to opportunities to substitute renewable energy sources for fossil fuels.