

**Biomass Energy Development Working Group
Final Report
January 17, 2012**

Pursuant to No. 37 of the Acts of the 2009 Session

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**Biomass Energy Development Working Group
Final Report**

Table of Contents

| | |
|---|----|
| Working Group Members | 1 |
| Working Group Charge | 2 |
| I. Overview | 5 |
| II. Working Group Findings | 7 |
| A. Modeling Subcommittee | 7 |
| 1. Recommended Additional Research and Analysis..... | 7 |
| i. Background | 7 |
| ii. BERC Vermont Wood Fuel Supply Model (2010 Update) | 9 |
| iii. Future Biomass Modeling Efforts | 10 |
| iv. Monitoring | 11 |
| 2. Recommendations | 13 |
| B. Enhancement and Development Subcommittee | 14 |
| 1. Discussion..... | 14 |
| i. Distributed Wood Pellet Manufacturing/Use | 16 |
| ii. Thermal and Thermal-led CHP | 17 |
| iii. Electrical Generation | 18 |
| iv. Agriculture-based Bioenergy..... | 19 |
| 2. Recommended Fiscal and Regulatory Incentives | 19 |
| 3. Recommended Standards and Policies..... | 22 |
| 4. Use of Roundwood..... | 24 |
| C. Forest Health Subcommittee | 24 |
| 1. Recommended Guidelines or Standards for Forest Health | 26 |
| 2. Recommended Wood Procurement Standards..... | 30 |
| 3. Carbon Accounting | 36 |
| 4. Short-Rotation Woody Crops..... | 38 |
| 5. Summary of Outreach/Education/Monitoring..... | 39 |
| Appendix A: List of Recommendations | 42 |
| Appendix B: Recommended Guidelines for Maintaining Water Quality, Soil Productivity and Biological Diversity on Harvesting Jobs in Vermont | 47 |
| Appendix C: Identified Forest Monitoring Activities in Vermont | 49 |
| Appendix D: Procurement Standards: Verification and Certification | 51 |

Appendix E: Memorandum on Permitting, Woody Biomass Energy Projects..... 54

**Appendix F: Biomass Energy Development Working Group; Enhancement and
Development Subcommittee; List of Pros and Cons..... 58**

**Appendix G: Biomass Energy Development Working Group Summary of Comments,
Public Hearing, Dec. 6, 2011.....61**

**Appendix H: Biomass Energy Working Group Written Comments Received on Draft
Interim 2011 Report as of December 8, 2011.....66**

Biomass Energy Development Working Group Members

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|--|---|
| One member of the House of Representatives | Rep. John Malcolm |
| One member of the Senate | Sen. Ginny Lyons |
| The secretary of natural resources or designee | Dep. Sec. Chris Recchia |
| The commissioner of public service or designee | George Nagle |
| A representative of the biomass energy resource center | Adam Sherman |
| Two representatives of the forest products industry | Rocky Bunnell, Paul Cate |
| Two representatives of natural resources or environmental organizations | Jamey Fidel, Robert Turner |
| Two representatives of an industry or utility that produces electricity or heat from biomass | Chris Brooks, Bill Kropelin |
| A representative of the Vermont woodlands association | Sam Miller |
| A representative of a university or college with a focus on biomass | Bill Keeton |
| A representative of the consulting foresters association | Ben Machin (2009–2010); currently vacant |
| A representative of the forest guild | Ehrhard Frost |

Note: This final report of the Biomass Energy Development Working Group reflects the recommendations of all current Working Group members except Mr. Brooks, who did not concur in the report. The report may not reflect the opinions or recommendations of prior members. The Working Group thanks all prior members for their participation: Rep. Chris Bray, Peter Condaxis, Kelly Launder, Ben Machin, and former ANR Secretary Jonathan Wood.

Biomass Energy Development Working Group Charge

No. 37 of the Acts of the 2009 Session

Sec. 1. BIOMASS ENERGY DEVELOPMENT WORKING GROUP

(a) The biomass energy development working group is established to enhance the growth and development of Vermont's biomass industry while also maintaining forest health. In order to meet these goals, the working group shall analyze current issues in the biomass industry in order to develop a coherent body of recommendations. These recommendations may include incentives, harvesting guidelines, and procurement standards for the development and operation of biomass energy in the state of Vermont. The working group shall also include the following members:

- (1) One member of the house, appointed by the speaker of the house;
- (2) One member of the senate, appointed by the committee on committees;
- (3) The secretary of natural resources or his or her designee;
- (4) The commissioner of the department of public service or his or her designee;
- (5) A representative of the biomass energy resource center, appointed by the committee on committees;
- (6) Two representatives of the forest products industry that represent logging, processing, or wholesale operator interests, one appointed by the committee on committees and the other appointed by the speaker of the house;
- (7) Two representatives of natural resources or environmental organizations that represent wildlife and biodiversity and forest health and sustainability interests, one appointed by the committee on committees and the other appointed by the speaker of the house;
- (8) Two representatives of an industry, organization, utility, or corporation that either produces electricity or heat from biomass or purchases power from biomass, appointed by the governor.
- (9) A representative of the Vermont woodlands association appointed by the governor;
- (10) A representative of a university or college with a focus on biomass policy or research appointed by the speaker of the house;
- (11) A representative of the consulting foresters association of Vermont appointed by the governor; and
- (12) A representative of the forest guild appointed by the speaker of the house.

(b) The working group is authorized to operate for a maximum of three years in order to review the adequacy of its initial recommendations, continue research and analysis, and make additional recommendations to the legislature. The working group is authorized to hold four meetings each year during the interim between sessions of the general assembly. The working group shall elect co-chairs at its initial

meeting, and one of the co-chairs shall be a member of the general assembly. For attendance at a meeting when the general assembly is not in session, legislative members of the commission shall be entitled to the same per diem compensation and reimbursement for actual and necessary expenses as provided members of standing committees under 2 V.S.A. § 406.

(c) The working group shall issue interim reports to the house and senate committees on agriculture and on natural resources and energy on or before November 15 of 2009 and 2010. The reports shall include:

(1) recommended fiscal and regulatory incentives for the promotion of efficient and sustainable uses of local biomass for energy production and opportunities for offering more predictability in the permitting process;

(2) recommended guidelines or standards for maintaining forest health, including model harvesting and silvicultural guidelines for retaining dead wood and coarse woody material; maintaining soil productivity, wildlife, and biodiversity and other indicators of forest health; and wood procurement standards. In reviewing and recommending standards for biomass procurement, the working group shall review whether:

(A) separate procurement standards are necessary for certain consumers of biomass, such as retail electricity;

(B) there are obstacles or policy considerations that need to be overcome to establish model procurement standards for biomass energy facilities;

(C) a uniform procurement standard for maintaining forest health would offer more predictability in the permitting process;

(D) procurement standards can be designed to effectively monitor whether the collective demand for energy produced from biomass does not impair long-term site productivity and forest health;

(E) it is feasible to coordinate with adjoining states to develop a regional procurement standard for biomass energy facilities.

(F) biomass procurement standards should require third-party certification; and

(G) a standard should be developed that would require biomass electricity generating facilities to provide for a fuel efficiency of at least 50 percent over the course of a full year.

(3) Recommend standards and policies for the design of new renewable energy from biomass that are designed to promote sustainable, efficient, local, and fair use of biomass supplies.

(4) Recommend additional research and analysis that is needed to ensure that forest health is maintained while providing for a sustainable, long-term supply of local biomass for the production of energy and forest products.

(d) On or before November 15, 2011, the working group shall submit to the house and senate committees on agriculture and on natural resources and energy a final report addressing the issues in subdivisions (c)(1)–(4) of this section.

(e) Prior to reporting to the general assembly under subsections (c) and (d) of this section, the working group shall allow for public review and comment of any proposed recommendations for incentives, guidelines, or standards for the development and operation of biomass energy. At a minimum, the working group shall allow the department of forests, parks and recreation; the department of fish and wildlife; the public service board; the agency of agriculture, food, and markets; the Vermont economic development authority; and the department of public service to review and offer comments on any proposed recommendations for incentives, guidelines, or standards. In addition, the working group should coordinate with the Forest Roundtable to hold a minimum of two meetings to collect stakeholder input and gather expert testimony on the issues included in this section.

(f) The working group shall seek funding from available funding sources to hire consultants and conduct research and analysis related to the issues included in this section. In no event shall the working group seek more than \$200,000.00 under this subsection. Funding acquired by the working group shall be administered by the office of legislative council.

(g) As used in this section, “biomass” means material from trees, woody plants, or grasses, including limbs, tops, needles, leaves, and other woody parts, grown in a forest, woodland, farm, rangeland, or wildland-urban environment that is the product of forest management, land clearing, ecosystem restoration, or hazardous fuel reduction treatment.

(h) Legislative council shall provide legal and administrative services to the working group. The department of forests, parks and recreation shall provide technical and economic advice to the working group.

I. Overview

No. 37 of the Acts of the 2009 Session of the Vermont General Assembly (Act 37) established a Biomass Energy Development Working Group (the Working Group) that would meet over the course of three years to address how to enhance the growth and development of the Vermont woody biomass industry while also maintaining forest health. Under its charge, the Working Group is to issue two interim reports and one final report to the Vermont General Assembly. The Working Group issued interim reports in January 2010 and January 2011.¹ This document is the final report of the Working Group.

The Working Group met 27 times, including two public hearings, to fulfill the statutory charge of Act 37 of the 2009 Session.² Section 1(c) of Act 37 requires the reports of the Working Group to address the following four issues related to the promotion, development, and health of Vermont's woody biomass industry and the forests of the state:

- 1(c)(1): Recommended fiscal and regulatory incentives for the promotion of efficient and sustainable uses of local biomass for energy production and opportunities for offering more predictability in the permitting process.
- 1(c)(2): Recommended guidelines for maintaining forest health, including model harvesting and silvicultural guidelines for retaining dead wood and coarse wood material; maintaining soil productivity, wildlife, and biodiversity, and other indicators of forest health; and wood procurement standards.
- 1(c)(3): Recommended standards and policies for the design of new renewable energy from biomass that are designed to promote sustainable, efficient, local, and fair use of biomass supplies.
- 1(c)(4): Recommended additional research and analysis that is needed to ensure that forest health is maintained while providing for sustainable, long-term supply of local biomass for the production of energy and forest products.³

In 2009, the Working Group formed three subcommittees to address the four issues that the Vermont General Assembly required under Act 37 to be included in each report of the Biomass Energy Development Working Group. The Working Group charged a Biomass Enhancement and Development Subcommittee

¹ The Working Group's interim reports are available on the web at: <http://www.leg.state.vt.us/workgroups/BioMass/>.

² The minutes of each meeting of the Biomass Energy Development Working Group may be accessed electronically at the Working Group's website: <http://www.leg.state.vt.us/workgroups/BioMass/>

³ Act No. 37, 2009 Sess., § 1(c).

with addressing Sections 1(c)(1) (recommended fiscal and regulatory incentives for the promotion of efficient and sustainable uses) and (3) (recommended standards and policies for the design of new renewable energy from biomass). The Working Group formed the Forest Health Subcommittee to focus on Section 1(c)(2), (recommended guidelines for maintaining forest health and for wood procurement standards). The Funding Subcommittee was formed to address issues related to Section 1(c)(4) (recommended additional research and analysis that is needed to ensure that forest health is maintained while providing for a sustainable, long-term supply of local biomass for the production of energy and forest products). In completion of its charge, the Funding Subcommittee focused on revisions and improvements to the Biomass Energy Resource Center (BERC) 2007 Vermont Wood Fuel Supply Model. As a result, the Working Group renamed this committee the Modeling Subcommittee.

Section II of this report includes subcommittee proposals adopted and approved by the Working Group as a whole as its recommendations. The Appendices include: a consolidated list of Working Group recommendations to the General Assembly; Recommended Guidelines for Maintaining Water Quality, Soil Productivity, and Biological Diversity on harvesting jobs in Vermont; a list of forest health monitoring activities in the state; memos discussing the verification and certification of procurement standards and the permitting of woody biomass energy projects; a list of pros and cons regarding biomass development; a summary of public comments received at the December 6, 2011 public hearing; and all written comments received on the public review draft of this report. The Working Group encourages the General Assembly to seriously consider the public comments included in the appendices, as many comments touch on topics that were outside the scope of this report but could serve as a basis for future research or evaluation.

It is worth emphasizing that the Working Group's charge pertains to *woody* biomass, that is, material from trees, or woody plants, including limbs, tops, needles, leaves, and other woody parts. The Working Group acknowledges that other forms of biomass hold promise as sources of energy; however, this report is limited to the scope of the Working Group's charge. Unless the context clearly indicates otherwise, references in this report to "biomass," with or without the word "woody," should be read to mean woody biomass. The Working Group recognizes the value of agriculturally based bioenergy and biofuels as a significant part of Vermont's energy and working landscape but does not possess the expertise to adequately consider this topic.

A number of public comments requested that the Working Group investigate the air quality effects of biomass combustion on the environment and public health. While the Working Group believes that air quality and public health should certainly inform decisions regarding expansion of the biomass industry, this topic is outside the scope of the Working Group's charge and was not specifically considered for this report.

General information about air quality and air pollutants can be acquired from the Air Pollution Control Division of the Vermont Agency of Natural Resources.⁴ The General Assembly should gather additional information on air quality effects to inform policy regarding expansion of the biomass industry.

Similarly, several public comments addressed the potential link between invasive species and the importation and exportation of biomass. Of particular concern were the emerald ash borer and the Asian long-horned beetle. While the Working Group did not specifically address this issue, it recognizes the value of monitoring the spread of invasive species in Vermont forests. The Working Group recommends that the General Assembly further investigate sources of funding for the monitoring and potential quarantine of invasive insects to protect the health of Vermont forests.

II. Working Group Findings

The Working Group formally voted to approve the following recommendations.

A. Modeling Subcommittee

1. Recommended Additional Research and Analysis to Ensure that Forest Health Is Maintained while Providing for Sustainable, Long-Term Supply of Local Biomass for the Production of Energy and Forest Products

i. Background

Central to the issue of biomass development is the question of the capacity of the forest to provide feedstock. Over the last 50 years, the state of Vermont has consistently grown more wood volume than has been removed, and consequently, volume in the state's forests has been increasing.⁵ However, the calculation of "available" supply from this inventory is not simple. Harvest levels for all wood products fluctuate with market demand and price. Rates of forest growth and mortality are neither constant nor linear. The land base itself may gain or lose forest over time. Parcel size and configuration can impact supply, as can the attitudes of landowners with respect to harvesting. All of these things contribute to uncertainty and risk in the prediction of available supply for policy makers, regulators, and developers.

⁴ Air Pollution Control Division, <http://www.anr.state.vt.us/air/>, retrieved Dec. 13, 2011.

⁵ Over the last 50 years, annual harvest removals in Vermont's forests ranged from a low of 1.1 million tons in 1970 to a high of 3.5 million tons in 1995. Over that time period, the state has continued to become more forested, both in terms of acres and inventory volume. Average stand density has increased along with forest age. The natural consequence of this maturing trend is that the amount of forest growth is slowing—older stands grow more slowly, in part due to increasing mortality. As of the most recently published data (2007), Vermont is still growing 1.7 times more total volume than is being removed through harvesting, but a 50-year trend of consistent increases in net growth has apparently turned the corner and the total amount of growth added between inventories declined slightly between 1997 and 2007. For a detailed discussion of forest status and trends see http://www.nrs.fs.fed.us/pubs/rb/rb_nrs51.pdf.

Averaged over the last 10 years, roughly 1.2 million green tons of high-value products (sawlogs and veneer) and 1.5 million green tons of lower-quality wood have been harvested in Vermont each year.⁶ Residential firewood and pulp-quality wood are the major components of the low-quality category, and with increases in fuel oil prices and the closing of pulp mills in New Hampshire, firewood now accounts for one-half or more of the lower-quality harvest volume.⁷ To further put these numbers in perspective, the McNeil Generating Station in Burlington and the Ryegate Power Plant combined consume roughly 435,000 green tons of harvested chips, with less than one-half of that amount estimated to come from within Vermont.⁸ Various recently proposed wood pellet plants typically demand 200,000 green tons per plant. A currently proposed combination electrical-generation and pellet plant would, if permitted and constructed, demand over 500,000 tons per year.⁹ Our inventory of volume in our forests may be growing, but it is not inexhaustible. However, adding up these consumption estimates can be misleading because historically, many more plants are proposed than ever get built. In addition, a portion of Vermont's forests benefit from some level of protection through federal and state forest ownership, trusts, easements, and the use value appraisal (UVA) program. Moreover, new demand does not necessarily or immediately create new, additional harvested wood from the forest. Prices for low-quality wood are still generally below levels that will motivate landowners to harvest this product alone, without also harvesting the more valuable sawlog products. Low-quality wood also can often satisfy demand for a range of different products. Some of what is now sold as firewood or pulp could easily be diverted to competing uses. Finally, not all of a new plant's supply will necessarily come from within Vermont—imported wood from adjacent states is likely.

The reader should draw the following points from this discussion. Under any development scenario, the supply of the woody biomass is influenced by physical, cultural, and economic factors. Promoting “efficient and sustainable” use, as called for in Act No. 37, requires that these factors influencing available supply be explored and understood. The sustainable supply question is highly complex, and no public interest is served by simple answers to complex questions. It is worth noting the difference in meaning between “sustainability,” which may encompass the totality of physical, cultural, and economic factors

⁶ Vt. Dept. of Forests, Parks and Recreation, Forest Resource Harvest Study, available at: http://www.vtfpr.org/util/for_utilize_harvsumm.cfm, retrieved Dec. 28, 2011.

⁷ Vt. Dept. of Forests, Parks and Recreation, Vermont Forest Resources Plan (state assessment section), available at: http://www.vtfpr.org/hm/for_resourcesplan.cfm, retrieved on Dec. 28, 2011.

⁸ BERC, Vermont Fuel Wood Supply Study. Executive Summary, available at: http://www.biomasscenter.org/pdfs/VT_Wood_Fuel_Supply_Study_execsum.pdf, retrieved on Dec. 28, 2011; Personal communication with Bill Kropelin, McNeil Generating Station.

⁹ Beaver Wood Energy, Fair Haven Section 248 Filing, available at: <http://beaverwoodenergy.com/wp-content/uploads/2010/11/Fair%20Haven%20Section%20248%20Filing.zip>, retrieved on Dec. 28, 2011.

above, and “sustainable yield,” which refers to the use of management procedures that ensure harvested resources are replenished before another harvest occurs.¹⁰

ii. *BERC Vermont Wood Fuel Supply Model (2010 Update)*

In 2009, the Working Group voted to encourage the revision of the Biomass Energy Resource Center (BERC) 2007 Vermont Wood Fuel Supply Model. The BERC Wood Fuel Supply Model was developed in 2007 based on the most current U.S. Forest Service (USFS) Forest Inventory and Analysis (FIA) data available, which were from 1997. New FIA data were issued in 2010, and the working group concluded that revision of the Wood Fuel Supply Model to reflect the more current data would be prudent and would be a valuable tool for evaluating opportunities for harvesting and biomass energy production in Vermont.¹¹ The Vermont Department of Forests, Parks and Recreation (DFPR) subsequently obtained funds and contracted with BERC to update the wood supply model using the new FIA data.

BERC integrated the new FIA data into the wood supply model and issued a final report in 2010 detailing the updated findings. BERC completed the wood supply model in three “runs”—conservative, moderate, and intensive. The moderate run was intended to serve as the best representation of reality, while the conservative and intensive scenarios depict the respective lower and upper limits of the model. These scenarios indicated the following availability of “net available” low-grade wood grown annually in Vermont that would be appropriate for use as biomass fuel above and beyond current levels of harvesting: (a) conservative scenario – 246,800 green tons; (b) moderate scenario – 894,900 green tons; and (c) intensive scenario – 1,940,700 green tons.¹² BERC defines “net available” low-grade wood as the amount of wood available annually that would be appropriate for use as biomass fuel above and beyond current levels of harvesting.¹³

For the purpose of informing its discussions, the Working Group assumed the moderate scenario of the wood supply model may be most realistic; however, other models suggest that there may be more wood or less wood available.¹⁴ The moderate scenario makes a variety of assumptions about the extent of the

¹⁰ BERC, *Vermont Wood Fuel Supply Study, 2010 Update*, available at:

http://www.biomasscenter.org/images/stories/VTWFSSUpdate2010_.pdf, retrieved Dec. 28, 2011;

“Sustained yield” definition: <http://merriam-wwebster.com/dictionary/sustained%20yield>, retrieved Dec. 28, 2011.

¹¹ Revisions to the BERC Wood Supply Model are due to methodological changes in how the U.S. Forest Service calculated the 2010 FIA forest inventory. The methodological changes are described in the BERC report available at <http://www.biomasscenter.org/index.php/resources/publications.html>, retrieved Dec. 28, 2011.

¹² BERC, *Vermont Wood Fuel Supply Study: 2010 Update*, Final Report at 5.

¹³ *Id.*

¹⁴ Buchholz, T., C. Canham, and S. Hamburg, *Forest Biomass and Bioenergy: Opportunities and Constraints in the Northeastern United States*. Cary Institute for Ecosystem Studies, Milbrook, NY. 75pp. (2011), available at: http://www.ecostudies.org/press_2011-02-17.html; NEFA, *Biomass Sustainability Project: A Flexible Regional Forest Model* (2011), available at: http://www.nefainfo.org/NEFA_SustainabilityProj_6.28.11_pres_webinar.pdf.

available land base, the impacts of physical constraints (slope, elevation, access, etc.), the inclination of the landowner toward harvesting, and other factors. The BERC wood supply model focuses on the yield of woody forest biomass under current forest conditions and management. The moderate scenario of the model indicates that there are slightly under 900,000 green tons of surplus low-grade wood grown annually in Vermont that could be used to advance woody biomass energy in the state. The model does not incorporate a move toward more intensive silvicultural practices, plantation-type silviculture, dedicated energy crops, or any agricultural biomass. BERC's full report updating the wood supply model is available at <http://www.biomasscenter.org/index.php/resources/publications.html>.

iii. Future Biomass Modeling Efforts

Using the methodological framework of the BERC Vermont wood fuel supply model, efforts are under way by the North East State Foresters Association (NEFA) to build a project-based wood availability model that will address some of the shortcomings of the original BERC model. These revisions are expected to be available by the end of 2011. They will incorporate an improved interface, the ability to integrate current FIA data easily, an extended time frame for the analysis, and the ability to modify many of the key assumptions over time. This tool is not intended to be a comprehensive model of the forest resource. Instead, it is designed to help answer questions about wood supply availability in the face of specific new projects and new projected demand. As in the original BERC model, the biological (forest growth) component of this model will remain relatively simple. There is no distinction among forest species or types and the model does not accommodate a range of harvest products. It continues with a similar county-level resolution and reports on net available low-grade fiber, but will be expanded with additional reports, maps, and charts.

The BERC project-level approach is a useful tool that can quickly provide insights into wood fuel availability using current data, with relatively little effort on the part of the user. However, it is recognized that many of the questions likely to surface around a transition to woody biofuels are likely to be more complex. NEFA is also in the process of developing a more comprehensive analysis tool that will require more effort to use, but will yield a wider range of results and insights.¹⁵ In comparison to the BERC approach, where a range of assumptions about growth, availability, and harvest are applied to inventory, this more comprehensive model will incorporate forest type detail, management and harvest intensity options, growth based on historic forest-type performance, land-use change over time (and other availability factors), and multiple product assumptions. Instead of a simple linear calculation as in the BERC model, this model

¹⁵ NEFA, [Biomass Sustainability Project: A Flexible Regional Forest Model](#).

incorporates an iterative mechanism that “solves” for a supply-demand balance over defined markets. The model can be driven by demand, supply, or price considerations. The results allow users to examine inventory, growth response, and market impacts, along with projected harvest.

The tool in development by NEFA will be based on a model that has seen extensive use in the US South, especially for the examination of biomass expansion in that region. As part of the development, accommodations will be made for conditions represented in northeastern forests, including multi-aged stands and a predominance of partial harvesting regimes. The model is currently under development and will be available for use by the second quarter of 2012.

The initiative and funding for both of these efforts currently comes through the North East State Foresters Association (NEFA). The state foresters from each of the four NEFA states (NY, VT, NH, ME) are actively involved in the development of these tools and are anticipated to be the primary users. NEFA also has initiated, and expects to continue, a process that engages a range of stakeholders in the design and use of the models. Partly as a result of this team approach and engagement, it was decided to support the development of two different tools with different but related purposes and users and different audiences. It is anticipated that, as users become familiar with these tools, they will begin to deliver insights into many of the questions and concerns of both policy makers and the public.

iv. Monitoring

Two primary considerations should guide the state’s approach to monitoring of woody biomass status and use. First, information should be collected that serves a distinct public purpose. Ideally, efforts directed at monitoring and data collection should serve *multiple* purposes. An example is the USFS Inventory and Analysis program.¹⁶ Data on the status of the forest resources can be used to assess forest health and forest stocks. It is used by many, including state forest biologists and biomass project developers, for many purposes.

Second, monitoring efforts should be commensurate with the value of the information generated. For a period of time through the 1980s, an annual survey of chip harvesting operations was conducted by DFPR

¹⁶ U.S. Forest Service, Forest Inventory and Analysis National Program, available at: <http://www.fia.fs.fed.us/>, retrieved Dec. 27, 2011.

staff.¹⁷ While it provided valuable information about the number of chip harvesting operations and harvested area, it was discontinued as growth through this period began to stabilize.

The Working Group has reviewed a variety of monitoring efforts, public and private. The Group examined a range of programs and options to provide some context for the recommendations that follow. Appendix C includes a matrix of monitoring efforts in Vermont (the monitoring matrix). Appendix D includes a list and summary description of various verification and certification mechanisms within and outside of Vermont that are relevant to this monitoring discussion and to issues related to forest health.¹⁸

The Group concludes from its review that information at the state level appears adequate in the area of forest inventory. The use of county-level extractions from these state-level sources must consider the lower levels of reliability typically associated with these subsets, but in general, existing programs appear to meet the needs in terms of quality, extent, and frequency. In the area of harvest reporting, the state relies primarily on its annual survey of mills to provide consumption information.¹⁹ Other periodic investigations supplement this annual effort, including a recent survey on firewood consumption and UVA program reporting.²⁰ In the event of an increase in intensive harvesting, the state could re-establish its annual survey of chip harvesting operations. Information at the county level may well become more important if large biomass operations are developed. Data available for regional and municipal planning are currently limited, though efforts to digitize UVA records should help to fill this void.

In contrast, information pertaining to sustainable forest management and on-the-ground practices is limited at the state level. In 1990, DFPR completed a harvesting impact study in response to a particular increase in biomass harvesting following on the oil crisis of the 1970s and a substantial increase in wood fuel consumption both by industrial and residential users.²¹ Such a study has not been performed in the ensuing 21 years. While multiple sources currently exist, they are difficult to aggregate due to a) a lack of consistency across monitoring programs, which may include first-, second-, or third-party verification, b) the voluntary compliance nature of many of these programs, and c) possible issues of information propriety. It is likely this area of monitoring will continue to be disorganized for some time to come, yet there is growing

¹⁷ Smith, Tattersall C., Wayne, Martin, C., Tritton, Louise M., eds., Proceedings of the 1986 Symposium on the Productivity of Northern Forests Following Biomass Harvesting. (1986) Gen. Tech. Rep. NE-115-proc. 104 p. [10Mb], available at: <http://treearch.fs.fed.us/pubs/viewpub.jsp?index=4162>, retrieved Dec. 27, 2011.

¹⁸ More information on monitoring and verification mechanisms is contained in World Resources Institute (WRI), Sustainable Procurement of Wood and Paper-based Products (Sustainable Procurement) at 2.13-2.15 and Table 12 (Version 2, June 2011), available at: <http://www.wri.org/publication/sustainable-procurement-wood-and-paper-based-products>, retrieved Nov. 8, 2011.

¹⁹ Vt. Dept. of Forests, Parks and Recreation, Forest Resource Harvest Summary, available at: http://www.vtfpr.org/util/for_utilize_harvsumm.cfm, retrieved Dec. 27, 2011.

²⁰ Frederick, Paul, Vt. Dept. of Forests, Parks and Recreation, Vermont Residential Fuel Assessment for the 2007-08 Heating Season (VRFA) at 2 (Aug. 2011).

²¹ Brynn, D., et al., Impact Assessment of Timber Harvesting in Vermont. (1990), available at: http://www.vtfpr.org/resource/documents/1990_harvesting_impact_report_full.pdf, retrieved Dec. 27, 2011.

interest on the part of biomass consumers in documenting the source and impacts of their procurement. In addition, the Working Group understands that DFPR seeks to complete a further harvesting impact report in the near term.

We recognize the following needs. Basic information on harvest activity, collected repeatedly at intervals, is vitally important as a reference to assess impacts (if any) as levels of harvesting change. Information about levels, type, and impacts of harvesting can inform appropriate action and policy. This information can also serve to inform the public on the relative benefits and trade-offs of using biomass for fuel. In our opinion, the need for this information should be monitored by the General Assembly and specific research should continue to include a combination of regularly gathered data (such as FIA and UVA reporting) and periodic investigations (such as the recent Residential Fuel Assessment and the pending timber harvesting impacts study).

There is a specific need to examine the quality of FIA data, on which virtually all analyses of resource availability rely as the bedrock. These data are coming with greater frequency, but as the data collection, analysis, and reporting adapt to this new schedule, there is greater need to evaluate potential discrepancies or anomalies in the data. We should be sure these data are solid, even as the federal funding for this program is trimmed.

We also recognize that there are gaps in information that could inform policy, either directly or as inputs to modeling. In the forestry realm, these gaps appear more often in the economic sector than in the biological. For example, it is well established that our harvesting workforce is both shrinking and aging, yet the impacts of this on the ability of project developers to generate biomass supply is unknown. We also know little about the relative difference between the economic benefits produced by many smaller biomass facilities compared to fewer larger facilities. We hear about new projects, large and small, as they are proposed across the region, yet there is no comprehensive database that monitors the size or status of these projects.

2. Recommendations

Based on the foregoing considerations, we offer the following *recommendations*:

- DFPR should complete a harvesting impact study similar to that completed in 1990. This study should help the General Assembly, state foresters, and the general public better understand baseline conditions pertaining to the types of harvesting, equipment used, and impacts to forest structure, wildlife, and water.

- The General Assembly should ensure that funding continues to provide for DFPR staff to review and analyze new releases of FIA data.
- The state should continue to examine the variations between different wood supply models to develop an accurate understanding of the available wood supply. Expansion of biomass harvesting in the state should be based on the premise that there is available woody biomass that can be harvested sustainably while maintaining forest health and productivity. Monitoring should occur to ensure confidence in our assumptions about future forest growth and broader ecosystem and social impacts.
- The state should encourage research particularly on economic aspects of biomass harvesting. This research should target economic benefits and impacts for different scale projects; constraints to development, including financing and workforce issues; the general responsiveness of the industry to increases in fossil fuel prices or increases in product demand as society moves toward a greater reliance on biomass for energy; and improved information about Vermont's substantial firewood sector— both demand and supply sides.
- Given the diversity and extent of existing publicly funded monitoring programs (see Appendix C), we *recommend* that a review of the coordination and execution of these programs be conducted. The monitoring matrix, perhaps expanded to incorporate more detail on each program, could serve to a) identify overlaps and gaps, b) review the adequacy of staff and funding, and c) examine how data are made available to the General Assembly and other policy or public groups for integration and analysis. Ideally, this review would include recommendations for improving existing programs and augmenting them in appropriate ways as the need and resources become available.
- The state should continue to explore the potential of woody and nonwoody agricultural biomass.

B. Enhancement and Development Subcommittee

The findings of the Working Group related to enhancement and development are set forth below under a discussion section followed by headings that reflect the statutory charge to the Working Group and a section on the use of roundwood.

1. Discussion

Successful enhancement and development of biomass energy use in Vermont is dependent on several factors. Foremost is ensuring that the fuel supply promoted is appropriate in quantity and type such that its use is

sustainable over time indefinitely. While woody biomass is renewable, it is not inexhaustible. Priority must be afforded the ecosystem values Vermont holds for its forests, with an eye toward protecting all values — from habitat and biologic diversity to the visual landscape and recreation — and many in between, including water quality, soil conservation, climate mitigation, and air quality. Still, healthy forests that preserve and enhance these values in many cases may benefit from management, and in the process of accomplishing this management, biomass for energy may also be made available. Section C of this report, on forest health, identifies factors that should be addressed to provide this balance, and this section of the report discusses how the Working Group recommends Vermont go about making best use of the biomass made available through this management work.

Several facts are relevant to deciding where and how to enhance and develop the resource. The first is that Vermont forestlands are approximately 86 percent privately owned,²² and any plan must work to ensure that landowners want to and can retain their lands as working forests indefinitely. The second is recognition that the Northeast in general and Vermont specifically are heavily dependent on oil for much of their energy needs, both in transportation and in building heat, which makes this portion of the region's energy profile most vulnerable and least secure. While use of biomass to create transportation fuel (cellulosic ethanol) is receiving a great deal of investment and attention from the U.S. Department of Energy, it remains in the developmental stage and would use a great amount of the resource for a relatively small portion of transportation fuel demand.²³ The Working Group therefore does not believe that biomass for production of transportation fuels is a wise use of the wood resource, as even full commitment of biomass to this effort would do little to affect energy security and likely would have a negligible effect on gasoline prices.

Considerations relevant to enhancement and development of woody biomass energy and to awarding incentives for such development include but are not limited to:

- a. Efficiency and resource sustainability — the enhancement and development of the woody biomass energy industry in Vermont should attempt to use the available resource sustainably, in a manner that maximizes efficiency while meeting energy goals and that focuses on the four sectors of growth discussed below where the use of biomass can have beneficial localized impact on our energy reliability, security, cost, and other public benefits.
- b. Job creation — both direct and indirect. Job creation would be a major driver of the local Vermont economy.

²² Vt. Dept. of Forests, Parks and Recreation, 2010 Vermont Forest Resources Plan at 91, available at <http://www.vtfpr.org/htm/documents/VT%20Forest%20Resources%20Plan.pdf>, retrieved Nov. 9, 2011.

²³ Parker, S., U.S. DOE to Invest in Cellulose to Ethanol Projects. (2007), available at: <http://www.renewableenergyworld.com/rea/news/article/2007/03/u-s-doe-to-invest-in-cellulose-to-ethanol-projects-47600>, retrieved Dec. 27, 2011.

- c. Property tax generation — the anticipated payment of property taxes should be a consideration when evaluating a proposed biomass business.
- d. Development and maintenance of the Vermont timber harvesting infrastructure — providing market growth and stability is a necessary component to a healthy rural economy. It is particularly important to encourage young entrants into the industry.
- e. Year-round demand for biomass wood – as the pulp industry fades, it is necessary to encourage businesses that can contribute to new markets for low-grade wood and replace fossil heating fuels.
- f. Value added to products produced — the value of the end product should be considered in the evaluation process. A manufactured product may have more value than a raw commodity.
- g. Factors affecting the environment and human health — emissions, forest health, water quality, waste disposal, and by-products must be considered in the evaluation process.
- h. The local economy — the expenditure and retention of dollars with the local and Vermont economy vs. payment for out-of-state fossil fuels should be factored into the evaluation.
- i. Timber stand improvement and markets to use diseased and damaged timber — timber stand owners need markets for diseased and damaged timber.

i. *Distributed Wood Pellet Manufacturing/Use*

According to the Vermont Residential Fuel Assessment for the 2007–2008 Heating Season, during that season, 2.8% of Vermont households (6,987) burned at least some wood pellets for space heating. In previous surveys, wood pellet usage was not significant enough to be reported.²⁴ Currently Vermont has one facility that manufactures wood pellets²⁵ and numerous distributors of wood pellets.²⁶

There is potential for increased biomass use by the residential sector in the form of replacing home oil heating systems with wood pellet stoves, furnaces, and boilers. Driven by high fuel prices, the number of wood pellet stoves shipped from manufacturers increased by 161 percent nationally in 2008.²⁷ According to the 2007–08 residential fuel assessment, approximately seven percent of Vermont households had installed

²⁴ Frederick, Paul, Vt. Dept. of Forests, Parks and Recreation, Vermont Residential Fuel Assessment for the 2007-08 Heating Season (VRFA) at 2 (Aug. 2011).

²⁵ Spelter, Henry, and Daniel Toth, U.S. Dept. of Agriculture, North America's Wood Pellet Sector, Research Paper FPL-RP-656 at 17 (Sep. 2009). Note that the facility listed on this page for Vermont is Vermont Pellet Fuel in Island Pond, a proposal which did not come to fruition. Vermont's one wood pellet manufacturing facility is the Vermont Wood Pellet Co. in Clarendon. See <http://vtdigger.org/2011/02/14/island-pond-pellet-plant-seems-at-dead-end/>, and <http://www.vermontwoodpellet.com/>, both retrieved Nov. 8, 2011.

²⁶ See, e.g., http://www.woodpelletfuel.org/find_pellet_fuel/Vermont/, retrieved Nov. 8, 2011.

²⁷ Christianson, R., HBPA: Pellet Stove Sales are Hot, (2009), available at: <http://biomassmagazine.com/articles/2494/hpba-pellet-stove-sales-are-hot>, retrieved Oct. 18, 2011.

or planned to install a new or used wood or pellet burning stove for the 2008-09 season.²⁸ Though the average price of no. 2 fuel oil in Vermont went down from \$4.13 per gallon in September 2008 to \$2.31 per gallon in 2009, it has increased since then and was \$3.57 per gallon in September 2011.²⁹ Pellet systems remain a viable alternative for many residential and smaller commercial applications; the U.S. Energy Information Administration's Heating Fuel Comparison calculator as updated in August 2011 estimates a cost per million British thermal units (Btu) for no. 2 fuel oil of \$24.30 compared to \$15.15 for wood pellets.³⁰

Wood pellet manufacturing would also provide an efficient year-round market for woody and potentially for agricultural biomass. The appropriate number of new pellet plants is difficult to determine as the market for wood pellets will have to grow in kind, addressing the current "chicken or egg" situation. In Appendix F, the Working Group lists pros and cons of encouraging the use and manufacture of wood pellets in Vermont.

ii. *Commercial/Industrial/Institutional Thermal and Thermal-led CHP*

Presently Vermont contains numerous commercial, governmental, and industrial facilities that use wood heat. According to the BERC database, these facilities include at least five state office complexes, 45 schools, three college campuses, one hospital, and several businesses.³¹

A major component of growth in the use of woody biomass for energy in Vermont will be the continued conversion by facilities that burn fossil fuels (typically oil and propane) to wood fuels (wood chips or wood pellets) in heating and cooling applications and where appropriate, combined heat and power (CHP) systems. This growth should include increased use of district heating, particularly in Vermont downtowns. There have already been many successful conversions from oil to wood, particularly in elementary/high schools, government offices, hospitals, industrial parks, and college campus facilities.³² Efforts are under way to demonstrate successful municipal (district energy) applications in one or more communities in Vermont.³³

²⁸ VRFA at 2.

²⁹ See Vt. Dept. of Public Service, Vt. Fuel Price Reports for Sep. 2008, Sep. 2009, Sep. 2010, and Sep. 2011, available at <http://publicservice.vermont.gov/pub/vt-fuel-price-report.html>.

³⁰ These figures assume a price of \$3.37 per gallon for no. 2 fuel oil and \$250 per ton for wood pellets. This calculator is available at <http://205.254.135.24/tools/faqs/faq.cfm?id=8&t=5>, retrieved Oct. 18, 2011.

³¹ Database Search Tool, <http://www.biomasscenter.org/database/database-search-tool.html>, searches performed Nov. 9, 2011.

³² See, e.g., BERC, *Biomass Energy at Work: Case Studies of Community-Scale Systems in the US, Canada, and Europe* at 3 (Barre, VT elementary and middle school), 13 (Bristol, VT Mt. Abraham high school), 27 (Middlebury College) (Feb. 2010).

³³ See, e.g., <http://www.montpelier-vt.org/group/99.html>, retrieved Oct. 18, 2011 (Montpelier, VT district energy project).

The Working Group has reviewed the advantages and disadvantages of commercial/industrial thermal and thermal-led CHP. Advantages include the positive track record and financial benefits of these existing biomass conversions, which make the concept of wood energy more acceptable. This particular market to expand the use of woody biomass also fits three important criteria when considering public acceptance in Vermont: small, local, and sited in (or near) existing facilities. Appendix F includes a more complete list of the pros and cons of encouraging these areas of woody biomass energy.

iii. Electrical Generation

Vermont currently has two woody biomass electric generation facilities: Burlington's 50 MW McNeil Generating Station and the Ryegate 20 MW plant.³⁴

The Working Group has evaluated the potential addition of one large-scale (20–25 megawatt) wood-fired electrical generating facility, including whether such a facility should utilize excess heat in the form of CHP or other technologies to improve plant efficiency. The location of any such facility would need to be coordinated with Vermont's utilities and VELCO to maximize balance for their systems.

Advantages of such a facility, if located in one of the southern four Vermont counties, would include providing a market for biomass fuel that is not seasonally restricted and “anchoring” a wood supply network in the four southern Vermont counties. In addition, existing biomass suppliers in Windsor, Windham, Rutland, and Bennington Counties now must truck their wood chips to markets outside this area; a plant located in this region would significantly shorten haul distances, making biomass production local and more economic as well as reducing consumption of diesel fuel.

One potential disadvantage is the possibility that such a facility would affect other uses of the fuel supply. Another potential disadvantage could arise from the currently low design system efficiency of an electric generation plant using woody biomass, particularly if the excess heat from the electricity production is not used for heating. Overall, the Working Group favors electrical generation using woody biomass that is part of a CHP project.

The Working Group addresses the question of design system efficiency further in Section B.3. below. Also, in Appendix F, the Working Group presents a more complete list of pros and cons of siting additional woody biomass generation in Vermont.

³⁴ Vt. Dept. of Public Service, Comprehensive Energy Plan 2011, vol. 2 at 83, sec. 5.8.1.1.

iv. *Agriculture-based Bioenergy, Including Biofuels and Methane Digesters*

The Working Group's charge limits consideration to woody biomass but certainly the growing of willow, poplar, and other fast-growing species specifically for thermal and electrical generation should be encouraged as a possible supplement to or replacement for more expensive species, especially because there is so much fallow land available on which to produce these species and harvest them with agricultural equipment.

2. Recommended Fiscal and Regulatory Incentives for the Promotion of Efficient and Sustainable Uses of Local Biomass for Energy Production and Opportunities for Offering More Predictability in the Permitting Process

Working Group recommendations on fiscal and regulatory incentives are set out immediately below.

The Working Group *recommends* that the General Assembly assign major priority to home heating with wood. In particular, tax policies advantageous to solar and wind projects should be extended to biomass consumers. Such tax advantages would be applied to the purchase of efficient heating stoves, furnaces, and boilers, and to district heating. Monetary incentives, such as a rebate program, could also be designed to encourage residents to adopt biomass-based home heating systems. Such incentives could be structured similarly to the outdoor wood boiler change-out program administered by the Agency of Natural Resources, which offers rebate vouchers of \$1,000–\$6,000 to homeowners who replace their outdoor wood boiler with a cleaner, more efficient alternative.³⁵

The Working Group also *recommends* that this wood home heating initiative be part of a larger undertaking to support thermal energy efficiency. State statute sets out ambitious goals for increasing building energy efficiency, reducing fossil fuel consumption, and increasing the use of renewable energy from Vermont's farms and forests.³⁶ At the current pace of effort, Vermont is likely to fall short of meeting

³⁵ Outdoor Wood Boiler Change-out Program, <http://www.anr.state.vt.us/air/hm/OWBchangeoutprogram.htm>, retrieved Dec. 27, 2011.

³⁶ 10 V.S.A. § 580(a) provides that: "It is a goal of the state, by the year 2025, to produce 25 percent of the energy consumed within the state through the use of renewable energy sources, particularly from Vermont's farms and forests." 10 V.S.A. § 581 provides that:

It shall be goals of the state:

(1) To improve substantially the energy fitness of at least 20 percent of the state's housing stock by 2017 (more than 60,000 housing units), and 25 percent of the state's housing stock by 2020 (approximately 80,000 housing units).

(2) To reduce annual fuel needs and fuel bills by an average of 25 percent in the housing units served.

(3) To reduce total fossil fuel consumption across all buildings by an additional one-half percent each year, leading to a total reduction of six percent annually by 2017 and 10 percent annually by 2025.

its building efficiency goals,³⁷ and it is not clear that it will meet its goals for farm and forest renewable energy production.³⁸ Funding will be needed to help achieve these goals. An example of a potential funding source would be a tax on home heating fuels to support thermal efficiency programs to be implemented on a whole building basis. Some portion of the funds raised could support residential heating with efficient woody biomass appliances.

The Working Group further *recommends* that the state support the concept of new wood pellet manufacturing facilities in Vermont. Growth in residential pellet use will need to coincide with increased pellet production, which is difficult to predict (see above). Project developers should be provided with information and guidance regarding the state's regulatory process.

To promote the expanded use of woody biomass in commercial/industrial/institutional thermal and thermal-led CHP applications, the Working Group *recommends* that the State of Vermont create an effective outreach program to inform potential candidates. Many locations have already been identified; however, a more complete list should be compiled. High-priority sites are locations where a thermal load uses extensive amounts of heating oil or propane. An analysis of existing programs and organizations that reach out to potential biomass users should be done. A comprehensive information package explaining biomass energy and highlighting successful wood conversion projects should be produced and made available to potential conversion sites. The package should also contain information regarding how to begin and negotiate the state regulatory process.

The Working Group also *recommends* that the General Assembly enact enabling legislation that allows municipalities to create and operate heating district utilities.

The Working Group further *recommends* that, as soon as feasible, the General Assembly lift the current suspension on applications for state aid for school construction³⁹ at least for the purpose of supporting school conversions to woody biomass energy.

The Working Group *recommends* as well that the Clean Energy Development Board, in consultation with the Department of Public Service (DPS), develop recommended incentives for woody biomass thermal

(4) To save Vermont families and businesses a total of \$1.5 billion on their fuel bills over the lifetimes of the improvements and measures installed between 2008 and 2017.

(5) To increase weatherization services to low income Vermonters by expanding the number of units weatherized, or the scope of services provided, or both, as revenue becomes available in the home weatherization assistance trust fund.

³⁷ Vt. Law School Institute for Energy and the Environment, Financing Residential Energy Efficiency in Vermont at 14 (July 2011).

³⁸ Vt. Agency of Agriculture, Food and Markets, Vt 25 x 25 Initiative, 2009 Progress Report at 9-12.

³⁹ 2007 Vt. Acts and Resolves No. 52 § 36.

energy that use a tiered structure that rewards greater design system efficiency with a larger incentive in comparison to less efficient systems.

The Working Group favors the location of additional biomass energy-related manufacturing facilities in locations for which the combination of benefits and supporting resources is most appropriate, whether the manufactured product is pellets, electricity, or another biomass energy product. Locations that would facilitate use of excess heating capacity should be encouraged.

New construction to support woody biomass energy development, including pellet manufacturing or electricity generation, likely will require permits to be issued before construction can begin. Appendix E is a memorandum from legislative counsel on permit reviews that are relevant to biomass energy development. The centralization of services and permitting provided or required by the state would facilitate the industry significantly.

In addition, incentives should be developed to provide model approaches to issues that can add further delay to a project if not handled in an appropriate way, such as procurement standards, forest health issues, air quality requirements, and other issues that are important to the affected public.

With respect to biomass energy, woody biomass projects that produce electricity will be subject to Vermont's "Section 248" permit process, which may take years from the initial application to project approval.⁴⁰ As an example, Ryegate Power Station's Section 248 process took 2½ years from the time of application to final permit approval.⁴¹

When considering expansion of the biomass industry in Vermont, the Working Group *recommends* improvement of the Section 248 application process to increase predictability and reduce processing time. Such improvement could result from a comparison of the Section 248 process with other permit programs, with a focus on helping developers in the preparation of their project applications. For example, the Act 250 program has crafted an application form that includes detailed guidance for an applicant.⁴² While the Public Service Board (PSB) has issued an application form for net metering systems — which by law are of limited size⁴³ — the PSB could and should create a form applicable to larger energy projects. The PSB also should consider the assignment of a person or persons who can assist the applicant in completing the application form in the same manner as Act 250 coordinators do today.

⁴⁰ More information about the Section 248 permit process is available from: http://psb.vermont.gov/sites/psb/files/publications/Citizens_Guide_to_248.pdf, retrieved Dec. 27, 2011.

⁴¹ Vt. Public Service Board, Docket #5217 (1989).

⁴² Vt. Land Use Panel, <http://www.nrb.state.vt.us/lup/publications.htm>, retrieved Dec. 27, 2011.

⁴³ 30 V.S.A. § 219a.

Enhancement of Vermont's biomass industry should come in the form of incentives that maximize the benefits and minimize negative impacts. Such incentives could include tax credits, low-interest loans, favorable power rates, and renewable energy credits. Geographic location of pellet mills, chip processors, and power plants in Vermont have direct transportation implications that should be considered when tax or other incentives are offered.

3. Recommended Standards and Policies for the Design of New Renewable Energy from Biomass That Are Designed to Promote Sustainable, Efficient, Local, and Fair Use of Biomass Supplies

Working Group recommendations on standards and policies for design are set out immediately below.

The siting of new wood pellet manufacturing facilities should be dispersed among various areas around the state. Wood availability numbers and existing supply infrastructure will have to be considered before pursuing multiple sites.

In addition, the Working Group *recommends* that the General Assembly should require all pellets sold in Vermont to be labeled as to moisture content, weight, list of ingredients, and suitability for various heating systems.

While commercial/industrial/institutional thermal load or thermal-led CHP systems are the most efficient use of biomass for energy generation, supplying this type of facility with biomass fuel is complicated by the seasonal nature of its operations, because more wood is needed during colder months. This complication negatively affects biomass producers who need to keep their products moving year-round. The Working Group *recommends* that the state should support and enhance the biomass supply chain around Vermont, based on a business model under which suppliers provide woody biomass products to a variety of markets on a year-round basis. An example of such a business model is that of Lathrop Forest Products in Bristol, a successful wood fuel supply system.

The Working Group understands the need for CHP requirements. The Working Group also understands that the sustainable management of forests for products procured by an individual plant is key to forest health and sustainability. Such management can result in the use of renewable forest products in a way that maintains forest health and sustainable management if the Working Group recommendations in this report are followed. Evidence indicates that a 50 percent design system efficiency level is attainable with

some CHP systems but is not possible in a stand-alone electric generating facility given current technology.⁴⁴ The Working Group defines “design system efficiency” as it is defined by existing statute: “the sum of full load design thermal output and electric output divided by the heat input.”⁴⁵ The Working Group considers design system efficiency to be synonymous with “fuel efficiency.” Every effort should be made to site and develop plants that make use of as much heat as possible. Regardless of location, any new plants should have a requirement to utilize thermal energy from the generation of electricity.

The Working Group did not evaluate research relating to the design system efficiency of woody biomass CHP as a standard relating to either the current Sustainability Priced Energy Enterprise Development (SPEED) program⁴⁶ or a renewable portfolio standard should one be developed, except for the discussion below of the SPEED program’s standard offer RPS. CHP is *recommended* for all new electric generation plants using woody biomass. For incentives other than the standard offer, we recommend that the DPS or other appropriate agency develop a tiered or seasonal requirement for new biomass electric generators in the state.

The Working Group briefly discussed the design system efficiency requirement of the “standard offer” program administered by the Public Service Board, under which up to 50 megawatts of renewable energy plants may contract for energy prices that are set to provide incentives for renewable energy development, and which requires that an eligible woody biomass project must have a design system efficiency of at least 50 percent.⁴⁷ The group does not recommend changing that requirement. The standard offer is an incentive to encourage highest quality clean energy development. Any standard offer benefit should be given only to plants achieving the highest level (50 percent) design system efficiency.

On the issue of design system efficiency, there is a distinction between incentive and regulatory programs. To date, many Vermont statutory requirements related to the design system efficiency of woody biomass energy projects have come in the context of incentive and not regulatory programs. It is reasonable to condition the provision of these incentives on achieving a design system efficiency standard that the market may not otherwise produce. In this regard, for incentive programs other than the standard offer, the Working Group *recommends*, as an alternative to a flat requirement of 50 percent for design system efficiency, that the DPS in consultation with the Clean Energy Development Board consider a tiered structure for incentives for woody biomass electric generation that would reward greater efficiency.

⁴⁴U.S. DOE, Office of Information Technologies, Energy Efficiency and Renewable Energy, Combined Heat and Power Cost Reduction Strategies, (2002), available at: <http://www1.eere.energy.gov/industry/glass/pdfs/chp.pdf>, retrieved Dec. 27, 2011.

⁴⁵ 30 V.S.A. § 8005(j) (design system efficiency requirement for standard offer program).

⁴⁶ More information about the Vermont SPEED program is available at: <http://vermontspeed.com/>, retrieved on Dec. 27, 2011.

⁴⁷ 30 V.S.A. § 8005(j).

In contrast, given the interconnection of the regional power grid, establishing a regulatory design system efficiency standard in Vermont may not be productive in the absence of a regional standard.

Accordingly, rather than requiring 50 percent design system efficiency for all woody biomass energy projects, the Working Group *recommends* that the General Assembly direct that the PSB, in its Section 248 proceedings, require that each woody biomass energy facility be designed for the optimum design system efficiency. Woody biomass energy projects that are not subject to Section 248 review should also be required to meet this standard if they are subject to other siting or land use proceedings such as Act 250 or local land use review.

4. Use of Roundwood

Wood heating appliances are a major source of heat for many Vermont homes.⁴⁸ We *recommend* that the state develop incentives for the efficient use of wood for home heating by providing financial encouragement to replace old, inefficient wood-burning units with more efficient, cleaner burning appliances, for the conversion to pellet-burning units, or for the installation of district heat.

We *recommend* that the state support policies to encourage growth of the public's use of low-grade roundwood for home heating, particularly from local sources. Such use would not only reduce Vermont's reliance on imported energy but also would promote job growth for local foresters, loggers, wood processors, and truckers in rural areas of the state.

The growing use of roundwood must be balanced with educational outreach. It would be helpful for the public to have a list of wood suppliers who meet some indicator of sustainability training, perhaps logger education certificate holders. The public needs to be reminded that long-distance hauling of firewood can result in the unintentional spread of undesirable insects. The state, a landowner group, or a forest industry organization should develop a fact sheet or website that describes firewood purchasing terms, including the difference between "dry," "seasoned," and "green" firewood.

We *recommend* that the Agency of Natural Resources (ANR) enlist a panel of experts to provide guidance on actual field performance versus lab tests on wood-burning appliances as to emissions levels, particularly in view of the Environmental Protection Agency's (EPA) recent decision to only require infrequent "tuning" of small boilers as opposed to numeric emissions limits. The General Assembly should be aware of potential environmental and human health impacts of each class of biomass appliance.

⁴⁸ Vt. Public Service Board, Vermont Residential Fuel Wood Assessment, available at: http://publicservice.vermont.gov/energy/ee_files/biomass/renew98report.pdf, retrieved Dec. 27, 2011.

C. Forest Health Subcommittee

Act 37 requires the Working Group to include in its reports recommended guidelines for maintaining forest health and to develop recommended wood procurement standards. To develop these recommendations, the Working Group established the Forest Health Subcommittee.

The Working Group recognizes opportunities for biomass harvesting to maintain or improve forest health including adjusting stand density and improving stand quality through removal of low-grade stems. The Working Group also recognizes the variability in landowner objectives for their forestland and that harvesting guidelines and wood procurement standards are best considered in that context. The Working Group further recognizes that increasing demand for wood used for heat and electricity has the potential to put strains on forest resources, particularly if we do not encourage proper harvesting practices and wood procurement policies. Balancing opportunities for biomass harvesting with long term maintenance of forest health has been a primary objective of the Working Group, and any expansion of biomass harvesting in the state should be based on the premise that forest health and productivity must be maintained. The Working Group also considered the issues of short-rotation woody crops as subjects of concern pertaining to forest health and also developed suggestions for education/outreach initiatives and monitoring activities to track impacts on forest health.

There is a discontinuity between the broad range of wood procurement practices mandated by the PSB for Vermont-based wood-fired electric producers through the Section 248 permit process and the absence of direct procurement standards required for other users of biomass. The Working Group acknowledges the desirability of PSB review and influence of harvesting practices conducted by electrical generators. There is an expectation that proposed generators would be subject to similar procurement standards including considerations for protection of forest health. The sub committee referred to the harvest standards used by the City of Burlington Electric Department (BED) since 1984,⁴⁹ which have worked well in the opinion of officials from the Department of Fish and Wildlife (DFW), and agreed that there are a few ways in which the PSB standards could be improved in light of recent research findings. These include an expansion of identification and protection of certain biodiversity criteria and protection of soil nutrients. Such policies should be incorporated into a model procurement policy, which could serve as a template for new facilities that need to go through the permit process.

⁴⁹Burlington Electric Department, Joseph C. McNeil Operating Station, available at: <https://www.burlingtonelectric.com/page.php?pid=75&name=mcneil>, retrieved Dec. 27, 2011.

It is unclear whether Act 250 requires policies or conditions to address wood procurement for facilities triggering its jurisdiction. As discussed further below, the Working Group *recommends* that the General Assembly create a uniform system for implementing wood procurement standards across a range of facilities, including electricity generators, district heating, combined power and heat, pellet manufacturers, and schools and office building complexes that heat with wood.

The findings of the Working Group related to forest health are set forth below under headings that reflect the statutory charge to the Working Group on forest health guidelines and wood procurement standards, after which appear sections on carbon accounting, short-rotation woody crops, and recommendations for outreach, education, and monitoring related to forest health issues.

1. Recommended Guidelines or Standards for Maintaining Forest Health, Including Model Harvesting and Silvicultural Guidelines for Retaining Dead Wood and Coarse Wood Material; Maintaining Soil Productivity, Wildlife, and Biodiversity, and Other Indicators of Forest Health

Over the past 10 years, the traditional fossil-fuel based energy markets have fluctuated significantly. These fluctuations have led states, businesses, and individuals to reexamine their energy supplies. One potential energy supply is woody biomass, and Vermont is fortunate to have significant forest resources — with over 4.5 million acres of forestland.⁵⁰ As a result, there has been significant interest in utilizing available woody biomass in Vermont for energy and thermal production for uses once supplied by fossil fuels. The potential for these new and expanded woody biomass markets has prompted questions and interest regarding the possible impacts that increased timber harvests and associated disturbances would have on long-term site productivity, water quality, and biological diversity. To fulfill the statutory charge and to address questions raised regarding the potential impacts of increased harvests, the Working Group reviewed whether harvesting guidelines would be appropriate for Vermont. In its review, the Working Group examined: existing guidelines in Vermont; how other states and jurisdictions have addressed concerns regarding increased harvests; and the available science and research. The Working Group also considered how and to what extent certain forest management practices such as protection of water quality, protection of biological diversity, and maintenance of soil nutrients are implemented during biomass harvesting.

⁵⁰ Vt. Dept. of Forests, Parks and Recreation, State Forest Resource Assessment, (2010), available at: <http://www.vtfpr.org/htm/documents/assessments.pdf>.

Six other U.S. states⁵¹ have developed guidelines specifically for woody biomass harvesting. Other states address water quality, soil productivity, and biological diversity in comprehensive forest practices acts or rules.⁵² Additional states have adopted voluntary forest management practices that address water quality, soil productivity, and the retention of a variety of forest structures.⁵³ Similarly, the Canadian provinces of Nova Scotia, New Brunswick, and Quebec are in the process of developing biomass harvesting guidelines addressing similar issues.⁵⁴

For over 30 years, Vermont has required its two wood-fired power plants to implement strategies to address public concern about forest health and other issues through procurement standards that require some review by the Vermont Department of Fish and Wildlife and professional foresters. DFPR has adopted Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont (AMPs),⁵⁵ and these practices, although not mandatory, have become an industry standard for timber harvests in Vermont.

However, woody biomass retention standards do not currently exist for timber harvest operations in Vermont. The PSB's influence over biomass harvesting does not extend to nonelectrical producers (such as those producing heat) nor to biomass consumers located out-of-state. Moreover, neither the AMPs nor the procurement standards for wood-fired power plants address soil productivity or biological diversity on harvest sites.

Thus, a challenging question addressed by the Working Group is how to move other biomass users in Vermont that produce heat or pellets (schools, institutions, commercial biomass users and the state) in the direction of taking greater responsibility for the level of forest management practices associated with their wood fuel supply.

⁵¹ See Maine, Biomass Retention Guidelines, (2010), available at: http://www.maine.gov/doc/mfs/pubs/biomass_retention/report/biomass_report_lr.pdf; Michigan, Michigan Woody Biomass Harvesting Guidance, available at http://www.mi.gov/documents/dnr/WGBH_321271_7.pdf; Missouri, Missouri Woody Biomass Harvesting, Best Management Practices Manual, available at: <http://mdc4.mdc.mo.gov/Documents/19813.pdf>; Minnesota, Biomass Harvesting on Forest Management Sites in Minnesota, (2007); Pennsylvania, Guidance on Harvesting Woody Biomass for Energy in Pennsylvania, (2008), available at: http://www.dcnr.state.pa.us/pa_biomass_guidance_final.pdf; Wisconsin, Wisconsin's Forestland Woody Biomass Harvesting Guidelines, (2008), available at: <http://council.wisconsinforestry.org/biomass/pdf/BHG-FinalizedGuidelines12-16-08.pdf>.

⁵² See, e.g., California Forest Practice Rules, 4 Cal. C.F.R. chs. 4, 4.5, and 10.

⁵³ See, e.g., New Hampshire Division of Forests and Lands and the Society for the Protection of New Hampshire's Forests, New Hampshire Forest Sustainability Work Team, Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire, (1997), available at http://extension.unh.edu/resources/files/Resource000294_Rep316.pdf.

⁵⁴ See Forest Guild, Alexander M. Evans, Robert T. Perschel & Brian A. Kittler, Revised Assessment of Biomass Harvesting and Retention Guidelines pp. 13-14 (2010) (discussing biomass guidance and policy in Canada).

⁵⁵ Vt. Dept. of Forests, Parks and Recreation, Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont, available at: <http://www.vtfpr.org/watershed/documents/Amp2006.pdf>.

Our solution, in addition to a model wood procurement standard, is the development of voluntary harvesting guidelines that, if implemented, would protect important resources and could be adopted by responsible biomass users. The adoption of these guidelines by existing biomass users would help assure the public of adequate resource protection and also could increase the predictability of permitting for proposed biomass users. The Working Group encourages biomass producers and purchasers to employ guidelines that meet or surpass the recommended practices to minimize risks to ecological values.

The Working Group drafted a set of such voluntary guidelines which include many practices that are not unique to biomass harvests and therefore could be recommended for all wood harvests. Forest management issues addressed by the Working Group include: rare, threatened and endangered species, rare natural communities, old growth forests, deer wintering areas, low-nutrient sites, steep slopes, retention of woody debris, salvage harvesting, and monitoring. In addition to proposed and existing biomass harvesting guidelines and regulations from several states, the Working Group studied recently released guidelines from the Forest Stewards Guild and drew upon these sources as well as experiences and opinions of representatives of the DFW and DFPR in the development of the voluntary guidelines. The voluntary guidelines are written so as to be general in view of conflicting research, flexible to accommodate a wide range of site conditions, understandable by those charged with using them in the woods, and easily implemented in the field.

Scientific support for provisions that address soil productivity and biodiversity is based on the concept that harvest residues and residual vegetation provide organic matter and nutrients that sustain productivity.⁵⁶ Consistent and quantifiable data on the relationship between removals and residuals and the resulting inputs and outflows on forest soils are lacking or at times conflicting. Scientific support for retaining forest structure such as snags, cavity trees, and down material is based on research that evaluates the role these elements provide for a variety of wildlife and ecological functions.⁵⁷ While data may be limited in certain areas, there are studies to draw upon, and forest managers should strive to implement the best science available and practice adaptive management as new science emerges.

The Guidelines for Maintaining Water Quality, Soil Productivity and Biological Diversity on Harvesting Jobs in Vermont are located in Appendix B of this report. The following three paragraphs summarize some of the issues addressed in these voluntary guidelines.

⁵⁶ See, e.g. Roberts, Scott D.; Harrington, Constance A.; Terry, Thomas A., Harvest Residue and Competing Vegetation Affect Soil Moisture, Soil Temperature, N Availability, and Douglas-fir Seedling Growth, Forest Ecology and Management 205 pp. 333-350 (2005), available at: <http://www.treesearch.fs.fed.us/pubs/20458>.

⁵⁷ See, e.g., Smith, Katherine Manaras, William S. Keeton, Therese M. Donovan & Brian Mitchell, Stand-Level Forest Structure and Avian Habitat: Scale Dependencies in Predicting Occurrence in a Heterogeneous Forest, Forest Science 54(1) pp. 36-46 (2008).

To protect water quality, the Working Group *recommends* implementation of DFPR's Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont as necessary. Similarly, the Working Group *recommends* that landing size should be minimized to the extent possible and that, as is required under the AMPs, a functional buffer be maintained between lands and water resources.

To protect soil productivity, the Working Group *recommends* that leaf layer disturbance at a harvest site be minimized unless required for regeneration. Stumps and roots should be retained intact, except as necessary for road landing and trail construction. Tree tops should be utilized as necessary to increase equipment flotation. The proportion of retained organic debris should increase as harvest intensity increases or the cutting cycle decreases. Additionally, chipper waste should be returned to the forest on return skidder trips as practical and necessary.

To protect biological diversity, the Working Group *recommends* that a harvest operator retain as many snags as safety, access, and landowner objectives permit. The Working Group *recommends* a minimum target for retained decaying trees and snags per harvest size. The group also *recommends* that down wood material be retained in place and that incidental breakage on whole-tree harvests be retained in place as safety and aesthetics allow. In addition, a harvest operator should consider retaining newly cut material on site if large wood material is lacking. The Working Group also *recommends* that at least five percent of the stand be retained when performing salvage harvests unless such a practice would be contrary to state or federal government guidelines.

The Working Group also *recommends* that ANR develop a means for monitoring, including field data collection, a representative sample of harvest operations for wildlife tree and biomass retention levels, and review or amend the guidelines in Appendix B periodically as necessary and as funding allows. Monitoring could become part of ongoing UVA inspections. Alternatively, the state could periodically review the need for reactivating and expanding the monitoring of biomass harvesting that was conducted in the 1980s and phased out due to a conclusion that the monitoring carried a high cost with low benefit. Also, the Working Group *recommends* that DFPR periodically reassess the use and adequacy of AMPs on all types of wood harvests and strengthen them if warranted.

The Working Group further recognizes the desirability of regional biomass harvesting standards so as to allow Vermont-based facilities to compete fairly with facilities in neighboring states that buy wood in Vermont. The Working Group *recommends* that the state pursue the development and adoption of regional biomass harvesting standards even in light of the political difficulty associated with such an endeavor.

2. Recommended Wood Procurement Standards

Subdivision 1(c)(2) of Act 37, in part, requires the Working Group to include in its reports recommended wood procurement standards. In reviewing and recommending standards for biomass procurement, Act 37 requires the working group to review whether:

- (A) separate procurement standards are necessary for certain consumers of biomass, such as retail electricity;
- (B) there are obstacles or policy considerations that need to be overcome to establish model procurement standards for biomass energy facilities;
- (C) a uniform procurement standard for maintaining forest health would offer more predictability in the permitting process;
- (D) procurement standards can be designed to effectively monitor whether the collective demand for energy produced from biomass does not impair long-term site productivity and forest health;
- (E) it is feasible to coordinate with adjoining states to develop a regional procurement standard for biomass energy facilities;
- (F) biomass procurement standards should require third-party certification; and
- (G) a standard should be developed that would require biomass electricity generating facilities to provide for a design system efficiency of at least 50 percent over the course of a full year.⁵⁸

a. Discussion: Model Wood Procurement Standard

Wood procurement standards are largely unique to each wood consumer, particularly as there applies to raw material specifications and delivery requirements. For example, a school may require frequent deliveries after hours of clean hardwood mill chips. A pellet manufacturer may require log-length softwood to supplement sawmill residue purchases. An electricity producer may be able to utilize all of the above plus chips made from forest residues. Many aspects of wood procurement standards do not affect forest health and will not be discussed here.

There are multiple options for potential implementation of the model wood procurement standards. For example, a buyer could decide to adopt the procurement standards as a matter of contract with its suppliers. Alternatively, the standards could be implemented as a condition of regulatory permit approval. Regardless of whether the standards are purely voluntary, contractual, or mandatory conditions of a permit, the Working Group, in response to its legislative mandate, has identified several attributes that should be

⁵⁸ 2010 Acts and Resolves No. 37 § 1(c)(2)(A)-(G).

included in a model wood procurement standard which would serve as a template for contracts, facilities going through the permitting process, or other uses. The template would be adaptable for facilities seeking a Section 248 or Act 250 permit and, in order to encourage the adoption of the standard, the General Assembly could examine whether compliance with the model procurement standard leads to a presumption that an applicant has met its burden in addressing procurement issues related to forest health. Furthermore, rather than expanding the jurisdiction of Section 248 or Act 250, the Working Group *recommends* that compliance guidelines would need to accompany implementation of any procurement policies for facilities that do not require a Section 248 or Act 250 permit. Any such guidelines should be cognizant of the regional system in which the biomass market is operating so they do not put Vermont biomass facilities at a competitive disadvantage. For example, a compliance officer housed within ANR could oversee the implementation of wood procurement policies for school or district heating projects or wood pellet facilities not subject to Section 248 or Act 250 oversight.

The Working Group *recommends* that the following attributes be included in a model wood procurement standard adaptable to all scales of biomass users except individual firewood procurement. The Working Group also believes that procurement standards must be implemented regionally to protect the competitive position of Vermont in the biomass industry. The Working Group recommends that the state engage in discussion regarding biomass procurement with other states in the region through the New England Governor's conference or another regional organization.

1. Harvesting guidelines. Adoption of the voluntary wood harvesting guidelines presented in Appendix B should be expected of wood suppliers selling wood directly from the forest to the consumer.
2. Verification of compliance with harvesting guidelines. Consumers should develop a means of verifying that harvesting guidelines are being used. The implementation of this objective will differ depending on the size (wood volume) of the consumer, and various examples of verification mechanisms are described in Appendix D to this report. Large users such as power plants should employ professional resource managers (foresters, ecologists, or wildlife biologists) to implement wood procurement plans including the monitoring of harvests. Small users could perform their own verification or buy wood through a broker or supplier contractually obligated to monitor harvests for compliance with the guidelines. Other options for assuring compliance with the guidelines could include buying wood from third party certified loggers or lands (SFI, FSC, PEFC⁵⁹), from lands managed under the UVA program, or only from harvests monitored by a professional forester, provided that these mechanisms incorporate the guidelines.

⁵⁹ These acronyms respectively stand for the Sustainable Forestry Initiative, the Forest Stewardship Council, and the Programme for Endorsement of Forest Certification Schemes. Please see Appendix D for more information.

Schools could economically secure the monitoring services they need by retaining a professional forester at the supervisory district or superintendents' association level.

3. Verification of land conversions. Consumers should have a means of verifying that land use conversions are genuine and not simply forest liquidation. For example, Vermont has a heavy cut law that requires a permit for harvests that exceed 40 acres and result in low residual stocking.⁶⁰ In addition, BED requires that landowners show evidence of the intent to use the converted land as proposed and have secured all necessary permits prior to harvesting.⁶¹
4. Conformance with applicable laws. All wood consumers should insist on suppliers conducting their operations in conformance with pertinent laws and regulations.
5. Clear contracts. The Working Group *recommends* the use of a wood supply contract that clearly explains the responsibilities of the consumer and the supplier.
6. State natural resources review. Representatives of an appropriate state agency should provide review and guidance on biodiversity criteria including wetlands, deer wintering areas, state ranked S1 and S2 natural communities, and habitats of rare, threatened, and endangered species when they appear on proposed harvest areas.
 - As mandated by the PSB's certificates of public good (CPG) for the Ryegate and McNeil power stations, representatives of DFW currently provide this review and guidance for wetlands, deer wintering areas, and habitats of rare, threatened, and endangered species when they appear on proposed harvest areas. The above procurement standards recommend continuing this review procedure and expanding the scope of review to include state-ranked S1 and S2 natural communities for all facilities, even those not subject to a PSB CPG.
 - However, if this expansion of the scope of review is implemented, then existing staffing levels at DFW may be inadequate to absorb the significant increase in review responsibilities for new biomass users. In this case, the Working Group *recommends* the addition of up to two positions at ANR with backgrounds in wildlife biology, ecology, or forestry, located in the vicinity of wood procurement activities of any major new biomass demand for the purpose of providing consistent and timely review and guidance in the identification and protection of rare, threatened, endangered species; wetlands; deer wintering areas, and rare natural communities. The subcommittee recognizes that state hiring limitations may preclude the addition of new staff at this time. Funding for staffing increases should be borne by resource consumers in the form of a fee assessed on wood consumption for all wood consumers procuring over 50 green tons per year. Further, strategies for "fast-tracking" the

⁶⁰ 10 V.S.A. § 2625.

⁶¹ Burlington Electric Department, [Harvesting Policy for Whole Tree Chipping Operations in Vermont](#)

permitting process should be considered to keep the regulatory approval process effective and efficient for all users.

b. Specific Criteria from Act 37

The Working Group reviewed the specific criteria from Act 37 on wood procurement standards and approved the following.

- i. § 1(c)(2)(A): Whether separate procurement standards are necessary for certain consumers of biomass, such as retail electricity*

No, separate procurement standards are not necessary for certain consumers of biomass. Currently, the two biomass electric generating facilities at McNeil and Ryegate Power station are the only facilities subject to a procurement standard. The Working Group recommends development of a model uniform procurement standard for all forest product facilities as discussed above and under subsections (ii) and (iii) below.

- ii. § 1(c)(2)(B): Whether there are obstacles or policy considerations that need to be overcome to establish model procurement standards for biomass energy facilities*

Yes, obstacles and policy considerations do exist that must be addressed in establishing model procurement standards. For instance, there is significant support for development of a model procurement standard, but there are issues and obstacles to such adoption. There also is a debate on whether such standards should apply only to woody biomass harvests or to all harvests because the majority of the harvests are integrated, that is, simultaneously extracting a suite of products. In addition, the standards for procurement currently vary greatly from state to state across the region. Buyers and the market in general do not recognize state lines and are not limited to the procurement standards in any one state. Consequently, as discussed in subsection B.2.v. below, the Working Group recommends that the state pursue a policy of regional coordination on a procurement standard.

- iii. § 1(c)(2)(C): Whether a uniform procurement standard for maintaining forest health would offer more predictability in the permitting process*

If a uniform procurement standard existed, it could provide predictability in the permitting process, but the permitting process or permitting standards for activities would need to be altered to incorporate a procurement standard. Biomass electric production in the state is currently the only activity subject to procurement standards as part of the PSB permitting process.⁶² If the pool of permits subject to standards

⁶² See, e.g., Public Service Board Docket #5217 (1989).

was increased or if a land use permit, such as an Act 250 permit, required procurement standards, a strong procurement standard could assist in permitting predictability and compliance with such a standard might be given deference by a regulatory or permitting authority.

iv. *§ 1(c)(2)(D): Whether procurement standards can be designed to effectively monitor whether the collective demand for energy produced from biomass does not impair long-term site productivity and forest health*

No, procurement standards alone cannot be designed to effectively monitor whether demand for biomass energy does not impair site-productivity and forest health. Additional monitoring independent of demand for biomass energy and independent of harvests in general gauge forest health and productivity.

v. *§ 1(c)(2)(E): Whether it is feasible to coordinate with adjoining states to develop a regional procurement standard for biomass energy facilities*

Yes, from the perspective of the Working Group, it is feasible and desirable to coordinate with adjoining states to develop regional procurement standards. Adoption of regional procurement standards would have substantial benefit for biomass energy facilities and forest resources. DFPR has pursued such regional coordination, most recently through the New England Governors' Conference.⁶³ However, the timing and implementation of a regional standard are difficult, and additional groundwork and negotiation are necessary before any foreseeable implementation.

vi. *§ 1(c)(2)(F): Whether biomass procurement standards should require third-party certification*

No, if a procurement standard is established, the standard should not require third-party certification. However, the Working Group encourages land management and harvesting under the use value appraisal program, land conservation agreements, or third-party certification systems or that are subject to the advice and services of a professional forester, all of which could elevate the quality of forest practices and improve management of the state's forest resources. Furthermore, some level of independent verification should be included in a model wood procurement standard as discussed above.

⁶³ The New England Governor's Conference, <http://negc.org/main/>, retrieved on Dec. 27, 2011.

- vii. § 1(c)(2)(G): *Whether a standard should be developed that would require biomass electricity generating facilities to provide for a fuel efficiency of at least 50 percent over the course of a full year*

No as to regulatory requirements, and yes as to voluntary standards. The Working Group makes a distinction between whether a 50% fuel efficiency standard should be required as a regulatory matter versus through the incorporation of an incentive-based program. The Working Group understands “fuel efficiency” to mean design system efficiency, or “the sum of full load design thermal output and electric output divided by the heat input.”⁶⁴ Using forest resources in the most efficient way possible is desirable, but a regulatory standard of 50% design system efficiency over the course of a full year may not be possible for certain biomass energy facilities in certain locations in the state. The Working Group does not want to discourage the location or operation of such facilities. Regarding the regulatory process, the Working Group also *recommends* that the General Assembly direct the Public Service Board to require each biomass energy facility to design for the optimum design system efficiency. In addition, the discussion above in Sec. B.3 indicates that, regarding incentive-based programs, the Working Group *recommends* that a 50 percent efficiency standard should be maintained for the standard offer program. For other incentive programs, DPS, in consultation with the Clean Energy Development Board, should develop a tiered structure for electric generation that would reward greater efficiency.

3. Carbon Accounting

There are potential environmental benefits from forest management that results in maintaining or increasing carbon storage in the forest.⁶⁵ Some forest landowners are seeking a financial return for carbon sequestration on their properties through participation in carbon markets.⁶⁶ There are differing views on the appropriate methods and scale of accounting needed to understand the net greenhouse gas emissions associated with different forest management approaches. Views differ, in particular, with respect to the emissions consequences of so-called “substitution effects,” or replacing fossil fuels and nonwood building materials with wood-derived energy and products.

⁶⁴ This is the definition of design system efficiency for wood biomass resources found in 30 V.S.A. § 8005(j) (design system efficiency requirement for standard offer program). While the wording is clear that the measurement is based on design (or peak) efficiency, it should be noted that peak efficiency and operational efficiencies averaged over a period of time (a year for example) can vary widely. Further, the variable of the input fuel value can be calculated on either a higher heating value (HHV) of wood or a lower heating value (LHV) of wood, which can greatly affect the efficiency calculation.

⁶⁵ Carbon Sequestration in Agriculture and Forestry, <http://www.epa.gov/sequestration/>, retrieved Dec. 27, 2011.

⁶⁶ More information is available from: <http://www.fs.fed.us/ecosystemservices/carbon.shtml>, retrieved Dec. 27, 2011.

An ongoing debate in the scientific literature has to do with the impacts of expanding wood bioenergy use on greenhouse gas emissions. Some have proposed that a shift to greater reliance on wood biomass energy will significantly increase net greenhouse gas emissions over the near term of one to several decades, primarily because of the lower energy conversion efficiency of wood as compared to fossil fuels.⁶⁷

Others have argued the opposite, viewing wood energy as largely carbon neutral.⁶⁸ In general, the disparity between these two views depends on the accounting assumptions made by researchers and modelers.

The crux of the debate comes down to whether or not there will be an initial increase in greenhouse gas emissions if more wood is used for bioenergy (a “debt”), particularly if it is harvested from growing trees, followed by a lag time until a net reduction in emissions is achieved (a “dividend”). Part of the ongoing discussion is how great the initial debt might be and how long a lag time we should expect until we gain the dividend.⁶⁹ A peer-reviewed paper resulting from research in Europe shows immediate emissions benefits from utilization of easily decomposed harvest residuals and biomass from plantations established on marginal agricultural land.⁷⁰ However, intensified harvesting of extant forests was projected to incur a carbon debt lasting many decades, assuming substitution for coal and natural gas.⁷¹ Substitution for thermal energy has been shown to incur a debt of much shorter duration.⁷² This question is important from a climate perspective because the near term could be a critical window for stabilizing atmospheric greenhouse gases, beyond which some scientists have suggested there may be irreversible disruption of the planet’s climate system.⁷³

⁶⁷ Searchinger, T.D., et al., Fixing a Critical Climate Accounting Error, *Science*, 326: 527-528 (2009); Walker, T., et al., Biomass Sustainability and Carbon Policy Study, Manomet Center for Conservation Sciences. NCI-2010-03 pp. 189, (2010), available at http://www.manomet.org/sites/manomet.org/files/Manomet_Biomass_Report_Full_LoRez.pdf; McKechnie, J., et al., Forest Bioenergy or Forest Carbon? Assessing Trade-offs in Greenhouse Gas Mitigation with Wood Based Fuels, *Environmental Science & Technology* 45: 789-795 (2011).

⁶⁸ Lippke, B., et al., Letter to U.S. House of Representatives Committees on Energy & Commerce and Natural Resources. (July 20, 2010); Lucier, A., A Fatal Flaw in Manomet’s Biomass Study, *The Forestry Source*, p. 4 (2010); Sedjo, R.A., Carbon Neutrality and Bioenergy: A Zero-Sum Game? Resources for the Future Discussion Paper, DP 11-15 (2011). Available at: <http://www.rff.org/RFF/Documents/RFF-DP-11-15.pdf>.

⁶⁹ McKechnie, J., et al., Forest Bioenergy or Forest Carbon? Assessing Trade-offs in Greenhouse Gas Mitigation with Wood Based Fuels, *Environmental Science & Technology* 45: 789-795 (2011).

⁷⁰ Zanchi, G., et al., Is Woody Bioenergy Carbon Neutral? A Comparative Assessment of Emissions from Consumption of Woody Bioenergy and Fossil Fuel, *GCB Bioenergy*, pp.1-12 (2011).

⁷¹ Id.

⁷² McKechnie, J., et al., Forest Bioenergy or Forest Carbon? Assessing Trade-offs in Greenhouse Gas Mitigation with Wood Based Fuels, *Environmental Science & Technology* 45: 789-795 (2011).

⁷³ Solomon, S., et. al., Irreversible Climate Change Due to Carbon Dioxide Emissions, *Proceedings of the National Academy of Sciences* 106. pp. 1704-1709 (2009).

Assuming that there will be some degree of near term debt and thus a lag time until net emissions reductions are achieved, and recognizing that this assumption has been challenged,⁷⁴ the amount of initial carbon flux and the time lag until carbon neutrality can be minimized by: 1) harvesting practices that do not significantly intensify overall harvest rates or wood removals; 2) harvesting practices, such as stand improvement cutting, that improve forest health and growth; and 3) local, small-scale energy applications with high conversion efficiencies. It follows that if minimizing carbon debt and lag time is an objective, then policy should promote high efficiency energy applications over lower efficiency applications.

Data from the USFS inventory and monitoring plots show that Vermont's forests are increasing in standing inventory every year.⁷⁵ In other words, the forest will continue to sequester carbon unless harvesting exceeds the annual net growth, tree mortality increases, or uptake rates decline. A carbon debt is less likely if the forest ecosystem has been maintained in equilibrium or has a growth-to-harvest ratio greater than 1:1,⁷⁶ though the science is still exploring this question. Also, the carbon stored in forest fuels is part of the earth's carbon cycle. At some time, all unutilized trees will die, decay, and emit carbon. However, though temporally dynamic, dead wood represents an important carbon pool, containing about 10% of the carbon stored in Vermont's forests. Therefore, maintaining a source for dead wood recruitment is an important consideration. Utilizing some of this material for fuel and lumber displaces the use of fossil carbon that could stay sequestered for centuries; a portion of harvested wood may be transferred to long-term storage of carbon in stable wood products.

Because the scientific community has not come to a consensus on the net carbon fluxes and greenhouse gas emissions consequences of wood bioenergy, we *recommend* that the state closely follow the development of this issue, including ongoing research at ANR, and initiate a process to officially adopt greenhouse gas accounting protocols relevant to wood bioenergy.

4. Short-Rotation Woody Crops

The Working Group discussed issues surrounding the culture of short-rotation woody crops (SRWCs). Although the establishment of such crops is not common at this time, the group feels that a potential exists for the expansion of these crops in view of subsidies for establishment and use of SRWCs through programs

⁷⁴ Lucier, A., A Fatal Flaw in Manomet's Biomass Study, The Forestry Source, p. 4 (2010)

⁷⁵ U.S. Forest Service, Research and Development. <http://www.fs.fed.us/research/>, retrieved Dec. 27, 2011.

⁷⁶ Strauss, W., How Manomet Got it Backwards: Challenging 'Debt-then-Dividend' Axiom, Unpublished white paper (2011), available at: www.FutureMetrics.com.

such as the Biomass Crop Assistance Program and recommended limits on collection of harvest residue biomass.⁷⁷

The Working Group developed the following list of concerns and *recommends* that they should be explored in more detail by the state of Vermont, researchers, or nongovernment entities.

1. Use of nonnative species or clones in Vermont and risk of such plants becoming invasive.
2. Weed control; potential chemical impacts and mechanical alternatives.
3. Possible impacts of SRWCs on biodiversity.
4. Possible impacts of SRWCs on wildlife habitat.
5. Possible impacts of SRWCs on water quality.
6. Benefits of SRWC establishment in riparian areas.
7. Carbon flux due to conversion of farmland or former farmland to SRWCs.
8. Economic impacts of converting productive farmland to fuel production.
9. Limitations to the use of SRWCs due to chip quality issues.
10. Potential greenhouse gas emissions related to the use of SRWCs.

Sources of additional information include, but are not limited to, Dr. Timothy Volk at SUNY College of Environmental Science and Forestry, Syracuse, NY and Mr. Jack Byrne of Middlebury College.

5. Summary of Outreach/Education/Monitoring

We *recommend* that the state of Vermont provide training opportunities for foresters, landowners, and loggers in the use of the state Geographic Information System (GIS) database to identify/protect biodiversity elements of the forest. We *recommend* that information on the state GIS database be enhanced to include a full description of species and community attributes, their location, and recommended protection and enhancement practices similar to existing management guidelines for deer wintering areas.

We *recommend* educational opportunities for foresters and loggers on the benefits and trade-offs of reducing tree utilization and increasing postharvest woody debris. A simple means to estimate residue levels

⁷⁷ Biomass Crop Assistance Program, <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ener&topic=bcap>, retrieved Dec. 27, 2011.

is needed for use in the field. The University of Vermont (UVM), the Forest Guild, the Vermont Woodlands Association, and the Vermont Forest Products Association (VFPA) are potential providers.

Educational opportunities on forest practices should include public–private partnerships that sponsor seminars or conferences for loggers and other forest product users in various regions within the state.

A sustainable harvesting manual should be developed, similar to “Good Forestry in the Granite State,”⁷⁸ to be used as a tool for increasing the awareness of landowners, foresters, and loggers of desirable practices. Possible sources are UVM, DFPR, or USFS.

We *recommend* that the state continue to monitor rates of forestland gain or loss, as well as the harvest and growth of timber including unutilized low-quality wood. Monitoring tools include USFS Forest Inventory and Analysis data, Vermont Wood Harvest Report, and Vermont Fuel Wood Study, as well as the BERC Wood Supply Model or other wood supply models.

We *recommend* that the state sample monitor harvest operations for residual woody biomass and wildlife tree retention as part of UVA inspections or by other cost-effective means.

We *recommend* that ANR determine if there is a need for and, if warranted, resume inspections of biomass harvests as done in the 1980s as part of the portable sawmill law or by other appropriate means.

DFPR is currently reviewing the AMPs. We *recommend* that the state reassess the use and effectiveness of AMPs every 10 years.

We *recommend* that the state, the U.S. Natural Resources Conservation Service (NRCS), or UVM monitor the rate of establishment of short-rotation woody crops and every 10 years assess the need for voluntary or regulatory controls of the SRWC concerns listed above.

We *recommend* that the state or an industry group compile a list of chunk firewood sources that possess credentials of sustainable harvesting training from whom the public and institutions could order sustainably harvested wood. Suggested credentials include Logger Education to Advance Professionalism (LEAP) training,⁷⁹ or Master Logger Certification.⁸⁰

We *recommend* that the state, Renewable Energy Vermont, or VFPA develop and distribute to the public information explaining the difference between “dry,” “seasoned,” and “green” firewood.

⁷⁸ Good Forestry in the Granite State, available at: <http://extension.unh.edu/goodforestry/index.htm>, retrieved Dec. 27, 2011.

⁷⁹ For more information on LEAP, go to <http://loggertraining.com/vt-leap.htm>, retrieved Oct. 25, 2011.

⁸⁰ For more information on Master Logger Certification, go to <http://www.masterloggercertification.com/>, retrieved Dec. 27, 2011.

We *recommend* that ANR compile and provide information to the General Assembly on emissions output under “field conditions” for wood-burning appliances that lack federal or state-mandated numeric emissions levels in order to prioritize incentives or develop regulations.

We *recommend* that the state initiate a process, working with key stakeholders including the ANR, UVM, DPS, and others, to research and adopt greenhouse gas accounting protocols relevant to wood bioenergy. In this regard, ANR has begun efforts to evaluate life-cycle carbon accounting as it applies to biomass, and the Working Group supports integrating this endeavor into such a process.⁸¹

⁸¹ Vt. Dept. of Public Service, Comprehensive Energy Plan 2011, vol. 2 at 89-90, sec. 5.8.1.4.

Appendix A: List of Recommendations, Biomass Energy Development Working Group

For ease of reference, this document lists the recommendations of the Working Group contained in the body of its report, divided into each of the report's three main areas. It is not a substitute for a complete review of the report.

A. Modeling

1. The Vermont Dept. of Forest Parks and Recreation (DFPR) should complete a harvesting impact study similar to that completed in 1990.
2. The General Assembly should ensure that funding continues to provide for DFPR staff to review and analyze new releases of Forest Inventory and Analysis (FIA) data.
3. The state should continue to examine the variations between different wood supply models to develop an accurate understanding of the available wood supply. Expansion of biomass harvesting in the state should be based on the premise that there is available woody biomass that can be harvested sustainably while maintaining forest health and productivity. Monitoring should occur to ensure confidence in assumptions about future forest growth and broader ecosystem and social impacts.
4. The General Assembly should encourage research particularly on economic aspects of biomass harvesting. This research should target economic benefits and impacts for different scale projects; constraints to development, including financing and workforce issues; the general responsiveness of the industry to increases in fossil fuel prices or increases in product demand as society moves toward a greater reliance on biomass for energy; and improved information about Vermont's substantial firewood sector — both demand and supply sides.
5. A review of the coordination and execution of existing publicly funded monitoring programs (see Appendix C) should be conducted to: a) identify overlaps and gaps, b) review the adequacy of staff and funding, and c) examine how data are made available to the General Assembly and other policy or public groups for integration and analysis. Ideally, this review would include recommendations for improving existing programs and augmenting them in appropriate ways as the need and resources become available.
6. The state should continue to explore the potential of woody and nonwoody agricultural biomass.

B. Enhancement and Development

7. Enhancement of Vermont's biomass industry should come in the form of incentives that maximize the benefits and minimize negative impacts. Such incentives could include tax credits, low-interest loans, favorable power rates, and renewable energy credits
8. Considerations relevant to enhancement and development of woody biomass energy and to awarding incentives for such development include but are not limited to:
 - a. Efficiency and resource sustainability — the enhancement and development of the woody biomass energy industry in Vermont should attempt to use the available resource sustainably, in a manner that maximizes efficiency while meeting energy goals and focus on sectors of growth where the use of biomass can have beneficial localized impact on our energy reliability, security, and cost, and can have other public benefits.
 - b. Job creation – both direct and indirect. Job creation would be a major driver of the local Vermont economy.
 - c. Property tax generation – the anticipated payment of property taxes should be a consideration when evaluating a proposed biomass business.

- d. Development and maintenance of the Vermont timber harvesting infrastructure — providing market growth and stability is a necessary component to a healthy rural economy. It is particularly important to encourage young entrants into the industry.
 - e. Year-round demand for biomass wood — as the pulp industry fades, it is necessary to encourage businesses that can contribute to new markets for low-grade wood and replace fossil heating fuels.
 - f. Value added to products produced – the value of the end product should be considered in the evaluation process. A manufactured product may have more value than a raw commodity.
 - g. Factors affecting the environment and human health — emissions, forest health, water quality, waste disposal and byproducts must be considered in the evaluation process.
 - h. The local economy — the expenditure and retention of dollars within the local and Vermont economy vs. payment for out-of-state fossil fuels should be factored into the evaluation.
 - i. Timber stand improvement and markets to use of diseased and damaged timber – timber stand owners need markets for diseased and damaged timber.
9. The General Assembly should assign major priority to home heating with wood. In particular, tax policies advantageous to solar and wind projects should be extended to biomass consumers. Such tax advantages would be applied to the purchase of efficient heating stoves, furnaces, and boilers and to district heating.
 10. This wood home heating initiative should be part of a larger undertaking to support thermal energy efficiency. Funding will be needed to help achieve these goals, and examples of funding sources would include a charge on energy inefficiency or a tax on home heating fuels. Some portion of the funds raised could support residential heating with efficient woody biomass appliances.
 11. The state should support new wood pellet manufacturing facilities in Vermont that are dispersed among various areas around the state. Project developers should be provided with information and guidance regarding the state's regulatory process.
 12. The General Assembly should require all pellets sold in Vermont to be labeled as to moisture content, weight, list of ingredients, and suitability for various heating systems.
 13. The state should create an effective outreach program to inform potential candidates for commercial/industrial and thermal-led combined heat and power (CHP applications), including compiling a complete list of potential sites (such as locations where a thermal load uses extensive amounts of heating oil or propane), analyzing existing programs and organizations that reach out to potential biomass users, producing a comprehensive information package explaining biomass energy, highlighting successful wood conversion projects and containing information regarding how to begin and negotiate the state regulatory process.
 14. The state should support and enhance the biomass supply chain around Vermont, based on a business model under which suppliers provide woody biomass products to a variety of markets on a year-round basis.
 15. To support the above recommendations 11, 13, and 14, the state should designate one staff person to advocate for biomass commerce and coordinate the enhancement and development of the biomass industry. This staff person could be located in the Agency of Commerce and Community Development.
 16. The General Assembly should enact enabling legislation that allows municipalities to create and operate heating district utilities.
 17. As soon as feasible, the General Assembly should lift the current suspension on applications for state aid for school construction at least for the purpose of supporting school conversions to woody biomass energy.

18. The Clean Energy Development Board, in consultation with the Department of Public Service (DPS), should develop recommended incentives for woody biomass thermal energy that use a tiered structure that rewards greater design system efficiency with a larger incentive in comparison to less efficient systems.
19. Services and permitting provided or required by the state should be centralized to facilitate the industry.
20. The state should develop model approaches to issues that can add delay to permitting a project if not handled in an appropriate way, such as procurement standards, forest health issues, air quality requirements, and other issues that are important to the affected public.
21. The Public Service Board (PSB) should improve its Section 248 application process to increase predictability and reduce processing time. The PSB could and should create a form applicable to larger energy projects. The PSB also should consider the assignment of a person or persons who can assist the applicant in completing the application form in the same manner as Act 250 coordinators do today.
22. The PSB, in its Section 248 proceedings, should require that each woody biomass energy facility be designed for the optimum design system efficiency. Woody biomass energy projects that are not subject to Section 248 review should also be required to meet this standard if they are subject to other siting or land use proceedings such as Act 250 or local land use review.
23. CHP is recommended for all new electric generation plants using woody biomass.
24. Economic incentive programs for biomass energy development should incorporate strong design system efficiency standards. The state should maintain the existing “standard offer” program’s requirement of 50 percent design system efficiency for woody biomass generation. For incentive programs other than the standard offer, as an alternative to a flat requirement of 50 percent for design system efficiency, the DPS in consultation with the Clean Energy Development Board should consider a tiered structure for incentives for woody biomass electric generation plants that would reward greater efficiency.
25. Additional biomass energy-related manufacturing facilities should be sited in locations for which the combination of benefits and supporting resources is most appropriate, whether the manufactured product is pellets, electricity, or another biomass energy product. Locations that would facilitate use of excess heating capacity should be encouraged.
26. The state should support policies which accommodate growth of the public’s use of low-grade roundwood for home heating, particularly from local sources.
27. ANR should enlist a panel of experts to provide guidance on actual field performance versus lab tests on wood-burning appliances as to emissions levels, particularly in view of the Environmental Protection Agency’s (EPA) recent decision to only require infrequent “tuning” of small boilers as opposed to numeric emissions limits. The General Assembly should be aware of potential environmental and human health impacts of each class of biomass appliance so as to make fully informed decisions regarding incentives and regulations for use.
28. ANR should compile and provide information to the General Assembly on emissions output under “field conditions” for wood-burning appliances that lack federal or state-mandated numeric emissions levels in order to prioritize incentives or develop regulations.

C. Forest Health

29. The General Assembly should create a uniform system for implementing wood procurement standards across a range of facilities, including electricity generators, district heating, combined power and heat, pellet manufacturers, schools, and office building complexes that heat with wood.

30. A model wood procurement standard adaptable to all scales of biomass users except individual firewood procurement should be developed. This standard should have the attributes discussed in the body of the Working Group's report.
31. If the scope of review for state natural resources permitting is expanded, then the General Assembly should consider adding up to two positions at the Agency of Natural Resources (ANR) with backgrounds in wildlife biology, ecology, or forestry, located in the vicinity of wood procurement activities of any major new biomass demand for the purpose of providing consistent and timely review and guidance in the identification and protection of rare, threatened, endangered species; wetlands; deer wintering areas, and rare natural communities. Funding for staffing increases could be borne by resource consumers in the form of a fee assessed on wood consumption for all wood consumers procuring over 50 green tons per year.
32. A compliance system must accompany implementation and enforcement of procurement policies for facilities that do not require a Section 248 or Act 250 permit. For example, a compliance officer housed with the Agency of Natural Resources (ANR) could oversee the implementation of wood procurement policies for school or district heating projects or wood pellet facilities not subject to Section 248 or Act 250 oversight.
33. Existing and future biomass users should adopt the voluntary harvesting guidelines contained in Appendix B to this report.
34. The state should develop a means for monitoring a representative sample of harvest operations for wildlife tree and biomass retention levels and should review or amend the voluntary harvesting guidelines periodically as necessary and as funding allows.
35. At least every 10 years, DFPR should reassess the use and adequacy of acceptable management practices (AMPs) on all types of wood harvests and strengthen them if warranted.
36. The state should pursue the development and adoption of regional biomass harvesting standards. In implementing this recommendation, the state should engage in cooperative discussions with other states through the Environmental Committee of the New England Governor's Conference or through another appropriate regional organization.
37. The state should closely follow the development of issues relating to carbon accounting for woody biomass and should initiate a process, working with key stakeholders including the ANR, DPS, the University of Vermont (UVM), and others, to research and officially adopt greenhouse gas accounting protocols relevant to wood bioenergy.
38. The state should explore in detail the concerns related to short-rotation woody crops (SRWC) listed by the Working Group in the body of this report. The state, the U.S. Natural Resources Conservation Service (NRCS), or UVM should monitor the rate of establishment of short-rotation woody crops and every 10 years assess the need for voluntary or regulatory controls of SRWCs.
39. The State of Vermont should provide training opportunities for foresters, landowners, and loggers in the use of the state Geographic Information System (GIS) database to identify/protect biodiversity elements of the forest. *We recommend* that information on the state GIS database be enhanced to include a full description of species and community attributes, their location, and recommended protection and enhancement practices similar to existing management guidelines for deer wintering areas.
40. There should be educational opportunities for foresters and loggers on the benefits and trade-offs of reducing tree utilization and increasing postharvest woody debris. A simple means to estimate residue levels is needed for use in the field. The University of Vermont (UVM), the Forest Guild, the Vermont Woodlands Association, and the Vermont Forest Products Association (VFPA) are potential providers.

41. Educational opportunities on forest practices should include public–private partnerships that sponsor seminars or conferences for loggers and other forest product users in various regions within the state.
42. A sustainable harvesting manual should be developed, similar to “Good Forestry in the Granite State,” to be used as a tool for increasing the awareness of landowners, foresters, and loggers of desirable practices. Possible sources are UVM, DFPR, or USFS.
43. The state should continue to monitor rates of forestland gain or loss as well as the harvest and growth of timber including unutilized low quality wood. Monitoring tools include United States Forest Service (USFS) Forest Inventory and Analysis data, Vermont Wood Harvest Report, and Vermont Fuel Wood Study as well as the Biomass Energy Resource Center (BERC) Wood Supply Model or other wood supply models.
44. The state should sample monitor harvest operations for residual woody biomass and wildlife tree retention as part of use value appraisal (UVA) inspections or by other cost-effective means.
45. ANR should determine if there is a need for and if warranted resume inspections of biomass harvests as done in the 1980s.
46. The state or an industry group should compile a list of sources of chunk firewood, along with credentials of sustainable harvesting training, from whom the public and institutions could order sustainably harvested wood. Suggested credentials include Logger Education to Advance Professionalism (LEAP) training or Master Logger Certification.
47. The state, Renewable Energy Vermont or VFPA should develop and distribute to the public information explaining the difference between “dry,” “seasoned,” and “green” firewood.

Appendix B: Guidelines for Maintaining Water Quality, Soil Productivity & Biological Diversity on Harvesting Jobs in Vermont

The Vermont Biomass Energy Development Working Group developed the following voluntary guidelines to provide recommended practices on protecting soil productivity and biodiversity for all wood harvests in Vermont. The voluntary guidelines are general, flexible, understandable, and easily implemented in the field to protect Vermont's forests.

1. Harvests should incorporate recognized silvicultural practices based on the stand conditions and landowner objectives. United States Forest Service Silvicultural Guides provide the kind of guidance needed; however, management should be adaptive to include new research findings, particularly in view of the varied nature of Vermont forests as a result of site conditions, past land use, prior management and future change (climate change and invasive species).
2. Harvest practices should take into account the existence and protection of rare, threatened and endangered species, State Ranked S1 and S2 natural communities, wetlands and deer wintering areas as shown on the State's Geographic Information System (GIS). Foresters, loggers and landowners should seek guidance from the Vermont Agency of Natural Resources regarding the location of such resources and any management considerations that should be taken into account before harvesting commences.
3. Implement "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont" (AMPs) as necessary or required.
4. Minimize landing size to the extent practicable for the scale of the operation.
5. Maintain a functioning buffer strip between harvesting operations and streams, wetlands, and other water bodies.
6. Harvesters should implement proper close-out procedures to be maintained by the landowner over time.
7. Minimize disturbance of the litter layer except as required for regeneration.
8. Retain stumps and roots intact except as necessary for road, trail and landing construction.
9. Use tree tops as necessary to increase equipment floatation and stabilize harvest trails.
10. As a general guide and not a precise measurement, retain a portion of topwood or equivalent material approximating 20 percent of harvested tree tops, left well-distributed on the harvest site in cuts removing one-third of the basal area or less. In heavier cuts (e.g. shelterwood and patches), retain a portion of topwood or equivalent material approximating 30 percent of harvested tree tops, left well-distributed on the harvest site.
11. Retain additional organic matter or avoid whole tree harvesting on nutrient-impaired sites (steep, wet, shallow, or sandy soils).
12. Increase the proportion of retained organic debris when cuts are heavy or rotations short. This recommendation must be balanced against potential impacts of harvesting additional acres to offset reductions in utilization.
13. Recycle unutilized wood that accumulates on the landing by returning it to the harvest site on return skidder trips.

14. Retain as many snags as safety, access, and landowner objectives will permit. Refer to **Table 1 below** for target levels of retained structure.
15. Retain all pre-harvest down wood in place.
16. Retain breakage incidental to harvesting (broken branches, unutilized trees) within constraints of safety and aesthetics.
17. Retain some newly cut material on site if large woody debris is lacking.
18. Salvage harvesting should leave 5 to 15 percent of the affected stand area unharvested by retaining patches and individual trees that are alive, dead, or dying, unless contrary to state or federal guidelines.
19. Take appropriate precautions to identify the presence or threat of invasive plants as per the landowner or forester.
20. Use buffer strips, where practicable, to protect aesthetic qualities along major trail corridors and along public roads.

TABLE 1: STRUCTURAL RETENTION GUIDELINES FOR HARVESTING WOOD

| Structure | Minimum Target/Ac* |
|---|--|
| Live decaying trees 12- 18" DBH | 4 |
| Live decaying trees > 18" DBH | 1 |
| Snags >10" DBH | 5 |
| Cuts removing \leq 1/3 basal area | Retention target: topwood equivalent material approximating 20% of harvested tree tops |
| Cuts removing > 1/3 basal area | Retention target: topwood equivalent material approximating 30% of harvested tree tops |
| *Retain smaller trees when suitable trees of these size classes are not present. The highest priority must be safety, with specific regard to OSHA regulations. | |

Appendix C: Identified Forest Monitoring Activities in Vermont

| | Monitoring Program | Date initiated | Frequency | Scale | | | | Run By | Category | | | | | Notes |
|---------------------------|---------------------------------------|----------------|-------------------------|-----------|--------|-------|-------|-----------------|---------------|------------|------|--------|--|--|
| | | | | Statewide | County | Local | Owner | | Forest Status | Harvesting | SFM* | Health | Wildlife/Water | |
| Public Initiatives | FIA | 1940s | 5-7 yr cycle | • | • | | | USFS | • | | • | • | | |
| | VT Forest Health Monitoring | | 5-7 yr cycle | • | | | | DFPR, USFS | | | | • | | |
| | VT Hardwood Health Survey | 1985 | 5-yr cycle | • | | | | DFPR | | | | • | | Currently suspended |
| | North American Maple Project | 1988 | annual | | | | • | DFPR | | | | • | | Exclusively for sugar bush and maple product production |
| | Vermont Monitoring Cooperative | 1990 | Various | • | | | | DFPR, UVM, GMNF | | | | • | | VMC performs long-term monitoring on two sites; also supports research by others |
| | Annual Aerial Surveys | | Annual | • | | | | DFPR | | | • | • | | Insect, disease |
| | Ground monitoring plots | | Annual | • | | | | DFPR | | | | • | | Insect |
| | AMP Effectiveness review | | Annual | • | | | | DFPR | | • | • | | • | Primary focus: Water Quality |
| | UVA inspections | | Periodic | | | | • | DFPR | | • | • | | | Forest management |
| | Long-term Soil carbon study | 2009 | Annual; 40-yr term | • | | | | UVM | | | • | | | Carbon monitoring: 18 locations. Designed to show the impacts of management |
| | Chip harvester operations | | Annual, 1981-1990. | • | | | | DFPR | | • | | | | Discontinued in ??? |
| | Harvesting Impacts Study | | 1990; proposed for 2012 | • | | | | | | • | | • | • | Design similar 1990 study funded and in process |
| | Mill consumption survey | | Annual | • | | | | | • | | | | Mill consumption is used to infer levels of harvesting | |
| | Resident Fuel Assesment | | Periodic | | | | | | | | | | | |

* Sustainable Forest Management

| | | Date initiated | Frequency | Scale | | | | Run By | | | | | | Notes | |
|--------------------------------|---|----------------|----------------------------|-----------|--------|-------|-------|------------------|---------------|------------|------|--------|----------------|--|------------------------------|
| | | | | Statewide | County | Local | Owner | | Forest Status | Harvesting | SFM* | Health | Wildlife/Water | | |
| Private programs | BED/Ryegate procurement standards | 1983? | Applies to all procurement | | | • | • | Utility | | • | • | • | • | Procurement standard. Only mandatory program, required by DPS and the utility's CPG. | |
| | Landowner Certification | | Annual | | | | • | various | | | • | • | • | Certification; Landowner opts in Certified land base is growing slowly. | |
| | Certified Fiber Sourcing | | By the job | | | • | | SFI, FSC | | | • | | | Certification of plant or mill. These programs are relatively new. | |
| | Master Logger's Certification | | By the job | | | • | | | | • | | | | | |
| | Bio-e woody biomass retention guidelines | Proposed 2010 | General management | | | | • | n/a | | | • | • | • | • | Voluntary. Landowner opts in |
| | Forest Guild Biomass Retention/Harvesting Guidelines for the Northeast | 2010 | General management | | | | • | n/a | | | • | • | • | • | Voluntary. Landowner opts in |
| | Vermont Family Forest Guidelines | 2008 | General management | | | | • | n/a | | | • | • | • | • | Voluntary. Landowner opts in |
| | | | | | | | | | | | | | | | |
| Other Models or Designs | Middlebury College Standards | Proposed 2009 | Applies to all procurement | | | • | | Biomass consumer | | | • | | | Procurement standard Hybrid student/professional model | |
| | BERC/Harwood Procurement matrix | Proposed 2010 | Applies to all procurement | | | • | | Biomass consumer | | | • | | | Procurement standard :Outlined in BERC study performed for Harwood Union HS | |
| | | | | | | | | | | | | | | | |

*Sustainable Forest Management

Appendix D: Procurement Standards – Verification and Certification

prepared by Aaron Adler, Legislative Counsel, Sep. 20, 2011

This document, created for the Vermont Biomass Energy Development Working Group, provides examples of verification mechanisms in order to inform the discussion of procurement standards for biomass energy projects. The document divides verification mechanisms into three categories: *self-verification*, *second-party verification*, and *third-party verification*, with examples in each category.

Self-verification

Self-verification means that a producer monitors and reports about its own harvesting or manufacturing process.¹ Conceptually, self-verification can simply be a declaration by a producer that a product meets a certain requirement, with the producer responsible for verifying compliance. Self-verification also may be accompanied by additional outputs. These outputs might include reports on sustainability, emissions, resource use, or other indicators.²

Examples of self-verification exist both in and outside of forest-based industries:

- The Vermont Public Service Board’s net metering application requires the applicant for approval of net metered renewable electric generation to self-certify compliance with various requirements, with penalties available for false or misleading certifications.³
- For potable water supply and wastewater system permits, Vermont law uses certifications by a licensed designer that the system design and installation meet applicable requirements. Penalties and remediation requirements may be imposed for certifications that are untrue or incorrect or designs or installations that do not comply with the applicable rules.⁴
- The European Union’s “Green Public Procurement” product sheet for government purchases of copying and graphic paper allows for acceptance of a producer’s “technical dossier” to show compliance with the suggested paper procurement criteria.⁵
- The Swedish Environmental Management Council’s basic requirements for procurement of renewable electricity (including biomass power) allow the use of self-declarations or company certifications in initial procurement stages such as a market analysis that precedes a contract negotiation, if followed by an investigation to determine which verifications are normally used within the

¹ World Resources Institute (WRI), Sustainable Procurement of Wood and Paper-based Products (Sustainable Procurement) at 2.11 (Version 2, June 2011).

² Id.

³ <http://psb.vermont.gov/sites/psb/files/rules/OfficialAdoptedRules/5100ApplicationForm2009.pdf>, retrieved Sep. 13, 2011. See Sec. 3.

⁴ 10 V.S.A. §§ 1973, 1975.

⁵ European Commission, Green Public Procurement Product Sheet: Copying and Graphic Paper, at 3-4, 6-9 (2008).

- industry.⁶ An example given is a self-declaration that conforms to International Organization for Standardization (ISO) 14021.⁷
- ISO 14021 is an international standard for environmental labels that are self-declared by the producer. It provides guidance on terminology, symbols, and testing and verification methods that an organization should use for self-declaration of the environmental aspects of its products or services.⁸ The standard does not require third-party verification; it requires that claims be substantiated by the producer and verifiable by the consumer.⁹

Second-party Verification

Second-party verification means that a buyer verifies that a supplier or the products of a supplier conform to a certain standard.¹⁰ Relevant examples include:

- The Ryegate Station's harvesting policy states that Ryegate's foresters or their agents will conduct periodic on-site inspections to determine compliance with the policy.¹¹
- The City of the Burlington Electric Department (BED) states that a BED forester monitors each harvest operation for the McNeil Station to ensure that the harvest is conducted properly.¹²
- The Swedish Environmental Management Council's basic requirements for procurement of renewable electricity (including biomass power) allow for the use of purchaser verification if third-party verification is not available and provide, as an example, that the purchaser may carry out an audit at a supplier in which documentation and other evidence is requested and scrutinized.¹³

Third-party Verification

Third-party verification means that an independent third party verifies that a supplier or its products conform to a certain standard and is considered to provide the most assurance that a standard is met.¹⁴ Third-party verification can be by a governmental or nongovernmental entity:

⁶ Swedish Environmental Management Council (SEMC), Procurement Criteria for Electricity, Basic Requirements, (Procurement Criteria) at 8 (v 1.0, April 4, 2008). Note that the Council states a belief that third-party verification is "safest and most reliable."

⁷ Id.

⁸ <http://www.iso-14001.org.uk/iso-14021.htm>, retrieved Sep. 14, 2011.

⁹ Kun-Mo Lee and Haruo Uehara, Center for Eco Design and LCA, Ajou University, South Korea, Best Practices of ISO 14021, at 25-6, 36-7 (2003).

¹⁰ WRI, Sustainable Procurement at 2.11.

¹¹ Ryegate Associates, Ryegate Power Station, Harvesting Policy for Whole Tree Chipping and Roundwood Operations in Vermont, at 1.

¹² <https://www.burlingtonelectric.com/page.php?pid=75&name=mcneil>, retrieved Sep. 14, 2011.

¹³ SEMC, Procurement Criteria at 9-10.

¹⁴ WRI, Sustainable Procurement at 2.11.

- The two major systems requiring third party verification are the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification Schemes (PEFC). Both systems used accredited bodies for certification. PEFC is an endorsement system involving mutual recognition of national and regional certification systems.¹⁵
- In the United States and Canada, the Sustainable Forestry Initiative (SFI) is a PEFC-endorsed certification system. The SFI 2010-2014 standard states that it:

[R]equires third-party independent certification audits by competent and accredited certification bodies for all certifications: forest land certification, fiber sourcing certification and chain of custody certification. All certification bodies must be accredited by a North American member of the International Accreditation Forum, i.e. ANSI-ASQ National Accreditation Board (ANAB), American National Standards Institute (ANSI) or the Standards Council of Canada (SCC).¹⁶

- The Northeast Master Logger's Certification Program provides third-party certification of logging companies.¹⁷ The master logger certification is issued by the Trust to Conserve Northeastern Forest Lands, a nonprofit organization.¹⁸ Obtaining certification involves a multi-step process that includes an application, field review of 10 to 15 of a company's harvest sites by independent verifiers, consideration of the application by a board representing multiple stakeholder interests, and post-certification auditing for two years.¹⁹
- Wisconsin uses a checklist completed by state natural resources personnel or a county forester during the close-out of a timber sale from state lands to confirm whether the state's biomass guidelines for harvesting on state lands were followed.²⁰
- Wisconsin also has considered the use of regular random sampling of harvested lands by state personnel as a means to monitor compliance with its biomass harvesting guidelines.²¹

¹⁵ Id. at 2.16-2.17.

¹⁶ SFI, Requirements for the 2010-14 SFI Program: Standards, Rules for Label Use, Procedures and Guidance, Sec. 1 at 1, 4 (Jan. 2010).

¹⁷ <http://masterloggercertification.com/index.php?page=about>, retrieved Sep. 15, 2011.

¹⁸ <http://tcnef.org/>, retrieved Sep. 15, 2011.

¹⁹ <http://masterloggercertification.com/index.php?page=process>, retrieved Sep. 15, 2011.

²⁰ Woody Biomass Harvesting Guidelines Implementation Plan Development: Report to the Wisconsin Council on Forestry at 3-4 (March 12, 2009) and attachment on monitoring (March 6, 2009); telephone communication from C. Hardin, Wisconsin Dept. of Natural Resources (Sep. 20, 2011).

²¹ Woody Biomass Harvesting Guidelines Implementation Plan Development: Report to the Wisconsin Council on Forestry, attachment on monitoring (March 6, 2009).

Appendix E: Memorandum on Permitting, Woody Biomass Energy Projects

Vermont Legislative Council

115 State Street • Montpelier, VT 05633-5301 • (802) 828-2231 • Fax: (802) 828-2424

MEMORANDUM

To: Rep. Christopher Bray

From: Aaron Adler, Legislative Counsel

Date: November 24, 2010

Subject: Environmental and land use review of woody biomass energy and manufacturing projects

You asked for a summary of current state laws under which the impacts of woody biomass development projects would be reviewed, including electric generation stations, district heating, and non-generation stations such as wood pellet manufacturing plants. District heating may or may not include cogeneration. Below I list and summarize permits and approvals that appear likely to apply to such projects. This list is limited to permits and approvals related to environment and land use and may not be exhaustive. The permits or approvals potentially apply to all the types of projects under discussion except where noted below in italics.

- **Land use permit under Act 250** (*manufacturing facility, district heating*). See 10 V.S.A. § 6001(3). An Act 250 permit would be required for a manufacturing facility such as a wood pellet plant, or a district heating project, if one of the jurisdictional thresholds is met. Relevant jurisdictional thresholds include:
 - For a commercial project, construction on a tract exceeding 10 acres in a town with zoning and subdivision bylaws or exceeding one acre in a town that does not have both such bylaws. 10 V.S.A. § 6001(3)(A)(i), (ii); Act 250 Rule 2(C)(5)(a). These thresholds would be relevant to a wood pellet plant.
 - For a municipal project, construction involving the physical alteration of more than 10 acres of disturbed land. 10 V.S.A. § 6001(3)(A)(v); Act 250 Rule 2(C)(5)(b). This threshold would be relevant to a municipal heating district.

Under the Act 250 process, a district environmental commission would measure the project against a list of environmental, land use, and economic criteria, including criteria related to air and water pollution, soil erosion, tariff, impact on governmental services, aesthetics, historic sites, wildlife habitat, growth in the town and region, agricultural and forest soils, energy conservation, and conformance with local and regional plans. 10 V.S.A. § 6086(a).

- **Certificate of public good under 30 V.S.A. § 248** (*woody biomass electric generation facility*) issued by the Public Service Board (PSB). A woody biomass electric generation facility requires a certificate of public good (CPG) from the PSB unless it is operated solely for on-site electricity consumption by the owners. 30 V.S.A. § 248(a)(2).

Review under 30 V.S.A. § 248 measures a project against economic, energy planning, land use, and environmental criteria. The PSB is required to give “due consideration” to most of the Act 250 criteria and to the plans and recommendations of the local governmental bodies and the recommendations of the regional planning commission. 30 V.S.A. § 248(b).

Electric generation facilities subject to PSB approval under 30 V.S.A. § 248 are exempt from Act 250. 10 V.S.A. § 6001(3)(D)(ii). In the case of woody biomass electric generation that is part of a district heating or manufacturing project, exemption of the generation from Act 250 may require clear demarcation and coordination of jurisdiction between the PSB and the district commission, assuming Act 250 applies to the heating or manufacturing project.

- **Municipal land use permit** (*manufacturing facility, district heating*). Depending on whether a municipality has adopted land use bylaws and what land uses it has chosen to regulate, a municipal land use permit may be required for a woody biomass manufacturing plant or a district heating project. Municipalities often require conditional use approval for commercial projects, which at a minimum must include review of the impact of the project on community facilities, the character of the area affected, traffic, bylaws and ordinances in effect, and utilization of renewable energy resources. A municipality may include other standards in conditional use review, including one or more of the Act 250 criteria. 24 V.S.A. § 4414(3).

State law exempts from local land use review electric generation that is subject to PSB approval. 24 V.S.A. § 4413(b); 30 V.S.A. § 248. This may raise issues for demarcating and coordinating jurisdiction between a town and the PSB.

- **Air pollution control permits** for construction or operation or both. 10 V.S.A. §§ 556, 556a; Vt. Air Pollution Control Regulations §§ 5-401, 5-501, 5-5003. The Agency of Natural Resources (ANR) administers the air pollution control program through the Air Pollution Control Division (APCD) of the Department of Environmental Conservation (DEC). Broadly speaking, these permits are required for sources of air contaminants and establish limits or controls on emissions of the contaminants to protect air quality. *Id.*; *see also* 10 V.S.A. § 558.
- **Permits for discharges to water.** As a delegated state under the Clean Water Act and under authority of the state’s own water pollution control act, ANR administers a variety of discharge permits through DEC. These permits protect water quality. 33

U.S.C. § 1251 *et seq.*, 10 V.S.A. chapter 47. Different permits apply to different types of discharges.

- Stormwater discharge permits apply to stormwater discharges from construction or operation or both. Each of these types of facilities will require authorization under the Construction General Permit for stormwater discharges into state waters or conveyances leading to state waters during construction if the total land disturbance will be one acre or more. ANR, General Permit 3-9020 for Stormwater Runoff from Construction Sites § 1.1 (2008).
- Each facility also may require a permit for stormwater discharges from the operation of the facility. These requirements may arise under federal or state law or both. The jurisdictional “triggers” for federal and state stormwater permits differ. For example, federal law applies to stormwater discharges from conveyances into U.S. waters (broadly defined). 33 U.S.C. § 1311(a), 1342(a), 1362(6), (7), (12), (14). State law requires a stormwater operating permit if the total impervious surface will be one acre or more and provides that ANR may require such a permit regardless of acreage if the discharge is into stormwater-impaired waters. See, e.g., 10 V.S.A. § 1264(d)(1)(D) and (E).

The review of a stormwater discharge may occur under a general or individual permit, depending on the facility and the discharge and whether the receiving water is not stormwater-impaired. See ANR, Vermont Multi-Sector General Permit 3-9003 for Stormwater Discharges Associated with Industrial Activity § 1.3 and Appendix D (2006); General Permit 3-9015 for New Stormwater Discharges to Waters That Are Not Principally Impaired by Collected Stormwater Runoff § B (2003).

- Other discharge permits may be required if the facility has a water discharge that is not stormwater. 10 V.S.A. §§ 1259, 1263. The term “discharge” means placing, depositing, or emitting wastes, directly or indirectly, into an injection well or state waters; the term “wastes” is broadly defined. 10 V.S.A. § 1251(3), (12). There are direct discharge, indirect discharge, and underground injection control (UIC) permits. A direct discharge permit will apply to a discharge that is delivered by a conveyance (including over land) right to a surface water. An indirect discharge means any discharge to groundwater, whether subsurface, land-based, or otherwise. 10 V.S.A. § 1251(15). UIC permits apply to injection wells used as a means of discharging waste into the ground. 10 V.S.A. § 1251(14).
- **Potable water supply and wastewater permit.** A potable water supply and wastewater permit is required from ANR before, among other things, the construction of a new building or structure unless an exemption applies. 10 V.S.A. §§ 1973, 1974. These permits are required in order to protect human health and the environment by ensuring that water supplies are potable and that on-site waste disposal systems are properly constructed and operated. 10 V.S.A. § 1971(1). One or more of the facility types under discussion may be served by its own on-site water supply or wastewater

system. However, if a site is served by municipal water or wastewater systems, it is possible that a permit may be granted based on proof that the facility has obtained an allocation from the municipality for water supply or wastewater disposal or both based on the facility's estimated use.

- **Other potential permits.** Other permits or approvals could apply depending on the facts and circumstances of a proposed project and the relevant site. For example, a permit or conditional use determination from ANR would be required if one of the facilities is proposed to be constructed within a significant wetland or the required buffer zone of such a wetland. 10 V.S.A. § 913(a). The review process for such a proposal evaluates its impacts on the functions and values of the wetland. 10 V.S.A. §§ 914(a), 6025(d)(5)(A)-(K); Vt. Wetland Rules § 9 (2010).

Please let me know if you have any questions.

Appendix F

Biomass Energy Development Working Group; Enhancement and Development Subcommittee; List of Pros and Cons*

Distributed Wood Pellet Manufacturing/Use

| Pros | Cons |
|---|---|
| <ul style="list-style-type: none"> • Provides commercial market for low grade timber, including markets for smaller woodlots • Provides reasonably priced, efficient residential and small business heating fuel • Potentially lowers transportation cost with short hauls • More efficient combustion leading to lower emission than firewood • Less labor intensive for consumers • Pellet use is a growth sector within forest products • Safe product for home use • Easily supplied by local markets • Promotes local economy with labor and capital investment • Steady year-round market for roundwood • Promotes energy independence • Lower cost than fuel oil and propane | <ul style="list-style-type: none"> • More expensive than cord wood • Bulk delivery infrastructure may be inadequate • Current standards and labeling are inadequate • Seasonal demand for pellets • Electricity required for pellet stoves |

***Carbon emission trade-offs are an important issue for each option and should be carefully considered. See Section C.3. of the report for a discussion of carbon accounting.**

Commercial/Industrial/Institutional Thermal and Thermal-led Combined Heat and Power

| Pros | Cons |
|--|--|
| <ul style="list-style-type: none"> • Provides higher efficiencies than electricity generation only • Provides commercial market for low grade timber • Promotes energy independence • Lower cost than fuel oil and propane • Adaptable to any type of logging • Available from local sources • Promotes local economy with labor and capital investment | <ul style="list-style-type: none"> • Increased handling and inventory costs • Tends to be seasonal demand, for the harvester, impacting year-round cash flow. • Higher processing and delivery cost • Requires generally higher quality fuel |

Electrical generation

| Pros | Cons |
|--|---|
| <ul style="list-style-type: none"> • Promotes local economy with large number of on-site and jobs in supporting industries. • Requires large capital investment, providing substantial property tax base • The only market for low grade chips • Steady year round market • Large scale allows for better emission controls • Electricity offers product versatility • Promotes energy independence • Replaces some fossil fuel use • Provides incentive for forest management • Contributes to baseload generation to compliment other renewables | <ul style="list-style-type: none"> • Efficiency suffers when thermal capacity is not utilized • Higher local truck traffic • Longer transportation distances for centralized large facilities • May strain local wood supply, unless wood procurement is distributed • In the absence of appropriate management practices, large-scale demand on resource may impact forest health. • May require large public investment |

Residential Firewood

| Pros | Cons |
|--|---|
| <ul style="list-style-type: none">• Supports local job market• Currently the lowest-cost option• Locally available | <ul style="list-style-type: none">• Labor intensive• Wood species limitations• Human exposure to soot, dust and residual particulates |

Appendix G: Biomass Energy Development Working Group Summary of Comments, Public Hearing

This document contains a consolidated summary of comments received by the Biomass Energy Development Working Group (the Working Group) during its public hearing in Montpelier, Vermont on Dec. 6, 2011. Comments are organized by topic.

Modeling:

- Southern Vermont has an excess inventory of low-quality wood available as a source for biomass.
- Vermont has a sustainable, but not infinite, amount of biomass, and 900,000 tons is a moderate and conservative estimate.
- Harvest rates are currently around 40% of annual production in Vermont. There is a total growth rate of 6 million tons, but many of these are very low quality trees. Without a biomass market, the low quality growth takes over.
- Wood energy estimates must be realistic and must recognize other potential uses of wood, such as carbon storage, wildlife, recreation, and other values. This report assumes that all of the available wood in Vermont should be used for energy, without accommodating these other values.
- Page 7 references a currently proposed combo plant that will combust 500,000 tons of biomass. This is an incorrect number. The plant will only burn wood residues.
- The moderate model is a good model for how much biomass Vermont can remove from its forests. The long term damage from overestimation or underestimation is significant.

Monitoring:

- Regarding monitoring, FIA data is useful, but it doesn't measure many important values. We need to monitor more values in forest health, such as wildlife and recreation.

Suggested Additional Research:

- A long-term study of environmental and sustainability impacts will be crucial to public support of biomass facilities. An air quality study differentiating between the types of fuel burned needs to be completed because the fuel type can vastly impact the resulting air quality effects. The committee should look at other funding models to support the required research.
- The committee should complete research on the economic impact of biomass harvesting on other industries, such as tourism, manufacturing, and education.
- Funding for the biomass industry should be that found in the BEREC study, and not government subsidized.
- Fuels beyond woody biomass should be studied.
- The production of biochar adds flexibility to the model of burning waste wood. Biochar is a carbon rich soil amendment that can replace the need for phosphorous based fertilizer, reduce greenhouse gases and air pollutants, and

result in a net gain of carbon sequestration. A biomass plant with the capacity to produce biochar could be instrumental for the remediation and productivity of Vermont soils.

Job Creation and Economic Development:

- Supporting the biomass industry will add jobs to the state in forestry, logging, manufacturing, and energy generation.
- Biomass supports a diversity of markets that are beneficial to woodland owners and Vermont industries.
- Large biomass facilities in Vermont will have a positive economic impact and create jobs.
- One person from every department in the state should be the official point person to move biomass commerce forward.
- The regulations in Vermont discourage industrial and manufacturing businesses from settling here.

Wood Pellet Manufacture:

- It would be nice to have more chip mills in southern Vermont. Economic benefits for the state would be strong because the money from this industry stays in Vermont. Without a chip market, it's very hard to grow better trees.
- Community-owned pellet production is a great way to put money back into the Vermont economy. Biomass co-op members buy a share of pellet production, just like a purchasing a Community-Supported Agriculture (CSA) share in the organic food market. This method involves consumers in the business of their heating needs, and meets those heating needs at a reasonable cost.
- Labeling requirements for wood pellets are important. It should be mandatory to identify non-organic items by percentage. Some pellets are made up of over 2% plastic. While most of the Vermont industry does not use plastic, this example shows how important labeling is.

Thermal CHP and Residential Heating:

- It's good to see the report focus on residential heating and combined thermal, which has a high efficiency level.
- More small towns should receive a chip plant with piped thermal.
- Combined cycle plants are a logical approach.
- There should be an efficiency standard for thermal biomass specifically, but it is measured in a multitude of ways, and we must agree on one standard of measurement for thermal efficiency.
- Regarding recommendations 8 and 9, the future of wood in Vermont is very dependent on the future price of oil. Peak oil is coming, and is even happening now. We have five years to make the transition away from an oil dependent economy. Vermont is very dependent on oil for residential heating, and this will put unprecedented pressure on Vermont's wood resources when oil runs out. Recommendations 8 and 9 should be expanded as much as possible.

Incentives and Subsidies:

- The tiered approach to incentives is very important to avoid bad short-term decisions and to support long-term policy.
- Biomass facilities should not receive subsidies from state government.
- Vermont should regulate biomass more and create incentive programs to achieve the highest possible efficiencies.
- A certificate of public good should be required for all centralized processing, including pellet processing over 30,000 tons per year.

Design and Efficiency:

- An efficiency standard of 50% is not strict enough.
- To get biomass moving quickly, interim recommendations on efficiency should be developed so that Vermont can gear up incentives and get biomass implemented.
- The emphasis on thermal use is good because thermal is about 80% efficient. Cogeneration extracts about 50%, and generation extracts 15-20% of the available energy in biomass. Efficiency standards are very important, and a 50% standard is reasonable because it would encourage local, smaller, distributed facilities.
- Regarding recommendations 20 and 21, stand alone power plants are an inefficient use of a valuable resource. 30% is an unacceptable efficiency standard and so is 50%, which should really be a floor level efficiency across the board.

Forest Health:

- Biomass harvesting is a tool for forest management and not a threat to the health of Vermont forests.
- The woody biomass industry encourages good forest management, which is good for Vermont forests.
- The current proposal will significantly increase forest cutting beyond sustainable levels. Studies indicate that Vermont forests are already being cut at close to maximum potential, and biomass acceleration would be an intensive and detrimental industry in Vermont's forests.
- The way this report is written is extremely detrimental to Vermont forests and the state is setting itself up to see its forests disappear.
- Biomass harvesting is "the best thing since sliced bread in forestry."
- Dealing with low quality wood in the forests is difficult. Biomass crews are helpful because they weed out the forest, and sometimes landowners even turn a small profit.

Harvesting Guidelines and Procurement Standards:

- Harvesting guidelines will be effective on a volunteer basis, but mandatory guidelines would be too burdensome.
- A regional biomass harvesting standard allows for regional competition at the expense of Vermont forest health.

- The recommended guidelines becoming part of a mandatory procurement policy is not a good idea because the guidelines are difficult to implement. It's nearly impossible to measure 30% of treetops when looking up from the ground level.
- Representatives from the logging industry believe that more regulations will be time and energy consuming. Mandatory regulations will make it difficult to stay in business in an industry where the profit margin is already very close.
- The layers of regulation will discourage biomass development, will discourage forest ownership, and will fragment the values that forests lend to Vermont.
- Procurement standards will be mandatory and not voluntary, and it is disingenuous to pretend otherwise. These standards set Vermont aside as an island, where there is less incentive for Vermont companies to buy local because New Hampshire and Canada do not have to follow these regulations.
- The whole forest products industry is already very regulated. The industry can only take so much more regulation because it must remain profitable.
- The report is unclear as to whether guidelines are mandatory or voluntary. There should be a threshold at which the guidelines become mandatory
- Other states (MA, NY, NH) do not have these regulatory requirements. This puts Vermont at a disadvantage. The guidelines sound great on paper, but are very difficult to implement. There is tremendous diversity among forests, and the guidelines won't apply uniformly to all of them.
- A set of regulations setting specific percentages to be "left" in the forest sound good, but practically, this system won't work. The regulatory process should have a longer amount of time for implementation because biomass is relatively new to Vermont.

Carbon Accounting, Air Quality and Greenhouse Gas Emissions:

- Air pollution from industrial scale biomass plants has not been addressed in the report. Medical associations have made a strong case for negative health impacts from biomass burning.
- Large biomass facilities are capable of complying with federal and state air quality standards.
- Burning wood is a potent source of particulates and ozone. The emissions from biomass combustion can be greater than that of fossil fuels. Portions of Vermont have very high asthma rates, so the state shouldn't support energy facilities that endanger public health.
- The current understanding from environmental scientists is that burning wood for energy emits more greenhouse gases than fossil fuels. These emissions are excessive in terms of state greenhouse gas emission reduction goals, which will be significantly undermined by biomass burning emissions.
- A carbon tax is the way to fund the change over away from oil.
- It is important that everyone understand the greenhouse gas emissions related to biomass. Large biomass facilities should be suspended until we understand more about emissions levels. Air quality should be considered in any new incentive programs, and large, concentrated sources of emissions should be discouraged.

Invasive Insects:

- Invasive insects have not been addressed in this report. Particularly, it should address the spread of the emerald ash borer and the Asian long-horned beetle, which are directly linked to biomass facilities.
- The continued importation of unprocessed biomass from other states is not in the vested interest of Vermont because of the unintended transport of invasive species and pathogens. Vermont shouldn't invest in infrastructure that requires the importation of biomass.

Procedure:

- This work is too important to only allow three weeks for public comment. The public comment period should be extended.
- This report is contrary to legislative intent because the layers of regulation will not help to encourage biomass development or forest health. The committee should consider the unintended consequences of the regulations found in the report.

**Appendix H: Biomass Energy Working Group Written Comments Received on
Draft Final Report**

Written comments from the public are organized in the order received.

December 8, 2011

BioE Working Group
 Vermont General Assembly
 133 State Street
 Montpelier, VT 05602 – 802-828-2228
 By Email: aadler@leg.state.vt.us

To the Biomass Energy Working Group, Vermont Legislature, public agencies and concerned citizens:

Please accept these comments from Massachusetts Forest Watch, regarding the Vermont Biomass Energy Working group, with consideration of the Vermont Comprehensive Energy Plan and Vermont biomass energy in general, and please consider the tone of these comments in the context that earlier comments from many citizens to the Vermont Biomass Energy Working group seem to have been ignored.

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. Air pollution, global warming and deforestation are important issues that cross state borders since we all share the same forest ecosystem, air-shed, and atmosphere.

THE FOXES ARE RUNING THE VERMONT BIOMASS HENHOUSE

Increased cutting and burning of forests is not “clean” or “green” and will increase air pollution, global warming emissions and deforestation.

In general, Vermont considers itself as a “green” state that operates with less corruption than the rest of the United States, but the Vermont Biomass Energy Working Group (BEWG) is working on 2 fundamentally corrupt and “not-so-green” principles mandated by the legislature:

- 1. The BEWG is heavily stacked with vested interests in state mandated taxpayer subsidies and promotion of increased cutting and burning of Vermont’s forests for biomass energy.**

Of the 11 non-politicians in the group, about 9 of them have a vested interest in increased logging and wood burning and/or are on record in support of increased wood burning.

The working group makeup includes: 1 representative from Biomass Energy Resource Center, 2 representatives from the forest products industry, 2 representatives from industry that produces electricity or heat from biomass, 1 representative from Vermont woodlands, 1 representative of the consulting foresters association, 1 representative of a university with a focus on biomass, 1 representative of the forest guild and 2 representatives of natural resources or environmental organizations.

The co-chair of the BEWG was previously the Executive Director at the Biomass Energy Resource Center, and is also currently the Deputy Secretary at the Vermont Agency of Natural Resources.

Even one of the “environmental organization/natural resource” members is a representative from Vermont Natural Resources Council who are on record promoting increased wood burning.

In order to have a credible balance in determining a response to the question of increased wood burning, the working group should have included a public health official, conservation and wildlife biologists, objective environmentalists, a forest ecologist, a climate scientist, and a soil scientist, etc. to examine the forest, air and water quality, public health, carbon and wildlife impacts.

2. **The BEWG is operating under instructions that Vermont should increase cutting and burning of forests rather than investigating the wisdom of such a policy, which is particularly striking since most Vermonters seem to want to clean the air and “reduce” carbon emissions, not make them worse.**

Rather than first examining the public health, carbon dioxide and potential forest impacts of increased wood burning and then determining whether or not it is a wise decision to increase forest cutting and wood burning in Vermont, the legislature, and working group, are working on the unexamined and forgone conclusion that wood burning energy should increase in Vermont.

For a state that likes to think itself as “progressive” and “green”, and who makes much of its living from tourists who come to see its “golden goose” forests and natural beauty, it is particularly odd that Vermont is planning to force taxpayers to subsidize *increased* cutting and burning of forests to fuel one of the dirtiest and most carbon intense forms of energy that exists, particularly at this time of polluted air, a carbon dioxide overloaded atmosphere and stressed forests.

There is no “right” way to force citizens to subsidize increased air pollution, carbon emissions and deforestation.

The following are comments on the specific recommendations of the Biomass Energy Working Group:

1. The working group suggests “voluntary” forest guidelines for logging to provide wood for biomass energy projects. Even existing forestry laws and “best management practices” are often ignored, so voluntary guidelines are not credible.
2. The working group suggests that the biomass industry monitor itself regarding forest impacts and dismisses third party certification. Even though most third party certification systems are not reliable for protecting forests, it is very telling that the working group could not even bring itself to at least attempt to protect the value of public subsidies with laws or by seeking out a credible third party certification. (See this article to learn how powerless even FSC forest certification which is considered by many to be the “best of a bad lot” of major certification systems is for protecting forests: http://e360.yale.edu/feature/swedens_green_veneer_hides_unsustainable_logging_practices/2472/)

It is not credible to suggest the industry monitor itself. Even the existing procurement standards for McNeil biomass and touted by the biomass working group are not credible (clearcutting is currently used to fuel McNeil), and the cutting barely receives anything more than a cursory glance from the “overseers”. No voluntary system, and no existing third party system is going to protect Vermont’s forests if biomass facilities demand fuel to continue operating once they are built. Only strong laws and enforcement can be depended upon to protect Vermont’s forests. Industry resistance to protective laws is often proof of the need for them.

3. There is no serious consideration of biomass incinerators from other states taking wood from Vermont.
4. There is no serious study of the carbon, pollution, biodiversity, soil, of public health impacts.
5. There is no serious consideration of increased risk of transferring the Asian Longhorned Beetle, the Emerald Ash Borer and other pests and pathogens to Vermont's forests from increased transportation of wood for increased biomass burning.
6. The working group calls for fast-tracking the permitting process for wood burning energy projects, which further puts at risk the carbon, pollution, biodiversity, soil, of public health impacts not addressed by the working group.
7. There is no serious consideration if the benefits of increased wood burning outweigh the costs, especially when considered alongside genuinely clean and green renewable energy options such as solar, geothermal, appropriately scaled wind and hydro, and most importantly conservation and efficiency.
8. Even the voluntary forest guidelines call for leaving only "5 live decaying trees" per acre. In other words, for all practical purposes, the guidelines endorse **clearcutting** forests for biomass.
9. The working group does not even call for any mandatory efficiency standards.

The following are some general thoughts and comments about biomass that I hope a responsible official will see and compel him or her to step in before Vermont goes off a tree-burning biomass cliff.

Most people know that we need to protect forests to absorb carbon dioxide, clean our air and water, provide flood control, shelter wildlife and provide the beauty that brings higher quality of life and tourist dollars to New England. So how did increased cutting and burning of forests (called "deforestation" and "pollution" when it occurs in other countries) get re-branded as "green" energy, particularly considering that burning wood is one of the dirtiest forms of energy that exists?

In addition to the strong influence of vested interests, the serious negative impacts from tree-fueled biomass energy are often glossed over when promoted under the "local" banner which seems to raise blinders to scrutinizing what local activity is being sold. Vermont Yankee is "local" and coal is local to West Virginians, so just because something is local, doesn't automatically mean it is good. (I do not support either of the above)

The latest credible science states the inconvenient truth that tree-fueled biomass electric facilities like the one proposed in Fairhaven are 50% worse than coal and 300% worse than natural gas for carbon emissions, dirtier than fossil fuels for most conventional air pollutants including particulates (even with modern air pollution controls and accounting for new tree growth), and will significantly increase forest ecosystem and wildlife impacts on already stressed forests.

Even more efficient combined heat and power (CHP) 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. Also, the air pollution profile in CHP biomass is dirtier than even oil, so think about that when

biomass is promoted as “good” for the climate, or “good” for heating hospitals and schools with their at-risk populations. New England already has the highest asthma rates in the nation. **According to the CDC, Rutland, VT has the highest asthma rate in the country and Burlington, VT is not much better.**

Producing tiny amounts of new biomass energy in New England would require drastic increases in cutting and burning of living, green trees. According to the Biomass Energy Working Group 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. Think about that the next time you recycle a “post-it” note to save trees.

Frighteningly, the recently released draft Comprehensive Energy Plan proposes getting 25% of Vermont’s energy from farms and forests by 2025 which would mean a drastic increase in forest cutting and carbon emissions, the exact opposite of what we need at this time. Additionally, New England’s forests are threatened by serious efforts to export wood pellets to Europe.

Nobody is saying “don’t ever cut a tree” or “don’t use your home woodstove” (although it is helpful to use cleaner, more efficient models). The intention here is to avoid *increasing* the cutting and burning of our critical forests. According to the Cary Institute for Ecosystem Studies, Vermont is already cutting 67% of its annual forest growth, and if inaccessible areas like steep slopes are taken into consideration, Vermont is already cutting about the “sustainable” limit.

We have big energy and environmental challenges, but wishful and delusional thinking, such as burning forests is “green” just because it is “local” is no better than West Virginians who want the money provided by dirty energy from their “local” resource. We can and must do much better.

We are lucky to have our world renown, golden goose forests again in New England. They were almost gone 80 years ago, and could go again. We do not the need additional pollution and tiny amounts of energy available from cutting, burning and belching them up dirty smokestacks, but we do need to protect our forests if they are to continue attracting tourist dollars, sheltering wildlife and cleaning up the mess we have already made of our air, water and atmosphere.

Locally produced solar, geothermal, appropriately scaled and located wind and hydro energy, along with conservation and efficiency can drastically clean up our energy supply, and help save our environment without destroying it. This is where we need to be putting our energy, so to speak.

It is truly disconcerting to see Vermont fret about global warming caused by high carbon dioxide emissions and then go ahead and promote drastically increased cutting and burning of trees for tiny amounts of energy.

In summary, “clean” and “green” energy does not come out of a smokestack, and sometimes denial is not just a river in Egypt.

The following pages include specific information related to biomass in Vermont, followed by links to the back-up data. Please include this information in the comments, and in your awareness.

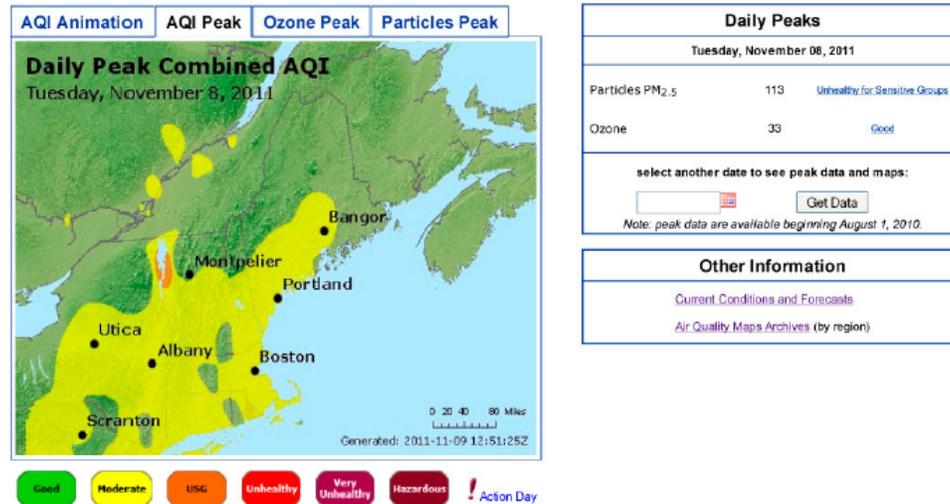
Sincerely,

Chris Matera, P.E.
 (WA State Registered)
christoforest@maforests.org
 413-341-3878

THE VERMONT BIOMASS *Air Pollution*

Below is the Environmental Protection Agency air pollution map for Vermont yesterday. Some days are better, some days are worse, but Vermont's air quality is already compromised. Increased tree cutting and burning would only make it worse.

AIRNow Home >> Vermont >> Burlington



Biomass developers falsely claim wood burning is “clean”. The table below compares air pollution rates for a proposed 34 MW wood biomass electric plant in Fairhaven, VT to a proposed 431 MW natural gas electric plant in Westfield, MA. The data is taken from air permits and is normalized for pollution emitted per unit of electric energy produced to compare apples to apples.¹ (Both facilities have modern air pollution controls)

Natural Gas vs. Fairhaven, VT Wood Biomass - Air Pollution Emission Rate

| POLLUTANT (lbs / megawatt hour) | NATURAL GAS (431 MW) | WOOD BIOMASS (34 MW) | DIFFERENCE |
|-----------------------------------|----------------------|----------------------|------------|
| Carbon Dioxide (CO ₂) | 816 | 2,993 | + 267 % |
| Carbon Monoxide (CO) | .034 | 1.063 | + 3,042 % |
| Volatile Organic Compounds (VOC) | .013 | .071 | + 426 % |
| Particulate Matter (PM) | .028 | .269 | + 871 % |
| Nitrogen Oxides (NOx) | .052 | .425 | + 719 % |
| Sulfur Dioxide (SO ₂) | .009 | .283 | + 2,903 % |
| Ammonia (NH ₃) | .015 | .083 | + 440 % |
| Hazardous Air Pollutants (HAPS) | .003 | .076 | + 2,522 % |

According to the Center For Disease Control (CDC) data, Rutland, VT already has the highest rate of asthma in the country.² Rutland is downwind from the proposed Fairhaven wood burning biomass proposal which would burn at least 350,000 tons of green wood per year. The Burlington area is already worse than 157 out of 192 metropolitan areas for asthma rates, 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 CHP⁴ and 900,000 tons for thermal biomass⁵ which would increase wood burning in VT by more than 100%.

THE VERMONT BIOMESS

Air Pollution

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.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 “*Short-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.

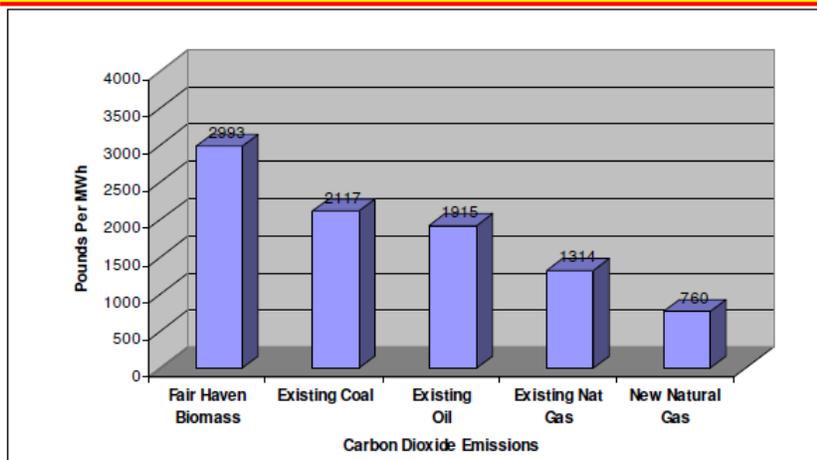
“Health experts are raising alarms about the impact that bio-energy has on air quality, particularly in Northern and Central Europe where the popularity of wood and timber products for home heating is soaring. European Environment Agency officials warned that rising levels of biomass in home heating 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

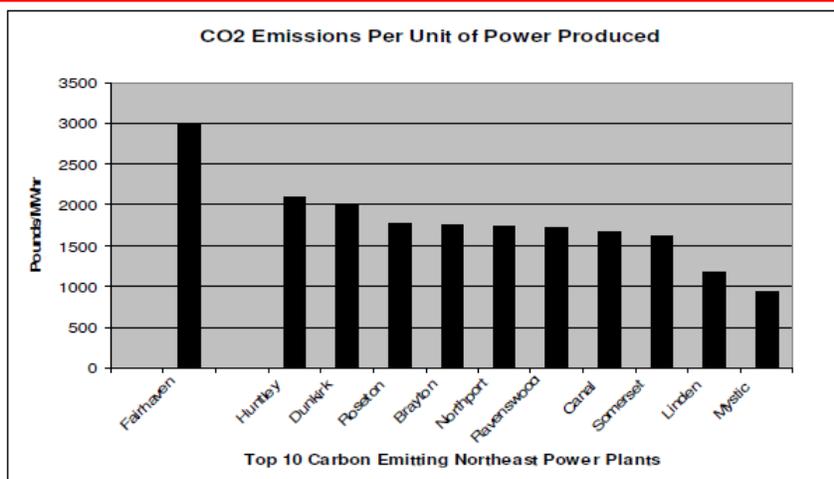
THE VERMONT BIOMESS *Carbon Emissions*

Fairhaven biomass developers claim they will emit 2,993 lbs of CO₂ per MWh of energy produced.¹¹ This compares to about 2,117 lbs per MWh for existing coal plants, 1,915 for existing oil plants, 1,314 lbs per MWh for existing natural gas plants and 760 lbs per MWh for new natural gas plants.¹²

Fairhaven Wood Biomass Carbon Emission Rate vs Other Fuels



Fairhaven Biomass Carbon Emissions vs Northeast Worst Polluters¹³



Even more efficient 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

Above CHP biomass emissions are based on 75% efficiency but the draft Vermont CEP suggests weakening the efficiency standards to less than 50% which would further increase biomass emissions.¹⁵

THE VERMONT BIOMESS *Carbon 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.*”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 levels¹⁷ 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.

THE VERMONT BIOMASS

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 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 claims there are only **175,000 green tons** of “forest residues” available in a 50 mile radius. Even if Fairhaven had access to 100% of these residues, it would provide only about 15% of their wood demand. (~ 50% of residues need to be left on the forest floor to replenish the soil)

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 is stacked with mostly 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%* more 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 CHP²⁶ and 900,000 tons for thermal biomass²⁷ which would mean a 92% increase in commercial logging in VT.²⁸

Footnotes:

- ¹ www.maforests.org/PVEC/NaturalGasvsFairhavenBiomass_PW.xls
- ² <http://apps.nccd.cdc.gov/brfss-smart/ListMMSAQuest.asp?yr2=2010&MMSA=All&cat=AS&qkey=4416&grp=0>
- ³ <http://apps.nccd.cdc.gov/brfss-smart/ListMMSAQuest.asp?yr2=2010&MMSA=All&cat=AS&qkey=4416&grp=0>
- ⁴ <http://www.vtenergyplan.vermont.gov/> (vol 2, page 99)
- ⁵ <http://www.vtenergyplan.vermont.gov/> (vol 2, page 233)
- ⁶ www.planethazard.com/phmapenv.aspx?mode=topten&area=state&state=VT
- ⁷ page 14 http://www.maforests.org/door_pellet_guidebook.pdf
- ⁸ <http://circ.ahajournals.org/cgi/content/full/121/21/2331>
- ⁹ Page 4 and 5 www.pfpi.net/wp-content/uploads/2011/06/ala-energy-policy-position.pdf
- ¹⁰ www.euractiv.com/specialreport-air-quality/doubts-cast-biofuels-air-quality-claims-news-508931
- ¹¹ Page 8 : www.anr.state.vt.us/air/Permitting/docs/ConstructionPermits/DRAFTap11015%5B1%5D.pdf
- ¹² Department of Energy, Table-1 www.eia.doe.gov/cneaf/electricity/page/co2_report/co2emiss.pdf
(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.colonialpowergroup.com/documents/MarlboroughDisclosureLabel.pdf
- ¹³ Page 1: www.environmentmassachusetts.org/uploads/90/c0/90c011ba2b26309987e273cd9c34d2b8/moreheatthanlight.pdf
- ¹⁴ See page 22: www.manomet.org/sites/manomet.org/files/Manomet_Biomass_Report_Chapter2.pdf
- ¹⁵ <http://www.vtenergyplan.vermont.gov/> (vol 2, page 164)
- ¹⁶ <http://216.250.243.12/90scientistsletter.pdf>
- ¹⁷ www.maforests.org/SCIENCE.pdf
- ¹⁸ www.birdlife.org/eu/pdfs/carbon_bomb_21_06_2010.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: www.ct.gov/dep/lib/dep/air/siprac/2010/mass_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.ecostudies.org/report_biomass_2011.pdf
- ²⁴ Page 4 <http://beaverwoodenergy.com/wp-content/uploads/2011/01/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.vtenergyplan.vermont.gov/> (vol 2, page 99)
- ²⁷ <http://www.vtenergyplan.vermont.gov/> (vol 2, page 233)
- ²⁸ 2009 Commercial Harvest <http://www.vtfrp.org/util/documents/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=pf&newstype=prfactsheet&type=detail&item=pf_20110503_energ_en_bcapl.html
- ³¹ www.maforests.org/PVEC/NaturalGasvsFairhavenBiomass_PW.xls
- ³² Page 13: http://www.manomet.org/sites/manomet.org/files/Manomet_Biomass_Report_Chapter1.pdf

To: Aaron Adler
From: Josh Schlossberg
Sent: 12/9/11
Re: Comment on Biomass Energy Development Working Group's Draft
Final Report

Comments on Biomass Energy Development Working Group's Draft Final Report

Josh Schlossberg, 1550 Center Rd., East Montpelier, VT 05602

gryneman@gmail.com, 802-223-5844

December 5, 2011

Thank you for providing this opportunity to comment on the final draft report of the Biomass Working Group. While I believe the Working Group would've benefited from a more balanced cross-section of stakeholders (particularly from the ecological and public health fields), I feel that every individual on the Working Group played a vital role in the shaping of this document, and I thank them for their countless hours of service, whether I agree with their opinions or not.

Below are excerpts from the report and my comments on them.

"When considering expansion of the biomass industry in Vermont, the Working Group recommends improvement of the Section 248 application process to increase predictability and reduce processing time." – P. 19

Due to the many documented impacts of industrial-scale biomass energy, particularly the added stress on forests, the emissions of carbon dioxide, air pollution, and the concerns of communities, it seems inappropriate for the Working Group to recommend further streamlining the Section 248 application process. It has been made clear on many occasions that the majority of Vermonters do not support weakening existing protections for public health and the environment.

"Enhancement of Vermont's biomass industry should come in the form of incentives that maximize the benefits and minimize negative impacts. Such incentives could include tax credits, low-interest loans, favorable power rates, and renewable energy credits." -P. 19

On one hand, the biomass industry touts its "cost-effectiveness," while on the other hand it insists that its financial viability can only come about with considerable federal and state taxpayer subsidies.

Due to the impacts on public health, climate, and forests, it is inappropriate for industrial-scale biomass energy—especially stand-alone, low-efficiency biomass power plants—to receive taxpayer subsidies, particularly during this time of economic hardship for Vermonters. It appears to be a major oversight of the Working Group to ignore the costs related to public health or the climate impacts of biomass energy, yet still recommend taxpayer subsidies for expanding the industrial biomass energy sector.

Diverting these taxpayer subsidies to industrial-scale biomass energy, particularly biomass power, will only limit the funding available for almost universally-supported community-scale energy projects such as small solar, small wind and micro hydro.

Further, any subsidies afforded to industrial-scale biomass energy would be provided on top of already existing tax breaks for the Vermont timber industry, which would unfairly compete with community-scale solar, wind and micro hydro.

“The Working Group recognizes opportunities for biomass harvesting to maintain or improve forest health including adjusting stand density and improving stand quality through removal of low-grade stems.” -P. 22

Above assessment by the Working Group is not a factual statement based on scientific observation, but rather a statement of opinion. This statement seems to be made in regards to the commercial value of trees to be sold for lumber, rather than the stability and health of a forest ecosystem. While some low-impact logging methods may speed the growth of certain commercial tree species and should certainly be favored over other methods for the production of necessary forest products, this does not mean this logging will “improve forest health.” A forest ecosystem consists not only of merchantable trees, but smaller or non-commercial tree species, understory plants, fungi, soil, insects, microbes, watersheds, fish and wildlife habitat, etc.

While certain timber practices are certainly less impactful than others and can sometimes roughly mimic—to a certain degree, at least—natural disturbances, tree removal from a forest always has impacts on the ecosystem. While impacts may be deemed by some to be worth the tradeoff in comparison to the benefits of forest products, this doesn’t mean the impacts don’t exist.

The majority of Vermont’s forests are *not* evenly-spaced, single-species tree plantations, but naturally regenerating forests. These naturally reseeded trees of varying ages and species and multi-story canopy have repopulated the previously cleared landscapes, as would occur following natural disturbances—albeit on a much larger scale. Again, while certain methods of low-impact logging in these forests may speed the growth of selected commercial tree species, I have not seen any evidence, nor has the Working Group put this evidence forth, that Vermont’s forest ecosystem itself is currently suffering from the absence of human interference.

As Nick Zandstra, a self-proclaimed “micro-logger,” stated in his low-impact forestry course at Yestermorrow Design/Build School: “Every time you take trees out of the forest, you’re mining the soil.” In fact, it can be argued that past clearing of Vermont’s forests has impoverished Vermont’s forest soils, which the intensified removal of trees and woody materials for industrial-scale biomass energy—particularly biomass power—will only exacerbate.

Following the retreat of the glaciers over ten thousand years ago, Vermont became a forested landscape. It is likely that the first forests were dense and perhaps not conducive to the rapid development of lumber or other forest products. Does that mean they were “unhealthy?” These slow growing trees eventually self-selected to create ecologically thriving forests. The slow growth resulted in close growth rings, meaning greater structural integrity for the trees, which allowed for the dead and downed wood to remain in the forest ecosystem *longer* before decaying and returning to the soil, better providing the essential components of a forest ecosystem, including wildlife habitat, and erosion and flood control.

Encouraging low-impact logging practices for the extraction of necessary forest products is not the same thing as claiming these practices will “fix” a “broken” forest. This underlying assumption made by the Working Group’s draft final report, if not by all its individual members—that Vermont’s forests *need* to be logged in order to thrive—seems to influence the entire report and its recommendations.

“Whether a standard should be developed that would require biomass electricity generating facilities to provide for a fuel efficiency of at least 50 percent over the course of a full year.

“No. Using forest resources in the most efficient way possible is desirable, but a standard of 50 percent fuel efficiency over the course of a full year may not be possible for certain biomass energy facilities in certain locations in the state. The Working Group does not want to discourage the location or operation of such facilities.” –P. 33

Unfortunately, the Working Group has chosen *not* to recommend an efficiency standard, despite the overwhelming public opinion to move away from inefficient, stand-alone biomass power plants. Even many of those Vermonters strongly in favor of expanding biomass heating or CHP applications are *not* in favor of stand-alone biomass power plants.

Even though the Working Group recommends forest harvesting and procurement standards for biomass energy—which I encourage to the strictest ecological standards possible—this refusal to discourage the most wasteful use of a limited forest resource greatly weakens the potential environmental benefits of such recommendations.

“Because the scientific community has not come to a consensus on the net carbon fluxes and greenhouse gas emissions consequences of wood bioenergy, we recommend that the State closely follow the development of this issue, including ongoing research at ANR, and initiate a process to officially adopt greenhouse gas accounting protocols relevant to wood bioenergy.” P. 33

Not a single scientific report that I have read has suggested that burning trees for energy *doesn't* put carbon dioxide into the atmosphere over a time frame that would not otherwise occur, were the trees or woody material to be left in the forest. There is, in fact, 100% consensus on this aspect of the issue.

Of course, there remains the so-called “biogenic” carbon “debate.” As we know, the reality is that the atmosphere doesn't distinguish between “fossil fuels carbon” or “tree carbon.”

Another perspective on that topic: much of the carbon that is being released from trees and wood being burned for biomass energy in Vermont is not simply some separate, compartmentalized form of “tree carbon,” but actually partially consists of past fossil fuels carbon emissions that have been sequestered by the forests over the decades. Since Vermont only has a few stands of forests remaining that existed before humans started burning fossil fuels, each and every piece of wood in the state is likely storing at least some fossil fuels carbon emissions, alongside this so-called “biogenic” carbon.

It is true that there is no official scientific “consensus” on the existence of human-caused climate change, either. But there must be a point in time where the data becomes clear enough to act upon the knowledge we have, rather than simply defer our decisions until there is 100% agreement with every entity or individual on the planet, no matter their agenda. As long as there are industries that benefit from the continued burning of fossil fuels, trees, or other materials, there will be untold sums of money thrown at “studies” contesting the impacts on the climate, preventing “consensus,” resulting in a continued lack of action. Even if consensus is reached at some point in time, will it be too late?

ISSUES NOT ADDRESSED BY WORKING GROUP

1) Air pollution from biomass burning

It is troubling to me that the Working Group would make recommendations for the expansion of industrial-scale biomass energy across Vermont without addressing the foremost concern of every single community fighting proposed biomass power plants across the U.S: air pollution. Medical associations such as the American Lung Association, American Academy of Family Physicians, the Massachusetts Medical Society and hundreds of medical doctors and medical professionals have made a strong case for the negative health impacts of biomass burning.

I hope the Working Group can state clearly in its final report that no expansion of industrial-scale biomass energy in the state take place until an adequate assessment of the current health impacts from biomass burning is undertaken, along with studies of potential future impacts. Ideally, the Working Group should recommend a moratorium on the permitting of industrial-scale biomass energy projects, until these issues have been investigated.

2) Invasive insects

It is also of concern that the issue of invasive insects, such as the spread of emerald ash borer and asian longhorn beetle, has not been addressed by the Working Group.

An outbreak of the emerald ash borer has been already been directly linked to the transportation of wood chips surrounding a biomass energy facility in Michigan (excerpt and link below). I am confused as to the omission of this extremely important issue from the report.

<http://www.forestwellness.com/>

“Beetles and larvae do survive the chipping process. One such report in support of this finding, also from Michigan, shows that the Emerald Ash Borer infested stands of elm trees in circles around a biomass co-generation facility to which chips from Emerald Ash Borer infested trees were hauled by truck. This was later verified by a 2005 study conducted by David L. Roberts, et al, of Michigan State University Extension.”

Thank you for the opportunity to comment. I hope to see a much-improved final report issued in the coming weeks with my above suggestions incorporated.

Josh Schlossberg

East Montpelier, VT

Josh Schlossberg, 1550 Center Rd., East Montpelier, VT 05602

gryneman@gmail.com, 802-223-5844

To: Aaron Adler
From: Jonathan Wood
Sent: 12/11/11
Re: Biomass Energy Working Group

**COMMENTS ON THE Nov. 21 PUBLIC REVIEW DRAFT
 BIOMASS ENERGY DEVELOPMENT WORKING GROUP**

Provided by: Jonathan L. Wood CF (Certified Forester) December 11, 2011

I am the Former Sectary of Natural Resources under Governor James H. Douglas, serving as the Co-Chair of this Workcation and professional experience are important to understand for the context of these comments. I have worked as a natural resource professional in Vermont for the last 34 years. I have worked for: the federal government, as a consulting forester, for State Government (including 6 years as Commissioner of the Department of Forests, Parks and Recreation). I was also employed as an industrial forester in charge of wood procurement and regulatory compliance for over 20 ing Group during the first two years of its work. These comments are made by me as a private citizen and forester. I am not representing anyone but myself. I have received no compensation or any other type of pecuniary gain for these comments.

My background, eduyears. I am now self-employed as a private forester.

The following comments are provided to suggest changes that need to be made to the report before it is presented to the Legislature.

As written the Draft Report's recommendations will harm the development of Biomass Energy in Vermont. This is directly contrary to Act No.37 of the 2009 General Assembly (See Section 1. (a) and other sections of the Act.).

MAJOR CONCERNS

The Committee was constructed to be made up of a representation of interested parties in a balanced way. This past year, after the elections and some resignations, the group changed. Under new leadership (new co-chairs) with some new members, and the lack of replacement of one critical member, the committee decided to revisit many of the issues that were previously the subject of compromise and general agreement. The result is a far less balanced report that contains recommendations that many of the original members would not have supported. The original intent of the legislation creating the committee has not been honored.

Significant changes have been made to the report since the Interim Report was issued. These include changes to some of the major points of agreement that were reached for the Interim Report. As someone who worked hard for the first two years, this is extremely disappointing.

MAJOR ISSUES

The recommendation that the legislature create, implement and enforce a procurement system for all types and sizes of biomass using facilities, with the only exception of home firewood, will be a major disincentive to the development of biomass facilities of all sizes in Vermont.

This will put Vermont companies at a serious disadvantage in the regional marketplace. The "Voluntary" harvesting guidelines were developed and constructed as a non-mandatory guidance document that could be of great educational value to the biomass

using industry. They have been made mandatory by making them the number one requirement of the procurement standards. This will make them unsuitable for education and, because of how and why they were developed, they will be impossible to enforce. Many portions of the report contain sensationalized statements with no basis in fact. They seem to be designed to raise unsubstantiated fears and questions. This clear negative bias should be purged from the final report.

The recommendations include new taxes, new regulations, and additional enforcement duties for state personnel, increases in state positions, multiple studies and monitoring requirements. This amounts to major new costs to both the private sector and state government with little justification or benefit.

GENERAL COMMENTS

As I will point out in each section, this report recommends significant new regulatory oversight of forest biomass harvesting that will cause unnecessary new costs to industrial users, timber harvesters, landowners and state government. That will discourage local biomass utilization.

Biomass is the lowest value product in the forest but has the potential to improve forest health and productivity through its harvest. To make it less advantageous to harvest low value crops from Vermont forests is not what the legislative charge was to the working group. It is in fact the opposite of the task. This jeopardizes an emerging economic and ecological opportunity.

The report is extensive and took three years to complete, it is 88 pages long, yet the comment period for the public is only 21 days! That is not a realistic time frame for meaningful public input and review. The distribution of information about the report's release for public comment was also extremely lacking. Both myself, and the other original co-chair were not informed about the release of the draft report. A longer public review and comment period should be allowed. This will add credibility for the public and affected interests.

The report contains serious bias against biomass utilization and forest management in general. It has been poorly received by Vermont's professional timber harvesters and the forest products industry. Many have found it insulting to the high quality management and professionalism that exists in our state. To a great extent, Vermont's forest land is very well managed.

There are scientifically inaccurate statements, as well as false and misleading information. Some areas of the report include assumptions, speculation and conclusions that have no place in a legislatively sanctioned report.

SPECIFIC COMMENTS

Page 1, Working Group Members, This list is misleading and needs to be re-written to clearly show the change-over in membership and leadership. The casual reader will think that the list of names represents the individuals that have written and support the report. As a past member and past co-chair, I strongly oppose the recommendations in this report and I am asking for the final report to clearly indicate the change in membership and leadership.

Page 7, the first paragraph shows serious bias and overstates the concerns about the reality of the available supply of wood in Vermont and the region.

Page 7, Second Paragraph, "Our inventory of volume in our forests may be growing, but is not inexhaustible". This is more bias and sensationalism, and just plain FALSE. There

are now hundreds of thousands of acres (actually its millions) in Vermont that are legally required to be managed on a long term sustainable basis, (Federal, State, Land Trusts, Easements, Use Value)

Page 11, top of page, “In the event of an increase in intensive harvesting” this is another sensationalized statement with absolutely no basis in fact. This is speculation that will cause fear.

Page 11, first full paragraph, “In contrast, information pertaining to sustainable forest management and on-the- ground practices is limited at the state level” compared to what? Vermont has an excellent system of monitoring and information (Appendix B)

Page 13, the whole page, in multiple places, has more bias and conjecture. Example: “Still, healthy forests that preserve and enhance these values in many cases may benefit from management (emphasis added). This is just a FALSE statement ALL forests benefit from management! Management does not mean harvesting, Wilderness is managed. This indicates more bias and misunderstanding. I made this very point numerous times during the process.

Page 16, iii Electrical Generation, “The working group has evaluated the potential addition of one large-scale Wood-fired electrical generating facility,” the rest of this section leads to no conclusion. So, you “evaluated” it but you have no conclusion?? Why? This issue was discussed at length during the first two years of the group. The need for year round markets to support a robust harvesting infrastructure was agreed upon. An additional electrical generation plant in southern Vermont would clearly be a huge asset to the development of smaller users in the area.

Page 17, 2, a tax on home heating fuels to support thermal efficiency programs! An efficiency fee already exists, so is this an additional tax on Vermont homeowners?

Page 19, top paragraph, quote; “The centralization of services and permitting provided or required by the State would facilitate the industry significantly”. Good, but this issue has been debated for decades and has never been implemented.

Page 22, top of page, quote; “We recommend that the state support policies which accommodate growth of the public’s use of wood for home heating, particularly from local sources”. This falls short of a recommendation. The main use of “biomass” in the state deserves more attention.

Page 23, top of page, quote; “There is a discontinuity between the broad range of wood procurement practices mandated by the PSB for Vermont-based wood-fired electric producers through the Section 248 permit process, compared to the complete lack of forest resource protection required of other users of biomass”(emphasis added). What an outrageous statement. This is inflammatory, FALSE and included, once again, to strike undeserved fear in the reader. No harvesting of forest crops can take place in Vermont without a significant level of legally required compliance with laws specifically designed for forest resource protection. Vermont has a Heavy Cutting Regulation, Acceptable Management Practices to protect water quality, Slash disposal laws, Chip Harvester Registration, and over 1.5 million forest acres in the Use Value Appraisal Program requiring treatments that meet silvicultural compliance. An additional, one million acres is public land, is managed under layers of professional oversight and regulation.

Page 23, 2nd paragraph, The Work Group is recommending that the Legislature, quote; “create a uniform system for implementing wood procurement standards across a range of facilities, including electric generators, district heating, combined power and heat,

pellet manufacturers, schools and office building complexes that heat with wood”. This will add cost to all users and producers. It will create a competitive disadvantage to all Vermont companies, as no other neighboring States or Province’s need to comply with these standards. I thought that we had settled this as an issue during the first two years of the Work Group. A regional standard is the only way not to punish our own companies. This will discourage local biomass business and make Vermont’s forests a resource for others.

Page 25, 3rd paragraph, you refer to the harvesting guidelines as “voluntary” this is misleading as they are incorporated into the procurement standards making them mandatory.

Page 28, 1st full paragraph, Quote; “the Working Group recommends that a compliance system would need to accompany implementation and enforcement (emphasis added) of procurement policies”. That is not a model. Making all biomass users, in just one small state, follow a procurement standard for a regional resource will be devastating to local economies.

Page 28, wood procurement attributes; number one, is adoption of the voluntary guidelines. That makes them mandatory. They were not designed to be enforceable and they are not.

Page 29, the paragraph following number 6, this adds an Act 250 criterion to the guidelines and the procurement standards (S1 and S2 State Ranked natural communities). Has there been evidence of the need for this presented to the committee in the last 11 months? Is there a problem with biomass harvesting and natural communities that has been shown? It is a very bad idea to make what landowners should see as an asset, into a liability on the land. This is mission creep.

Page 29, last paragraph, you are recommending 2 biologists at the state level for each new “major” facility; (what’s major?). This would be paid for from a “fee” on all wood consumers procuring over 50 green tons per year? That is not a way to encourage. That is how you discourage. This is unnecessary, expensive, unsustainable, and contrary to the legislation.

Page 32, Carbon Accounting, this is not a topic addressed in Act 37. The whole section is unnecessary and full of conjecture, assumptions and highly disputed science. This should be removed from the report. Highly controversial, this brief personal “opinion” is very inappropriate.

Page 34, under #5, quote “We recommend education opportunities for foresters and loggers on the benefits and trade-offs on reducing tree utilization and increasing post-harvest woody debris”. Reduced from what? What is your base line? There has been no reliable evidence that there is a lack of residual woody debris on harvests in Vermont. Landowner goals are different.

Page 36, Appendix A, first paragraph, you say again “not mandatory”, you are intentionally misleading people. If incorporated into a procurement standard, as you recommend, it is mandatory.

Page 36, Appendix A, number 2, this is not consistent with what you say earlier (page 25) about these being “understandable by those charged with using them in the woods and easily implemented in the field” This is an activity that foresters commonly do, not harvester operators!

Page 36, Appendix A, number 4, look up the word “practicable” in the dictionary. The

word “practical” is what you need here. It is “practicable” to send kids to school in hot air balloons.

Page 36, Appendix A, number 11. This is just plain wrong scientifically, I remember pointing this out to the group, Nutrient impaired sites (steep, wet, shallow or sandy soils) will NOT become better sites from leaving more organic matter. They are just poor sites, you cannot fix that. This recommendation was for good sites that may have been impacted by acid rain, or other nutrient depletion.

Page 37, Appendix A, this ignores the common need for wind-throw/storm salvage.

Page 37, Appendix A, number 18, this is fine as a guideline, but impossible to enforce as a standard. Most of the recommended retention “guidelines” are too difficult to measure.

Page 37, Appendix A, number 20, practical not “practicable”

Page 37, Appendix A, Table 1, This is fine as a “truly voluntary” guideline, but totally impossible to regulate as a standard. Even if it was measurable, or implementable, it can only be determined for compliance at the end of a job, by then the wood is all cut and shipped.

Page 48, pros and cons, electrical generation, quote; “may strain local wood supply, unless wood procurement is distributed”, the 30 years of experience with BED have shown otherwise.

Page 48, Pros and Cons, electrical generation, quote; “In the absence of appropriate management practices, large-scale demand on resource may impact forest health”. As pointed out, appropriate management is required by the Section 248 permit process.

CONCLUSION

The report can still be of value if the clear language of Act 37 is followed. The State of Vermont can and will act quickly to protect forests if they ever come under unsustainable harvesting pressure (Example: Heavy Cutting Emergency Rule/Law). Vermonters care too deeply for the forest. But we can be far too protective in a way that will let this opportunity pass us by.

Biomass utilization is the most encouraging economic development and conservation opportunity to come along in decades. This is the time to act, to both develop an exciting opportunity for Vermont’s economy and to provide a source of economic return to Vermont’s landowner. Forests will remain as forests when landowners can afford to own them.

The Following will make this report have real value and lasting positive impact:

- The report should not recommend procurement standards for Vermont users.
- Vermont should take a leadership role in the development of a regional standard.
- Return the harvesting guidelines to truly and absolutely voluntary so that they can be embraced as a technology transfer and educational asset (The Interim Report version).
- Remove the inclusion of S1 and S2 State Ranked natural communities from the guidelines.
- Purge the report from all conjecture, assumptions, unfounded concerns and bias.
- Eliminate the unnecessary addition of new taxes, fees, regulations, and state personnel.
- Challenge the emerging industry, existing harvesting professionals, and state resources to work together to create a partnership.

- Create real incentives, (Tax relief or payments to loggers and landowners for following guidelines) so that all interests can continue to protect forest health and encourage the development of a vibrant, sustainable biomass industry.
- Recognize and embrace the true potential that these new markets can have to maintain Vermont's forest resource base, protect forest health and support the working landscape.

Thank you for the opportunity to comment.

Jonathan L. Wood CF

FOOTNOTE: There is no instruction on where to send these comments or when the comment period ends in the distributed draft. (The deadline is only noted in meeting minutes on P.77)

To: Aaron Adler
From: Rebecca Ryan, American Lung Association in Vermont
Sent: 12/11/11
Re: BioE Report

December 9, 2011

To: Aaron Adler, Legislative Council
 From: Rebecca Ryan, American Lung Association in Vermont
 Subject: BioE Report

On behalf of the American Lung Association in Vermont (ALAVT), I am writing in response to the Biomass Energy Development Working Group's draft 2012 Final Report. The American Lung Association:

- 1) does not support biomass combustion for electricity production. The use of biomass for the production of electricity is a highly inefficient use of forest resources and can result in undue air pollution. There are many other means of generating electricity that are far more efficient and result in fewer emissions. If biomass is combusted, state of the art technology must be deployed.
- 2) strongly opposes the combustion of wood at schools and other institutions with vulnerable populations. Given that many schools in Vermont have converted from conventional heating systems to biomass units, and more will likely follow suit, the ALAVT strongly recommends the state require air permits and air emissions standards for future systems and air quality monitoring for those already installed.
- 3) strongly opposes the use of outdoor wood-fired boilers (OWBs) for heating and other purposes, and supports measures to greatly reduce emissions from or eliminate OWBs. While standards for OWBs have been adopted for OWBs by the Agency of Natural Resources, these standards are woefully insufficient to protect human health.

If biomass is to be promoted as an energy source, it is imperative that strong measures are implemented to manage and oversee the air emissions impacts. The goal of biomass combustion for energy should be that the health risks due to emissions are no greater than from conventional fuel combustion. To this end, the ALAVT offers the following comments. The ALAVT recommended changes are bolded and align with the report's recommendations listed in Appendix I.

A. Monitoring

3. The legislature encourage research particularly on the **positive** economic aspects of biomass harvesting **and the negative aspects of air emissions**. This research should target economic benefits and impacts for different scale projects; constraints to development, including financing and workforce issues; and the general responsiveness of the industry to increases in fossil fuel prices or increases

in product demand as society moves towards a greater reliance on biomass for energy **and on human health.**

4. A review of the coordination and execution of existing publically funded monitoring programs (see Appendix B) should be conducted to: a) identify overlaps and gaps, **including air quality monitoring** b) review the adequacy of staff and funding, and c) examine how data are made available to the legislature and other policy or public groups for integration and analysis. d) Ideally, this review would include recommendations for improving existing programs and augmenting them in appropriate ways as the need and resources become available.

B. Enhancement and Development

7. Considerations relevant to enhancement and development of woody biomass energy, and to awarding incentives for such development, include but are not limited to:

- a. Efficiency and resource sustainability – the enhancement and development of the woody biomass energy industry in Vermont should attempt to use the available resource sustainably, in a manner that maximizes efficiency **and cleanliness** while meeting energy **and air quality** goals and focus on sectors of growth where the use of biomass can have beneficial localized impact on our energy reliability, security, and cost, and other public benefits **without compromise to lung health.**
- g. Factors affecting the environment and human health – **air contaminant** emissions, forest health, water quality, waste disposal and by-products must be considered in the evaluation process.

8. The legislature should assign major priority to home heating with wood **once the Agency of Natural Resources (ANR) in conjunction with the Department of Health has completed a health impact assessment concluding that the human health impact of such an initiative would be no different than the continued use of conventional fuels, or such emissions standards are in place to ensure this outcome.**

9. This wood home heating initiative should be part of a larger undertaking to support thermal energy efficiency **and air contaminant emissions reductions.** Funding will be needed to help achieve these **dual** goals, and examples of funding sources would include a charge on energy inefficiency or a tax on home heating fuels. Some portion of the funds raised could support residential heating with **clean** efficient woody biomass appliances.

In order for biomass to make meaningful in roads to home heating, emissions from biomass heating appliances/equipment need to have emissions characteristics equal to or better than conventional fuels.

10. The state should support new wood pellet manufacturing facilities in Vermont that are dispersed among various areas around the state **once ANR has developed emissions standards for pellet burning appliances that ensure emissions from these devices are not greater than what would be emitted by the use of conventional fuels.** Project developers should be provided with information and guidance regarding the state's regulatory process. **The state should analyze the negative impacts associated with an increase in unhealthy emissions due to diesel truck traffic related to these facilities.**

11. The General Assembly should require all pellets sold in Vermont to label their product as to moisture content, weight, list of ingredients, and suitability for various heating systems. **Further, the General Assembly should direct ANR to adopt fuel quality standards to manage emissions as it has for conventional fuels.**

15. As soon as feasible, the General Assembly should lift the current suspension on applications for state aid for school construction at least for the purpose of supporting school conversions to woody biomass energy. **In lifting the suspension, the General Assembly should require air quality permits for new applications, the application of best available control technology and specific emissions standards for future biomass boilers installed in schools. Requiring permits and emission standards should prevent increased emissions in the proximity of children, who are particularly vulnerable population to the ill effects of air contaminant emissions. For schools that have already converted to biomass boilers for heating, the General Assembly should provide for air quality monitoring and corrective action if elevated levels of air contaminants are measured.**

16. The Clean Energy Development Board, in consultation with the Department of Public Service (DPS) **and ANR,** should develop recommended incentives for woody biomass thermal energy that use a tiered structure that rewards greater design system efficiency **and lowest air contaminant emissions** with a larger incentive in comparison to less efficient **and higher emitting** systems.

22. Economic incentive programs for biomass energy development should incorporate strong fuel efficiency standards. The state should maintain the existing "standard offer" program's requirement of 50 percent design system efficiency for woody biomass generation. For incentive programs other than the standard offer, as an alternative to a flat requirement of 50 percent for design system efficiency, the DPS in consultation with the Clean Energy Development Board **and ANR** should consider a tiered structure for incentives for woody biomass electric generation plants that would reward greater efficiency **and lowest air contaminant emissions.**

26A. The General Assemble should authorize a wood-stove change-out program designed to incentivize the replacement of older stoves with new ones. Replacing an uncertified stove with a stove certified to EPA emission standards results in some 75% reduction in emissions and a 50%

improvement in heating efficiency. This has the benefits of reducing health-threatening air emissions and increasing efficient use of a valuable resource, the Vermont forest.

26B. Air emissions standards for biomass energy utilization should have the goal of being of no greater health risk due to air emissions than conventional fuels. Standards set for biomass burning equipment should be subject to continuous improvement so as to meet and then exceed this goal.

27. The General Assembly should direct ANR to establish a program to monitor and assess the air emission and air quality impacts of biomass energy, and report to the legislature on a five years basis on the threat to human health these emissions represent and on measures that can be implemented to reduce emissions from the various uses of biomass as an energy source.

To: Aaron Adler
From: Peter Condaxis
Sent: 12/11/11
Re: Comments on the Bio-E Final Report Public Review Draft

COMMENTS ON THE 11/21/11 PUBLIC REVIEW DRAFT OF
THE BIOMASS ENERGY WORKING GROUP FINAL REPORT
DECEMBER 9, 2011

My name is Peter Condaxis; I am a resident of Berlin Vermont, I have been employed by Ryegate Power Station in Ryegate Vermont as its' regulatory forester since the plant began operation in 1992. As most of you know, I am a former member of the Biomass Energy Working Group, serving as a wood industry representative from 2009 – 2010. These comments represent my personal thoughts, concerns and *recommendations* as a professional forester and citizen of the State of Vermont.

- The report has been written such that overall language is soft or neutral (i.e. “in many cases may benefit”, “should attempt” pg. 13) in the Enhance/Development discussion, and strong (*recommends*) all through the Forest Health/Regulation discussion. The entire last paragraph on pg. 19, which should strongly summarize the Enhancement/Development section, basically says nothing; *it needs to be completely rewritten, beefing up the language and providing specific recommendations.*
- Many statements in the report prey on fears and misconceptions of some groups and individuals regarding the impacts of a “potential increase in biomass harvesting levels” in Vermont. Many of these issues were of great concern before the McNeil and Ryegate facilities came on the wood-using scene, and after 28 years of regional biomass harvesting to fuel McNeil and 19 years to fuel Ryegate, none of these issues have proven to be long-term concerns. *These fear-mongering statements should be removed from the report – they are easy to identify.*
- There is no mention of property rights in the report. While there is acknowledgment that Vermont’s forest land is largely owned by private non-industrial owners, there is no mention of the impacts created by the report recommendations on these individuals and

families. These include: delay of scheduled harvesting, increased cost of timber sale preparation & administration, decreased revenue resulting from harvest restrictions, increased taxes, and the simple fact that many landowners desire a biomass harvest because the result is a “cleaner” forest than results from a conventional “roundwood” harvest. *The report should contain a statement to the effect that individual landowner property rights must be considered if additional forest practices regulation is recommended.*

- The recommended “harvesting guidelines” and “procurement standard” will serve to make Vermont an “island of regulation” in New England, surrounded by states that have no such standards. We discussed this many times during the first two years of the working group, and I was hopeful that there was a general understanding of the concept – unfortunately, it has been lost in this version of the report. While difficult, *the recommendation needs to be for Vermont to strongly push for a regional standard; otherwise, potential new biomass-using businesses will look to neighboring states to locate. Also, sawmill residues must be exempt from the harvest guidelines as it will be impossible to “source” loads of mixed mill waste.*
- The Working Group recommends the legislature assign major priority to home heating with wood (pg. 17) but then basically ignores the fact that the majority of “biomass” currently used for home heating (750,000 tons annually, more than McNeil and Ryegate combined) is chunk firewood. There is some discussion on conversion of conventional wood burning to pellets (Recommendations 8 & 9), but this change will take many years and older wood stoves will be around for a very long time. *The entire firewood issue gets shortchanged; it needs much more substance in the report...firewood is biomass too!*
- The discussion on Electrical Generation (pg. 16) leads nowhere, other than the statement that “the WG favors electrical generation...that is part of a CHP project” – and this is weak language as well. As I suggested on many occasions during my time with the Working Group, Vermont needs a large-scale biomass-using facility in the southern part of the State. The advantages listed in the report far outweigh the (for the most part, perceived) disadvantages. *The only way the State will successfully grow the thermal, CHP and pellet*

- biomass industries in Southern Vermont is to have a regional large, stable, year-round chip market. I do not favor any given project, only that the facility be between 20 and 30 megawatts and located in the southern half of the State (US Route 4 corridor -> south).*
- I support the need for future monitoring efforts; however, these must be commensurate with the State's (read: Dept. of Forests, Parks & Recreation's) ability to absorb this additional workload. *As part of this monitoring effort, it is critical that the issue of forest invasive species be addressed by additional funding of research and control programs.*
 - Appendix A, the so-called "harvest guidelines", have suffered from severe mission-creep. We all agreed last year the Guidelines should be voluntary; now, as a required part of the Procurement Standard, they are in essence mandatory. *If the Harvest Guidelines are to be "general, flexible, understandable and easily implemented in the field" (as stated on pg. 36), they need to be dialed back to a version similar to the one found in the Biomass Working Group's "Interim Report" released earlier this year. At minimum, Guidelines #2 (S1/S2 natural communities review), #10 (requirements for topwood retention), #18 (restrictions on salvage harvesting) and Table 1 (Structural Retention Standards) are unreasonable and should be removed.* I strongly support Recommendations 37, 38 & 39 for training and educational opportunities for foresters, landowners and loggers regarding biomass harvesting. These opportunities for woodland managers and harvest contractors will provide the best environment in which to accomplish the intent of the harvest guidelines without additional, over-burdensome regulation. As awareness of the concept of biomass retention increases, land owners and managers will, over time, modify harvesting practices to accommodate these concerns.
 - It is disconcerting to me that after 3 years in the making, the Working Group has provided only three weeks for public review/commentary of the report. *This is woefully inadequate, as is the three-day time period allowed for your own assessment of commentary from the December 6th public hearing and any written testimony received during that time. The written comment period should be extended until at least December 31st, 2011.* I was extremely disappointed to

learn that Chris Bray, the individual who sponsored this legislation and co-chaired the Bio-E Working Group for the first two years, was not informed of the release of the draft Final Report or of the Public Hearing. *I believe the Working Group should apologize to Mr. Bray for this oversight.*

I thank the Biomass Energy Working Group members for your many hours of effort. The result of your work is a flawed document (which comes as no surprise, given the complexity of the subject) which I cannot support, but it can be improved by incorporating the recommendations I have made. My concerns are for the future of Vermont's forests and those people who make their livelihoods from the forest – we have an opportunity to make a difference by providing something to the legislature that is reasonable, implementable and will lead to a positive future for Vermont biomass. Please consider including my recommendations in the final report.

Thank you,
Peter Condaxis

To: Aaron Adler
From: Timothy Maker
Sent: 12/12/11
Re: Bio E Report Comments

Comments on Draft Bio-E Working Group Report

BY: Timothy Maker
President/CEO
Community Biomass Systems, Inc.

DATE: December 9, 2011

Introduction

The Biomass Energy Development Working Group and all its members, former and current, deserve the thanks of the people of Vermont for three years of hard work in responding to the charge from the Legislature to lay out a blueprint for the future use of the state's forests as an energy feedstock while, at the same time, protecting that resource for future generations.

Because the Bio-E Report is a visionary document, the foundation for future legislation, it is important to get the context right. Understandably, the Report works from a Business As Usual context, assuming that the energy economy of the future will be a linear extension of what we see today. The Report makes a set of detailed and reasonable recommendations that, unfortunately, do not fully represent the challenges of a very different and inevitable energy future that is near at hand.

Context: The future of Vermont's forests depends on the future price and availability of oil.

We are all making the transition in our understanding of Climate Change toward a realization that it is real, that we can see its impacts here in Vermont, that it is caused by our use of fossil fuels, that its consequences are momentous, and that we have entered a very challenging and hugely expensive phase of adaptation to its impacts. Policy makers here and around the globe need to begin connecting the dots to understand that Peak Oil is also close at hand and will have similarly momentous impacts on our world. The global oil peak is the point at which in each future year there is less and less oil available, when global oil supply goes into decline.

All national governments, including our own, understand Peak Oil and its transformative impacts. The idea of oil peaks is not new. US oil production peaked 40 years ago, in 1970. Global oil discoveries peaked in 1962. The US Department of Energy's Energy Information Administration (EIA), our official source for energy projections, recognizes that the point at which the all-time global maximum rate of extraction of oil is reached is near at hand. As little as five years ago, EIA projected the peak would occur in "only" 25-30 years.

How close might the global peak be, given what we know today? The growing consensus among expert sources is that we may already be in a five-year “bumpy peak” period before the years when the oil available to the global economy begins its steady, steep, year-after-year decline. According to data from the widely respected and historically conservative International Energy Agency (IEA), 2010 was the first year since the discovery of oil in 1859 that global supply of oil was less than global demand. This is a flashing red light that we ignore at our peril. IEA’s *2011 World Energy Outlook*, released in November, confirms “the end of cheap oil” and calls for “stringent new action” by the global community before 2017.

We have lived in a world, in all of our lifetimes, in which – even with price fluctuations and occasional short-term supply interruptions – there has always been enough oil. Post-peak, oil supply will not be able to meet demand. Demand will of course shrink in reaction, but the world depends so completely on oil that decreasing supply will inevitably and rapidly lead to competition for the resource and sky-rocketing price. Everyone knows the relationship of price in the law of supply and demand.

Here is where we get back to Vermont’s forests. In Vermont, where we are highly dependent on oil to meet even the most basic needs of winter comfort and survivability, sharp increases in the price of oil lead us to turn to our own indigenous fuel: wood, in the form of cordwood, woodchips and now pellets. There is no other fuel that will be able to come close to meeting our needs for heating in a post-carbon world. We will not heat our existing buildings with wind or even a great expansion of solar. The Report correctly recognizes that we will not be able to replace oil and gasoline with biologically derived liquid fuels. Bio-diesel will help and new bio-fuels will be produced, but not at the scale and price that we will be able to afford.

Post-peak we will enter a world where there will be a historically unprecedented demand on our forests for fuel, directly and as a feedstock for pellet production. A future where wood-as-fuel vies with wood-for-sawlogs as the “highest and best use” is not out of the question. At current oil and wood prices, Vermont schools with woodchip heating plants can today afford to pay close to \$200 per ton for wood and still beat the price of oil. We are already in a world where woodchips and wood pellets manufactured across the US are in global demand and shipped across the Atlantic and Pacific to international markets in Europe and Asia. There is a high likelihood that, post-peak, Vermont use of the Vermont wood fuel resource will be in direct competition with international markets that can afford to pay more for our resource than we can afford.

The implications of this change are indeed momentous for the state of Vermont and for the future viability of our forests. The Working Group needs to look at its recommendations through this new lens and the Legislature will need to begin, quickly, to think about forest and energy policy in a new light.

We now have minimal regulation of how harvesting takes place in our forests and the threat of new regulation is met with angry protest. In the post-peak world if we do not plan and regulate the use of our forests, they will be cut and sold off to the highest bidder and we Vermonters may not be able to afford to stay in the game.

Comments on Key Recommendations

The one place in the Report that explicitly recognizes the impact of competition between wood and oil is **Recommendation 3** (as numbered in Appendix I). This should be strengthened.

Creation of an Aggressive Wood Heating Initiative:

In terms of laying the groundwork for future legislation, policy and needed action, the most important points of the Report are **Recommendations 8 and 9**, which call for a “wood home heating initiative.” I strongly urge that the Bio-E Working Group expand this to include heating all buildings in the state. The Report correctly recognizes the importance of funding for this initiative. To be effective in meeting the challenges of converting our space heat economy away from fossil fuels to renewable fuels this program, which I have suggested be called “Biomass Vermont,” will require far more funding than can be imagined coming from conventional federal or state budget sources. A significant new funding source is required to provide the necessary level of incentives. The Report suggests “a tax on home heating fuels.” As I argued in my comments on the Draft Comprehensive Energy Plan (CEP) – which I sent to the chairs and staff of the Bio-E Working Group – some kind of a carbon tax will be needed to fund the 90 percent reduction in fossil fuels called for by the CEP. The Report’s funding recommendation should be strengthened.

There are excellent models for such a wood heating initiative in Europe, as I detailed in my CEP comments, coming from Scandinavia and, most noteworthy, Austria. The state of Upper Austria has instituted a program to get off oil for heating, which has already reduced state-wide oil consumption by half. The basis for the program is incentivizing and using woodchip district heating in towns and cities, woodchip systems in other large buildings and campuses, wood pellet boilers for all residential applications not served by district heating, and cordwood stoves for rural and farm settings with ready access to firewood. It is worth noting that the Austrians have made it as convenient to burn wood pellets as oil, by focusing on pellet boilers and bulk delivery, not pellet stoves and bagged fuel. We would do well to follow their example, instead of trying to convince the general public of the merits of handling 40 pound bags of pellets. In addition to facilitating the shift away from oil reliance, this initiative has attracted manufacturing and jobs to Upper Austria and has made the state into the foremost supplier of wood boilers to the rest of Europe.

The False Promise of Wood-fired Power and CHP:

It is understandable that policy makers would look favorably to Vermont’s forests as a source of fuel for producing renewable electricity. What could be more natural for a state that is 80 percent forested? Fortunately, due to the leadership of the Biomass Energy Resource Center and others, we now have a good understanding of the inherent problems of wood-fired power plants and can see why this technology should not be pursued. The Report appropriately recognizes this fact and recommends that stand-alone wood-fired power plants not be pursued (**Recommendation 21** says that CHP, not stand-alone power, is “recommended for all new electric generation plants using woody biomass”).

The inescapable problem of wood-fired power plants, using commercially available steam turbine technology to make electricity, is their extremely low efficiency in converting Btus in wood to kWh of electricity. The world's largest wood power plants, at around 65 MW, have efficiencies of about 30 percent. The smaller the plant's capacity the lower its efficiency. At 10 MW, the efficiency of steam-cycle power production from wood is around 10 percent. Clearly, the idea of scattering a number of small, stand-alone wood-fired power plants around Vermont makes no sense. Such terrible waste of the valuable forest resource would be too great.

What about combined heat and power? There is a general belief that CHP is always a good idea because it produces two energy outputs (heat and power) from the same fuel input. This understanding is based on the model of natural gas CHP technologies. However, wood-fired CHP is a completely different technology and operates at much lower efficiency.

The only truly commercial wood-fired CHP technology uses the same steam cycle as wood-fired power production. The problem is that this technology produces anywhere from three to ten times as much heat as electricity. It is inherently suited only for heat-led CHP, where the application is primarily intended to produce heat and electric production is secondary to the heat load. The Report correctly acknowledges this in **Recommendation 12**.

So far in my analysis the Report has got it right in its understanding of the efficiency question and of the necessity for heating prioritized above power production. Where the report falls short is in its implied over-assessment of the extent of the potential opportunities for heat-led CHP and its leaving the door open to hugely inefficient wood-fired power plants masquerading as CHP plants.

Vermont, as a non-industrial state, has very few year-round really large heat loads. They occur in the forest products industry and perhaps in a few large settings with industrial-scale process heat requirements. The Report, in **Recommendation 12**, correctly calls for identifying these applications and putting in place incentives to create truly optimized wood-fired CHP systems in these locations.

The Report is full of recommendations that imply, in its treatment of permitting, incentives and regulation, that we can get a lot of wood-fired power production by identifying and building CHP systems (**Recommendations 12, 17, 18, 19, 20, 21, 22, and 23**). I think that this creates an unrealistic expectation.

I believe that Vermont needs to get over the idea that our forests will source a new addition of renewables to the task of replacing Vermont Yankee and fossil-fired generation. We should stop looking to woody biomass as a big player in solving our future power needs.

The Role of MacNeil:

MacNeil Generating Station has played an overwhelmingly important role in the development of biomass energy in Vermont and – with its mandated wood procurement standards – has been arguably the most important force for sustainable harvesting in the wood baskets from which it draws its fuel. Unfortunately, MacNeil, as a stand-alone, steam-cycle power plant, will never be able to waste less than

70 percent of the wood it consumes. MacNeil now wastes something like 300,000 tons of low-grade wood each year.

I strongly recommend a committed, funded program to create the MacNeil-based Burlington district heating system that has been under discussion and development for decades. The future of MacNeil, in the early 21st century, must be to turn it into the heart of a heat-led CHP system that supplies the heating needs of downtown Burlington, UVM, Fletcher Allen, and the adjoining residential and commercial neighborhoods of the city. This could be one of the strongest recommendations the Report has to make. This would be a signature project that puts Vermont on the map for our commitment to climate change action, increased efficiency, reduction in fossil fuel consumption and sustainable use of forest resources.

A Comprehensive Wood Energy Efficiency Standard:

The simplest way to address the issues of efficiency and waste of the forest resource is to establish a “floor” level of efficiency for all future thermal, CHP and power uses of woody biomass. **I recommend that the state adopt an across-the-board 50 percent minimum efficiency regulation for wood-fired energy sited in Vermont at all scales from residential to industrial/utility.** This regulated floor efficiency should apply to all applications regardless of whether or not they fall under currently regulated activity.

We need to keep clearly in mind this fact: 50 percent efficiency for a wood-using facility means that half the wood delivered to the facility is wasted – a loss and a drain on our valuable forest resource that we cannot afford, particularly in the future world (described above) where the external demands on Vermont’s forests are certain to increase dramatically. Imagine a world in which half the harvested wood and half the trucks that came through the mill gates of our sawmills deposited those logs in piles out behind the mill to rot, never to be made into useful products. We would not allow this waste in the forest products industry and we should not allow it in the energy industry.

The Report incorrectly leaves the door open to much lower efficiency wood-fired power plants that masquerade as CHP plants by adding some level of thermal use, such as pellet production, large-scale greenhouses or co-locating new industries with large year-round process heat loads (**Recommendation 22**). The question of how to treat such proposals is easily answered by the 50 percent minimum efficiency standard. The Report correctly recommends that the PSB be the regulatory gate-keeper on the question of the design efficiency of any wood energy facility that proposes to produce power (**Recommendation 19**).

The Report introduces the idea of a tiered schedule of efficiency levels as the basis for program incentives (**Recommendations 16 and 22**) to “reward greater efficiency.” This excellent idea should be applied to all new wood energy facilities: a 50 percent minimum efficiency regulation for all thermal, CHP and power with tiered incentives to “reward greater efficiency.” As noted above, the central idea of this program should be expanded to recognize that the required funding for incentives will need to be

large enough to effectively stimulate the daunting transition inherent in reducing our fossil fuel dependency by 90 percent by 2050.

The wood efficiency incentive program will need to be crafted to recognize the special case of district heating, which brings the goal of biomass heating to downtown areas where it will be impractical if not impossible to install building-by-building stand alone wood heating plants, either pellet or woodchip fueled. Large district heating plants have the added advantage of scale for installing order-of-magnitude more efficient emissions control equipment, compared to small building-by-building wood plants.

Tim Maker Qualifications

Tim has a career in energy efficiency and renewable energy in Vermont starting in 1980. He has been a project manager for woodchip heating systems in schools and other applications for 25 years. Since 1986 he has been a voice in policy formation and implementation for responsible wood energy projects. He was project manager for half the early school woodchip projects in Vermont, and has written an influential guidebook on institutional woodchip heating as well as a guidebook for decision makers of municipal district heating systems. He was the founding executive director of the Biomass Energy Resource Center, where he worked for eight years, and a founding director of Renewable Energy Vermont. He is currently principal of Community Biomass Systems, a project development and project management company located in Montpelier. He has worked nationally in biomass energy policy development, education, and project implementation since the mid-1990s. He has directly managed projects in Vermont, Maine, New Hampshire and Montana and played an indirect role in the establishment of many other biomass energy systems around the country. He has been a frequent speaker at Vermont and national conferences and is closely connected to the biomass thermal industries in Canada and Europe. He served on a Care International team to restore wood heating infrastructure in Kosovo after the war there in 1999. He was nominated by the US Forest Service and served a three-year term on the joint USDA/DOE Biomass R&D Initiative Technical Advisory Committee that worked on liquid bio-fuel development under the previous administration.

To: Aaron Adler
From: Ted Verrill, Beaver Wood Energy
Sent: 12/12/11
Re: Comments on Biomass Working Group Draft Final Report

BEAVER WOOD ENERGY

December 12, 2011

Biomass Energy Development Working Group
Legislative Council
State House
115 State Street
Montpelier, VT 05633-5301

Re: November 21, 2011 Public Review Draft of the Biomass Energy Development
Working Group Final Report

Beaver Wood Energy LLC ("BWE") is pleased to offer its perspective on the Draft Final Report of the Biomass Working Group. As you may know, BWE is currently developing the Fair Haven Renewable Energy Center in Fair Haven, VT - a combined heat and power ("CHP") facility consisting of a 34 MW biomass electric generating facility, a 110,000 ton per year wood pellet manufacturing facility, a hydroponic crop facility and possibly other steam users.

First, we applaud the efforts of the Working Group in addressing its legislative mandate and the scope of its recommendations. While BWE believes that it can meet the suggested forest sustainability guidelines set forth by the Biomass Working Group in Appendix A to the Draft Final Report on a theoretical level, we also appreciate the concerns of foresters and landowners in trying to put such guidelines into affect. It may be more appropriate to require foresters to follow good forest management practices (part of their expected licensing requirements), rather than stipulate in legislation some formulaic or percentage harvesting requirements difficult, if not impossible, to implement in practice.

Second, we support incentives for the biomass industry, including the adoption of favorable power rates for biomass electric generating facilities. We also strongly believe that the development of biomass energy promotes significant local job creation, increases state and local tax revenues, fosters overall economic growth, is an efficient use of an indigenous resource and offers the potential for many value-added products

(see 7 a. - i. of Appendix I) - therefore, the use of biomass resources in applications that best meet these objectives should be preferentially encouraged. In particular, we support the suggested application of the 'optimal design system efficiency' standard by the PSB in Section 248 proceedings. We would propose that for CHP facilities that must acquire permits under multiple regulatory regimes - such as Section 248, Section 250 and/or other - any hurdle cleared in one proceeding be sufficient to satisfy a similar hurdle under other proceeding(s), and that any such CHP facility could proceed under multiple regulatory regimes simultaneously rather than seriatim - saving both time and money. We are also pleased with the Working Group's recommendation for further state support of pellet manufacturing.

While the foregoing expresses our views on the recommendations of the Draft Report, we would be remiss if we did not point out what we believe to be factual errors, as well as provide a warning regarding the affect of expected EPA MACT regulations.

The first complete paragraph of the Draft Final Report introduces the premise that Vermont's forest resources are limited. While that premise may be generally true, we find the specific enumerated available forest resources in the Draft Final Report to be significantly understated. From comments made by one of the foresters at the December 6 public hearing and from the forest resource study conducted by our expert, *annual forest growth in Vermont exceeds BERC's 'moderate scenario' many times over.* Therefore, we suggest that the Final Report refrain from placing unnecessary usage restrictions on Vermont's forest resources.

The 5th sentence of the aforementioned paragraph on page 7 of the Draft Final Report, reads as follows - "A currently proposed combination electrical-generation and pellet plant would, if permitted and constructed, demand over 500,000 tons per year." It's rather clear that this sentence refers to the BWE Fair Haven facility. What's unclear is the reference to the use of '500,000 tons per year', which does not identify whether such feedstock is high-value, low-value or other. In addition, because of this lack of clarity, the reader is drawn to the conclusion that 500,000 green tons of wood out of 900,000 green tons of wood available annually (as established by the BERC study) is being used by one facility. This reading was made abundantly clear by speaker references to this example at the December 6 public meeting. *We would request that this sentence be removed from the Final Report, or modified to reflect actual wood usage at the BWE Fair Haven facility, as follows.* BWE will *only* use forest residue (tops, limbs, branches and bark), as well as some diseased, crooked and invasive trees as feedstock for its electric generating facility - to which BWE will agree to stipulate. The BWE electric generating facility will not be using what the Working Group or BERC defines as woody biomass typically

used for either 'high-value products' (saw logs and veneer) or 'low-valued products' (firewood and pulpwood). Thus, BWE's Fair Haven facility will not "... demand over 500,000 tons per year" of either 'high-value' or 'low-value products', but instead, will use wood otherwise available for 'low-value products' - or approximately 200,000 tons per year - for only the wood pellet manufacturing facility at Fair Haven. Since the feedstock study conducted by our wood supply expert concluded that only 40% of the total pellet feedstock requirements of the Fair Haven facility are likely to be harvested from Vermont forests, only 80,000 tons of wood otherwise available for 'low-value products' would be diverted to the Fair Haven facility. This is significantly less than the misidentified 500,000 tons.

As you may know, EPA has undertaken the task of crafting emissions regulations for various types of boilers used to generate electrical, thermal and process power - boiler 'maximum achievable control technology' (MACT) rules - for industrial, commercial and institutional boilers and process heaters. BWE has been monitoring these rules with interest for the potential affect that they may have on our Fair Haven facility. Of late, it appears that EPA has agreed to take another look at such rules as they affect biomass facilities in particular. While our Fair Haven facility will likely satisfy such air emissions standards as currently contemplated with its expensive and extensive emissions control devices in place, such is not typically the case for thermal only applications of biomass boilers. For example, biomass boilers for space heating in schools, office and government buildings or process heating for manufacturing facilities would currently be subject to the MACT regulations. In order for these facilities to comply with the proposed regulations, significant pollution control equipment would be required at a cost that could make such thermal uses of biomass uneconomic. We bring this to the Working Group's attention given its recommendations for further use of biomass thermal applications.

Sincerely,

Beaver Wood Energy LLC

To: Aaron Adler
From: Schuyler Gould
Sent: 12/12/11
Re: Attention: BioE Working Group

This is an elaboration of my remarks before the BioE Group on December 6th. It concerns the development of a new product and industry, biochar, in conjunction with the new guidelines being developed for the biomass industry in Vermont.

Biochar is a carbon-rich soil amendment, produced through pyrolysis of a variety of materials, in particular of a readily available renewable resource in Vermont, our mixed hardwood and softwood forests. One production model for biochar uses the attendant by-products of heat, biogas and bio-oil directly to produce electricity—efficient on one level though necessarily adding significant startup costs to a facility. Nevertheless, there is much that recommends this model, whether as a self-contained facility or as an adjunct to one which has electricity as its primary output.

While its production on an industrial scale is still in its infancy in this country, biochar has great promise as a means to retard the leaching of soil nutrients, to make them more available for plant growth, and to increase a soil's ability to retain water. Ongoing trials are proving its ability to reduce the need for phosphorus-based fertilizer by as much as 40%. Because of its long term stability in soil, it can in some production models result in a net gain in carbon sequestration while also decreasing soil emissions of nitrous oxide and methane, both major greenhouse gases and air pollutants. There are presently numerous initiatives to develop standards for the product as well as for its use in the field, but the first among equals for all things biochar seems to be the International Biochar Initiative (IBI). Biochar Northeast was born at the Northeast Biochar Symposium at Amherst, MA, but is presently based in Vermont, with members from across New England, New York, and Pennsylvania. There are numerous participants in Vermont conducting field trials (UVM, Shelburne Farms, Goddard College). There is a strong working group at the Pioneer Valley Biochar Initiative in conjunction with the University of Massachusetts in Belchertown, MA. Overall, there are dozens of initiatives across this country and around the world addressing the exciting potential of a product used for thousands of years but only now beginning to be understood and utilized in a scientific way.

Setting standards for production and use is a necessary precursor to its being accepted in the marketplace on a large scale, and yet such standards are difficult to arrive at without large scale trials conducted in the communities which will be using the product. Development of the industry is therefore necessarily an incremental process requiring increasing production while at the same time nurturing the markets that can use the product.

The need for such a product is apparent, particularly in Vermont. Phosphorus pollution abatement in Lake Champlain has been a tough nut to crack. Despite lofty goals set in 1995 to reduce phosphorus loads by 25% per five-year period over the next twenty years

in order to attain “in-lake phosphorus concentration criteria” deemed necessary for a healthy ecosystem, and the expenditure of over \$100,000,000 to achieve these goals, improvements in all areas of the lake have been modest at best. Water quality monitoring from 1992 to 2007 by the Lake Champlain Basin Program confirms this. While there has been some pointed success in reducing point source pollution, this currently accounts for only 5% of the load. And while there has certainly been success in reducing nonpoint source pollution, continued urbanization of agricultural and forested lands with its attendant pollution has resulted in virtually no overall improvement in the criteria. A 2008 review of the health of the lake indicates a need for a 45% reduction in the present phosphorus load in the Lake Champlain Basin.

The 2010 update of the pollution prevention, control, and restoration plan, [*Opportunities for Action: An Evolving Plan for the Lake Champlain Basin, sponsored by the Lake Champlain Basin Program administered by a consortium of U. S. and Canadian state and federal agencies*](#), includes a thorough review of all the issues related to phosphorus abatement as well as an extensive plan of action. However, there is no mention of the benefits of using biochar as a soil amendment, whether for urban landscaping, home and garden use, or commercial agriculture, and even if it were wholly understood that biochar could be a significant tool in the abatement of phosphorus in the Lake Champlain Basin, where would one get it?

At this stage in its development, the biochar industry is focused on smaller pyrolysis systems to provide biochar, heat, and possibly electricity for use by the producer. Biochar is certainly available on the open market, but it is expensive with delivery adding significantly to its cost. But the market is growing. As noted, there is a concerted push by the International Biochar Initiative to standardize the characterization and utilization of the product with such driving innovation in production technologies and, ultimately, demand as costs come down.

While there seems to be no method of power generation that doesn't have its “issues,” and this would include Vermont's own biomass plants in Burlington and Ryegate, there is much that recommends the further development, and hopefully better management, of Vermont's aging forests as a resource for the production of, amongst other things, wood pellets, electricity, and, I suggest here to the Committee, biochar.

I am ill-equipped to judge the merits of Beaver Wood Energy's proposed power plants or to characterize the controversies surrounding them. However, if there is any virtue in their basic model of electricity generation and wood pellet production from waste wood, then the production of biochar can only add flexibility to the model, both in general and in particular in terms of an industrial facility like those proposed by Beaver Wood Energy. I understand from one of the nation's leading experts in biochar research (Tom Miles of **T.R. Miles Technical Consultants Inc.**, tmiles@trmiles.com) that a “piggyback” pyrolizer running in conjunction with a wood boiler power plant can turn three tons of biomass into one ton of biochar and volatile gases (fed into the

boiler) with energy equivalent to that produced by one ton of biomass. You effectively get one ton of biochar out of two tons of biomass. In the larger picture, one ton of biomass generates approximately one megawatt of electricity. It should be noted that an efficient pyrolyzer in such an arrangement is between 5% and 10% less efficient at energy production, should it be adjusted to produce just volatile gases (and ash), than an efficient wood boiler. Importantly, a production pyrolyzer can be operated at less than full capacity, thereby allowing it to respond to the demand (hopefully increasing) for biochar.

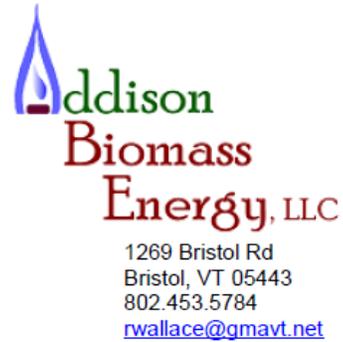
Obviously this is a simplification of the entirety of processes required to deliver a usable biochar product. However, the coupling of a pyrolyzer with a biomass power plant could be the key to kick-starting a substantive biochar industry in Vermont (there is at least one commercial producer of biochar in Vermont). The attendant benefits could be great. New technologies for the production of biochar and new research into its use have proven that the use of biochar can contribute in an essential way in these critical times to the remediation and productivity of our soils, the sequestering of carbon, the reduction of other harmful greenhouse gases, to reducing pollution and the preservation of our water supplies, and to the production of renewable, locally generated electricity.

Whatever the larger picture of the potential of biomass in Vermont's energy future, it seems prudent that the BioE Group consider biochar, and the facilitation of its production and use, in the context of the development these new guidelines.

Thank you.

Schuyler Gould
45 Granite Street, #3
Barre, VT 05641
802-479-7227
skygvt@aol.com

To: Aaron Adler
From: Roger Wallace, Addison Biomass Energy
Sent: 12/12/11
Re: Comments - BioE Working Group Report



December 12, 2011

Biomass Energy Development Working Group
C/O Aaron Adler, Legislative Counsel
133 State Street
Montpelier, VT 05602

Via email:

RE: Written comments on the draft final report

I wish to thank the Working Group for all the diligent work that has been done on the report and for the opportunity to comment on the final draft. The group has worked long and hard on this draft. I'll try to keep my comments brief in recognition of the effort that has been contributed so far.

I am an engineer that has been working on renewable energy systems and energy analysis for several decades. I have been working directly in the renewable energy industry for almost 20 years and I have worked in biomass energy sector for the past 7 years. I have worked in renewable energy long before it was a highly profitable industry and my comments reflect social and environmental concerns more than business concerns.

The following two pages contain my comments and they are referenced, where possible, to Appendix I of the draft final report. Supporting documentation for the following comments can be provided upon request.

Thanks again for your efforts.

Sincerely,

Roger Wallace, E.E.
Engineering Project Manager
Addison Biomass Energy, LLC

8. The legislature should assign major priority to home heating with wood. In particular, tax policies advantageous to solar and wind projects should be extended to biomass consumers. Such tax advantages would be applied to the purchase of efficient heating stoves, furnaces, and boilers, and to district heating.

COMMENTS: Biomass, from a combustion and particulate emission perspective, is a low rank coal. If Vermont is not careful, we could convert an energy issue to a health issue. EPA wood stove regulations have not changed since 1988. Wood stove regulations have not been updated more for political reasons than for scientific or technology reasons. Numerous wood heating appliances are “exempt” from EPA regulations including many pellet stoves, wood furnaces and indoor wood boilers. The air quality in my local community has decreased significantly after many home owners have installed new wood stoves and pellet stoves since 2007. Further, it is my understanding that Rutland is very close to becoming an EPA nonattainment area due to particulate emissions from wood combustion. The Working Group should link recommendation 8 to recommendations 25 & 26. One possible method to create this linkage would be to-

- have the wording of recommendation 8 clearly reference recommendation 26 and,
- modify the wording of recommendation 26 to include appliances regulated by numerical emissions standards that are greater than 20 years old.

10. The state should support new wood pellet manufacturing facilities in Vermont that are dispersed among various areas around the state. Project developers should be provided with information and guidance regarding the state’s regulatory process.

COMMENTS: State support (tax credits, grants, low-interest loans, etc.) for new wood pellet manufacturing facilities should come with conditions that will protect Vermont’s energy security. Pellets are an internationally traded energy commodity often sold to the highest bidder. The majority of pellets produced in North America are shipped to Europe and Europe has positioned itself to be the high bidder for pellets in the future. Vermont is very near a major pellet export pathway- The Saint Lawrence Sea Way.

One means of better ensuring Vermont Energy Security may be to qualify state support as follows. After specific minimum owner salaries and profit thresholds are met, any pellet manufacturing facility that accepts state support must, in perpetuity, prioritize a minimization of average product transport miles (miles/tons produced) over larger profits and larger salaries of owners. This type of conditional support would allow the owners of a new pellet facility to make good salaries and realize reasonable profits. However, it would obligate them to serve their local community instead selling to the highest bidder once good profitability is obtained. A reporting and auditing mechanisms would need to be established and safe guards against selling to nearby reseller would need to be put in place.

11. The General Assembly should require all pellets sold in Vermont to label their product as to moisture content, weight, list of ingredients, and suitability for various heating systems.

COMMENTS: Standardized laboratory testing of wood pellets, regularly obtained by pellet manufacturers, also includes the measurement of ash content (percent by weight) and heating value (BTU/lb or metric equivalent). These two parameters are much more important to end users than a “list of ingredients” and more specific that “suitability for various heating systems.” The General Assembly should also require that all pellets sold in Vermont include ash content and heating value parameters in the required product labeling for the benefit of the end user.

16. The Clean Energy Development Board, in consultation with the Department of Public Service (DPS), should develop recommended incentives for woody biomass thermal energy that use a tiered structure that rewards greater design system efficiency with a larger incentive in comparison to less efficient systems.

COMMENTS: In addition to being a policy document, the Working Groups report will also be a de-facto technical document. Industry groups will attempt to persuade legislators, state agencies and any other organizations responsible for establishing or implementing the recommended policies & practices what the Working Group's intents are and how to interpret the report's wording. There is a specific danger around any reference to "efficiency," especially when it is connected to financial incentives. Please don't leave any easy loopholes. Too many shenanigans have occurred and will continue to occur around the definition of "efficiency." When the definition of efficiency is manipulated, the end user suffers and energy is wasted. Many different measures of efficiency exist; some are standardized and some are not.

Different interpretations of efficiency measures have been detrimental to end-users time and time again. The classic example of selling a large boiler with a very high AFUE efficiency rating into a low heat load application is well known. There is one Vermont, biomass specific example I wish to provide here. There are installed wood chip and wood pellet boiler systems in Vermont that have good "design system efficiency." However the systems are often way too big for the buildings in which they are installed and the realized seasonal efficiency is much, much lower than the facility owners expected. The system vendor made more money, the project engineer made more money, the architect made more money, but the facility owner (often a school district along with the Vermont school construction aid program) has paid too much money for a less efficient system.

Many different measures of efficiency and qualifying terms used in the various industries interested in this report- combustion efficiency, thermal efficiency, seasonal efficiency, LHV and HHV are a few examples. Please use these terms as necessary, add a glossary and remove potential loopholes in the recommendations.

On a related note, "system efficiency," which is a very imprecise phrase, should include the total system; from biomass harvest to final delivered energy. The state would also benefit from a metric that tracks the ratio of delivered energy to the amount of fossil fuel energy used to harvest, process and transport biomass energy products.

Wood Procurement Standards (under Section C, Forest Health)

COMMENTS: There are numerous recommendations for "wood procurement standards" focused on forest health issues. The recommend attributes should also include standards focused on biomass fuel quality that will help increase operational efficiencies, particularly in situations where a "compliance officer" is assisting a school, small scale district heating project or office building complexes in which the end user may not be well trained in biomass procurement. For example, procurement standards for chip fire facilities should include requirements such as maximum & average moisture content, minimum energy density and accurate measurement of delivered quantities. Such requirements would be very beneficial for less knowledgeable buyers and help mature the market.

In addition, in this day of inexpensive and easy to use moisture meters, truck integrated scales and smart phone applications; selling wood by the cord or by the ton is an antiquated policy that is often detrimental to the end user. Definitions similar to ASME standards for fossil fuels should be developed such that would be ultimately purchased by the BTU's delivered and not by a unit of weight or volume. The moisture content in wood is not constant and therefore, any definition should use a low heat value (LHV) basis.

To: Aaron Adler
From: Center for Biological Diversity, Partnership for Policy Integrity and Vermont Sierra Club
Sent: 12/12/11
Re: Biomass Report Comments



To: Biomass Energy Development Working Group
From: Center for Biological Diversity, Partnership for Policy Integrity and Vermont Sierra Club
Date: December 6, 2011
Re: Comments on Report on the Future of Vermont Biomass

In response to today's hearing and your call for public comment, we would like to respond, in brief, to the Biomass Energy Development Working Group's report on the future of biomass energy in Vermont. We are concerned that your plan, which calls for significantly increased biomass energy production, would threaten Vermont's forests, the health of Vermont citizens, and the greenhouse gas reduction goals set by the Vermont state legislature.

1) The Threat to Vermont Forests

The current proposal for expanded biomass power will significantly increase forest cutting in Vermont, beyond any level that might be considered sustainable. Current data, including studies from the Cary Institute of Ecosystem Studies and the Biomass Energy Resource Center indicate that Vermont's forestlands available for logging are already being cut at close to maximum potential – and yet bioenergy facilities proposed in the state would require nearly 1.5 million tons of additional wood a year, with the Beaver Wood Energy facility proposed for Fair Haven itself requiring in excess of 500,000 tons of wood a year. In addition, biomass harvesting is by definition a more intensive form of harvesting which can have detrimental effects on a range of ecosystem values. There is no protective harvesting standard in place, and no analysis or understanding of how this harvesting, increased in both volume and intensity, would affect the long-term health and diversity of Vermont's forests.

2) The Threat to the Health of Vermont Citizens

Burning wood is a potent source of particulate matter, as well as other pollutants that contribute to ground-level ozone. The pollution profile of wood is similar to and in some cases even greater than that of fossil fuels. Vermont already has asthma rates above the national average, with the Centers for Disease Control rating Rutland and Burlington as having some of the highest asthma rates in the country. The health impacts from wood burning are so great that the American Lung Association recently adopted a position

opposing the use of biomass for energy. Increasing the number of biomass facilities in Vermont would negatively impact air quality and the health of state residents.

3) *The Threat to Vermont's Greenhouse Gas Reduction Goals*

While the Biomass Energy Development Group report is equivocal on the issue of carbon emissions from biomass, and at one point implies that they are “carbon neutral,” current understanding is that harvesting trees for energy emits more carbon than fossil fuels – even when wood is harvested at “sustainable” levels. The State of Massachusetts is putting in place regulations that will restrict biomass eligibility for renewable energy credits, having recognized that net emissions from biomass energy are excessive in light of near-term greenhouse gas reduction goals.

The Vermont legislature has adopted an initial goal of reducing greenhouse emissions by 25% below 1990 levels in 2012, with even larger cuts to follow. These goals will be fundamentally undermined by new biomass facilities that will actually increase carbon emissions.

#

In conclusion, we believe that rather than promoting the exploitation of forests for fuel, the State of Vermont needs to adopt the precautionary principle. Vermont's trees and forests are invaluable for sequestering carbon, preventing soil erosion, keeping our air and water clean, providing habitat for myriad animals and plants, and keeping the state beautiful—which among other things protects our tourist economy. Our forests have far more value alive than cut down for dirty, low-efficiency fuel.

Until such time as there is a solid understanding of how much wood is realistically available without diminishing the long-term health and diversity of Vermont's forests, and scientific analysis of the impact of utility-scale biomass facilities on human health and on climate change is included in any energy plans, we must recommend a moratorium on any new biomass energy facilities.

Our organizations welcome the opportunity for further dialogue with the Working Group on this critical issue, and would be pleased to present you with the scientific analysis underlying our concerns and conclusions. We can be reached as follows:

Mollie Matteson, Conservation Advocate, Center for Biological Diversity (802) 318-1487; mmatteson@biologicaldiversity.org

Mary Booth, Director, Partnership for Policy Integrity - (917) 885-2573; mbooth.pfpi@gmail.com

David Ellenbogen, Chair, Vermont Sierra Club (802) 363-6868; pianomath@gmail.com

The Center for Biological Diversity is a national, nonprofit conservation organization with more than 320,000 members and online activists dedicated to the protection of endangered species and wild places. The Center maintains its Northeast office in Richmond, Vermont.

The Partnership for Policy Integrity (PFPI) is a New England-based organization using science, policy analysis and strategic communications to promote sound renewable energy policy.

The mission of the Sierra Club is to explore, enjoy and protect the planet. Vermont Sierra Club has 3,000 members.

To: Aaron Adler
From: Ann Ingerson, The Wilderness Society
Sent: 12/12/11
Re: Biomass Report Comments



December 12, 2011

Aaron Adler, Legislative Counsel
Agatha Kessler, Committee Assistant
Biomass Energy Development Working Group
(via email at aadler@leg.state.vt.us)

Re: TWS Comments on Public Review Draft of Biomass Energy Development Working Group Final Report, Released November 21, 2011

Dear Vermont Bio-E members:

Thank you for the opportunity to comment on the draft of your final report to the Vermont Legislature. We believe that this report offers an opportunity to contribute to a consensus about high-priority uses of Vermont's forest biomass resources for energy production, while protecting other forest values that Vermonters care about. We understand that your mandate from the legislature was specifically to promote biomass energy development. We urge you to also consider the broad costs and benefits of biomass energy development, and support only those policies that create clear social and environmental benefits rather than promote development for development's sake.

We commend the committee for urging resource protection through a combination of voluntary and mandatory harvesting standards, recognizing environmental and social limits to wood supply, and prioritizing the most efficient and socially beneficial uses of the resource. These positions could be stated even more clearly and we suggest some specific improvements in the following pages. Our major points concern:

- Feedstock supply estimates must be realistic and recognize the **value of intact forests** for carbon storage, wildlife habitat, recreation, and other values. Rather than *assume* that it is in the best interests of the state to maximize wood flowing to this relatively low-value use, Vermont should increase its wood energy capacity in gradual steps over time as monitoring increases confidence in our assumptions about future forest growth and broader ecosystem and social impacts.
- **Monitoring** to assess the impacts of expanded biomass use on Vermont's forests must go beyond FIA-based wood inventories to include impacts on **forest productivity and biodiversity**. The effects of repeated whole-tree removals should be assessed through long-term field monitoring on a variety of sites. A biodiversity assessment would require more thorough

mapping of habitat and species, understanding of climate change vulnerabilities, and assessment of cumulative impacts on non-threatened species that could become threatened through incremental habitat destruction. Funding for monitoring and enforcement of procurement standards (see below) should be built into newly permitted energy uses through a fee on large-scale users.

- Because it will take time to fully understand impacts, expanded biomass use must be governed by strong **procurement standards** that protect soils, residual stands, and biodiversity. The report draft is unclear as to whether standards should be voluntary or mandatory. We recommend mandatory standards for operations above a set volume (tentatively 5,000 green tons) of wood use - including both end users and wood providers who deliver to multiple smaller facilities. Smaller operations should be urged to voluntarily follow the same standards, which should be published jointly with Vermont's revised water-quality AMPs. Regional coordination will be critical, since Vermont is likely to both import and export energy wood.
- Policies should prioritize the **most efficient uses** for a limited wood supply and favor **smaller-scale distributed** facilities. Efficiency requirements should be tied to any wood energy subsidies, including building envelope efficiency standards as a prerequisite for new wood heat conversions. State support for electricity generation from wood should require a minimum of **50% energy conversion**. This would require a thermal component, which would favor advanced technologies located near energy users, rather than subsidizing an already-mature technology and reinforcing the current pattern of large-scale generation which requires long-distance transport of wood and costly transmission capacity.
- Permitting of new wood energy facilities should be suspended until the state develops a carbon accounting methodology that assesses actual net change in atmospheric greenhouse gases due to increased biomass combustion. Estimating the atmospheric effects of combustion emissions over time requires tracking **forest carbon changes due to increased bio-energy use**. Such an assessment must compare forest carbon stocks under proposed bio-energy scenarios to an expected trend without such uses.
- Policy priorities should consider the employment potential for alternative wood energy applications and should address equity concerns arising from **impacts on current wood users**. The state should better understand its **firewood and home heating sector** before instituting new policies that could have unintended consequences on this important but poorly documented wood use.
- Incentive programs for expanded use of wood energy should be contingent on maintaining or improving local **air quality**. Where appropriate, incentives should require improved emission controls in new facilities, or mitigation through improving existing equipment, to ensure no net degradation of air quality. (For instance, a biomass facility might finance a wood-stove swap program to install EPA-certified wood heat equipment in area homes to offset its new emissions.)

Comments on specific report passages follow.

p. 7 1st paragraph: The state-wide ratio of growth to removals is an inadequate indicator of whether a given level of removals is sustainable, for all the reasons listed in the draft. Sustainable wood flows should ideally be assessed by tracking growth:removal ratios on the subset of forested acres that are under active commercial timber management. Inventory increases on acres not managed for timber should not be allowed to mask decreases on accessible acres.

p. 7 end of 2nd paragraph: *“Some of what is now sold as firewood or pulp could easily be diverted to competing uses.”* As acknowledged later in the report, such a market shift could harm current and potential users of wood heat, many of whom may be at the lower end of the income spectrum. Public subsidies should not advantage one market segment over others unless justified by over-riding public and environmental values that are not recognized in the marketplace. In this case, it is not at all clear that subsidized uses of wood for energy produce greater benefits than existing low-tech low-cost home heating uses.

p. 7 end of 2nd paragraph: *“Finally, not all of a new plant’s supply will necessarily come from within Vermont—imported wood from adjacent states is likely.”* It is equally likely that wood from Vermont will be exported to other states. This is particularly true for northern Vermont given the planned 75 MW Burgess Biopower electric facility in Berlin, New Hampshire, which will be the largest wood-burning plant in the northeast; it may also be true for areas within trucking distance of New York or Quebec.

p. 8 last paragraph: The moderate scenario for the revised BERC wood supply indicates slightly *under*, not *over*, 900,000 green tons available wood. The assumptions behind this scenario are fairly optimistic in that they assume that 30% of owners with parcels <50 acres and 75% with parcels >50 acres will be willing to cut biomass. The National Woodland Owners survey for 2002-6 indicates that only 17% of the state’s family forest parcels <50 acres and 47% of those >50 acres have owners who intend to harvest any wood (<http://fiatools.fs.fed.us/NWOS/tablemaker.jsp>). Some landowners may be particularly reluctant to allow whole-tree harvesting to sell low-value biomass.

p. 11 3rd full paragraph: FIA measures a selected panel of plots each year, with full measurement of all plots every five years (pending sufficient funding). Hence estimates actually lag conditions on the ground by several years, and reporting of data from this source should not imply that estimates correspond to the last year of the series. Because of the multi-year lag in FIA data, and very limited forest health monitoring plots, rapid assessment of forest health changes will need to be monitored some other way. Whole tree harvesting, likely to be the most common harvest approach for energy wood, has been utilized to a limited extent across Vermont’s forest landscape. Permitted or subsidized wood energy uses should not immediately utilize the full available supply, but should rather be implemented gradually to allow course corrections as we learn more about impacts.

p. 12 Recommendation 2: Funding is needed not only to continually evaluate FIA data results, but also to monitor many other factors that affect forest productivity, ecosystem health, biodiversity, and forest carbon stocks. We support the report recommendation of a fee on wood users to help fund this effort.

p. 12 Recommendation 3: Economic research should include improved information about Vermont’s substantial home firewood sector – both demand and supply sides.

p. 13 1st paragraph: Thank you for clearly stating the limited role that biomass harvesting, or in fact any commercial harvesting, may play in supporting good forest management: *“Still, healthy forests that preserve and enhance these values in many cases may benefit from management, and in the process of accomplishing this management, biomass for energy may also be made available.”* This sentence

should be highlighted for emphasis, as it clearly depicts the ideal role for a biomass energy market in facilitating good forest management. It also indirectly points to the danger that large long-lived centralized energy facilities, possibly with favorable sales contracts adjusted for wood costs (as is the case for the Burgess Biopower plant in New Hampshire) may over-ride good silviculture in the drive to fill the wood yard regardless of forest conditions and land management priorities.

p. 13 end of 2nd paragraph: We agree with the Committee's conclusion that transportation fuels are not the best use of wood energy feedstocks. We are puzzled that the same conclusion does not seem to apply to electricity. Conversion efficiency is actually higher for liquid fuels (with some uncertainty due to immature technology) than it is for stand-alone electricity. Furthermore, very little of Vermont's greenhouse gas emissions are from electricity - the majority are from transportation, with heating close behind - so prioritizing greenhouse gas reductions would seem to rank electricity even lower than liquid fuels.

p. 14 consideration d: Maintaining timber harvesting infrastructure should also give consideration to the potential for small firewood processing businesses with low barriers to entry to provide employment that is widely distributed around the state.

p. 14 consideration f: Value-added forms of wood energy can in fact bring increased profits to the state, but this may not be true for businesses established by outside investors, as is usually the case for very large facilities. When Vermonters are the consumers of the products (true for the most part for home heating), less added value, and hence lower prices, may actually be preferred. Some consumers may prefer the convenience of pellets, for instance, but a public subsidy for that option would be justified only if there are greater social and environmental benefits, a matter which bears investigating. Employment potential, emissions from transportation and manufacturing as well as combustion, ability to use lower-grade wood, and lower capital equipment costs should all be considered before instituting policies that favor pellets over traditional firewood.

p. 16 Electrical Generation. It is unclear why the Committee favors establishing an additional electrical wood facility of a specific size or location. It is unlikely that a single wood-fired plant would eliminate the need for new transmission. Demand reduction, smart grid technologies, distributed generation at homes and businesses, and other non-transmission alternatives are the best solution to transmission bottlenecks for high-use hotspots.

It is also unclear that a large facility is needed to "anchor" a supply network. For a given limited supply of low-quality energy wood in a region, multiple small users (pellet plants, industrial CHP, district heating, home firewood users) could support the same supply network as a single large user. Rather than supporting a supply network that *serves* smaller buyers, a large facility with a guaranteed long-term electricity contract would most likely *compete* with smaller users and drive up the price (this possibility is mentioned almost as an afterthought in the next paragraph). Over time, as oil prices rise and more small users enter the market, such a large user would reduce wood heating opportunities for homes, schools, and other smaller users. Rather than encourage a large new "anchor" facility, the state might better encourage new investments in the supply chain by coordinating markets so that smaller wood suppliers and users develop in synch.

Other disadvantages for a single large-volume user such as an electrical or biofuel plant include: added transportation emissions and truck traffic involved with a centralized facility drawing from a very large wood basket; and more concentrated particulate pollution when large volumes of wood are burned at a single location.

p. 17 mid-page: We agree that home heating with wood should be a policy priority for Vermont, especially if aging stoves are replaced with clean-burning and more efficient ones. Any subsidies for wood heating equipment should be packaged with weatherization assistance to reduce total heat needs. Programs should also evaluate local conditions and monitor concentration of wood heat sources to avoid degrading winter air quality.

p. 17 end-page: Please explain the term “residual BTUs” and the mechanism of a charge on energy inefficiency. The Committee should consider other creative funding options such as financing installation of efficient wood heat technology through fuel dealers who recoup the investment through a surcharge on pellet or firewood sales over time. On a side note, LIHEAP should not be funded by siphoning off weatherization investment dollars; this is a very short-sighted approach to meeting the heating needs of Vermonters.

p. 18 2nd paragraph: Promotions for CHP and district heat should include a caution about particulate emissions, how to assess whether they will be important in a particular project location, and recommended ways to minimize them.

p. 18 4th paragraph: If state aid is re-activated for school wood heat conversions, funded schools should be required to bring building envelopes up to a high standard of efficiency in order to conservatively size new heating equipment.

p. 18 5th paragraph and p. 21 2nd paragraph: Tiered subsidies for wood heating equipment of increasing efficiency may be appropriate, but the lowest eligible level should set a high bar. Public funds should not be used to subsidize currently available technology, but should incentivize development and installation of superior equipment and support the public good by minimizing the stress on our forests. Incentives should require at least 50% efficiency for CHP and 75% efficiency for heat, with those levels ratcheting up over time as technology improves.

p. 19 4th paragraph: Section 248 permits apply for the most part to facilities that affect the state’s land, air and water for many decades. An extended permitting process may be needed to thoroughly investigate all costs and benefits and provide for meaningful public input. Rushing a project through permitting is likely to lead to bad decisions, increase antagonism between proponents and opponents, and undermine Vermont’s generally civil approach to civic engagement. We would not support an abridged process for large utility-scale projects.

p. 19 5th paragraph: The Committee has not sufficiently demonstrated that additional financial incentives are needed to promote biomass energy development in the state. Rather than initiate a new set of subsidies that could have unintended consequences and stretch an already-stretched state budget, it would be helpful to investigate actual suspended projects - such as pellet facilities proposed in

Island Pond and Lyndonville - to identify specific obstacles. Wood heat conversions have proceeded relatively rapidly under current market conditions and are likely to accelerate on their own as oil and propane prices rise. Gradual development allows all segments of the market to develop in concert, and gives agencies time to monitor impacts.

p. 21 1st paragraph: Thank you for recommending that Vermont's SPEED program retain a 50% efficiency standard. This standard, with a higher bar for heat, should apply to all wood energy subsidies.

p. 21 last paragraph: Policies that encourage conversion of chunk stoves to pellet stoves should consider total efficiency and emissions for the entire energy system from forest to heated building. Pellet systems have less ability to use tops and branches, require more transportation to and from the factory and often to retail facilities, and require energy for drying and pelletizing and operating the pellet stove. In some cases, a pellet technology may be a clear improvement in efficiency and emissions, but public funds should not be used to encourage conversions unless the advantages are clear.

p. 22 last paragraph: "Forest health" is sometimes confused with commercial forest productivity. A "healthy" natural forest may contain many diseased and dying trees (see the attached article by Raffa 2009). Adjusting stand density and removing low-grade stems may promote increased commercial timber value, and biomass markets may help finance those activities. But that is not necessarily equivalent to improving forest health – hence the need for solid procurement standards and monitoring. Please consider using a term that more accurately describes the actual management goal.

p. 30 2nd paragraph: We support the application of voluntary harvesting guidelines to all timber harvest operations. The concerns addressed by these standards are valid regardless of the markets to which wood is shipped and it makes sense to maintain a level playing field among alternative wood uses. These should be disseminated along with water-quality AMPs.

p. 28 No. 1 Making standards purely voluntary is highly unlikely to lead to widespread compliance. Harvesting standards should be mandatory for large wood users and processors (perhaps those which handle or burn more than 5,000 green tons per year).

p. 28 No. 2 and p. 31 3rd paragraph: Verification as described on p. 28 is really self-verification, not "independent" verification as implied on p. 31. Given the low value of biomass and the high cost of third-party verification, some level of self-reporting by operators or users will probably be necessary, but spot checking by public employees will be important to ensure that this system is working.

p. 29 last full paragraph: We support the concept of a fee on wood users to fund the necessary agency staff to monitor mandatory compliance and promote voluntary compliance with harvesting standards. This fee should be pro-rated by wood volume and should apply to large-scale processors as well as large end-users (while avoiding double-charging for the same volume of wood).

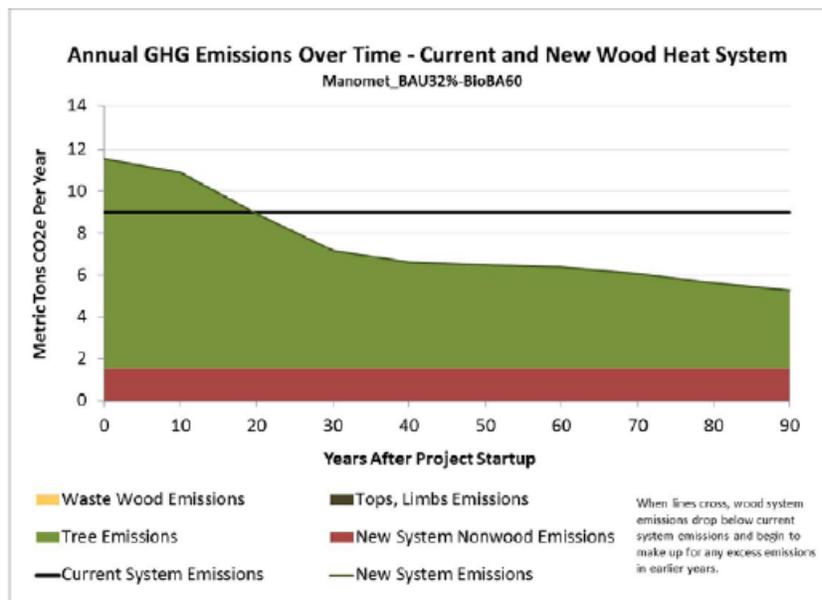
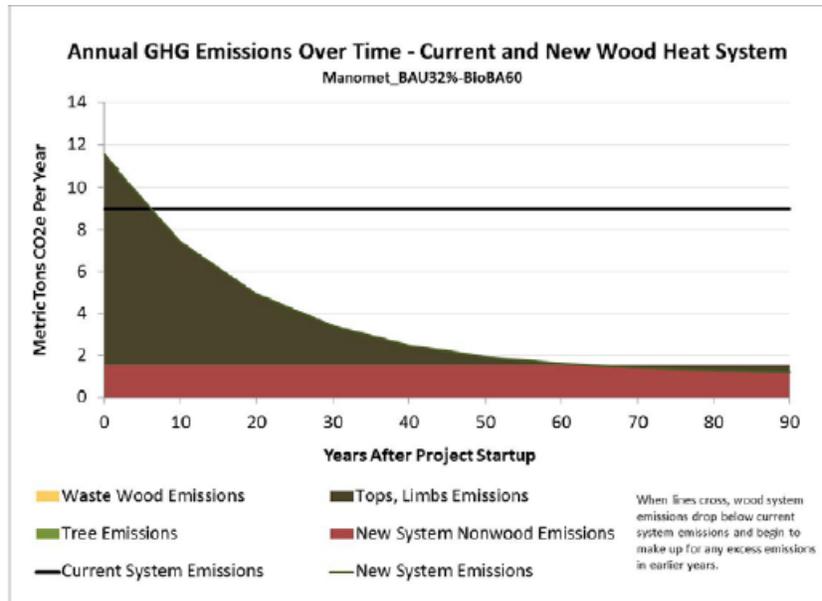
p. 31 v: We agree that regional coordination of harvesting standards is critical. In particular, the new Burgess Biopower plant in Berlin, NH, which will be the largest wood-fired electricity plant to-date in New England in a location with already-tight wood markets, will likely draw large volumes from northern

Vermont that will presumably not be subject to procurement standards imposed on Vermont wood users. The plant is required to demonstrate sustainable practices, and Vermont may be able to influence the standards applied to wood from our state.

p. 32 last paragraph: Since this section mentions the Public Service Board, it apparently refers to electrical facilities, which typically have efficiencies less than 25%. It is unclear what “optimum” fuel efficiency would mean in this context. A consistent minimum efficiency threshold of 50% would be appropriate for *all* types of bio-energy applications in order to prioritize uses with the best energy yield; the entire quantity of usable wood in Vermont could easily be absorbed for space heating alone with conversion efficiency of 65-85%.

p. 33 1st full paragraph: We disagree with the first part of this statement and heartily agree with the latter: *“A carbon debt is less likely if the forest ecosystem has been maintained in equilibrium or has a growth-to-harvest ratio greater than 1:1 (Strauss 2011), though the science is still exploring this question.”* U.S. EPA is currently investigating how to assess net emissions from biomass combustion for purposes of regulating greenhouse gas emissions. Their Science Advisory Board had three days of lively discussions in late October, during which members presented many challenges to EPA’s initial proposal to consider biomass “carbon neutral” when regional growth exceeds removals. See attached The Wilderness Society’s comments to EPA on the proposed framework, and our suggestion for an alternative approach.

The remainder of this paragraph is confusing (understandable, as carbon accounting is a complex undertaking!), and could be supplemented with a bit more detail on which sources of wood likely have lowest emissions over time. The charts below are from a tool developed by The Wilderness Society to compare emissions from a wood heat system to those from a fossil-fuel based system (oil in this case). They illustrate two characteristics of biogenic emissions: 1) they are higher than fossil emissions at the stack (a “carbon debt” due to high moisture, inefficient combustion, and high C:H ratio); and 2) they decline over time as long as source forests grow on average more rapidly than aging unmanaged stands (this long-term “dividend” of rapid regrowth depends on forest type and condition, silvicultural practices, whether the same land base is cut once or repeatedly, etc.). In general, use of tops and limbs from current harvest operations has less GHG impact than cutting of new whole trees because these materials have a more rapid turn-over if not burned for energy. (Use of these residues needs to be limited to protect forest productivity and biodiversity, which is what a good procurement standard should do.) Under the particular assumptions modeled, the “payback period” at which the dividend repays debt and the wood system starts to lower overall emissions is 13 years for logging residues and 50 years for expanded harvest of whole trees.



p. 34 first recommendation: GIS data are only as good as the field surveys that generate the raw information. Any state’s natural heritage database is necessarily incomplete because agency staff cannot cover every acre of the state. In addition to enhancing the GIS database with more complete information, part of the procurement standard process should require agency staff to map the area and update the natural heritage database when necessary.

p. 35 last paragraph: As ANR develops a greenhouse gas accounting protocol, please recommend that the agency incorporate stakeholders and the public who may have experience and expertise to offer. Permitting of large new biomass projects should be suspended until this accounting system is in place.

p. 36 Harvesting Guidelines: Guidelines should recommend no whole tree harvesting on steep slopes.

p. 36 No. 5 Vernal pools should be explicitly included in the list of wetland types requiring a buffer. Please define “buffer” – is this a no-disturbance no-harvest zone, or are some removals and some roads and crossings permitted under restricted conditions? If these standards are to guide field practice, buffer widths and definitions will need to be provided.

p. 36 No. 7 In addition to minimizing litter layer disturbance, operations should minimize damage to residual stands – a clear hazard with expanded whole tree harvesting.

p. 36 No. 10 20% retention is well below what is recommended by the Forest Guild (a minimum of 25-33%). We recommend changing this to one-third for cuts removing one-third or less of basal area, with higher retention required for heavier cuts or on sensitive sites. Guidelines should also recommend operating in winter or leaving materials to dry down on-site before skidding to maximize dropping of leaves and needles in place.

p. 36 Nol. 11 Please clarify the meaning of “organic matter”.

p. 36 No. 12 The second sentence under this point is not helpful to practitioners making decisions on the ground. If the Committee wants to offer this point as an advisory to agency staff developing procurement guidelines, perhaps it could be a footnote.

p. 37 No. 17: Please clarify: Is this newly-cut material an addition to the retention of tops addressed on the previous page? Does this refer to large stems only?

p. 37 No. 19: Language on invasives provides little guidance for action. How is presence or threat of invasives likely to affect recommended biomass harvesting practices?

Appendix E Wood Energy Pros and Cons p. 47

We suggest adding the following pros and cons:

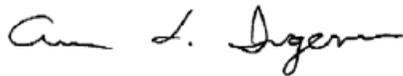
- Pellets cons:
 - costs are high not only for fuel but also for capital equipment (somewhat higher than for fossil fuel heating equipment and much higher than efficient chunk wood stoves);
 - higher transportation costs and emissions due to transport to the manufacturing plant, and often to a retailer, before eventual delivery to the site of use;
 - substantial electricity needs for pelletizing, in addition to energy required for drying feedstock (this portion is similar to the energy used in a wood chip furnace or boiler to drive off excess moisture, but wood stoves burning well-seasoned wood don't require drying energy).
- Electrical generation cons:
 - concentrated emissions due to combustion of large quantities of wood at a single location.
- Residential firewood pros:
 - low barriers to entry for processing businesses;

- possible to use low-tech harvest equipment that minimizes soil and stand damage;
- activity – and hence employment – well distributed across the state, with potentially low transport;
- lowest cost to home-owner for both equipment and fuel cost;
- reduced total energy use due to incidental zoning (room with wood stove kept warmest while remainder of dwelling is cooler, cooler temperatures at night).
- Residential firewood cons:
 - higher emissions if older stoves are used, or if stoves are operated improperly or green wood is burned.

* * * * *

Thank you for the opportunity to comment. We look forward to the final report, and to following up with legislative proposals that emerge from its recommendations.

Sincerely,



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PERSPECTIVE

A Literal Use of "Forest Health" Safeguards against Misuse and Misapplication

Kenneth F. Raffa, Brian Aukema, Barbara J. Bentz, Allan Carroll, Nadir Erbilgin, Daniel A. Herms, Jeffrey A. Hicke, Richard W. Hofstetter, Steven Katovich, B. Staffan Lindgren, Jesse Logan, William Mattson, A. Steven Munson, Daniel J. Robison, Diana L. Six, Patrick C. Tobin, Philip A. Townsend, and Kimberly F. Wallin

"Forest Health" has become one of the most widely used terms in ecosystem management. Its popularity derives from powerful personal imagery, connecting the fragility of health with ecosystems. It addresses a need for an efficient term to describe the vitality of the world's forests, a usage we support. However, broad adoption has brought multiple usages, not all of which correspond to the term's literal meaning or convey such clarity of intent. Although "Forest Health" makes no reference to human expectations, these values are often inserted, suggesting a natural order is at risk if particular preferences are not met.

This disjunct arises when three overlapping but distinct concepts are conflated: pest management, sustainability, and ecosystem functioning. The term "pest" is intrinsically tied to human expectations, defined as an organism that interferes with our management objectives. When native bark beetles kill large numbers of trees in commercial plantations, they're pests. But if they do likewise in a wilderness area, they're not pests, even though some people might disapprove of their actions. If they kill trees in a national forest managed for multiple uses, they're pests in regard to some human values but not others.

"Sustainability" likewise refers to human objectives, specifically the degree of utilization that can be achieved without diminishing the resource below its steady production capacity, or degrading associated resources. The US Forest Service (2004) defines sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The Society of American Foresters (SAF) (Helms 1998) uses a similar definition, emphasizing a forest's ability to maintain its essential functions "in the context of human activity and use." Whether a particular degree of utilization is sustainable depends on multiple factors, including some species with which we have competing interests. Various human expectations can conflict, so "sustainability" should only be used in the context of specific needs, activities, or uses.

"Ecosystem functioning" is independent of human expectations, referring to the collective processes of resident species interacting with each other and the physical environment. Windstorms, wildfires, and insect outbreaks are among many natural disturbances

that play essential roles in forest ecosystem function. They can release plant growth, alter nutrient cycling, and increase food resources, all key processes operating within normative limits of resiliency (Folke et al. 2004). A major lesson of the 1988 Yellowstone fires was that native ecosystems can recover quickly from seemingly catastrophic disturbances (Turner et al. 2003).

Current understanding of ecosystem dynamics suggests that factors compromising inherent processes and resilience should be emphasized when evaluating forest health. Understanding a system's limits requires knowledge of patterns, processes, interactions, and responses to external drivers. Some forces that threaten to drive ecosystem functioning beyond limits of resilience include climate change, invasive species, atmospheric pollution, soil erosion, and fragmentation. Not only are these external drivers significant threats by themselves, they also can alter ecosystem dynamics to cause native species to become emergent threats.

Edmunds et al. (2000) tabulated seven widely used definitions of "Forest Health." Five make no mention of human objectives, but rather emphasize two primary themes, ecosystem functioning and resilience. The other two, and that of SAF (Helms 1998), also include these themes, but superimpose terms such as "perceived" condition, "unusual levels of disease," and "land management objectives." However, those themes are already included within, and are more fitting to, definitions of pest management and sustainability. Kolb et al. (1994) described how the origins of "Forest Health" were rooted in concepts of "ecological integrity," but subsequent definitions were broadened to include human values.

Broadened definitions have recently become even more pervasive and are often used to drive policy. For example, the Healthy Forest Restoration Act (2003) emphasizes economic and other anthropocentric values while presenting a title that suggests otherwise. A supporting White House includes statements such as "Rather than renewing forests, these (catastrophic) fires destroy them," contrasting with most contemporary views on disturbance ecology, ecosystem functioning, and resilience (e.g., Turner et al. 2003, Folke et al. 2004).

Another source of misapplication arises because "Health" is most commonly associated with individuals (or collectively to populations), especially humans (Kolb et al. 1994). Policies that allowed treatable human diseases to go unchecked would be unconscionable. But extrapolating from that connotation to ecosystems is invalid. Disturbance may be required for functioning of an ecosystem as a whole, even while detrimental to some individual organisms. Furthermore, recovery from a disturbance can extend beyond the lives of individual community members. Also, the reduced abundance of one species often favors the increase of another. Hence, the presence of dying and decomposing trees is not necessarily indicative of an unhealthy ecosystem and often promotes a rich diversity of species and functional groups.

In contrast to naturally functioning ecosystems, agricultural and intensive forest production systems have specific management objectives, and their success can be defined accordingly. They can provide valuable environmental services and be sustainable, exert substantial environmental costs and be unsustainable, or show various combinations thereof, depending on how they're managed. However, they are not "healthy ecosystems" in the sense of functioning within the range of natural variability. That does not diminish their value. In fact, they would rightfully be deemed failures if allowed to behave

naturally, because their purpose is to provide essential human benefits at the expense of other ecological processes.

We identify three adverse effects of incorporating human expectations into terms, such as "Forest Health," that do not explicitly express them. First, this disjunct can be exploited to blur debates on government policies. For example, if one is free to espouse that an insect is inherently harmful to forest health without having to specify whose economics and expectations are being impaired, then advocating on behalf of vested interests can be replaced with a vague portrayal that "the environment" is being threatened. This can lead to policies and practices that detract from the values of others, or even become real threats to forest health. Second, failure to provide accurate modifiers for each context in which "Forest Health" is used causes misunderstanding (Kolb et al. 1994). Contradictions between what a term literally means and how it is employed generate distrust among the public, needed allies in safeguarding both ecosystem function and sustainable management. Third, revisionist usages create an ever-shifting boundary. For example, expansion of human structures into forest margins poses well-documented threats to forest ecosystems. But if we define "Forest Health" in anthropocentric terms, then the threat (habitat fragmentation) becomes the object of protection, and it falls to management agencies to interrupt those forest processes that incur cost, inconvenience, or danger to individuals choosing to live at the human-wildland interface.

A misrepresentation of our views might be used to argue that managing forests for multiple human values is somehow inferior to natural processes. To be clear, forest products and services are essential for our well-being, and judicious management can provide a combination of material, ecological, sociological, and spiritual values. But we oppose obscuring these goals within terms not denoting them.

We encourage the distinct-singular use

"Forest Health" only when describing the extent to which ecosystem processes are functioning within natural historical variability. We recommend that appropriate modifiers, such as "Forest Health and Sustainable Management," be attached whenever the term is coupled with human expectations.

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EPA Scientific Advisory Board Biogenic Carbon Emissions Panel

c/o Dr. Holly Stallworth

Designated Federal Officer (DFO)

SAB Staff Office

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Attn: Draft Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources

October 18, 2011

Dear EPA Scientific Advisory Board Biogenic Carbon Emissions Panel:

Thank you for this opportunity to comment on The Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources, released September, 2011. The discussion section of EPA's draft framework outlines many of the core issues involved in accurately accounting for these emissions. We appreciate the clear analysis of such a controversial and complex issue. However, the methodology ultimately proposed actually repeats past errors in treatment of biogenic emissions by crediting bioenergy with the growth of forests that would occur anyway. That is a logical error, and one with important implications. According to Pan et al. (2011)¹ forests globally offset significant anthropogenic emissions and "there are extensive areas of relatively young forests with potential to continue sequestering C in the future in the absence of accelerated natural disturbance, climate variability, and land use change". EPA's proposed framework would allow biomass energy expansion to completely eliminate this important forest sink before emissions are recognized and regulated, resulting in much higher atmospheric carbon levels.

The first section of our comments examines the claims made for the reference point baseline. The second examines spatial and temporal issues. The third highlights sources of uncertainty in the proposed reference approach. The fourth addresses some of the computational challenges related to

¹ Pan, Yude, Birdsey, Richard A., Fang, Jingyun, Houghton, Richard, Kauppi, Pekka E., Kurz, Werner A., Phillips, Oliver L., Shvidenko, Anatoly, Lewis, Simon L., Canadell, Josep G., Ciais, Phillipe, Jackson, Robert B., Pacala, Stephen, McGuire, David A., Piao, Shilong, Rautiainen, Aapo, Sitch, Stephen, Hayes, Daniel. 2011. A Large and Persistent Carbon Sink in the World's Forests. Science Express, 10.1126/science.1201609.

proposed parameters and equations. The final section proposes an alternative approach for the Scientific Advisory Board to consider.

1. Baselines

The reference point baseline does not distinguish the emissions effects from a permitted facility from the many other influences on forest carbon stocks in a region. The next several pages of these comments respond to specific passages in the draft framework that we believe misrepresent the advantages of the reference baseline approach.

p. 25 “Reference Point: If stocks increase or remain constant from that level, then this approach would conclude that the biogenic feedstock source region itself is not contributing to an increase in CO₂ concentrations, and therefore stationary source emissions of CO₂ from consumption of biologically based feedstocks from this region are also not contributing to an increase in CO₂ concentrations.” [emphasis added]

p. 43 This is a simplifying assumption, however, because other significant factors—unrelated to the production of biogenic feedstocks—may influence changes in land-based carbon stocks. These factors range from anthropogenically induced factors such as land-use change (e.g., urbanization) and timber harvest for roundwood, forest management decisions that might increase or decrease carbon stocks in a given area, to natural disturbances such as insect infestation, storm damage, drought, and fire. As long as carbon stocks on land are increasing, this contribution of other factors does not change the methodological result because, in the aggregate, depletion of carbon stocks caused by all other factors, including harvest of biogenic feedstocks for use in stationary sources, is balanced by sequestration” [emphasis added]

The logical inference made in these passages does not hold true. EPA is tasked with regulating emissions from stationary sources, not with regulating emissions from regional forest landscapes. Hence the biogenic emissions methodology must not only indicate whether emissions from forests across a region are increasing or decreasing, it must indicate *which activities* caused a *net* increase so that EPA can fairly regulate those under its jurisdiction. Biomass utilization is just one among many influences on forest carbon levels. Using an analogy from statistical analysis, we need a multiple regression, not a simple regression or correlation, to tease out the impacts of the various independent variables on the dependent variable of forest carbon stocks. Since it is impractical to project forest growth, management practices, pest and disease cycles, competing wood uses, etc. on a regional scale, the only practical way to specify the net effects of additional bioenergy wood use is through forest growth and harvest modeling both with and without the proposed bioenergy use (see suggested approach in Section 5 below).

p. 27 “The reference point approach answers the question “is the region gaining or losing carbon to the atmosphere?” More specifically, it asks “is the theoretical condition required for biogenic feedstocks to have no net CO₂ impact on the atmosphere from losses of land-based biomass (i.e., that land-based carbon stocks are not declining) being met?” The answer will show whether the atmosphere gained or lost CO₂ from, at least in part, production and use of the biogenic feedstocks in a region.” [emphasis added]

Constant or rising carbon stocks across a region are *neither a necessary nor a sufficient condition* for biogenic feedstocks to have a negligible net CO₂ effect. The phrase “at least in part” in the selection above points to the difficulty. *Multiple* anthropogenic and natural forces influence whether a region’s forest carbon stocks are increasing or decreasing. An *increase* due to the *combination of all these influences* cannot rule out the possibility that biomass utilization, *in isolation*, is *slowing* that increase. Conversely, increasing regional carbon stocks are *not* a theoretical condition required for biogenic feedstocks to have no net CO₂ impact. It is entirely possible for a region to be *losing* net carbon (for instance to severe unnatural fire), but for biomass operations in the region to *reduce that loss* by reducing fuel loads.²

p. 42 “If carbon stocks were historically constant or increasing and continue to do so, then the reference point baseline approach would show that the biogenic feedstock source region—and the associated use in the stationary source itself—is not contributing to an increase in net CO₂ concentrations, and therefore stationary source emissions of CO₂ from consumption of feedstocks from this region are also not contributing to an increase in net CO₂ concentrations.” [emphasis added]

“Constant or increasing” are treated in this passage as equivalent states, but they are not. If carbon stocks were *constant* in recent years, and they continue to be stable after new biomass energy facilities begin operating, *with all other uses held constant*, then there is valid reason to believe that the biomass operations are not increasing net atmospheric CO₂. However, if carbon stocks were *increasing* in recent years, and we expect them to continue increasing, then a transition to *constant* stocks after biomass energy facilities begin operating represents a *net emission*. A fixed reference point baseline would permit newly-established biomass facilities to slow or even halt the process of carbon accumulation in forests recovering from past disturbances, without any regulation of the net emissions that result.

p. 41 “This framework seeks to quantify the annualized net CO₂ emissions associated with using biogenic feedstocks in stationary sources at the regional scale. This is done by analyzing landscape-level changes in carbon stocks, consistent with the way carbon debt is described by Fargione et al. (2008) and Zanchi et al. (2010). In the framework, the “debt” is factored into annualized net emissions.” [emphasis added]

This passage implies that the proposed framework is consistent with treatment in Zanchi et al., while in actuality this source clearly supports the methodology suggested in section 5 of these comments. Carbon debt is not actually acknowledged by the draft framework until it accumulates to the point where it reduces forest carbon across an entire broad region.

p. 27 “For this reason, any GHG mitigation policy affecting terrestrial sequestration or biogenic CO₂ emissions would likely need to estimate future emissions and sequestration levels in scenarios with and without the policy in order to assess its possible impacts. Either the anticipated future or the comparative approach could be effectively employed in such situations. Because both approaches use projections of future emission levels, the uncertainty inherent in those projections

² Studies of the net effects of fuels reduction thinning on long-term carbon stocks have yielded variable results – leading many researchers to conclude that the effects are too uncertain to be incorporated in a standardized accounting system.

would need to be considered and addressed appropriately. In the case of carbon stocks on land, uncertainties are related to modeling and extrapolation, as well as to the potential for unexpected future events, both biophysical and economic.” [emphasis added]

p. 28 “Conversely, the reference point approach allows for assessment of whether the atmosphere gained or lost CO₂ from a particular region. This approach is useful for situations that do not require an evaluation of the possible impacts of a specific policy or program, but rather seek a measurement of what has or has not occurred on the landscape. Such an approach will implicitly incorporate, for example, historic trends in forest stocks, current forest management conditions, and other demands for biogenic feedstock materials that could influence carbon stock changes. [emphasis added]

As illustrated by these passages, EPA does acknowledge the usefulness of a “with-and-without” approach for some purposes, but it does not recognize regulation of stationary source GHG emissions as one of those purposes. We agree that a “with and without” approach is necessary to assess the effectiveness of policies designed to decrease GHG emissions. We believe that regulation of biogenic GHG emissions is such a policy – like regulation of criteria pollutants, regulation of GHG emissions is intended to reduce those emissions by limiting them at each source. We concur that the modeling required for such an approach is uncertain, but measurement of current carbon stocks is equally fraught with uncertainty (see Section 3 below).

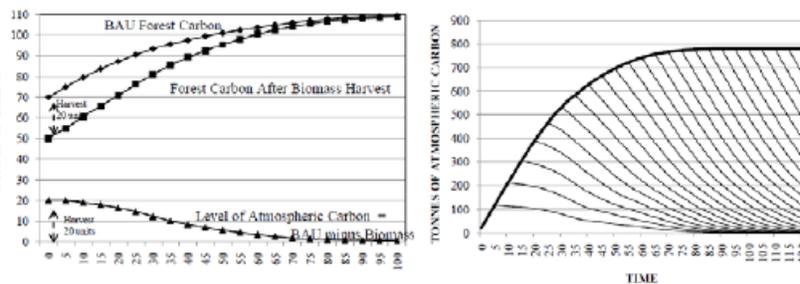
The draft framework describes three alternative baseline approaches, and explains why the other alternatives are not recommended. The discussion of alternate baseline approaches is unnecessarily confusing because it fails to distinguish differences in basic accounting assumptions from differences in methodology appropriate to distinct research questions. We believe that Fargione et al., Searchinger et al. and Manomet (as well as Zanchi et al., which receives less attention) are all compatible approaches that differ only in response to the demands of contrasting research questions.

- Fargione et al. (2008) assessed the carbon impacts of land conversion to supply feedstocks for biofuels. Fargione et al. arbitrarily defined the loss of carbon over 50 years as the carbon debt, assuming that the new lower carbon equilibrium will be established by that date (though most of the debt occurs much more quickly during land clearing operations). That debt is repaid by reduced fossil emissions over time. Fargione et al. calculations are on a per-hectare basis, and they do not address the question of how much conversion would result from each unit of biofuel produced, a critical component of assigning land use emissions to a production facility. In order to use their approach to regulate stationary source emissions, it would be necessary to establish a without-biofuels baseline of land conversion rates, and assess net emissions based on a change to with-biofuels conversion rates (presumably higher) – then multiply additional hectares converted by the per-hectare carbon debt.
- Searchinger et al. (2009) build on the Fargione et al. approach by acknowledging a broader set of land management changes incentivized by bio-energy uses, including those that fall short of land conversion. They explicitly introduce the need for a comparison of emissions with and without bioenergy uses in order to assess net GHG impacts. *“Bioenergy therefore reduces greenhouse emissions only if the growth and harvesting of the biomass for energy captures carbon **above and beyond what would be sequestered anyway** and thereby offsets emissions from energy use. This additional carbon may result from land management changes that increase plant uptake or from the*

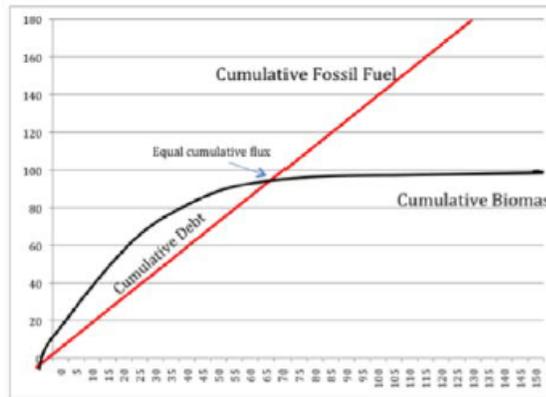
use of biomass that would otherwise decompose rapidly” (Searchinger et al. 2009). [emphasis added]

- The Manomet (2011) approach is very similar to the previous two, but in the Massachusetts context changes in land management that fall short of actual conversion represent the major source of carbon debt. They omit soil carbon impacts, and consider only the immediate losses of forest carbon due to increased intensity of harvest removals during previously-planned operations. Though their initial modeling was done at a stand level, they have also aggregated stands up to a landscape scale for a plant operating continuously over time (see right-hand chart below).

Spatial and Temporal Aggregation of Stand-Level Plots



Landscape Scale Cumulative Carbon Debts & Dividends



From Walker, Tom. November, 2010. Manomet & Biomass: Moving Beyond the Sound Bite. Presentation to: Clean Energy States Alliance

Despite the fact that forest carbon impacts occur on multiple stands over time - unlike the mostly-one-time conversion impacts considered by Fargione et al. - a new landscape-wide carbon equilibrium is eventually reached. (This example assumes that the new biomass use continues indefinitely but does not expand in scale. Modeling also assumes a single harvest on each stand –

repeat harvesting before forest carbon fully recovers on managed stands would delay the equilibrium point but would reduce the total acreage required to feed a facility). As for Fargione et al. the landscape carbon debt is repaid over time by reduced fossil emissions.

For EPA's anticipated application, we believe that Fargione et al., Searchinger et al. and Manomet all support a projected baseline that considers likely trends in terrestrial carbon stocks without a contemplated new use, then considers carbon stocks with the new use, and calculates net impacts as the difference between the two. The common thread is the projection of the without-biomass and with-biomass situations over time. Despite the uncertainties involved with such projections, this is the only legitimate approach to determining net effects of a particular contemplated wood use. By emphasizing the differences between these studies, EPA overlooks a growing consensus around biogenic carbon accounting among scientifically rigorous assessments.

2. Importance of Spatial and Temporal Factors

Aside from appropriate baselines, net emissions should be assessed at an appropriate scale and with explicit recognition for changing emissions over time. The results of the draft framework depend strongly on the defined *regional boundaries*, as illustrated by the New Hampshire case study. Regional definitions will be subject to intense political pressure and influence. According to the text on p. 39, *"the framework quantifies the changes in carbon stocks on the landscape where the biogenic feedstock is produced or collected."* On the contrary, the proposed framework does *not* restrict analysis to the landscape where the feedstock is produced. Rather, it combines that landscape – where forest carbon impacts may occur – with a much broader region where compensating changes may mask impacts in a specific facility woodshed. Consistent with BACT determinations for individual plants, assessment should be based on conditions *within the woodshed of each individual plant*.

The discussion on p. 24 about excluding reserved and "nonworking" lands further highlights the difficulties of defining appropriate spatial limits for a regional reference baseline.³ Clearly, biomass plants operating in a region should not count sequestration on reserved lands, which would occur regardless of the level of biomass removals, as an offset to their emissions. The same difficulty applies to forestland that is not reserved but is not actively managed – for instance, smaller woodlots surrounding rural residences that are held primarily for nontimber purposes. If emissions

³ *"Ideally, an accounting framework would allow for a distinction between "working" and "reserved" lands. For instance, if all forestland is included in the calculation of changes in carbon stocks, then intensive harvests on "working" forests could be offset by carbon sequestration on "reserved" lands. However, there is an active debate about just what constitutes the working forest land base (i.e., Alig et al., 2002). Some fraction of the land base is "reserved" by legal limits on logging, and there is clearly a significant fraction of the remaining forest land that is not available for harvest because of a wide range of biological, physical, legal, economic, and social concerns (Buchholz et al., 2010; Butler, 2008). These limits on the availability of working forest land are difficult to quantify and may vary over time. For example, the increasing "parcelization" of forest land (i.e., subdivision into smaller ownerships) is generally assumed to reduce the land available for harvest because harvest operations are impractical on very small landholdings. The minimum effective size of a working forest may well change over time, however, with changes in harvest technology and/or commodity prices" (Draft p. 24).*

were assessed as the difference between with-biomass and without-biomass projections under conditions appropriate to a particular facility's woodshed (for instance by scaling up the Manomet stand level approach to incorporate multiple stands over succeeding years), it would not be necessary to delineate working and non-working lands on the landscape.

Aside from supporting the concept of a without-biomass baseline, the Manomet approach also emphasizes the importance of emissions timing. On p. 22⁴ the EPA draft framework describes the Fargione et al. carbon debt concept as a permanent debt, never repaid as long as the land use conversion is permanent. But even a temporary debt affects the climate during the time period before it is repaid. And even without permanent land use changes, if a new debt is incurred with each year's additional biomass combustion, the net effect is a permanent debt (lower equilibrium forest carbon stocks) until those operations are shut down and the source forests have time to fully recover. That temporary effect must be reflected in emissions regulations. Ignoring it would be equivalent to exempting particulate emissions from regulation because they eventually settle out of the air where people no longer breathe them in. The methodology hedges as to whether even a permanent debt due to land use change must be addressed in emissions regulations.⁵ The assumption that temporary emissions are not significant is illustrated by the following statement, which indicates that a delay in reabsorption by source forests is irrelevant to carbon accounting.

p. 33 "Re-growth in a sustainably managed forest would result in sequestration on a time scale concurrent with harvest removals." [emphasis added]

Given a sustainably managed forest – presumably meaning growth equals removals – adding a new bio-energy use will inevitably lower carbon stocks, at least temporarily, until a new equilibrium is reached. We recommend that the Scientific Advisory Board explicitly discuss the significance of the timing of emissions, and its relevance to climate mitigation goals. A consistent treatment should acknowledge the importance of temporary emissions increases, and assign them a relevant value relative to permanent changes.

3. Certainty and Simplicity of Proposed Approach Compared to a Projected Baseline

Regardless of the merits of a reference point versus a projected baseline, or the significance of the region or the timing of emissions relative to forest absorption, EPA's draft seems to imply that a reference baseline is preferred because it is measurable and simple to administer, while a projected baseline would be too uncertain and complex to be practical.

⁴ "The form of carbon debt relevant to stationary source accounting is incurred when there is a reduction in long-term average carbon stocks on an area of land, when the land is converted from a prior land use (typically with high levels of carbon stocks) to a land use devoted to production of a biomass feedstock (but typically with lower levels of carbon stocks). The magnitude of the debt is a function of the difference in the long-term average carbon stocks under the two land uses. The debt is incurred over the period of time that the system moves from the old carbon stock level to the new level, and the change over time can be annualized" (Draft p. 22).

⁵ "As stated earlier, it may or may not be necessary to consider these concepts in an accounting framework for biogenic CO₂ emissions from stationary source" (Draft p. 22).

p. 27 “In essence the first approach [reference baseline] addresses the observable change from the initial condition, while the second and third approaches [anticipated future and comparative] include progressively greater elements of the opportunity cost, which explains what the outcomes would be if alternative futures and different system descriptions are compared. The choice of baseline determines how the comparison with the observed condition is represented, and thus ultimately determines the outcome of the accounting framework.” [emphasis added]

p. 42 “This type of baseline was selected because, in developing a framework for a stationary source to adjust its total onsite biogenic emissions, answering the question “Is there more or less carbon stored in the system (the stationary source and its feedstock-supply source) at the end of an assessment period than there was at the beginning?” is a straightforward way to assess an individual stationary source’s emissions using existing data.” [emphasis added]

These passages imply that the reference point baseline relies on measurable factors, while the other two approaches are increasingly speculative. Simplicity of administration and measurement are irrelevant if the parameter being measured is the wrong one for the task at hand (see Baselines section of these comments). In addition to yielding results that fail to serve the intended purpose, however, an observed change in forest carbon across broad regions is much less certain than is often assumed. The proposed methodology is highly reliant on FIA data. Though FIA data provide the best and most consistent forest inventory estimates of perhaps any country in the world, these data were not designed to track forest carbon stocks or fluxes on a yearly basis.

First, FIA data are subject to relatively large *sampling errors* and the process of making inventories *consistent from state-to-state* is still incomplete. Definitions vary regionally as to what tree volume is incorporated in these measurements (minimum tree diameters, noncommercial species, unsound wood, etc.), and some states are far behind others in adopting an annual schedule. If regions are sufficiently large to provide statistically valid estimates of changes in forest carbon stocks, any marginal change caused by a single biomass facility would likely be well *within the range of sampling error* for this data set. The draft framework case studies use growth and removals estimates to calculate the GROW factor. Growth and removals FIA data depend upon remeasurement of plots, hence sampling errors are higher than for volume estimates – particularly for removals since relatively few plots experience removals during a sampling interval.

Second, the proposed methodology defines the reference baseline using a *single carbon pool* that is most directly related to actual FIA measurements – above ground live biomass. Actual FIA measurements are limited to tree species and diameter and sometimes height. FIA uses allometric equations to calculate tree volume and biomass, and these equations have an associated estimation error that varies depending on the completeness of the data set used to develop each equation. Proxies are used when a particular species has no associated equation. When it comes to biomass and carbon estimates, this adds a new difficult-to-quantify source of error to the known sampling errors.

Finally, valid FIA estimates suffer from a significant *time lag*. Most FIA surveys sample a panel of plots each year and statistically valid estimates require combining data from multiple years of sampling, usually at least five. This is why the methodology proposes using a five-year rolling average to assess the GROW term (p. 54). Any changes due to increased biomass use or other

factors will be fully reflected in the data only 5 or more years after a biomass facility begins operating. The significance of this lag can be illustrated by considering estimates of nonsoil forest carbon from Annex 3 of EPA's 2011 GHG Inventory. The change in nonsoil forest carbon based on the sum of the most recent FIA inventory for each state is reported as -155.9 million metric tons C (negative numbers in this context represent an increase in carbon stocks).⁶ The change for the nation as a whole, based on mean changes from the USFS "carbon calculator" for the years 2000 to 2009⁷, is reported as -166.8 (220.6 total forest minus 53.8 soil). Hence the most recent surveys for each state indicate net forest sequestration that is 7% lower than the reported national average, which incorporates some earlier data years. Assuming this represents a real downward trend, this is a large difference over a short period of time, so a five-year lag in monitoring could result in significant net emissions going undetected.

If future forest carbon levels depart from past patterns, it is unclear whether or how this would affect the permit status of existing plants. If forest stocks begin to trend downward *after* a set of biomass plants has been permitted, the logic of the reference baseline would call for reclassifying those plants as net emitters. Once new plants have been licensed, however, it will be extremely challenging to change course if forest impacts are recognized so long after the fact and such adjustments would increase risk for regulated facilities. The discussion of average versus marginal assessments on p. 29 seems to assume that *only changes caused by new plant capacity* should affect emissions calculations (though how those changes are allocated among wood users in a region is subject to discussion).

We point out these limitations not to criticize the FIA program, which is the best tool of its kind, but to urge the Scientific Advisory Board to carefully examine the assumed measurability and certainty of the reference point baseline, before rejecting any alternatives on that basis.

4. Role of Specific Parameters and Computations in the Proposed Framework

When the draft framework moves from general discussion to specific computations, the weaknesses of the proposed approach become clear in a lack of clarity and the need for ad hoc variables added to the equation to patch obvious loop-holes. Some computational weaknesses are inevitable for a methodology that must approximate field conditions using very incomplete data, but their existence means that the reference baseline is not in practice much simpler or clearer than a projected approach. Several modifications to the basic reference methodology have been proposed to cover obvious loopholes, and these additions render the resulting methodology highly complex and subject to manipulation.

- Total forest carbon stocks include carbon stored in below-ground live tree biomass, understory, standing and down dead wood, forest floor, and soil carbon, yet the reference baseline uses only

⁶ Annex 3 Table A-215. Mean year of data collection was 1994 for New Mexico, 2001 Wyoming, 2003 Oklahoma, 2004 Louisiana, with most states in the 2005-7 range.

⁷ Note that numbers in the "carbon calculator" are extrapolated and interpolated to fill in the years between surveys, so it is unclear precisely which years this average actually represents, but it incorporates some data from survey years just before or after the year 2000 - overall an older data set than the state-by-state data.

above-ground live tree biomass, so the GROW term will not reflect any changes in the other pools. Intensive biomass harvesting could well deplete dead wood and eventually forest floor and soil pools, and these changes would need to be captured in the **SITE_TNC** term of the proposed equation. Bringing site-specific factors into the methodology as an add-on makes computations just as uncertain and complex as a straightforward projection would be. It is unclear how this term will be calculated for a particular facility, nor whether it will be sufficiently broad. The text implies that the methodology will capture these effects.

p. 40 “Depending on the nature and quantity of land that is converted from one land-use type to another, the implications for the change in carbon stocks on land could be fairly minimal to quite large. For example, changes that result from shorter harvest cycles for forests and the impacts of different land uses and management regimes on carbon pools such as live biomass, dead biomass, and soil carbon are reflected in this framework.” [emphasis added]

The case study treatment, however, indicates that changes in management incentivized by new biomass uses will not be fully reflected in the **SITE_TNC** term.

p. 79 “This case study assumes that feedstock was sourced from managed timberland, using established harvesting methods, and thus assumes that there are no changes in site CO₂ emissions or sequestration as a result of the feedstock production.”

- Although the discussion mentions the relevance of feedstock type (waste versus forest residues versus roundwood, for instance), the methodology does not use this information directly to determine net emissions. Instead, the methodology proposes a new term (**AVOIDEMIT**) that reflects “anyway emissions” of waste and residue feedstocks. The proposed framework provides little guidance for quantifying this term. Treatment in the text implies a very broad interpretation of this term, beyond waste sources, that would include virtually any material that has no current commercial market.

p. 30-31 There are occasions when woody biomass may be removed from a forest without affecting markets for commercial roundwood. In such cases, leakage effects are minimal or non-existent, and the alternate fate of this biomass would be loss to management-induced prescribed fire, wildfire, or decomposition. Examples include harvest of pulp-quality biomass for energy purposes in a region where a pulp market is absent, pre-commercial thinning of trees that are not of a merchantable size, low-grade biomass harvests in large areas of forest damaged from insects (e.g., beetle-killed timber), hurricanes, or wildfire. [emphasis added]

Defining the **AVOIDEMIT** term would require, at a minimum, tracking various feedstock sources and calculating rates of decomposition or combustion given alternative fates. It would seem more straightforward to report these feedstock sources separately and apply generic factors that reflect the net effect of immediate combustion versus emissions from alternative uses.

- The text suggests that additional ad hoc adjustments should be made when forest carbon reductions occur that are not related to biomass harvesting.

p. 28 “An accounting framework that seeks to account for carbon stock changes occurring offsite should nevertheless acknowledge the possibility that these exogenous factors are likely to

influence carbon stocks on land and—depending on the policy or program—may potentially attempt to account for these factors.”

p. 43 “When carbon stocks are declining, however, understanding attribution is more important. Arguably, producers and consumers of a biogenic feedstock should not bear responsibility for declines in carbon stocks if other factors are the primary drivers of the decline... Ultimately, the decision about how to handle attribution in situations where carbon stocks are declining is critical but not resolved within this framework.”

The case studies do not employ ad hoc adjustments of this type, but the averaging approach for regions with declining biomass produces much the same result. Case Study 2 Average Method on p. 88 of the draft apportions decreasing forest biomass across all timber users, even when it is a new biomass energy facility that tips the region from sink to source. This method would allow biomass combustion facilities to shift a portion of their emissions impact to unregulated sectors. Facilities in regions with increasing forest carbon do not similarly share credit for increases (which in fact would be illogical since all timber users likely reduce carbon sequestration compared to a non-use reference point). Using averaging in regions with declining forest biomass, while permitting sources in regions with increasing forest biomass to use the full amount of the increase as an exclusive offset, would introduce a double standard which would treat biogenic sources in the most favorable way possible in all cases.

5. Alternative Approach for Consideration

The key element of a biogenic emissions accounting framework must be an assessment of how feedstock sources offset stack emissions by either absorbing carbon dioxide or avoiding emissions at another location. Since emissions clearly occur at the stack, the burden should be on regulated facilities to demonstrate that those off-site offsets in fact occur. To simplify administration and reduce enforcement costs for both agency and permitted facilities, EPA may wish to establish some standardized factors and methods that regulated facilities may use to demonstrate the offsets. We have argued above that the draft framework as presented has serious flaws as a standardized method, and that these flaws need to be remedied.

In response to the EPA’s Call for Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources in 2010, The Wilderness Society recommended an approach that we think is simpler and no less certain than the recommendation being forwarded to the SAB for review. We recommend that the SAB consider this approach (outlined below, slightly modified⁸) as an alternative to the draft framework.

⁸ Acknowledging the uncertainty of carbon benefits from forest fuel treatments, we have deleted the special category for fuel reduction thinnings.

- A. Distinguish four categories of woody biomass feedstocks that differ in their greenhouse gas impacts, and require biomass combustion facilities to track and report feedstock quantities by source category⁹:
- i. wood waste (including mill, clean construction and post-consumer waste, and urban tree trimmings);
 - ii. logging residues from commercial timber operations;
 - iii. annual and short-rotation biomass crops; and
 - iv. whole trees from expanded harvest operations.
- B. Develop a carbon intensity factor (similar to the “biogenic accounting factor” in EPA’s draft methodology, but specific to each feedstock type) for each of these fuel types for regions of the country with relatively uniform forest types, product mixes, silvicultural practices, and alternative fates for waste wood. Facilities that can document that their source differs from this regional average may petition for a lower carbon intensity based on evidence they provide about feedstock sources.
- i. Carbon intensity factors would be relatively low for materials diverted from the waste stream. There will be a minor negative climate effect due to accelerated emissions from combustion of materials that would otherwise decompose over a longer time period, particularly those deposited in anaerobic landfills. There may also be negative climate effects if waste materials are diverted from recycling or reuse. There will be a small positive climate effect if combustion reduces methane emissions compared to business-as-usual decomposition. Factors should be updated as monitoring improves understanding of how alternative uses of wood waste affect emissions or sequester long-term carbon.
 - ii. Logging residues from existing commercial timber operations would likely have a carbon intensity similar to that for wood waste, based on the half-life of dead wood in regional forests. This low carbon intensity would apply only to use of residues from harvest operations that would have occurred in the absence of biomass energy use. It is difficult to demonstrate, however, that a harvest operation would have occurred in the absence of biomass markets. A rough proxy might be the proportion of feedstock from tops and limbs versus chipped whole trees. Unfortunately, tops are likely to be mixed with whole low-quality trees that represent new live-tree removals and hence fall into the fourth feedstock category. The AVOIDEMIT factor in the proposed methodology faces this same difficulty of distinguishing “anyway” emissions from new emissions.

Foresters overseeing harvests that include biomass shipped to a regulated facility may be asked to report proportion of material from tops and limbs, versus chipped whole trees.

⁹ Note that such tracking would be required in order to calculate the AVOIDEMIT factor in any case.

Ideally, EPA might develop a materials test based on bark percentage or some other measurable factor to confirm percent of a load sourced from whole trees.

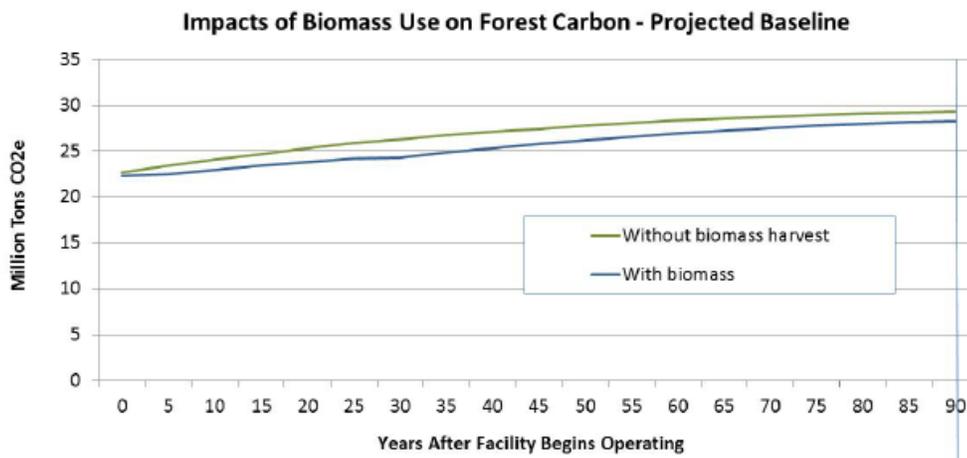
Since intensive use of this source may potentially damage soils, residual stands, and wildlife habitat, its use would need to be guided by procurement standards that protect ecosystem health. If a regulated facility does not incorporate mandatory procurement standards that include such protections, carbon intensities should be set higher to reflect possible losses of future forest carbon potential through damage to soils and residual stands.

- iii. Short-rotation biomass crops harvested on a continuing basis may have carbon intensities near zero if previous land uses maintained similar or lower mean levels of carbon stocks (e.g. cropland), and if carbon stocks recover rapidly post-harvest (e.g. less than ten year rotation). If biomass crops are grown on land converted from higher-carbon uses (e.g. mature forest), the intensity factor would be higher. For purposes of calculating a regional carbon intensity factor, EPA should document previous land uses for biomass plantations and apply those proportions to develop a regional weighted average. Carbon intensities should also reflect the likelihood that source lands may undergo land use change and hence fail to reabsorb the carbon released after the previous rotation. Monitoring over time would permit EPA to update these factors.
- iv. Materials from dedicated harvesting of live vegetation from lands not planted exclusively for bioenergy should be assigned carbon intensities based on modeling “without-biomass” and “with biomass” scenarios. Rather than project highly-uncertain future forest carbon levels across entire woodsheds (which will vary depending on unknown factors such as climate, weather events, pest and disease pressures, and non-biomass harvest volumes) it is sufficient to model the net biomass harvesting impacts at the stand level (similarly to the approach used for the Manomet Massachusetts study and by Zanchi et al.), using forest types, stand ages and stocking levels, and management approaches that represent conditions across the facility woodshed. The without-biomass baseline would be based on common harvest practices within that woodshed, stratified by forest type and ownership if necessary to reflect significant differences in management. The with-biomass projection would estimate changes to forest carbon pools given expected new roundwood harvest methods for operations supplying biomass feedstocks. The with- and without-biomass projections can then be aggregated up to the full woodshed scale and extended over the facility lifetime, based on representation of each stand type and practice across the entire woodshed. This approach would net out the effects of influences not related to harvest activities for biomass. It would also avoid the difficulties with regional definition, and marginal versus average treatment, since only the net effects of the regulated facility would be explicitly modeled – all other influences would be the same for with-and-without scenarios and so would not need to be modeled.

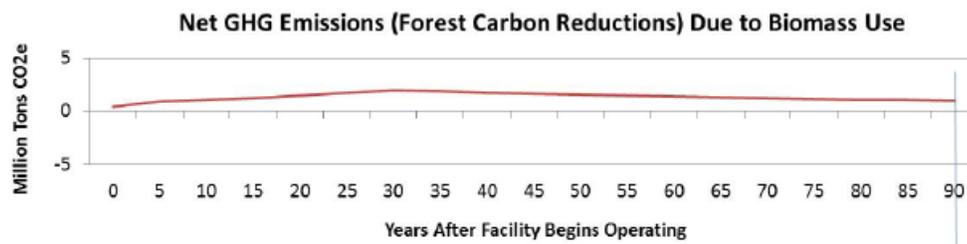
Facility reporting of roundwood feedstock quantities, surveys of forest practices on lands with and without biomass harvesting, and tracking of regional carbon stocks over time could be used to periodically update modeling assumptions for purposes of permit renewal.

To illustrate how the with-and-without projection might work, the charts below illustrate the net forest carbon impacts from introducing a stationary biomass combustion facility burning roundwood over a thirty-year lifetime in a region where “business as usual” is increasing forest carbon. Note that a reference point baseline would indicate that this facility has zero net GHG emissions, which is clearly not the case.

The first chart assumes, as does the Manomet stand-level modeling, that harvesting reduces current carbon stocks but also increases the rate of post-harvest regrowth for source forests (this response would only occur for fairly mature forests where competition has begun to slow net growth, and would be delayed if harvests involve clear-cutting with little advanced regeneration).

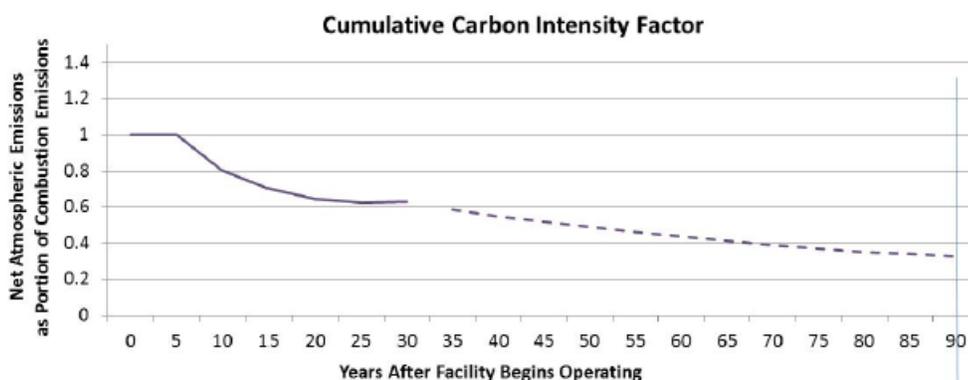


The second chart shows net GHG emissions (the difference between with- and without-biomass projections) resulting from operation of this facility over time. Note that the net effect continues to diminish after the plant ceases operation as forests continue to recover.



The third chart shows cumulative carbon intensity (net emissions based on changes in forest carbon stocks divided by total combustion emissions). Net emissions decline over the

facility lifetime as previously harvested areas recover and actually grow at a faster rate than unharvested forest areas. For simplicity, EPA could apply the mean value consistently throughout the facility lifetime. If this plant were to extend its operation beyond 30 years, the carbon intensities would eventually stabilize as continued reductions in forest carbon from new harvest are only partly offset by regrowth of previous harvest sites. If the plant ceases operations as planned at year 30, however, and if harvest sites continue to recover, carbon intensity of the plant's emissions would continue to decline. It is this decline that leads some to advocate for ignoring biogenic emissions; however, the net emissions effects last for many decades or even centuries, so their atmospheric impacts need to be reflected in GHG regulations.



Given modeling uncertainties, EPA might assign a relatively high carbon intensity factor to this feedstock type (hence encouraging use of the previous three categories which clearly have lower net emissions). Individual facilities might petition for a lower factor based on documented carbon-conserving practices on source lands, including required certification by Forest Stewardship Council or similar third party, documented new planting on formerly low-carbon lands, easements that protect sources lands from conversion, etc.

- C. Once regionally-appropriate or woodshed-specific carbon intensity factors are developed for each feedstock source, a permittee would estimate feedstock volumes from each source and multiply each by the appropriate factor to estimate net emissions to be reported. BACT might be based in part on maximizing use of lower-emissions feedstock.
- D. Another factor, mentioned only briefly in the framework document, that may be relevant to BACT determinations is the efficiency with which feedstocks are converted to useful output. EPA's goal for regulating GHG emissions from biogenic energy should be to minimize emissions per unit of useful energy. Aside from reducing net emissions, increasing output from the tons of feedstock combusted is another way to achieve this objective. Hence BACT may be related to a minimum energy conversion efficiency, which may be met by combined heat and power operations or technological improvements to combustion equipment.

* * * * *

The Wilderness Society

Comments on EPA Biogenic Emissions Framework

Thank you for the opportunity to comment on EPA's draft Accounting Framework for Biogenic CO2 Emissions from Stationary Sources. We welcome any further opportunities for public input into this process.

Sincerely,

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To: Aaron Adler
From: Mary S. Booth, Partnership for Policy Integrity
Sent: 12/12/11
Re: PFPI detailed comments on Vermont BioE Working Group report



From: Mary S. Booth, Partnership for Policy Integrity
Date: December 12, 2011
Re: Comments on the Bioenergy Working Group report

Vermont's forests need protection from overharvesting for "energy wood"

1. Vermont's working lands are *already* being harvested at close to maximum potential.
 - a. Cary Institute report: harvesting in VT is 67% of net growth. But, only about 2/3 of lands are harvestable. This means that harvesting on working lands is at or close to the maximum sustainable yield already, without any new demands.
 - b. Cary Institute mid-range estimate is about 600,000 green tons availability. BERCC middle estimate of "low grade wood" availability is ~895,000 green tons, 50% higher than the Cary Institute report.
 2. Existing demand for "energy wood" is ~1.5 m tons; proposed new demand is up to ~2 m tons. Combined potential demand is more than 3.5 m tons.
 - a. Total new wood demand from just one facility – the Beaver Fair Haven plant – is 570,000 tons per year. This one facility could take up equivalent wood to entire "available" wood supply calculated by Cary Institute report.
 - b. Report's recommendation (p. 18) that new pellet plants be built is troubling in light of this
- **There needs to be a statewide assessment of harvesting potential**
 - **There should be a moratorium on new facilities until an assessment can be done**

| Status | Type | Name | Demand | |
|----------|------------|-------------------|---------|--------------------------|
| Existing | Elec gen | McNeil | 500,000 | Existing demand |
| Existing | Elec gen | Ryegate | 250,000 | 1,535,925 tons |
| Proposed | Elec gen | North Springfield | 300,000 | |
| Proposed | Elec gen | Gilman | 150,000 | |
| Proposed | Elec gen | Fair Haven | 350,000 | Proposed demand |
| Existing | Heating | Residential | 700,000 | 1,488,000 tons |
| Existing | Heating | 41 schools | 25,000 | |
| Existing | Heating | Middlebury | 20,000 | |
| Existing | Heating | Bennington Coll | 4,000 | Potential demand |
| Existing | Heating | Green Mtn Coll | 5,400 | 3,023,925 |
| Existing | Heating | Offices | 6,500 | |
| Existing | Heating | N.Country Hosp | 3,000 | |
| Existing | Heating | NRG | 25 | Available low-grade wood |
| Proposed | District E | Montpelier | 15,000 | |
| Proposed | District E | Randolph | 12,000 | Cary Institute |
| Proposed | District E | Middlebury | 29,000 | ~615,000 tons |
| Proposed | District E | Brattleboro | 32,000 | |
| Existing | Pellets | Vt Wood Pellet | 22,000 | BERC |
| Proposed | Pellets | Vt Biomass E | 220,000 | ~900,000 tons |
| Proposed | Pellets | Vt Pellet Works | 160,000 | |
| Proposed | Pellets | Beaver FH | 220,000 | |

A biomass/timber procurement policy is needed

1. Biomass harvesting is by definition an intensified kind of harvesting that removes the majority of living material from a site. There is large potential for heavy cutting and extensive soil disturbance.
2. A proposed procurement policy and “acceptable management practices” are weak and if not backed up with laws, are meaningless.
 - a. The report (page 31) itself states that “procurement standards alone cannot be designed to effectively monitor whether demand for biomass energy does not impair site-productivity and forest health”
3. The report states that “the majority of harvests are integrated” (page 30) but is ambiguous about whether procurement standard should apply to all kinds of harvests. Since biomass is most likely to be removed in the course of a timber harvest, it seems obvious that the procurement standard should apply across all types of harvests.
 - **Procurement standard should apply to all harvests, not just harvests specifically conducted for biomass fuel.**
 - **Procurement standard should have enforceable provisions and not simply be a voluntary standard**
 - **There should be frequent and rigorous follow-up to ensure the procurement standard is met. The state should ensure this is specifically funded.**
 - **There should be a moratorium on new biomass and pellet facilities until a rigorous and enforceable procurement standard is in place.**

Carbon emissions from burning wood for energy should be acknowledged

1. Report states there is no consensus on what net carbon emissions are, but appears to lean toward acknowledging there are impacts.
 - a. Report plays both sides of the debate – at one point appears to imply that “sustainability” guarantees no net carbon emissions. This is not the case.
2. Report states that VT should follow the carbon issue and adopt a protocol for greenhouse gas accounting from biogenic sources.
 - **There should be a moratorium on new biomass energy facilities until a protocol to count CO2 emissions is in place**

Particulate and other pollutant emissions should be acknowledged

1. VT asthma rates are already higher than the US average
2. School-sized and other institutional biomass boilers do not typically employ sophisticated emission controls for particulate matter; there are never any controls for carbon monoxide (and by extension, organic hazardous air pollutants) beyond “good combustion practices”.
3. Most facilities burn green wood chips and emissions can vary significantly, yet there is typically no air quality impacts modeling conducted for small-scale facilities
4. The report recommends lifting the moratorium on state aid to school biomass boiler installations
 - **The state should not offer aid for school or other installations of biomass boilers unless site-specific air quality modeling and risk assessments are conducted.**
 - **The state should conduct some on-site monitoring at existing facilities, if it has not done so already.**

To: Aaron Adler
From: Lara Shore-Sheppard, Southern Vermont Citizens for Environmental Conservation and Sustainable Energy
Sent: 12/12/11
Re: BioE Report

Southern Vermont Citizens for Environmental Conservation and Sustainable Energy
191 Swallow Hill Road
Pownal, VT 05261

December 12, 2011

Dear Members of the Biomass Energy Development Working Group,

We write as co-directors of Southern Vermont Citizens for Environmental Conservation and Sustainable Energy (SVCECSE), a Vermont non-profit organization with over 500 members. Our group was founded in 2010 in response to Beaver Wood Energy's proposed wood-fired, utility-scale power plant in Pownal, Vermont. As citizens potentially affected by this plant proposed for our region, we have worked to educate ourselves on the implications of wood-fired electricity generation.

Consequently, we read the draft final report with interest. We applaud the Working Group's efforts to contend with the many issues inherent in its charge. However, we share key concerns about the report that have been articulated in the letter of comment (dated December 6, 2011) from the Center for Biological Diversity, the Partnership for Policy Integrity and the Vermont Sierra Club, namely that the report's recommendation for significantly increased energy production from woody biomass threatens the health of Vermont citizens and Vermont forests and would undermine the goal of greenhouse gas emissions reduction in the immediate future. It was particularly notable that in the report there was virtually no mention of the potential threat to human health posed by biomass combustion, a process that involves the release of significant quantities of particulate matter.

We urge you to take the concerns expressed in the letter from these three organizations into account in formulating any final recommendations to the legislature.

Sincerely,

William Gentry
Lara Shore-Sheppard
Charley Stevenson

Co-Directors, SVCECSE

To: Aaron Adler
From: Robbo Holleran
Sent: 12/12/11
Re: BioE Report

Robbo Holleran

Forester

211 Green Mountain Tpk., Chester VT 05143 (802) 875-3021 Phone, 875-2337 Fax
 Providing a complete forest management service since 1982

To: Biomass Energy Development Working Group
 Re: Final Report (Draft) Comments

December 12, 2011

I would like to add written comments to my two or three minutes of oral comments from the December 6 “open mic’ night”.

First of all, the entire report begs the question ‘What is the problem?’ We have 30 years of experience with biomass harvesting in Vermont, and the report reads like there is some crisis to be averted by additional review, monitoring, and regulation. Forestry practices in Vermont have improved dramatically in the 29 years I have been in business. And Vermont has the best on-the-ground forestry in all of New England and New York, in my opinion. I am licensed to practice forestry in Mass and NY, and do some work in New Hampshire, and travel the entire northeast with an educated observance of forest practices. I am neither able to do as good a job, nor am I expected to do as good a job in the other states, though New Hampshire is close to our standard.

Massachusetts, for example, has highly regulated forestry, which does not provide an improved practice. In fact, I think the regulation is part of the reason for poorer practices. One instance of this is the simple cost of additional paperwork. This requires additional administration fees that results in harvesting more of the valuable wood, and less return to the landowner. In Vermont, I can do harvests with a high percent of pulp/low grade (95% or better) and cover administration costs, but in Mass, that percent drops to 70-80%. Practically, that means harvesting 4-6 times as many valuable trees in what should be an “improvement cut”. Another factor is the time delay in approvals. The flexibility we have in Vermont to start a job on short notice, without an approval process and according to accepted practices, allows us to move to another lot if, for example, it is too wet or markets change. This actually provides a level of environmental and economic benefit in Vermont. In Mass, it might take a month or more to approve an alternate lot. Modern logging equipment is too valuable to sit idle for a month. A portion of this difference is the lack of low-grade markets, such as pulp. Trucking pulp from central Mass to Maine or New York State is possible, but not profitable. So, firewood and small amounts of biomass are the only options for those improvement cuts. Additional low-grade markets are needed both there, and here in Vermont, to improve this. For Vermont to go the way of Massachusetts with additional levels of approval and regulation will add costs and constraints that will not improve the practice, on-the-ground, of forestry.

I believe Vermont has a higher standard of practice, in general, due to the landowners. Landowners expect good forestry. They have the highest interest in protecting their property from poor management. Who cares most about a particular acre of forestland? The Use Value Program has educated landowners, by constant contact with consulting foresters and state foresters, about their choices and obligations. Landowners who are not in UVA are exposed to those who are, and the logging professionals. Since most logging contractors work with foresters, at least some of the time, and have participated in various educational programs, they are better equipped to perform to higher standards. Even the “bad apples” in the industry are aware of their AMP responsibilities, landowner expectations, and various laws including the “heavy cut” law. The “poor practices” that I see here, are far better than “poor practices” elsewhere.

The main issues of potential problems addressed in this biomass report could be:

Unsustainable harvesting:

Overall, we harvest about 40% of growth, so a 250% increase could be sustainable. Actually, increasing the harvest would increase the growth rate, so with intensive management, it would be possible to harvest at 3 to 5 times the current level. On the qualitative issues of sustainability, Vermont has shown a track record of continual improvement in forest practices, and additional low grade markets will only improve that. If our current biomass or pulp users were to shut down, we would clearly see a decline in forest management practices. There is more on this in my following text.

Forest health:

This is a broad issue, and I will cover some of the subjects below. First of all, I want to point out that tree diameter growth is controlled by crowding. When you look at the growth rings in a tree, and see variations, they are not controlled by the weather. That is a myth for most temperate forests, except in desert environments. In a crowded forest, each tree grows slowly. Total growth may be about the same, distributed onto more trees. But each tree is less healthy, less vigorous, and has less energy. This is why thinning is so important, and it is fundamental to any discussion of forestry. It is so simple as to be overlooked. I realize that the discussion of diversity (flora and fauna species, and forest structure), rare habitats, invasive species and unusual events makes this complicated. But when people suggest that a forest full of unhealthy trees is “healthy” because now it is the ‘fungi and insects’ turn to flourish, I think that is misguided.

So, starting with the premise that crowding is the main problem that affects tree health, harvesting somewhere near the growth rate is part of the solution. This is also the tool we use to meet other objectives. Concentrating the growth onto more desirable trees for durable and valuable wood products is common, along with influencing species composition, and forest structure for a range of goals, such as wildlife habitat. Since Vermont forests tend to be well stocked, but also tend to have a high proportion of cull

trees, an economical method of removing these trees provides an avenue to improve forest health along with achieving these other objectives.

And regenerating mature or low quality forests is a challenge that many foresters choose to put off. Many harvests result in poor regeneration for a range of reasons. Lack of daylight in lighter harvests or small groups is one problem that often results in shade tolerant weed species such as beech or striped maple. Lack of scarification in winter harvests often leads to sprout growth of beech or striped maple. Even if good regeneration is established, deer and moose browse can weaken preferred species so that the successful species are beech and striped maple. In all of these scenarios, biomass harvesting can be part of the solution, by removing more of the low quality overstory, providing more daylight and scarification, and providing enough regeneration that after the ungulates have eaten their fill, there is enough left for adequate forest regrowth.

Along these lines, our Use Value Appraisal program is set up to effectively mandate active forest management in exchange for fair taxation of that land. This is because those who set it up were aware of the wide range of benefits to active management. These are both ecological and economic benefits. Use Value standards require the improvement in the ratio of acceptable growing stock. (pg 24-25 of the Program Manual.) So, additional markets for cull trees is helping to meet other state-approved goals for forest health and productivity.

Clearcutting:

This is an acceptable practice in many forest types, according to approved silvicultural guides and the UVA Program Manual. From both a forestry and wildlife perspective, we should probably do more, rather than less. Clearcutting can add to the biological diversity (I'm not suggesting we clearcut entire townships here). Appropriate sized clearcuts provide habitat used by a wide majority of game and non-game wildlife species. Tree and plant species diversity can be increased with clearcutting, as species such as butternut, birch, aspen, and many others, are increased by heavy cuts, and are mostly absent from late-successional forests. And clearcuts add structural diversity to a largely middle-aged to mature forest on a landscape scale. Since many of Vermont forests are near maturity, it is time to consider regeneration options. Of course, any heavy cuts over 40 acres need both forestry and wildlife approval through the "heavy cut" law.

Liquidation cutting:

When landowners decide to move their capital out of the "tree-growing business" liquidation cutting results. We have seen this with some ownerships, such as the Ward Lumber Company lands, which resulted in the heavy cutting act, and the timber gains tax law. Driving factors include taxation and regulation. Making land management more burdensome with regulations will encourage liquidation harvesting, not additional investment in tree growth.

High-grading:

This is, I think, a far greater problem than any of the above. “Cut the best and leave the rest” has been widely practiced over the last century, partially due to lack of markets, and high logging cost on rough terrain. But folks don’t seem to mind high grading. It looks OK from a distance. It is still “forest”, and I have heard folks say “At least they did not clearcut it.” But the productive potential can be severely set back, and I have one lot I manage that was high-graded 50 years ago. The portions that were clearcut were ready for a profitable commercial thinning 5 years ago. I am still waiting for a market opportunity to do a regeneration harvest in the high-graded sections. The clearcut sections have higher present value. Of course, biomass markets would make this possible, and are actually the antidote to the poison of high grading.

Harvesting immature growing stock:

This goes back to liquidation cutting. Why would a landowner decide to sell biomass for a dollar or two per ton, instead of waiting to sell those trees for \$100 per ton? Only because they have decided that the tree growing business is a bad idea. What would make them think like that?

Carbon management:

While our forests, under current practices, continue to accumulate carbon, we simply cannot afford to designate our forests for carbon management. If carbon sequestration were really the most important thing in the world, we should be clearcutting the forests and sinking the wood in the ocean. Then we should be spraying herbicides and planting hybrid poplar or some genetically engineered tree for super growth, and clearcutting them and sinking them in the ocean on short rotations. That would maximize the forest potential to sequester carbon. I believe the benefits of managing the natural forest types we have far outweighs carbon maximizing goals. Leaving the forest alone, or minimizing harvest to maximize carbon storage is misguided. Having a balance of age classes, a wide mix of species and structural diversity, and providing a full range of forest products produces the best range of benefits to society and the environment, along with economic benefits that allow us to maintain this resource sustainably. This would also provide some “carbon benefits” as fossil fuels are replaced by biomass, and durable wood products replace more energy intensive materials. In the management of forests for higher-value durable products, biomass is one of the by-products. Salvaging mortality, cull trees and potential mortality for biomass, at any efficiency, has the carbon benefit of replacing fossil fuels. In the course of normal forest management, this is the debris that would decay anyway, and release its carbon into the atmosphere. I remember when girdling cull trees was common practice, or just flopping them down to rot. It was dangerous, expensive, and landowners did not like the mess.

Water quality:

It is disingenuous to suggest that AMP’s in regard to water quality are voluntary. They are mandatory, first of all, on any Use Value property, chip harvest, or Act 250 regulated harvest. They are also mandatory on any harvest with potential impacts to water quality.

If you get mud into a brook, AMP's are mandatory. It is that simple. In the rare case that a harvest is not regulated in some other way, and there is no risk to water resources, then AMP's are voluntary. But if there is no risk to water, then what is the problem?

Whatever we do as a committee, legislature, or society, has to be economically sustainable. In the extreme, would we want a committee of "ologists" reviewing the harvest of every tree to be certain it meets each criterion? Wait, we have that on the national forest, and how is that working out? I think we all agree: that is not practical. On-the-ground management in the Green Mountain NF is not any better than on most Use Value properties. Stepping back to the big picture, we want landowners to continue to engage in investment of growing quality timber for value added opportunity. This is long term. It is good for the environment and the economy. It is sustainable. We want folks to grow 20" veneer hardwoods and mature softwoods. We want them to harvest in a sustainable way so that stands are properly regenerated. We like to walk through forests at the middle or later in that rotation, and we like to hunt where there is a higher proportion of the younger age classes. We want the roads and trails to be well maintained, to reduce risk of erosion and provide easy access for ongoing management, recreation, safety, and possible salvage of storm damage or other calamity.

How do we get someone to love their land, and grow trees for 100 years or more? How do we steer the economics so it is in families' best interest to grow trees? They need stability, low carrying cost, and a reasonable expectation that they will have a return on that investment. Our Use value program was a step in the right direction. It takes competition for our wood products to provide wood sales profitable. How do we get mills to locate in Vermont, instead of just across a bridge somewhere, or in another country? We have wood, and some really nice wood. We also have a lot of junk. By adding cumbersome regulation, this could be a "jobs bill" for neighboring states. Every time a mill goes out of business, or a new law is passed that hinders mills or landowners (such as raising Use Value penalties, or raising the cost of doing business for mills or landowners), they have to decide whether to keep at it. There are folks on the committee, perhaps well-intentioned, who would like to see greater scrutiny, more accountability, more administration, for harvesting. Each of these has the intention of improving practices on the ground, but they will have unintended consequences by raising costs and discouraging investment.

Let me give an example. The heavy cut law was supposed to control the perceived excesses of clearcutting. Of course, harvest levels were completely sustainable at about 50% of growth, but a big swath had just been "smacked" right outside of Montpelier, in full view of the Interstate. In some ways it was simple: if you want to do a heavy cut, it just has to meet forestry and wildlife standards. It doesn't stop it. So the "good" heavy cuts will happen, and the "bad heavy cuts" will be controlled. First of all, you can harvest a forest and leave 100 trees per acre, and still be a "heavy cut" as defined. It is a complicated law that requires specific forestry understanding. I know of many cases where a landowner and/or logger did not want to deal with the permit, but extracting the value was the main goal of the harvest. (Think: 'liquidation cut', and why someone might decide to take their money out of the forest.) The chosen option was high grading. If you

leave enough trees, it is not a heavy cut. In most forests, the value is concentrated in 20-40% of the trees, so you can cut the best and leave the rest. So this “forest protection” law had the direct effect of poor forest practices. Many of us warned the legislature that this would happen.

To reiterate one of the things I said at the public meeting, there is ample supply of biomass. These numbers are taken from the FIA data, and confirmed by my professional experience. We don't need a federal grant to come up with ballpark figures, but I can be accused of some rough rounding here. Gross tree growth is about 0.6 cords per acre per year, average. With 4.5 million acres, that is about 2.7 million cords. We lose about 24% of that to mortality, (0.6 million cords) because our forests are overcrowded, near maturity, poorly managed, and due to natural causes. Net growth is about 2.1 million cords. We harvest about 40% of total growth, or 1.1 million cords. Forest stocking continues to rise, average tree size and number of trees also rises. So the total annual growth, above current harvests, amounts to 1.6 million cords. Times 2.3 green tons per cord gives 3.7 million tons. And I'll agree that a fair proportion of that is not available for a wide range of reasons. But we also lose 0.6 million tons to mortality. And I do not believe the FIA data accounts for topwood, as it is figured in cubic feet of merchantable stems. My experience says that adds about 20%. So the real starting figure for possible annual biomass supply, above current harvest, will include growth, mortality and tops. This will be over 4 million tons. So the BERCC data is questionable, to suggest that the high end of the range is less than 2 million tons and a moderate scenario would yield less than 1 million tons.

A more important fact is that 30-40% of the standing trees are “unacceptable growing stock” (weeds or culls), due to a wide range of factors. Just the standing inventory includes about 25 tons per acre of junk wood, times 4.5 million acres, is over 100 million tons, not including growth. Why do you think there are so many proposals for biomass in the region? Would someone really invest millions of dollars in a facility that was going to run out of wood? Or have to pay a high price for scarce wood? Out of all the proposals over the last few decades, none of them (that I know of) dropped their plans because of supply issues. They drop out because of Vermont specific regulations about site issues, water supply, power sales, and the regulatory climate. It was said about Burlington and Ryegate, that the hills would be bald for miles. A quick tour on Google Earth shows this is not the case. And when we think of supply, we have to remember that any plant in Vermont will draw some wood from across a border.

Should the best advice to a biomass proposal be “Build it across a state line. That's why they make bridges.” ?

My comments should be just “common sense” for a forester's perspective, as one who represents the landowners. I want to apologize for the absence of the person who should have been representing consulting foresters, and by proxy, landowner's perspectives. Private landowners maintain more than 80% of Vermont forests, providing the products and “ecological services” that we all enjoy. When you drive down a scenic road, fish in a clear stream, or enjoy the fall foliage, do you thank the landowners who provide this? Or

do you kick them in the shins by making it more difficult to decide to grow trees for a multi-generational investment?

From a forest management perspective, biomass harvesting really is the best thing since sliced bread.

Respectfully submitted,

Robbo Holleran

To: Aaron Adler
From: Jamey Fidel
Sent: 12/12/11
**Re: Public Comments on Draft Final Report, Biomass Energy
Development Working Group**

**Stakeholder Feedback on the Bio-E Draft Report –
Forest Roundtable Meeting**
November 29, 2011

Jamey Fidel gave an overview of the Bio-E Report.

Questions and Comments:

Hervey Scudder asked whether McNeil procurement standards were considered in the Bio-E's work on procurement policies. Jamey stated that the Bio-E group used McNeil as a template and worked with Fish and Wildlife Department, Forests, Parks, and Recreation and others to develop the model approach. Jim Shallow asked whether the model procurement standard only applies to Vermont procurement. Jamey replied that it only applies to Vermont procurement, and there are challenges with not having a regional standard. Hervey said a potential problem is that people may buy from another state—the procurement standards may create disincentive for them to procure wood in Vermont. Ehrhard Frost acknowledged that regional cooperation is difficult.

David Paganelli commented that having a market for low quality wood is nice, but this could mushroom into something bigger if there is a serious energy crunch. There is only so much additional wood within our forests – the 900,000 ton target may not be the right benchmark. When you take “a lot,” what is the long-term impact to the health of the forest? He said we need more emphasis in this plan on maintaining healthy forests. We need to know how much we can grow in our forests each year without undermining productivity and the organic matter of our soils. He noted a deficiency in the report in #11 under forest health because it only deals with nutrient-deficient sites, not nutrient-rich sites.

Melissa Reichart asked for clarification on whether the 900,000 tons figure is based on what is there now, or the amount that can be taken each year for 150 years. Jamey suggested that BEREC would be able to answer detailed questions about the 900,000 tons figure. Melissa said we are seeing more whole-tree harvesting recently. Ehrhard asked the group what type of harvesting is going on, and what percentage is whole-tree harvesting? Steve Sinclair said the Division of Forests does not know the answers to these questions for certain.

Jim Shallow said that 900,000 green tons means nothing to him without the context of knowing how it fits in historically with what we were harvesting. Steve Sinclair offered that the annual harvest has declined. Ann Ingerson added that harvest of *high quality* sawlogs has decreased, but harvest of low quality material has increased.

Jim said it would be very helpful in the report to know historic trends and conditions on the 900,000 tons figure over the last 20 years at least. Jamey mentioned that some of these questions may be answered starting on page 7 of the report.

Ann asked what happens once the report goes back to the legislature. Jamey said that the Bio-E Group does not know. He explained that some of the people who commissioned the report (Chris Bray) are gone, but implementation will need to be sorted about between the legislatures, state agencies (DPS and ANR), etc.

David Paganelli adamantly stated that the number one objective should be to maintain the productivity of our forests, and this is dominant over economics and having a source of energy. The harvesting must be sustainable. Don't take more than the forest can provide. David Paganelli said it should be in the report as the first objective. There was general consensus among the Roundtable stakeholders endorsing David's suggestion.

Ehrhard stated that we don't even know now if we are overharvesting. We need better baseline and monitoring data. Phil Huffman said it is not just about growing trees, but preserving the attributes the forest has to offer. Melissa suggested adding a scientific panel to perform literature reviews and gather scientific information related to impacts of harvesting. Paul Frederick mentioned that the Department of Forests, Parks, and recreation is doing a harvesting assessment (there was report about this project earlier in the day).

To: Aaron Adler
From: Charles Levesque
Sent: 11/21/11
Re: Biomass Energy Development Working Group

Aaron - I am in possession of the draft report from the Working Group. I'd like to offer a couple of edits to something on page 9:

Top of the page:

Using the methodological framework of the BERC Vermont wood fuel supply model, efforts are underway by the ~~Northeastern State~~ **North East State** Foresters Association (NEFA) to build a project-based wood availability model that will address some of the shortcomings of the original BERC model. These revisions are expected to be available in 2012 ~~by the end of 2011~~.

At bottom of page:

The initiative and funding for both of these efforts currently comes through the **North East State** Foresters Association (NEFA).

Charles Levesque
Executive Director
North East *State* Foresters Association

To: Aaron Adler
From: Tela Zasloff
Sent: 11/23/11
Re: Public Hearing on Biomass Energy Development

Dear Biomass Energy Development Working Group:

Our Bennington-Berkshires Citizens Coalition has been working for over a year now, on following the proposals by Beaver Wood/Bechtel to build biomass incinerators in Pownal and Fair Haven, VT. We urge you to seriously consider the dangers to the health of the forests of Vermont, to public health, and to the quality of life of the local populations. Below is a summary of our concerns:

[A report for Bennington-Berkshire Citizens Coalition, June 2011: "Beaver Wood Energy Biomass Projects in Smalltown New England" . Read the full report (17 pages) at <http://benningtonberkshirecc.org>]

For the past year, Beaver Wood Energy,LLC/Bechtel Corporation has been proposing to build, in Pownal, Vermont, a biomass woodburning plant to produce 29.5 MW of electricity for the state. They have chosen as their site a now defunct racetrack grounds in a narrow valley along the Hoosic River that is the entrance way to southern Vermont. To meet the deadline imposed by federal government incentives to begin building alternative energy sources, Beaver Wood/Bechtel tried to skirt around the state permitting processes, but failed to meet the requirements for even the initial permitting agency, the VT Public Service Board. They have withdrawn their application for their Pownal project from that agency, but have kept open their applications to the other permitting agencies, including applications to build a second plant in Fair Haven, VT. They have stated publicly that they will continue to consider Pownal as a possible site. [*Rutland Herald*, 4/25/11]

Local objection to the plant has been building in this region—a committed and organized opposition from local citizens who want to protect their towns, environment and quality of life. These local citizen movements, which are happening across the country, are a challenge to corporate developers, who see moving into small town regions like ours as an opportunity to make a profit. In the case of the proposed Pownal plant, these citizen groups—non-government, non-profit, non-corporate--are protesting on the grounds that this biomass incinerator would increase the pollution to levels dangerous to public health, spew more carbon in the air than coal-burning plants, endanger the surrounding land, water and mountains upon which the area depends for tourism, destroy the forest's ability to sustain itself, and overwhelm with heavy traffic, noise and ugliness, the quality of small town life for which the region is most valued by residents and visitors.

Scientists and medical organizations, including the American Lung Association, provide overwhelming evidence of the reality of these threats to local communities from building biomass woodburning facilities on this scale. As pointed out by the 90 scientists

who wrote to Speaker Pelosi and Majority Leader Reid in May 2010, and by the Intergovernmental Panel on Climate Change, biomass energy is highly inefficient, emits 50 percent more carbon pollution than coal per unit of energy produced, and at the scale proposed, will require forest cutting at such a rate that the forests cannot sustain themselves, increasing the negative effects on the climate. In New England, it would take 40 years of forest regrowth to soak up the carbon produced by one biomass plant burning wood to produce electricity.

Research by scientists and environmental experts has shown that the McNeil biomass incinerator in Burlington, VT, is the single largest polluter in the state. Here is a summary of their findings. [Source: PlanetHazard.com tracks the top ten polluters in every state, getting its data from the 2002 [Environmental Protection Agency National Emission Inventory Database](#)]

The McNeil 50-megawatt biomass incinerator in Burlington is Vermont's top polluter. Vermont's other biomass incinerator, Ryegate, comes in at # 4. McNeil sources its wood in Vermont, New York, Quebec, Massachusetts and New Hampshire from clearcuts of up to 25 acres. The incinerator burns 500,000 green tons a year of wood. The following website has tracked a long list of all of the pollutants put out by the McNeil incinerator and their pounds per year.

<http://planethazard.com/phmapenv.aspx?mode=topten&area=state&state=VT> Total Emissions: 2,096,495.23 A report put out by the Sierra Club in 2000--"The Impacts of McNeil Station," included the following information: (1) "Local residents' primary concerns are disturbing noise and vibrations, pungent odors, fugitive dust emissions, and nauseating stack emissions."; (2) "During a September 1985 fire at McNeil Station, McNeil operators ordered the breach of a berm, releasing countless gallons of concentrated wood chip leachate into the...groundwater supply. The leachate contained phenol, furfural and furfural derivatives, which are all products of wood chip fermentation. . . .The EPA has classified phenol as a priority pollutant and furfural and formaldehyde as toxic pollutants."

The big question for our local communities is: Should we trust Beaver Wood/Bechtel--or any developer of biomass incinerators--to build a wood burning plant that is safe and productive for our region? We have determined that we cannot. Below is our Press Release for this report.

We hope you will consider all this information with the serious intent it deserves, and protect our forests and the health of our communities. Thank you.

Tela Zasloff
Bennington-Berkshire Citizens Coalition
jzasloff@adelphia.net
(413) 458-4846

Press release for "Beaver Wood Energy Biomass Projects in Smalltown New England"

FOR IMMEDIATE RELEASE July 12, 2011

BENNINGTON-BERKSHIRE CITIZENS COALITION RELEASES REPORT ON BEAVER WOOD ENERGY'S RECORD IN SMALLTOWN NEW ENGLAND

The Bennington-Berkshire Citizens Coalition has released a report outlining the checkered environmental record of the developers seeking to build a 29.5 megawatt wood-burning power plant in Pownal, VT.

According to the report, "Beaver Wood Energy Biomass Projects in Smalltown New England," which is available at the Bennington-Berkshire Citizens Coalition website, www.benningtonberkshirecc.org, Thomas Emero and William Bousquet, the present Beaver Wood developers, have been operating wood-fired electricity-generating power plants for BWE's corporate predecessors, including GenPower LLC and Alternative Energy Inc., Maine, and its branches, Northeast Empire Limited Partnership (NELP) and Beaver Plant-Livermore Falls G.P., Inc. These companies--while Emero was Counsel and Bousquet was Vice President for Engineering and Operations--have had a long history of fines for exceeding air emission limits, and violating environmental reporting and safety requirements, dating back to the early 1990s.

Late last year, the Vermont Public Service Board, the state's utility permitting agency, granted Southern Vermont Citizens For Environmental Conservation & Sustainable Energy, along with the Town of Williamstown and Williams College, permission to intervene in the permitting process for Beaver Wood's Pownal project.

Partly in response to opposition from local stakeholders, Beaver Wood chose to put its Pownal project on hold but has said it will return to the area once it has successfully completed a similar wood-burning power plant in Fair Haven, VT.

Medical and environmental experts agree that large-scale biomass incineration increases levels of dangerous airborne particulates and thus poses a threat to public health. In addition, large scale wood-burning for electricity generation is less efficient and produces more carbon dioxide into the atmosphere than coal-burning processes.

Among the issues of concern to local residents, including Williams College, are the threats posed by Beaver Wood's project to the forests, surface and subterranean water resources, and largely pristine ecology upon which the area depends for tourism. The Pownal plant would require 100 round trips per day by trucks laden with logs to feed its burners and would overwhelm the local secondary roads with heavy traffic, noise and exhaust.

Thomas Emero's and William Bousquet's past record in developing such projects in small towns in Maine, New Hampshire, and Vermont, shows a singular lack of concern for these issues. Not only have their power plant projects frequently exceeded pollution limits and violated environmental reporting and safety requirements, they have dealt with town residents and state authorities in a dishonest manner.

The source for the information in this report is a 2,695-page set of records retrieved from publicly available documents using Maine's Freedom of Access Act and research using newspapers and websites.

"Early in this process, we asked whether this region would benefit from this particular plant, given the proposed location, the technology, and the principal developers. Months of careful research

have led to the conclusion that all three factors are cause for grave concern," said Charley Stevenson, a member of the Bennington-Berkshire Citizens Coalition and a Director of the Southern Vermont Citizens For Environmental Conservation & Sustainable Energy.

Bennington-Berkshire Citizens Coalition, www.benningtonberkshirecc.org

Added data to Tela Zasloff written testimony:

The scale of the biomass facility does not determine whether it is a threat or not. One of the biggest threats from the biomass plans and proposals in Vermont is the multitude of "small" facilities being proposed. ***Small facilities pollute more per unit of energy than the bigger ones. The problem is the overall increased cutting and burning of trees for biomass, no matter what the scale of the facility.***

Some data on this:

Vermont Comprehensive Energy Plan, Volume 2 :

www.vtenergyplan.vermont.gov/sites/cep/files/Vol%202%20Public%20Review%20Draft%202011%20CEP.pdf

Page 98

The Vermont Statutes provide a goal for the state, by the year 2025, to produce 25% of the energy consumed within the state through the use of renewable energy resources, particularly from Vermont's farms and forests (10 V.S.A. § 580).

Page 99

*In 2008, the Vermont 25 x '25 group conservatively calculated that wood-fired electric plants produced approximately 1,200 billion Btu of power (~40 MW). **This demand would require about 300,000 green tons of wood....***

Page 99

*The CHP base-level in 2008 showed 760 billion Btu of CHP (~25 MW) increasing markedly by 2025 to 3,060 billion Btu (~100 MW at 65% system efficiency). **This additional production of 75 MW CHP would require approximately 400,000 green tons of new wood supplies.***

Page 233

4.2.2.3.1.2 Projected Biomass for Thermal Uses

Potential availability of wood in excess of current harvest levels is discussed in Section 3. Projections of potential wood fuel availability are blind to end use for energy production. Given the largely unregulated market, it can be expected that, in general, prices paid for wood will play a dominant role in determining how much wood goes to the different energy uses.

A volume of 900,000 green tons of additional low-grade wood for fuel use per year, if applied to residential space heating alone, could replace 37 million gallons of heating oil.

No regulatory system exists to apportion wood fuel volume among the many choices for energy uses.

Note: Total *increased* wood burning suggested is 1,600,000 green tons. This represents about a 100% increase in commercial forest cutting in Vermont. There is no guarantee that this number would not go even higher, especially when it is promoted and subsidized by the state.

To: Aaron Adler
From: Peter Carothers
Sent: 12/5/11
Re: Biomass for Power, cogeneration only

Please include a prohibition for any new biomass fueled power generating stations that do not capture the majority of waste heat for useful purposes such as space heating, domestic hot water, or process heat for industrial or agricultural applications.

Peter Carothers, PE
New Haven

To: Aaron Adler
From: Sarah Mittlefehldt
Sent: 12/5/11
Re: Comments on Report for Public Review 11-11-11

Hello BioE Committee-

Thank you for your good work in researching the viability of forest biomass energy in Vermont. For the past year, I have been involved with the Poultney Woodshed Project--a research endeavor that has looked at community-scaled biomass energy in central Vermont. Specifically, I've been helping Green Mountain College source it's new cogeneration plant with local, sustainably harvest fuel (5,000 annual tons). My background in forestry makes me excited about the possibly of small-scale biomass in Vermont. My background in history, however, makes me concerned about the possible ecological problems that might ensure if Vermont choses to promote larger scale industrial biomass plants, such as the one proposed by Beaverwood Energy in Fair Haven.

I attended a public meeting about the proposed Fair Haven plant and when I inquired about the company's plan for regeneration and how the company planned involve foresters in the sourcing process, the representative told me that it was "Not my problem. That's what the State is for." I was deeply concerned by the company's nonchalance in this regard and the way in which they grossly overestimated biomass availability in our region. The estimates of available biomass that the company presented did not account for slope, ecologically sensitive areas, or political availability and land ownership. I am reassured by the work that the BioE committee is doing in this regard and I hope that if any of you are involved in the permitting process for the Fair Haven plan--and others like it--that you will continue to be diligent in your efforts to protect Vermont's working forests by protecting the integrity of our forest ecosystems.

Thank you for your good work.

Sarah Mittlefehldt

Sarah Mittlefehldt, PhD

Assistant Professor of Environmental Studies & Natural Resource Management

Green Mountain College

One Brennan Circle

Poultney, VT 05764

[\(802\) 287-8384](tel:(802)287-8384)

To: Aaron Adler
From: John Morris
Sent: 12/5/11
Re: Comments on the draft report of the Biomass Energy Development Working Group

Hire an editor.

To: Aaron Adler
From: Joan E. Knight
Sent: 12/5/11
Re: Comment on BioE

I think the two key principles that were in the VNRC email on Dec 5th are extremely important. Given those principles, I support the use of biomass for energy (to make electricity or to heat buildings).

Joan E. Knight, MAT, MS, CMHC
3 East Village Dr (off 180 East Ave)
Burlington, VT 05401-3471
[\(802\) 863-8755](tel:(802)863-8755) Home & Work
[\(802\) 233-0120](tel:(802)233-0120) Mobile (Please use this phone when you can't reach me at the other and can't wait for a call back. Thanks.)

"The only way to heal our increasingly broken world and communities is to come back together, to play together, think together, plan and act together." Bill McKibben

To: Aaron Adler
From: Scott Fisk
Sent: 12/6/11
Re: Biomass Energy Development

To Whom It May Concern:

I am a business owner in Bradford, VT. I am unable to attend tonights meeting regarding The Biomass Energy Development Working Group but wanted to express my concern's on how important it is to keep all the Biomass Plants in operation.

As a logger I supply Ryegate with chips for there energy plant. Ryegate is an essential part of my business as well as many other Vermont, New Hampshire and surrouding state loggers.

For years the wood business has been declining. Mills, loggers and truckers have gone out of business and many more are to follow. Without the operation of Ryegate and other Energy and Pulp Mills more businesses will be closing.

Closure of these plants will be devesate the communities. People will be unemployed. Energy costs will rise. Businesses in Vermont will close.

Biomass energy is an essential piece of the logging industry as well as many other industries and I wanted to express how important it is to remain in operation.

Thank you.
Scott Fisk,
Fisk Trucking LLC

To: Aaron Adler
From: Gary L. Leavens
Sent: 12/6/11
Re: Biomass Energy Development in Vermont

Dear Mr. Adler,

It is my understanding that Biomass Energy efficiencies are far better directed toward heating than electricity generation. I hope this is the primary direction we are headed in for Vermont Biomass Development.

Obviously, the other concerns are soil and residual stand impacts on our forest lands in Vermont.

We are fortunate to have this is a viable and healthy fossil fuel alternative, providing we act responsibly.

Best regards,

Gary

To: Aaron Adler
From: Fred Burlett
Sent: 12/9/11
Re: BioE Working Group Comments

Fred E Burlett
2155 East Clarendon Road
North Clarendon Vt 05759
Phone Number [239-331-5001](tel:239-331-5001)

Winter Address
14100 East Tamiami
House # 158
Naples Florida 34114

Knowing that this group is working on this very important issue that will effect Vermont in many ways in the future,I must address you with my concerns.I feel that with the demise of Vermont Yankee in the near future,Vermont will be totally dependent on foreign energy,and will not be engaged in the quest for Renewable Energy.I would encourage and recommend to this group, more use of ample woody biomass inventory.As a natural resource that Vermont possesses.We should consider a biomass plant of 30 megawatts or larger to keep some semblance of control of our electrical needs.I am also troubled by the absence of a forester from the private sector as a member of your working group.I would encourage you to fill that vacancy or at least give weight to the comments you have received around the state from this knowledgeable group.

It appears to me that this report may be politically weighted against large scale co gen plants,I would hope not..I would urge you to correct this mistake in your finale draft..Vermont needs this renewable energy potential as a bargining chip for future rate rises by our foreign supplyers.Don't sell Vermont short in this very important step you as a group, are taking. |

To: Aaron Adler
From: Daniel H. Hudnut
Sent: 12/9/11
Re: BioE Working Group Comments

Greetings:

Here are my comments on the November 21, 2011 public review draft of the Biomass Energy Development Working Group.

First of all, I am curious who has been made aware of the existence of this document and how. Wagner Forest Management manages over 24,000 acres of forests in the state and is an active member of several forest-related stakeholder groups. I am a member of the Society of American Foresters. I only became aware of this report following an email from another industry stakeholder. And at no point during the process, to my knowledge, were we engaged for our perspective on the issues at hand.

Second, the comment period provided strikes me as exceptionally short, given the complexity of the topic(s) at hand.

Upon first reading, my primary objection is to Appendix A. The Working Group's decision to develop guidelines "for all wood harvests" in Vermont greatly exceeds the scope of their charge. This report calls for a study of the impacts of timber harvesting, but then assumes there are problems and prescribes corrections.

Land owners and managers working under the Sustainable Forestry Initiative (SFI), the Forest Stewardship Council (FSC), the American Tree Farm System, or even Use Value Appraisal must already demonstrate sustainable management principles and practices, including many of the basic items listed. However, the insertion of unsupported quantitative references is deeply disturbing. There is no presentation of (or references to) science to accompany the quantitative guidelines put forth as #10, #14 (Table 1), or #18.

Fundamentally, no one has demonstrated that there is a problem that needs to be fixed by harvesting guidelines, for biomass harvests or harvests in general. The scale of harvesting has collapsed in Vermont in the last decade. I would assert that forest management and timber harvesting in the state are practiced very professionally. We do not need further prescriptive standards to improve results or conditions in the woods.

One further specific comment. Page 20, second full paragraph. The Pellet Fuels Institute already has labelling standards. Don't re-invent the wheel. See <http://pelletheat.org/pfi-standards/pfi-standards-program/>

Please feel free to contact me if you have any questions relating to these comments,

Daniel H. Hudnut
Maine Licensed Professional Forester

SAF Certified Forester
Residence: 963 Beaver Meadow Rd., Sharon, VT



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To: Aaron Adler
From: Bruce P. Shields
Sent: 12/10/11
Re: BioE Report

Comments of Bruce Shields, forest landowner and investor in Vermont's Forest Products industry, on Biomass Energy Working Group Final Report Nov. 21, 2011

General Comment: The fundamental assumption of this paper is that the Vermont legislature can modify the economics of forest production in ways which some fraction of the legislature believes socially desirable. I will contest that assumption in my specific comments.

Page 8, on the topic of modelling. The assumption is that meaningful data can be generated by massive relational database models of Vermont forest growth. Some years back, the Vermont Forest Products Association challenged the accuracy of the SPECTRUM model used by the US Forest Service to calculate Allowable Harvest Quantities on National Forest lands. The Vermont Legislature appropriated funds to Vermont Dept. of Forests, Parks & Recreation to hire a technical review of SPECTRUM. This review found that several of the layers of that Relational Data Base made use of residual or derived values rather than known values, and that assumptions which guided the derivation therefore forced outcomes which reflected the assumptions rather than describing any real situation. As a result of that review, USFS has very slightly revised the Allowable Harvest Quantities, and committed to reviewing its entire program of modelling. That experience should at the least cause Vermont to be very skeptical of using any computer generated modelling in a regulatory manner.

The problem with modelling is that at best it can only project the past into a future time frame. Modelling is useless for predicting real-time changes. The largest conceptual issue with modelling is exposed by use of the term "low grade" or "low value" wood. No place in this document is the dynamic nature of markets for wood products discussed. For instance, in the past 30 years pulpwood suitable for paper making has declined in relative value for three market reasons. First, a traditional consumers of market pulp in Europe and the United Kingdom have begun generating their own supply and stopped buying North American pulp. Secondly, massive projects in equatorial areas have exploited the capacity of plantations to supply pulp mills using relatively small areas -- given differentials of incident sunlight, an acre of Brazilian tree plantation produces 6 X the fiber one acre of Balsam land in Maine will. Third, paper recycling programs have reduced the requirements for virgin pulp by as much as 1/3. The market is able to absorb less than half the pulpwood from Vermont it did 30 - 50 years ago, and the relative market price of pulpwood has dropped into the lowest value category. In fact, demand of fuel for space heating causes schools to outbid paper mills for wood chips during the winter.

Totally different technological change has severely shrunken the market for higher grades of sawlogs or other structural wood. Solid wood flooring has become an item in the luxury market, replaced by various forms of engineered wood or petroleum derived "snap in" flooring. Solid wood furniture has become a luxury product, with the entire low and middle range of furniture dominated by veneers or synthetic coatings mimicking veneer bonded onto particle or oriented strand board rather than wood. And highly engineered structural woods such as Microlam® have reduced the premium once paid for wood timbers. So the value range of the whole middle range of log quality has dropped. No modelling program seems able to adjust for the future effects of unknown technical and market developments, most of which recently have had the unexpected effect of sharply reducing demand for medium and better grades of lumber. That reduction in demand means that many logs which even just 20 years ago would have been purchased by sawmills now passes into the firewood market. I do not find any discussion in the modelling section on how landowners are to increase their income to meet the increased demand for income from the governmental sector of Vermont.

Page 23, regarding forest resource protection. The statement appears, *There is a discontinuity between the broad range of wood procurement practices mandated by the PSB for Vermont-based wood-fired electric producers through the Section 248 permit process, compared to the complete lack of forest resource protection required of other users of biomass.*

Apparently the standard for protection is bureaucratic supervision and interference. The statement is utterly untrue. Vermont land is predominantly owned by individuals who have a strong stake in the future of their forest. The claim that the forest is "unprotected" would appear to be a self-serving statement by persons seeking employment as regulators. There is no information suggesting that by any objective standard (rate

of regeneration, or any other measure) land subject to the Burlington Electric regulation grows more, better, or more valuable timber than land not subject to it. But the regulation is a heavy burden which reduces income to the landowners without any recompense.

Page 24, AMPs not mandatory. The statement is made that the AMP's are not mandatory. That is an ignorant statement. A person not applying the AMP's can be prosecuted for failing to use them. How much more of a mandate could be created?

Page 26, salvage retention. Adoption of arbitrary benchmarks such as retaining 5% residual on salvage jobs creates conflict and leads to litigation, because every site differs, and the interpretation of the benchmarks depends on the personal inclinations or unsupported judgements of individual regulators. Salvage of a Spruce Budworm, ice storm damage, and tornado or micro-burst damage all have widely different characters. A skilled operator has far better judgement than most regulators.

Page 37, snag retention. This topic is loved by wildlife theoreticians who have never worked in the woods. It can be diametrically opposite to requirements of Workers Compensation underwriters. No operator should ever be placed by the Legislature in a position where complying with demands of a regulator causes prosecution or fines by a different agency.

Page 47, regarding governmental preference for certain fuels. The Legislature must not try to tilt the economic scales for or against particular fuels or modes of delivery. No committee is smart enough to think of every case, and so will inadvertently reward poor behavior. Solid firewood requires certain methods of material handling which will not be acceptable for every customer. My own home requires 6 cords of wood cut 21" length to 6" caliper maximum. That works out to one full truckload of wood annually, with nominal weight of 18,000 pounds, reduced after processing to 2500 pieces. In the processing, it must be moved three times. Not every homeowner has the option of that handling. When the furnace is running, it must be tended 3 times daily minimum, and up to 6 times daily in cold weather, necessitating either hiring a furnace tender or maintaining a completely redundant second heating system capable of automation if the homeowner desires to be absent for even one or two days. If the homeowner's choice is a redundant system, that homeowner will obviously engage in fuel substitution depending on relative prices -- and that clearly complicates any projections or forecasts of timber demand. Also, solid fuel is a poor fit for properties which may be rented or leased. Wood pellets resolve many of the logistic issues of solid wood, and because of issues of space, time, physical strength, attendance and others, the market will clear pellets at a substantially higher value per thermal unit than solid wood because pellets carry a far lower nuisance premium than does solid wood. I would urge that the final report not recommend to the legislature any effort to reshape the market for residential heating fuel.

Bruce P. Shields
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bshields@pwshift.com

To: Aaron Adler
From: Richard Morgenthal
Sent: 12/11/11
Re: BioE Working Group

To Whom it May Concern:

I am commenting on the Biomass Energy Working Group's consideration of increased large scale biomass energy production for the state of Vermont. Among questions to consider are ones of environmental sustainability, personal health and safety, as a means to producing electricity for the citizens of this state.

As a founding member of the Bennington Berkshire Citizens Coalition and a resident of Pownal, I consider the pursuit of additional large scale biomass facilities to be counterproductive to Vermont's better interests.

Our forests, one of Vermont's greatest resources, serve as a safeguard for preserving the quality of the air we breath by sequestering the harmful carbon we manufacture due to air pollution from industry, and autos, etc. We are seriously threatening this possibility by firstly, harvesting the trees to such a great extent to provide the fuel for biomass incinerators thus eliminating their filtering benefits and secondly, by burning the wood, thereby producing more carbon as a by-product of this incineration process. Though state of the art standards are mandated in the development of these facilities, it comes as no surprise that the pollutants that are still discharged provide a serious health threat to the community and the environment. Accordingly, the American Lung Association, the Sierra Club and numerous other federal and local organizations are vehemently opposed to the further construction of large scale biomass facilities. More recently, the state of Massachusetts and the city of Springfield has enacted legislation delaying any further development of large scale biomass facilities. The fact that there is very little visible pollution emitted from the smoke stacks of these incinerators, a common argument that the developers make, is no indication as to their detrimental health effects. Actually, the finer the pollutant emitted, the deeper the toxins are penetrated into our lungs.

Much of the question as to the viability of biomass comes down to scale and efficiency. Biomass is one word, with varied implications. Large scale biomass, for the production of electricity is inordinately inefficient. For the small amount of kilowatt gain, the efficiency of a typical 29 mgw plant hovers around 15%. The enormous amount of heat that is generated in this incineration process is largely lost. Necessitating more than 500 gallons of water per minute 24/7 pulled from nearby natural water sources to cool these incinerators, 85% drifts out as steam mixed with pollutants. This mixture then escapes into the environment through the smoke stacks, subject to wind inversions and topical downdrafts. The remaining 15% not lost up the stack returns to the environment in the form of concentrated liquid pollutants. Beaver Wood Energy, the developers of proposed plants in Fairhaven and Pownal, proposed increasing their plant's efficiency to 20-25% due to the use of a small amount of the heat discharge to be used to dry the wood pellets that they hope to produce. This was their efficiency estimate as of 1 year ago. Since then, they upped their efficiency estimate to 50% to satisfy the BioE Working Group's demand

for at least 50% efficiency for electricity producing biomass. Its not difficult to imagine why the Working Group would insist on increased efficiency, given the low ratings by these plants. However, it is difficult to imagine that Beaver Wood could double their incinerator's efficiency by the suggestion of the Working Group alone.

In contrast, small scale biomass energy used primarily for heat production is very efficient. Used for smaller applications including hospitals, universities and municipal buildings, the heat production enjoys efficiencies in the 80-85% range. As a result, most of the energy generated is utilized by the first action of the combustion cycle-heat. There is no additional natural resource lost in this process for cooling purposes, as heat is the objective and water is not wasted. The use of this energy generation is localized, spontaneous and efficient, not requiring transmission lines and large scale logging of our forests, nor numerous logging trucks to transport it. Its not pollution free though, as there is always a price to pay for our energy needs. However, there is no comparison between these effects and the deleterious effects of large scale biomass production and transportation on a huge area.

As cost is always an issue, this too must be considered in evaluating the feasibility of increased large scale biomass for Vermont. In this economy, the creation of jobs is a central issue. Though temporary jobs are being promised for the construction of these facilities as well as several permanent jobs to maintain the plants, there is a cost to the state for this possibility. Beaver Wood Energy has offered to charge the citizens of Vermont 12 cents per kw for the electricity produced in their facilities. Additionally, they will derive federal tax credits for the creation of the facility. The production of wood pellets, an additional product for them to privately market and manufacture, has been added to the plant proposal and to their bottom line. As a priority, the developers are able to utilize this benefit to add to the supposed efficiency of their plant, which is crucial for the plan's survival;. Certainly the developers like this economic efficiency of scale by having additional products to promote the core plan's efficiency. However, is it prudent for the people of Vermont? A recently signed extension of the state's arrangement with Hydro-Quebec for many years insures adequate, clean energy for half the price, or .06 cents per kw! With all the pressure on the state budget we can ill afford to overpay to such an extent for our energy. Understanding Vermont's desire to be more self-reliant, this arrangement with Hydro-Quebec gives Vermont, at the very least, a period of time to investigate truly sustainable, risk adverse alternatives to it's energy needs that can be achieved at home.

In closing, whether its wind, solar or another new technology that proves to be reliable, we must incorporate a system that is both efficient and safe for our communities and environment in the long term. Vermont does not have an energy crisis at the moment that necessitates an immediate and hasty decision. Careful consideration must be given to all the alternatives without being cajoled by the marketing of developers of large scale biomass plants, coining popular phrases that promote sustainability and green technology. These large scale biomass facilities are neither. It would be a serious mistake for the members of this committee, who are responsible for the welfare of the citizens of the state Vermont, to fall victim to the irresponsible claims by these private enterprise developers.

Sincerely,

Richard Morgenthal
Pownal, Vermont

To: Aaron Adler
From: Chris McGrory Klyza
Sent: 12/12/11
Re: Biomass Energy Development Working Group Draft Report

I would like to offer a few comments on the Biomass Energy Development Working Group Draft Report.

1. If biomass development is to be supported with public funds such as grants or subsidies, we should have mandatory—not voluntary—harvesting standards. Forest health must be protected.
2. The report should include some discussion about the dangers of wood pellets becoming a commodity. As is clear in the dairy market, once a Vermont product becomes part of an undifferentiated commodity stream, the product is part of a global network that puts pressures on lowering price. The cost of that lower price will be paid by loggers, forest owners, and the land.
3. Biomass should not be used for large scale electricity due to its inherent inefficiency.
4. I applaud the discussion of carbon and forest biomass. Burning biomass releases carbon. It can be sequestered over a period of time if we know that the forests will remain to grow trees. One way to think about this is to think about a time period and acreage necessary to consider biomass carbon neutral. I urge Vermont to be proactive rather than reactive in this thinking about carbon and biomass.
5. While the resources of BERC are important and useful in the conversation, we should all remember that BERC's mission is to promote the use of biomass.

Thanks.

Chris McGrory Klyza

59 North St

Bristol, VT 05443

klyza@middlebury.edu

To: Aaron Adler
From: Frank Hudson & Kathy Beland
Sent: 12/6/11
Re: Biomass Energy

Biomass Energy Development Committee,

As two Vermont consulting foresters we would like to give our opinion on the future of biomass energy in Vermont. First I would like to state the obvious or perhaps not so obvious fact that wood is "stored solar energy". This energy can be used 24/7 not just when the sun is shining. While we are in favor of solar panels where they can economically be used, we would rather look at a hillside of growing trees storing solar energy (as well as providing many other environmental services), rather than look at a hillside of solar panels. Perhaps one of the best uses of direct solar energy would be to dry woodchips, storing that solar energy in the form of a dryer more energy rich chip.

In order to grow high quality timber we need to cut competing low quality trees. The more markets landowners have for low quality wood the faster we can increase the production of high quality wood. As a general statement high quality wood sequesters carbon longer both on the stump and in the wood products it produces. For example hardwood furniture sequesters carbon longer than a cord of firewood or a roll of paper towels. Foresters are more likely to grow veneer potential trees on a longer rotation than firewood potential trees.

Finally the more we can provide domestic energy the less we need to rely on foreign energy sources which are often brought at a high cost of treasure and the lives of our brave young men and women in uniform.

Respectfully submitted,

Frank Hudson
Consulting Forester

Kathy Beland
Consulting Forester

To: Aaron Adler
From: Phil Stannard
Sent: 12/11/11
Re: BioE Working Group Comments

I believe your Nov. 21 draft has failed miserably in its mission to establish and enhance the growth and development of Vermonts biomass industry, while maintaining forest health". I believe your greatest success is to further delay specific policies that would benefit the industry and to further an obstructionist, progressive administrative agenda, further delaying the ability of the private sector to develop industry from this resource while you encourage the public sector and public facilities to lead in this effort. The PSB planning document defers to your committee; Your comm. deferred to the BERC study which you now have; while you now defer to the "Modelling Sub-Committee", which openly defers to "further study". Further study enables further delays, and further delays, often by design, feed the administrative progressive obstructionist agenda, and policy base. Under this model, worthy private sector projects die, entrepreneurs get old and die, and as evidenced by present conditions, economic health and vitality dies with them. I congratulate you now, in advance of the death of Beaver Wood Energys 30 meg. power generation plant, due to systematic delays, cleverly disguised as "policy-making". Your study very cleverly recommends standards and bars either too high or too low to fit the BWE 30 meg. or pellet-making facility proposals. For proof of this I refer to pgs. 3,7,8,9,10,11,12,13,15,16,18,19,20,21,22,23,24,27,28,30,31,32,33,34,40,52,59,and61. The entire page 12 describes 5 recommended deferrals to DFPR. Your biggest failure is your lack of accomplishment as described in your so-called effort to "Fullfill the statutory requirement of Act 37 of the 2009 session,section 1(c)". My specific reference is to page 5, bullet point #1 of 4, specifically 1(c) (1), recommended fiscal and regulatory incentives for the promotion of efficient and sustainable uses of local biomass FOR ENERGY PRODUCTION and opportunities for offering more predictability in the PERMIT PROCESS". Also 1(c)(3), "recommended standards and policies for the design of new renewable energy from biomass that are designed to promote sustainable, long-term supply of local biomass for the production OF ENERGY from local biomass supplies". Please better explain your numerous references to the "Fair use of the resource" and explain to us in more detail how a govt body determines " fairness " in the commercial development of a resource based set of industries in a free market society ! ? In paragraph 2 of page 7 your calculation of biomass inventory is flawed by any professional calculation (with none quoted). Some more reasonable projections were offered by private foresters at your Dec. 6 public hearing. I strongly urge you to weight that testimony heavily in correcting your projections since you employ no private forester on your committee. Your conclusions about inventory on page 10 are seriously flawed. State of VT. has no useful inventory of its own timberlands and state owned timberlands are largely out-of-service do to their need to be subjected to litigations from a dozen or more private interest groups, each with special demands. State lands are for the most part not even harvested. Again I urge you to weight the testimony of the private forest management profession. As an aside, if we started harvesting State-owned forests and more federal lands, we could fuel several Biomass Power gen. plants for the foreseeable future. Also your estimate of 86% private ownership is skewed when considering public controls through

land trusts and "USE-VALUE". Your entire report encourages municipalities, State agencies, and schools to pursue ENERGY production using biomass and excludes any useful recommendation for permitting private commercial development, an honor only reserved for pellert manufacturing. You refuse to mention Beaver Wood Energy by name, referring to it only subtly as " a project ", but you have taken testimony from Tom Emero of BWE on June 14,2011, as a " stakeholder ", and further discussed the subject on July 19. His project has been proposed for longer than your committee has existed, and this administrations policy on Beaver Wood is said to depend on the results and recommendation of your committee, which will defer to the need for more , ifnot endless, information. I further find it curious that you do favorably mention operations of Lathrop Forest Products, of Bristol, and you frequently refer to the models of Ryegate and McNeil in your discovery.I urge you to own and project an opinion on the BWE model, as well. Finally, your harvesting guidelines are ill-defined, ill-advised, redundant and unenforceable. I strongly urge you to abandon them entirely.. Best regards, Phil Stannard (SR) Pres. Wood One Inc., Forestry management , 45 yrs., Members S.A.F. P.O box 111 Fair Haven, VT., 05743 [802 265 4455](tel:8022654455) [802 236 5933](tel:8022365933).

To: Aaron Adler
From: Colleen Goodridge
Sent: 12/12/11
Re: BioE Working Group re: BioE Report

ATTN: BioE Working Group

With 80% of the State of Vermont being forested, we have a tremendous resource, a renewable resource, which will be available for future generations, if used wisely. Keeping a strong forest products industry in Vermont is of critical importance not only for the wood products generated from the forest, but also for employment, wildlife habitat, forest health, and recreation and tourism opportunities.

The BioE Working Group has been gathering data and information on biomass development in Vermont concerning future projects. While this study is necessary and responsible, it is time to move forward and bring some projects into operation. Basic rules, regulations, and standards are needed for the physical plants, as well as raw material procurement, however, over-regulation and “analysis paralysis” will certainly cripple any project that could be beneficial to our state.

CONSIDERATIONS:

- Being “green”-being good stewards of the land, using every product coming from our forests, a renewable, natural resource, for its highest and best use-from our chips to our veneer logs.
- Forest Landowners-being able to have a market for some of their lower grade wood would allow them to realize more dollars back on their investment. If landowners can't afford to keep their forestland, it will be sold, often in small parcels, increasing the chances of development and land fragmentation.
- Employment-Vermonters need jobs!
- Markets-One of the top challenges for the forest products industry is access to markets, especially lower grade wood. Markets need to be within a reasonable trucking distance to make the sale of their products viable. The economic conditions of recent years have made it extremely difficult for all in the wood industry. If the forest products industry is to survive, development of these markets now is necessary.

Let Vermont forests work for Vermonters, encourage the growing, harvesting and processing in Vermont by Vermonters.

Let us encourage companies that want to invest in our state. Some biomass development, which would include monitoring for data to be used in evaluation of other projects, would be very beneficial to our forest economy. To delay, over-regulate, or discourage these companies would be very disappointing. We can do better!

Vermont's forests and forest products industries are crucial to sustaining the rural character and economics of our Vermont communities-today and in the future.

Colleen Goodridge

President

Goodridge Lumber, Inc

Albany, VT

[802-755-6298](tel:802-755-6298)

To: Aaron Adler
From: George J. Stannard 3rd
Sent: 12/12/11
Re: BioE Working Group Comments

Comments on Biomass Working Group Study Report
by George J. Stannard 3rd
33 West Street
Fair Haven, Vermont 05743
tel: [\(802\)-265-4486](tel:802-265-4486)

At the public hearing on December 6, 2011 in Montpelier, Vermont, the very first speaker was stopped by Senator and Co-Chair Ginny Lyons for saying that he "approved of this project". Senator Lyons stated that the speakers should address only the report draft and not any specific project.

Everyone in the room, on both sides of the table, knew that the speaker was referring to the application, submitted over a year ago, of Beaver Wood Energy for a biomass energy/pellet plant in Fair Haven. And it seems that most, or at least many, realized that this report was a somewhat subtle attempt to help other politicians to turn down the Beaver Wood Energy application.

Although this study has been underway for about three years, it has certainly changed direction in the last year or so under the Shumlin administration, as evidenced by the December 6 testimony of Jonathan Wood, a former member of the Working Group under the Douglas administration. Mr. Wood did not ask, but rather demanded, that his name be removed from any association with the group.

Under the Douglas administration all of the Working Group member positions seemed to be filled, but ironically the only unfilled working-group position was (and solely under the Shumlin administration) "a representative of the consulting foresters association". Of all the member categories, one has to wonder why that one is now vacant. Of all the professions, foresters are the most equipped to understand and interpret the accuracy of the data.

My biggest problem with this report is that it seems to be, in contrast to Senator Lyons' chastisement of the first speaker, all about Beaver Wood Energy. While ostensibly scientific, this report is actually more political than anything else. It is very subtle in its attempted kiss of death to the Beaver Wood Energy project. On page 16, it states that "The Working Group has evaluated the potential addition of one large-scale (20-25 megawatt) wood-fired electrical generating facility..." (they were all well aware that Beaver Wood Energy had applied for almost thirty megawatts).

If not by name, Beaver Wood Energy is certainly mentioned in the report when it says on page 7 that "A currently proposed combination electrical-generation and pellet plant would, if permitted and constructed, demand over 500,000 tons per year. Our inventory of volume in our forests may be growing, but it is not inexhaustible." The last sentence would appear to me to be a negative comment on the unnamed proposed project. After five more sentences in the same paragraph, it says "Finally, not all of a new plant's supply will necessarily come from within Vermont - imported wood from adjacent states is likely."

Although this fact is included in a marginal way, it is downplayed, nor it is emphasized later in the report when the available amounts of biomass are discussed.

And nowhere does it mention that if the Beaver Wood Energy project is not permitted in Fair Haven, it can seek to locate in New York State (which is within two or three hundred yards of the proposed Fair Haven site), where New York can generate electricity from Vermont biomass, instead of the other way around.

Finally if, as I suspect, this report is designed to help squelch the Fair Haven project, why do we all have to invest so much money and time in trying to permit a project which was destined for rejection by the "higher powers". If politics could be foresworn and an honest answer given, millions in money from both the taxpayers and the applicant and years of aggregate time could be saved.

To: Aaron Adler
From: Neil Robinson
Sent: 12/12/11
Re: BioE Working Group Comments

Gentlemen:

The lack of strong endorsement of biomass by your group and specifically not mentioning the Beaverwood Fair Haven project, needs no further study and are poorly represented by your final draft.

Since you chose to use the Ryegate and McNeil plants as representative models, I feel compelled to offer the ensuing facts and benefits which Beaverwood's Fair Haven plant will provide.

Capitalizing on stack heat by producing wood pellets and hydroponic production. A truly unique application which enhances Vermont's green movement and will generate national publicity.

The foregoing will create additional employment while providing a reliable competitive wood pellet source and local fresh produce.

State and municipal tax revenues-how many other municipalities can you name that will have over one million dollars of new tax revenues?

Improved hunting opportunities because of improved wildlife habitat. Check with any hunter on this one, especially after this deer season.

Additionally I find it dismaying that this administration is married to solar and wind energy, although neither has anywhere near the capacity factor of biomass. It would behoove you to read Dorothy Schnure of Green Mountain Powers comments on March 27th in the Times

Argus regarding her companies history with wind turbines and negative remarks about solar.

Finally perhaps the greatest immediate benefit to Vermonters would be sending a clear message to the rest of our country that our state is not anti-business and is taking positive steps to replace fossil fuels through cutting edge technology.

Hopefully you will seriously consider my remarks in your recommendations.

To: Aaron Adler
From: Phil Stannard
Sent: 12/12/11
Re: BioE Working Group Comments

To whom it should concern,

I am a forester in the State of Vermont and I have been very excited about the possibility of a new biomass power plant, local to the area where I manage forestland (Vermont and **Eastern New York**). A majority of the wood lots in the area, where I practice forestry have been high-graded (take the best and leave the rest) several times over. The reason that I have been excited is because I realize how important it is to have more readily available markets for the low-grade material that is in our forests. These low quality trees occupy crown space, which inhibits the growth and/or establishment of more valuable trees. **I am talking about trees that provide useful veneers, lumber, flooring and fuel, while improving wildlife habitat and when they are growing vigorously, they lock up a great deal of carbon and provide clean air.**

Now that I have read the Biomass Working Group Study Report Draft, I am not nearly as excited as I was. I now realize that the report has been designed to thwart the project that would utilize my low grade woody material and generate (much needed) base-load power and (much needed) home heating wood pellets from the most efficient and environmentally sound facility in the country, thus far. It is obvious that a powerful few in the Vermont State Government have tried to seal the fate of one particular project, with this report. It became most obvious to me when I compared the NALG (Net Annual Low Grade) estimate of the working group study to that of the BERC study. The BERC study volumes reflect those of counties in neighboring States within the supply area.

I just thought of something ----- I bet they could put their facility on the other side of the river and the wood supply could still come from the same areas. New York could reap all of the benefits. Even though they are not asking for any subsidies, I bet New York would help them establish their facility with Empire Zone business incentives.

Then, when Vermont has it's back against the wall and is in dire need of base-load power, it can purchase it from Canada, Massachusetts and New York.

To: Aaron Adler
From: Thomas D. Emero
Sent: 12/29/11
Re: Beaver Wood Energy's comments to BioE Working Group

As I discussed with Mr. Recchia soon after the public hearing, Beaver Wood Energy's comments were submitted without being fully vetted by our whole team and contained a few minor overstatements regarding wood fuel. Accordingly, I have edited BWE's comments and submit this corrected version now.

Thank you. Happy New Year to all.

[Beaver Wood Energy, LLC](#)

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BEAVER WOOD ENERGY

December 29, 2011

Biomass Energy Development Working Group
Legislative Council
State House
115 State Street
Montpelier, VT 05633-5301

Re: November 21, 2011 Public Review Draft of the Biomass Energy Development
Working Group Final Report

Beaver Wood Energy LLC ("BWE") is pleased to offer its perspective on the Draft Final Report of the Biomass Working Group. As you may know, BWE is currently developing the Fair Haven Renewable Energy Center in Fair Haven, VT - a combined heat and power ("CHP") facility consisting of a 34 MW gross biomass electric generating facility, a 110,000 ton per year wood pellet manufacturing facility, a hydroponic crop facility and possibly other steam users.

First, we applaud the efforts of the Working Group in addressing its legislative mandate and the scope of its recommendations. While BWE believes that it can meet the suggested forest sustainability guidelines set forth by the Biomass Working Group in Appendix A to the Draft Final Report on a theoretical level, we also appreciate the concerns of foresters and landowners in trying to put such guidelines into effect. It may be more appropriate to require foresters to follow good forest management practices (part of their expected licensing requirements), rather than stipulate in legislation some formulaic or percentage harvesting requirements difficult, if not impossible, to implement in practice. Second, we support incentives for the biomass industry, including the adoption of favorable power rates for biomass electric generating facilities. We also strongly believe that the development of biomass energy promotes significant local job creation, increases state and local tax revenues, fosters overall economic growth, is an efficient use of an indigenous resource and offers the potential for many value-added products (see 7 a. - i. of Appendix I) - therefore, use of biomass resources in applications that best meet these objectives should be preferentially encouraged. In particular, we applaud the suggested application of the 'optimal design system efficiency' standard by the PSB in Section 248 proceedings. We would propose that for CHP facilities that must acquire permits under multiple regulatory regimes - such as Section 248, Section 250 and/or other - any hurdle cleared in one proceeding be sufficient to satisfy a similar hurdle under other proceeding(s), and that any such CHP facility could proceed under multiple regulatory regimes simultaneously rather than seriatim - saving both time and money. We are also pleased with the Working Group's recommendation for further state support of pellet manufacturing. While the foregoing expresses our views on the recommendations of the Draft report, we would be remiss if we did not point out that we believe to be factual errors, as well as provide a warning, regarding the affect of expected EPA MACT regulations.

The first complete paragraph of the Draft Final Report introduces the premise that Vermont's forest resources are limited. While that premise may be generally true, we find the specific enumerated available forest resources in the Draft Final Report to be significantly understated. From comments made by one of the foresters at the December 6 public hearing and from the forest resource study conducted by our expert, *annual* forest growth in Vermont exceeds BERC's 'moderate scenario' many times over. Therefore, we suggest that the Final Report refrain from placing unnecessary usage restrictions on Vermont's forest resources.

The 5th sentence of the aforementioned paragraph on page 7 of the Draft Final Report, reads as follows - "A currently proposed combination electrical-generation and pellet plant would, if permitted and constructed, demand over 500,000 tons per year." It's rather clear that this sentence refers to the BWE Fair Haven facility. What's unclear is the reference to the use of '500,000 tons per

year', which does not identify whether such feedstock is high-value, low-value or other. In addition, because of this lack of clarity, the reader is drawn to the conclusion that 500,000 green tons of wood out of 900,000 green tons of wood available annually (as claimed by the BERC study) is being used by one facility. This reading was made abundantly clear by speaker references to this example at the December 6 public meeting. *We would request that this sentence be removed from the Final Report, or modified to reflect actual wood usage at the BWE Fair Haven facility, as follows.* BWE will use primarily forest residue (tops, limbs, branches and bark), as well as some diseased, crooked and invasive trees as feedstock for its electric generating facility. There is approximately 2,631,347 tons of saw logs harvested yearly within 50 miles of the project. Saw logs include lumber and veneer logs, pulp wood for paper and pellet manufacturing, high grade wood chips for thermal boilers, and fire wood. Since approximately 35% of a tree is in the top and branches (harvest residue), this amounts to approximately 920,000 tons of harvest residue currently being left in the woods each year from these operations within 50 miles of the project. To be very clear, this 920,000 tons of forest residue is not material which is currently used in any significant percentage by thermal boilers because it is too poor of a quality for them. It also must be clearly understood that this 920,000 tons of forest residue is also not the 900,000 tons of Net Available Low-Grade Growth (NALG) as identified in the BERC Study. NALG is defined as "wood that would be appropriate for use as biomass fuel (for thermal boilers) above and beyond current levels of harvesting within the state of Vermont." NALG is not harvest residue. It is also important to note that the 900,000 tons of NALG identified in the "moderate Scenario" of the BERC Study quickly grows to 3.1 million tons of NALG available if you add the neighboring counties of neighboring states. This is relevant in the discussion of the use of NALG by the pellet manufacturing facility addressed below.

The power plant needs approximately 362,000 tons per year of fuel, and is designed to combust low grade material such as bark and other harvest residue. Operations at the pellet manufacturing facility will generate about 26,000 tons of bark and about 39,000 tons (see below) of forest residue all of which will be delivered to the power plant as fuel. As a result, the power plant will need about 297,000 tons per year of additional fuel which represents about 32% of the 920,000 tons of harvest residue currently being left behind in the woods from existing operations.

Harvesters are desperately in need of a market such as the one the power plant will create where they can bring this material. The market price for forest residue is currently and has been for many years around \$30.00/ton.

The BWE pellets are made from primarily the same material which biomass thermal boilers use for fuel and which material is identified in the BERC Study as Net Available Low-Grade Growth (NALG). This material is a high grade wood chip made from low grade pulp quality wood. However, the majority of what

the pellet facility is doing is converting this material into a more dense, very low moisture, cleaner and unified size material. Total input into the pellet facility is about 223,000 tons/year. Of this, approximately 26,000 tons of bark will be removed and burned in the power boiler and about 87,000 tons of water will be removed by drying resulting in about 110,000 tons of wood pellets available at the local market. These pellets are ideal fuel for small home sized stoves and furnaces all the way up to units of 2 million or 3 million btu's, large enough for many commercial buildings.

As a result of the harvesting of the feedstock for the pellet manufacturing there will also be about 78,000 tons of forest residue created ($35\% \times 223,000 = 78,000$ /year). Studies are clear that recovery of more than 50% of this forest residue is not economically feasible so it is reasonable to assume that only about 39,000 tons of this forest residue would be used by the power plant as fuel. As discussed above, there will also be about 26,000 tons of bark removed from the pellet feed stock and sent to the power plant as fuel. Finally, since the site for the power facility is literally located on the border with New York, it is fair to assume that half of the pellet feedstock will come from New York. Accordingly, it is fair and reasonable to assume that the power plant will only use about $(26,000 + 39,000 = 65,000 \times 50\% = 32,500$ tons of the 900,000 tons of NALG wood claimed in the BERC Study or 4%.

While it would be inaccurate to state that the BWE electric generating facility will not be using "any" of the 900,000 tons of NALG identified in the BERC Study, it is fair to say that the BWE power facility will not use a significant amount of this material (approximately 4%).

As you may know, EPA has undertaken the task of crafting emissions regulations for various types of boilers used to generate power – or boiler 'maximum achievable control technology' (MACT) rules – for industrial, commercial and institutional boilers and process heaters. BWE has been monitoring these rules with interest for the potential affect that they may have on our Fair Haven facilities. Of late, it appears that EPA has agreed to take another look at such rules as they affect biomass facilities in particular. While our Fair Haven facilities will likely satisfy such air emissions standards as currently contemplated with its expensive and extensive emissions control devices in place, such is not typically the case for thermal only applications of biomass boilers. For example, biomass boilers for space heating in schools, office and government buildings or process heating for manufacturing facilities would currently be subject to the MACT regulations. In order for these facilities to comply with the regulations, significant pollution control equipment would be required at a cost that would likely make such thermal uses of biomass uneconomic. We bring this to the Working Group's attention given its recommendations for further use of biomass thermal applications.

Sincerely,
Beaver Wood Energy LLC