



**RESEARCH  
REPORT**

**Maine Bioenergy at the  
Crossroads  
Costs of a Failing Industry**

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Mary S. Booth, PhD  
Partnership for Policy Integrity

April 18, 2017



## Maine Bioenergy at the Crossroads

### Costs of a Failing Industry

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## Executive Summary

Taxpayers and ratepayers have doled out over a quarter of a billion dollars since 2008 in in state and federal subsidies and grants, aimed at keeping Maine’s biomass industry afloat, in a desperate bid to save forest industry jobs across the state. The payments have done little to stop the bleeding from an industry that generates electricity too dirty to be eligible for clean energy subsidies in some neighboring states, and too expensive to compete with alternatives without multi-million dollar subsidies.

There is almost no kind of subsidy that has not been tried. Since 2008,

- Over 90 percent of ratepayer-funded Renewable Energy Credits (RECS) in Maine have gone to aging biomass power plants, totaling more than \$68 million.
- RECs from other states have been more lucrative than those from Maine; total payments may have been around \$60 million per year in some years.
- State and federal grants totaling \$15 million in grants were made to the Verso Bucksport mill for expanded bioenergy; the facility closed a year after receiving the grants.
- Other federal grants, including to a biofuels venture, total over \$30 million. The equipment from that facility was put up for auction.
- The federal Biomass Crop Assistance Program (BCAP) allocated over \$35 million in matching payments for deliveries of bark and chips to biomass power plants in Maine. The funds went to 150 recipients, with just 15 recipients (10 percent) receiving over half the payments. Some recipients were later seated on the state’s 2016 commission to study the benefits of the biomass industry – which not surprisingly recommended that the state grant more subsidies to the industry.

Name	City	State	Payments
PRIME TIMBER COMPANY LLC	BANGOR	ME	\$ 2,924,207
WT GARDNER & SONS INC	LINCOLN	ME	\$ 2,438,490
JAMES B LIBBY	LINCOLN	ME	\$ 2,318,280
J D RAYMOND TRANSPORT INC	DOVER FOXCROFT	ME	\$ 1,485,297
GREAT NORTHWOODS LLC	BANGOR	ME	\$ 1,170,968
PLUM CREEK MAINE MARKETING INC	CROSSETT	AR	\$ 1,139,990
MAINE-LY TREES INC	STRONG	ME	\$ 1,029,435
RICHARD CARRIER TRUCKING INC	SKOWHEGAN	ME	\$ 918,521
TREELINE INC	LINCOLN	ME	\$ 792,121
TIMBER EXPRESS INC	MADISON	ME	\$ 705,409
LINKLETTER & SONS INC	ATHENS	ME	\$ 693,821
GORDON LUMBERING LLC	STRONG	ME	\$ 683,324
HANINGTON BROTHERS INC	MACWAHOC PLT	ME	\$ 625,845
PRENTISS & CARLISLE MANAGEMENT CO	BANGOR	ME	\$ 580,400
ELLIOTT JORDAN & SON INC	WALTHAM	ME	\$ 571,663

The 15 companies that received more than half of BCAP payments allocated in Maine, 2009 – 2012.

Maine policymakers keep asking biomass industry insiders, some of whom are among the greatest beneficiaries of public subsidies, how to keep the biomass industry going. Not surprisingly, they keep getting the same answers, usually involving asking for more financial support.

Biomass advocates are less likely to tell policymakers that:

- Maine's biomass facilities, including some receiving renewable energy subsidies worth millions of dollars a year, represent the largest polluters in the state, emitting smog-forming chemicals, particulate matter, and greenhouse gases. Meanwhile asthma in Maine exceeds the national average, incurring costs over \$173 million each year.
- Massachusetts stopped granting renewable energy subsidies to Maine biomass plants because biomass was found to worsen carbon pollution and is little to no help in fighting climate change. Connecticut is about to reduce subsidies to old, polluting Maine plants as well, in order to make room for new zero-emissions wind and solar.
- The loss of lucrative subsidies from Massachusetts and eventually Connecticut means Maine will see a steep increase in the amount of support the state must provide to keep biomass plants operating.
- Meanwhile, the Maine Public Utilities Commission has warned that subsidizing refurbished biomass plants as "new" renewable generation is driving REC prices down and preventing development of new renewable energy in Maine.
- The majority of Maine's biomass comes directly from the woods. Though stumpages costs are around \$3 per ton, the delivered cost of biomass is around ten times higher, partly because harvesting and transporting biomass burns so much fossil fuel.
- Biomass energy will always need big subsidies, because plants spend more to generate power than they can make selling it. Fuel costs alone per megawatt-hour are similar to recent wholesale power prices.
- Biomass is worth a fraction of sawtimber, thus even massive upscaling of bioenergy would not replace the value that evaporated from the market with the decline in sawlog harvesting in the mid-2000's.

Most importantly, bioenergy and forest industry insiders won't talk about the value of rebuilding Maine's forests to act as a sink for atmospheric carbon pollution – and the damage that current management is doing to forest carbon storage. As acknowledged by the Paris Climate Accord, expanding and restoring forests is essential if we are to have a hope of limiting the damage climate change will bring. Forest carbon programs already exist, and could be expanded if subsidies for bioenergy were reallocated to support rebuilding forests.

Bioenergy will always have a role in Maine where facilities burn forest product manufacturing wastes onsite for heat and power, thus also avoiding disposal costs. However, continued support for low-efficiency wood-burning power plants will prolong the financial bleeding and subsidy dependence by supporting the lowest value use of wood – burning it. As atmospheric carbon dioxide continues to increase, and climate change effects deepen, policymakers should commission independent, science based studies to help Maine value forests as carbon storage, rather than as fuel.

## Introduction

Maine's sawmills and paper mills have burned biomass to generate onsite heat and power and dispose of industrial wastes for more than a century. In recent decades, as traditional forest-based manufacturing has declined, Maine's biomass power sector has become increasingly dominated by wood-burning power plants built exclusively to generate electricity solely for the grid. Not affiliated with any manufacturing operation, and always somewhat marginal, these plants have relied on renewable energy subsidies and tax credits to remain viable.

Now, however, subsidies for biopower are drying up, and the biomass sector is in trouble. In response, the state is scrambling to preserve biomass jobs – most recently, with a controversial \$13.4 million public money bailout of four biomass plants in 2016. A legislative commission appointed to examine the “benefits” of the biomass industry has recommended still more subsidies for the industry. Yet almost none of the discussion about Maine's biomass sector has addressed the real financial costs of biomass energy, or its impacts to forests, air quality, and the climate. As Maine policymakers weigh granting still more public funds to the bioenergy sector, they should consider these costs.

**Maine's \$13.4m bailout of the biomass industry in 2016 was followed by a Commission on the industry's “benefits.” Policymakers still haven't gotten the whole story.**

## The rise and fall of biomass energy in Maine

### 1980s: Optimism

Use of biomass for heat energy is long-standing, but real growth in biomass electricity started with addition of about 300 megawatts (MW) of capacity between 1950 and 1980, mostly in the industrial sector. Much faster growth in biopower capacity occurred following enactment of federal and state laws in the 1970's and 1980's that promoted energy independence and allowed utilities to charge more for locally produced power (Figure 1).<sup>1</sup> By the early 1990's, capacity had tripled, as new standalone wood-burning plants were built and paper mills added additional electrical generation capacity. Money was invested, power began flowing, and studies were undertaken.<sup>2</sup>

### 1990s: Pessimism

By the mid-1990s, efforts to make Maine a national bioenergy powerhouse were unraveling. First, traditional forestland ownerships were broken up and sold off. For a century, pulp and paper companies in Maine had amassed hundreds of thousands of acres so they could control the supply and price of wood. That control frayed when Diamond, Great Northern, Scott, International Paper and other corporations split their woodlands from their mills, then sold the forest acreage to real estate investment trusts, timber management groups, and other speculators. The supply side of the biomass market slid into chaos.

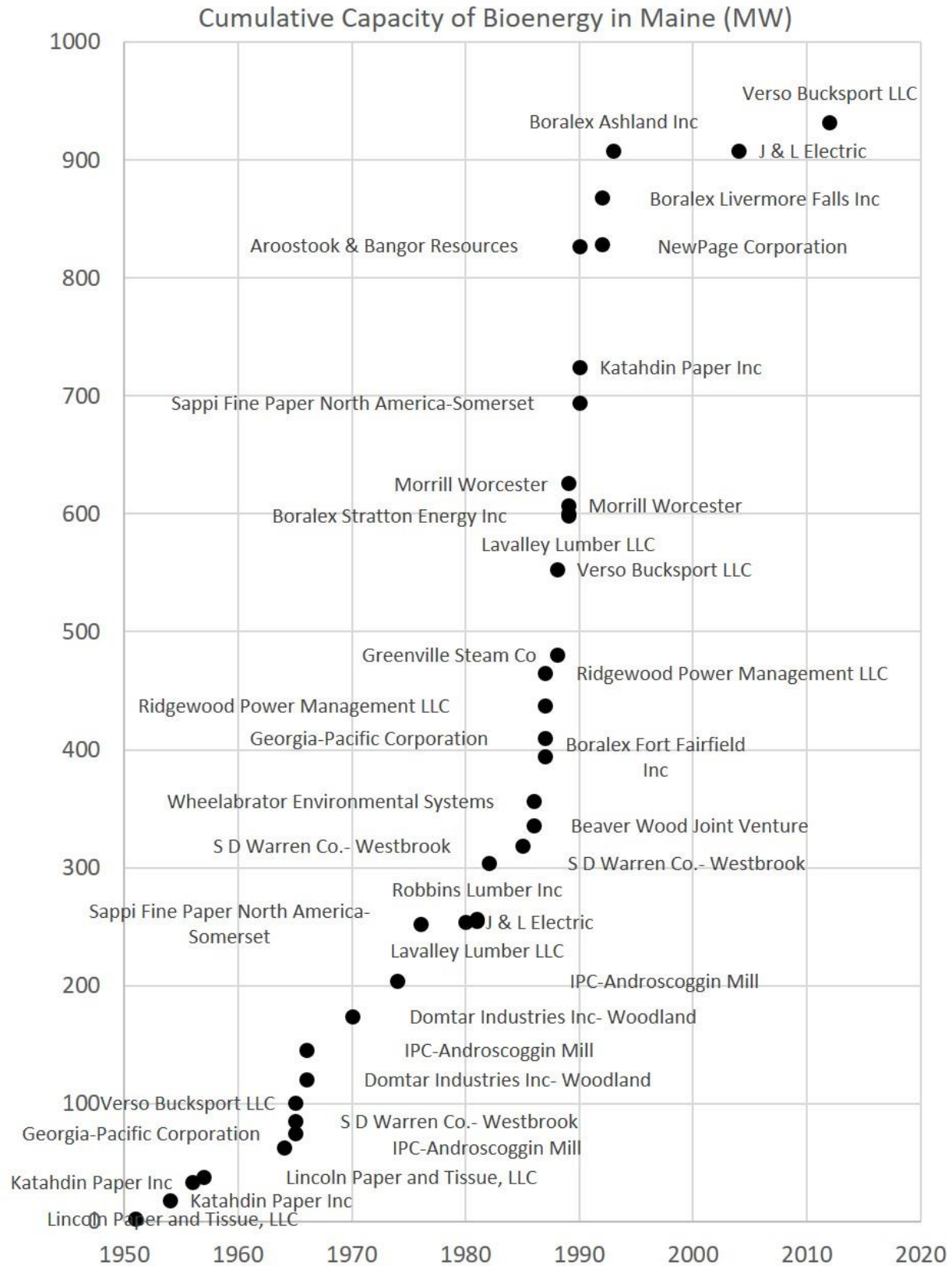


Figure 1. Cumulative buildout of biomass plants in Maine, showing the step increase that occurred after 1980.<sup>3</sup> Many plants are no longer operating, and the table does not represent current capacity.

Then the paper mills, a foundational element of Maine's economy, started to close in the face of global competition, mechanization and shrinking market demands for paper. In a few short decades, thousands of woods and mill workers in Maine lost their jobs.

The biopower sector was further impacted by an unexpected drop in oil prices in the 1990's that caused utility customers to pay millions of dollars in above-market costs for biomass power.<sup>4</sup> Regulators responded by ordering power companies to buy out the highest-priced bioenergy contracts, which closed a number of plants, though some were restarted again later.<sup>5</sup>

### **2000s: A downward spiral**

In the early 2000's, the trends toward collapse of Maine's forest industry accelerated. Additional large forestland ownerships in Maine disintegrated as more than 10 million acres of forestland were sold, often at fire sale prices. More paper mills closed, including American Tissue in Augusta in 2001, Yorktowne in Gardiner in 2002, Eastern Pulp & Paper in Brewer in 2004, Great Northern in Millinocket in 2008, Otis in Jay in 2009, U.S. Gypsum in Lisbon Falls in 2009. Falling oil prices and the expansion of natural gas pipelines precipitated additional closures of standalone biomass facilities, for example the Boralex Sherman plant in Stacyville (2009), which closed after its contract with the Maine Public Service Company terminated.<sup>6</sup>

### **2010s: National headwinds**

Ongoing mill closures in Maine have included Lincoln Paper & Tissue in Lincoln in 2013, Great Northern in East Millinocket in 2014, and Red Shield in Old Town in 2015. These closures shuttered associated biomass co-generation operations,<sup>7</sup> but standalone biomass power plants have also struggled, due partly falling power prices nationally.

Across the country, biomass power has often turned out to be more expensive than other sources of electricity.

- In New Hampshire, Cate Street Capital's new biomass plant in Berlin generates power that is "usually way above market value."<sup>8</sup> The plant has a 20-year contract that will cost ratepayers \$125 million more than if they had purchased electric power on the open market.<sup>9</sup>
- In Texas, two new biomass plants were taken offline soon after startup due to their inability to compete with cheaper wind and gas-generated power. A plant in Lufkin, which had received a \$30 million federal grant, was sold for pennies on the dollar, and a plant in Sacul has been kept on standby, costing Austin ratepayers about \$54 million annually.
- In Florida, Gainesville Renewable Energy received a \$116 million federal grant to build a wood-burning plant that has proven largely uneconomic to run. Ratepayers are paying \$70 million a year to keep that plant idling.<sup>10</sup>
- In Wisconsin, We Energies got a \$75 million federal grant to build a 50 MW biomass plant at the Domtar paper mill in Rothschild. The plant went online in 2013 but by 2015 it was operating only minimally because the company determined running the plant was more costly than running their natural gas plant or buying power on the market.<sup>11</sup>

Maine's plants continued to operate with the help of subsidies, providing a market for Maine loggers impacted by closures of pulp and paper mills. However, closure of two Covanta wood-burners in early

2016 reduced demand further, leaving the market, in the words of one operator, “saturated” with wood.<sup>12</sup> Responding to pleas from loggers and the biomass industry, the Maine legislature passed the \$13.4 million bailout in 2016 to restart the two recently closed plants and keep two other biomass plants operating, in order to preserve outlets for wood and associated jobs.

The bailout is just the most recent chapter, however, in a history of public funding for bioenergy.

## Propping up a declining industry

Maine’s biomass industry has received a variety of subsidies, grants, and tax credits over the years, in addition to the historically higher prices for power they have been allowed to charge. Over the last ten or so years, these supports have amounted to more than a quarter of a billion dollars.

### *Grants and tax credits funded by federal tax dollars*

Maine’s biomass industry has received tens of millions in taxpayer-funded federal grants and subsidies since 2009.

#### Stimulus grants

The American Recovery and Reinvestment Act (aka “The Stimulus”) provided at least two sources of funding for new biomass energy facilities in Maine. The “Public Building Wood to Energy Program” allocated about \$11 million to Maine that supported installation of 22 biomass heating projects at schools and public buildings.<sup>13</sup> Additionally, direct grants for biomass electricity were made under the U.S. Treasury’s Recovery Act, Section 1603(b) Program, which converted the 30% investment tax credit (ITC) for construction costs of certain renewable energy facilities into a direct cash grant.<sup>14</sup> In Maine, 1603(b) awardees were

Maine’s biomass sector received millions of dollars under the Stimulus.

- OKJ Construction in Skowhegan, which received a \$41,514 grant to for a “wood-gas, biomass electrical generation plant”<sup>15</sup> and also a \$20,000 grant from the “Rural Energy for America” (REAP) program administered by the U.S. Department of Agriculture.<sup>16</sup>
- Canada-based Irving Forest Products, which received \$313,058, although it is not clear how the money was spent.
- Verso Bucksport, which got \$13,653,000 for its biomass plant under the 1603(b) program<sup>17</sup> and an additional \$2 million grant from Efficiency Maine.<sup>18</sup> Verso closed Bucksport mill in 2014, the year after it received the grants.<sup>19</sup>

A separate Department of Energy program made a \$30 million grant in 2008 for a pilot project to develop cellulosic ethanol from wood at Old Town Fuel and Fiber.<sup>20</sup> The project showed some success but was not sustained and by 2015, the equipment for the process was being auctioned.<sup>21</sup>



### The Federal Production Tax Credit (PTC) and Investment Tax Credit (ITC)

Certain Maine biomass power plants may have been eligible for the Renewable Energy Production Tax Credit (PTC), which was originally enacted in 1992. The program provides a tax credit for renewable energy generators serving the grid, with the current rate for biomass facilities set at 1.2 cents per kilowatt-hour (about half the rate for wind and solar).<sup>22</sup> The credit has generally been available for ten years following initial operation, and has been worth about \$4.4 million per year to a 50 MW plant operating full-time. Given the age of the Maine biomass power fleet, and the fact that facilities can only take the tax credit for ten years at most, it is unlikely that the Maine biomass industry has benefited much from this program in recent years. However, as an alternative to the PTC, facilities can instead opt to take the Investment Tax Credit, which in recent years was made available as a cash grant under the 1603(b) program. As discussed above, some Maine facilities did benefit from this program.

### The Biomass Crop Assistance Program

The Biomass Crop Assistance Program (BCAP) is a federally funded program at the Department of Agriculture that subsidizes farmers to grow energy crops, and loggers to harvest and transport biomass. The kind of forestry practiced in Maine generates lots of biomass, and wood chips are not costly – for instance, average stumpage prices in 2014 and 2015 were \$3 a ton and below (minimum \$0.25, maximum \$12.00).<sup>23</sup> As industry data show, while biomass can constitute a relatively high volume of a harvest, it yields less than 5% of the value (Figure 2). However, harvesting and delivering biomass ties biomass prices to fossil fuel prices, which can add significantly to total cost, as it requires upwards of two gallons of diesel per ton of wood chips by the time biomass is delivered to the power plant.<sup>24</sup> Delivered prices for biomass range from \$20 to \$40 per green ton, or about ten times the stumpage price.

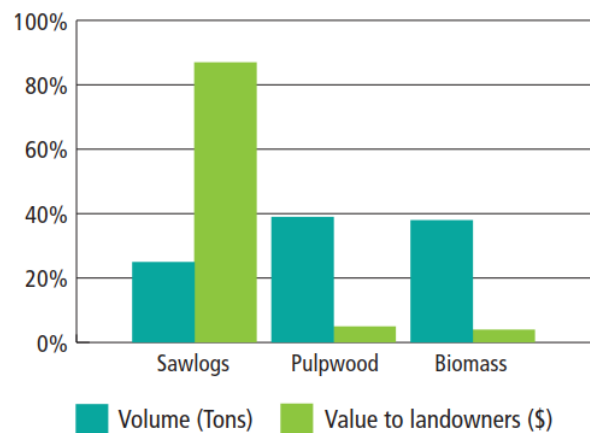


Figure 2. Pulpwood and biomass represent the majority of wood removed from typical forestry operations in Maine. (North East State Foresters Association, 2013).<sup>25</sup>

Data from the Maine Forest Service shows that most of the biomass burned in Maine's power plants comes straight from the woods. For instance in 2015, of the 3.84 million tons of biomass from Maine's forests, 78 percent was "biomass chips" defined as coming from "limbs and tops, cull trees, and smaller trees not suitable for higher value products," with the balance classified as hog fuel, which is the sawdust, bark and shavings produced at mills.<sup>26</sup>

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Table 1. The 15 companies that received more than half of BCAP payments allocated in Maine, 2009 – 2012.

To mitigate biomass costs, BCAP’s “Collection, Storage, Harvest, and Transport” (CHST) subprogram provides matching payments for biomass deliveries. In the initial years of the program, recipients were eligible for two years to receive up to \$45 per dry ton (about \$25 per green ton) of woody fuels delivered to qualified facilities.<sup>27</sup> While the CHST program is now funded at a lower level, data requested from the US Department of Agriculture show that for 2009 to 2012, about 150 logging and trucking companies in Maine received about \$35.6 million in CHST payments – more than any other state under the program.<sup>28</sup> More than half the payments in Maine went to just 15 recipients (10 percent of total recipients), a list that includes companies that do business in several states (Table 1). As discussed below, some members of a committee tasked by the legislature with analyzing the “benefits” of Maine’s biomass power industry were also recipients of CHST funds.

**Just 10 percent of logging companies received over half the subsidies for biomass fuel deliveries.**

### ***Other sources of support from Maine and federal taxpayers***

Other federal programs also provide grants and loans for bioenergy in Maine, including the Renewable Energy for America Program, New Markets Tax Credits, and the Forest Service’s Woody Biomass Utilization Grants program.<sup>29</sup>

- Maine received \$380,170 from the U.S. Department of Agriculture’s “Wood Innovations” program to develop a Maine State Wood Energy Assistance Team and a program to promote greater use of bioenergy.<sup>30</sup>

- In 2015, the Rural Energy for America program granted \$500,000 to Athens Energy to build a new bioenergy generator, and \$56,520 to install a feedstock pre-dryer system.<sup>31</sup>
- The federal Advanced Biofuel Payment Program has funded at least three Maine pellet producers: Corinth Pellets \$1,153, GF Funding \$1,652, and Maine Wood Pellet Co. \$2,393.<sup>32</sup> While these amounts are small in comparison to other federal biomass grants, the program is of note because “advanced biofuels” usually implies production of liquid fuels from non-food cellulosic biomass sources, including wood, but in this case, the program is funding wood pellet companies that produce solid fuels.<sup>33</sup>

Maine has numerous other state programs that can support biomass, though in some cases the funds may have ultimately been derived from federal sources or the Regional Greenhouse Gas Initiative (RGGI). Programs include the Maine Municipal Bond Bank, Maine New Markets Tax Credit Program, Finance Authority of Maine’s Seed Capital Tax Credit Program, PUC’s Renewable Energy Pilot Program, the Maine Technology Institute’s Renewable Energy Technology Fund, and the Small Enterprise Growth Fund.<sup>34</sup>

- Efficiency Maine has provided \$500 to \$5,000 incentives to get homeowners, schools and municipalities to shift to pellet stoves and biomass boilers.<sup>35</sup> It has also made larger grants for conversions to biomass, such as the \$2 million grant to Verso Paper Bucksport discussed above and a \$1 million grant to the Jackson Laboratory.<sup>36</sup>
- A new Maine Born Global Challenge aims to “commercialize innovative technologies” including biomass handling and storage.<sup>37</sup>
- The Finance Authority of Maine authorized \$12 million in Maine New Market tax credits to leverage \$30 million in investment<sup>38</sup> for Athens Energy, the plant that received \$557,000 from USDA, as discussed above.<sup>39</sup>

### ***Renewable energy subsidies from electricity ratepayers in Maine***

Like many states, Maine has a renewable portfolio standard (RPS) that requires the amount of electricity generated from renewable sources to increase over time. This requirement is a source of subsidies to renewable energy generators, including biomass power plants. Ratepayers pay extra on their electric bills so that utilities can purchase renewable energy credits (RECs) that are issued by renewable energy generators, with each REC representing the “environmental attributes” of one megawatt-hour of electricity generation.<sup>40</sup> The income stream from RECs acts as a subsidy to renewable energy generators and can amount to millions of dollars per year at larger biomass plants.

The biomass industry cannot operate without these subsidies. In a 2016 presentation, Eric Kingsley of Innovative Natural Resource Solutions, a bioenergy consulting company, notes that the cost of bioenergy generation – absent profit – is about \$90 per MWh.<sup>41</sup> However, wholesale electricity prices have of late been much lower – for instance, average 2016 prices in New England ranged between \$20 and \$50 per MWh, with occasional spikes.<sup>42</sup> Since the

**Biomass power has typically received over 90 percent of renewable energy subsidies in Maine, amounting to over \$60 million in recent years.**

most efficient biomass plants must burn about 1.5 tons of chips to generate one megawatt-hour of electricity (and Maine’s plants are not that efficient), this means the cost of fuel alone is currently exceeding the revenue that plants can generate by selling electricity. Biomass generators thus depend on the revenue they get from selling RECs to make up the difference between the cost of generating power, and the revenue from selling it.

Class I	Class II	Fuel Type	State	Unit Name
Y		Biomass	NH	Burgess Biopower
Y		Wood	ME	Fort Fairfield
Y		Biomass	NH	Indeck Alexandria
Y		Biomass	ME	Rumford Paper Co. No4
Y		Biomass	ME	S.D. Warren-Westbrook
Y		Biomass	ME	Sappi Somerset TG#1 & TG#2
Y		Biomass	ME	Westbrook Unit 21
Y	Y	Biomass	ME	Androscoggin G-1
Y	Y	Biomass	ME	Androscoggin G-2
Y	Y	Biomass	ME	Androscoggin G-3
Y	Y	Biomass	ME	Covanta Jonesboro
Y	Y	Biomass	ME	Covanta West Enfield
Y	Y	Biomass	ME	Jackson Laboratory Biomass
Y	Y	Biomass	ME	Moose River Unit #1
Y	Y	Biomass	ME	Scott Paper Somerset
Y	Y	Biomass	ME	Irving Forest Products Unit #1
	Y	Wood	ME	Boralex Stratton
	Y	Wood	NH	DG Whitefield, LLC
	Y	Biomass	VT	J C McNeil
	Y	Wood	MA	Pinetree Power
	Y	Wood	ME	ReEnergy Livermore Falls
	Y	Wood	ME	ReEnergy Stratton
	Y	Municipal solid waste	CT	Bristol Refuse
	Y	Trash-to-energy	ME	Eco Maine
	Y	Trash-to-energy	CT	Lisbon Resource Recovery
	Y	Trash-to-energy	MA	Ogden-Martin 1
	Y	Trash-to-energy	ME	PERC-Orrington 1
	Y	Trash-to-energy	MA	Resco Saugus
	Y	Municipal solid waste	CT	Secrec-Preston
	Y	Trash-to-energy	NH	SES Concord
	Y	Municipal solid waste	CT	So. Meadow 5
	Y	Municipal solid waste	CT	So. Meadow 6
	Y	Trash-to-energy	CT	Wheelabrator Bridgeport, LP.
	Y	Trash-to-energy	MA	Wheelabrator North Andover
	Y	Trash-to-energy	MA	WMI Millbury 1

Table 2. Biomass plants and waste incinerators listed as qualified for Maine’s RPS in Q1 and Q2 of 2016.<sup>43</sup> Designation of “fuel type” is reproduced as stated by NEPOOL. Not all these plants are necessarily operating or currently receiving subsidies.



A variety of biomass plants and waste-burners qualify for Maine's RPS, including some located in other states (Table 2). All are significant sources of pollution (Table 4). Maine's RPS is heavily dominated by biopower, with biomass plants receiving 96 and 92 percent of Maine's Class 1 RECs in 2013 and 2014, and 88 percent in 2015. Data from Maine's Public Utilities Commission show that for 2008 to 2015, biomass plants received around \$68 million from Class I RECs in Maine (data on Class II RECs is not presented in enough detail to determine the amount allocated to biomass, but the total cost appears to be less than \$1 million.)

Prices of renewable energy credits in Maine fluctuate but have been relatively low, held down in part by the glut of biomass power available. As the Maine Public Utilities Commission notes, low prices can prevent other renewable energy generators, like wind power, from entering the market:

*"it is important to recognize that the prices for Maine Class I RECs declined substantially over the two years leading up to 2014. This has occurred because Maine's portfolio requirement includes, as an eligible resource, refurbished biomass facilities (which are not generally eligible in other New England states)... Because nearly all compliance is from refurbished biomass facilities, Maine's Class I renewable resource portfolio requirement primarily provides financial support to refurbished facilities as opposed to the development of new renewable resources."*<sup>44</sup>

### **Renewable energy subsidies from other states**

Maine biomass plants can receive renewable energy subsidies from other states, providing they meet air pollution, fuel procurement, efficiency, and vintage requirements. While REC prices are highly variable, potential income from out-of-state RECs to Maine's biomass industry is upwards of \$60 million a year. Massachusetts and Connecticut have provided the most lucrative subsidies, though limits on particulate matter and nitrogen oxides emission rates as a condition for receiving Massachusetts subsidies<sup>45</sup> meant that Covanta's Jonesboro and West Enfield facilities were the only facilities in Maine eligible for Massachusetts RECs. (Air pollution from biomass plants in Maine is discussed below).

Massachusetts' requirements tightened further after the state commissioned a study that concluded low-efficiency biomass power plants significantly increase CO<sub>2</sub> pollution over fossil fuel plants.<sup>46</sup> Following a public process, Massachusetts eliminated subsidies for biomass plants operating at less than 50 percent efficiency, thus effectively limiting subsidies to combined heat and power plants that could demonstrate their 20-year net CO<sub>2</sub> emissions were no more than 50 percent those of a natural gas plant.<sup>47</sup> The Covanta plants did not meet the standard, but were grandfathered and continued receiving RECs from Massachusetts for another three years. When the subsidies ended in early 2016, Covanta closed both Maine plants, as well as its wood-burning facilities in California, citing low energy prices.<sup>48</sup>

**Massachusetts eliminated subsidies for Maine biomass power plants due to greenhouse gas pollution; Connecticut also wants to reduce subsidies to old, polluting biomass power plants in Maine.**

Connecticut's RPS has historically been more lenient, granting subsidies to certain biomass plants in Maine that were historically too polluting to qualify for the Massachusetts standard, and too old to qualify for the Class I standard in Maine.<sup>49</sup> Data on income from renewable energy subsidies is closely held, but can be estimated. Maine's ReEnergy Stratton plant, built in 1989, and the Livermore Falls plant, built in 1992, do not qualify for Class I RECs in Maine (which on average yielded \$19.876 per MWh in 2013), but do qualify for Class II RECs (which at most yielded \$1 per MWh). However, these plants did qualify for more lucrative Class I RECs in Connecticut, which in 2013 were yielding \$53 to \$55 per MWh.<sup>50</sup> Assuming an average Connecticut Class I REC price of around \$54, and assuming the two plants sold RECs in that market and obtained RECs for all the power they generated that year,<sup>51</sup> the Livermore Falls plant could have received around \$15 million from Connecticut RECs, and the Stratton plant could have received around \$18 million. The ReEnergy Fort Fairfield plant, which was qualified in both Maine and Connecticut, could have received \$13.8 million in Class I RECs from Connecticut.

Massachusetts REC prices in 2013 were higher than in Connecticut; representative prices were around \$63 per MWh,<sup>52</sup> though Covanta's Jonesboro and West Enfield plants, which were eligible for Class I RECs in Massachusetts, generated less electricity than the ReEnergy plants, reducing their potential income.

Like Massachusetts, Connecticut is seeking to promote less polluting sources of renewable energy, which means income to Maine biomass plants from Connecticut RECs may be reduced. A Connecticut Department of Energy study in 2013 notes, *"In 2010, a total of 76% of Connecticut ratepayers' investment in Class I resources went to support biomass plants located primarily in Maine and New Hampshire. These plants are among the least 'clean' Class I resources."* The study recommends a *"gradual phase-down of the disproportionate share of Connecticut's RPS that is met by biomass and landfill gas facilities, many of which have been in existence since before the State's RPS was established. By gradually reducing the value of renewable energy credits awarded to those sources, the State can replace many of these resources with new, cleaner resources such as wind power, solar arrays, or other zero-emissions renewables."*<sup>53</sup>

As of mid-2016,<sup>54</sup> ReEnergy's two Maine plants were still qualified to receive RECs in Connecticut, despite news reports<sup>55</sup> and a claim in the Governor's 2015 energy report that Connecticut "essentially prohibits" biomass from the state's renewable portfolio standard.<sup>56</sup> However, language establishing a ramp-down of subsidies to biomass is included in legislation being considered by the Connecticut legislature in 2017,<sup>57</sup> and the plan is for Connecticut to issue a revised schedule of subsidies for bioenergy starting in 2018.<sup>58</sup> The Maine Governor's energy office recognizes the threat that losing subsidies in other states represents, and proposes working with all New England states "to align the various REC markets where possible" as a solution, because limited eligibility in other states forces bioenergy producers "to sell their RECs in the limited Maine market, and this drives down the Maine REC price."<sup>59</sup>

## Maine's big bailout

Maine biomass operators knew they would lose Massachusetts subsidies as of late 2012, when the state issued its policy, but took little action until 2016, when the subsidies ended. At that point, biomass industry advocates pleas for support intensified, and in April the Maine Legislature voted for an emergency bailout that would preserve some jobs by keeping certain biomass plants operating.<sup>60</sup> The Public Utilities Commission was authorized to enter a two-year contract with biomass generators, funded with \$13.4 million from the state's rainy-day fund, to pay the difference between operating costs and prevailing electricity prices for two years. The deal was controversial, ultimately benefiting just two companies - New York-based ReEnergy, which owns four biomass power plants in Maine, and Stored Solar, the company that had bought the two recently closed Covanta wood-burners.<sup>61</sup> As a condition of getting the subsidy, the companies promised to preserve 87 jobs at the power plants and buy 1.1 million tons of Maine wood per year. They were obligated to put up cash or credit as a security deposit in case they failed to meet these obligations.<sup>62</sup>

The 87 jobs preserved by Maine's biomass bailout cost on average \$77,000 per year.

With the average direct cost of the 87 jobs at \$77,000 per year, the bailout was a costly way to maintain employment. However, while the "wood energy" sector is the second-smallest jobs provider on the list, jobs at biomass power plants can be well-paying and are thus meaningful in Maine's struggling economy. Additionally, each job preserved at a plant was additionally assumed to preserve more than two logging and trucking jobs, which 2013 data from the North East State Foresters Association shows is a significant job creator in the state (Table 3).<sup>63</sup>

Description	Millions	FTE jobs
Forestry, logging & trucking	\$240	5,200
Wood products manufacturing	\$797	5,000
Furniture and related product manufacturing	\$171	1,480
Paper manufacturing	\$4,000	7,300
Wood energy	\$209	325
Christmas trees and maple syrup	\$16	128
Forest Recreation	\$2,800	19,800

Table 3. Jobs in Maine's forest-based economy, 2013.<sup>64</sup>

Despite the promises of job preservation, some legislators nonetheless felt the biomass bailout amounted to corporate welfare for out-of-state speculators. State representative Beth O'Connor (R-Berwick), a member of the Maine Legislature's Energy, Utilities and Technology Committee, pointed out "*since 1995, biomass plants have received more than \$2.6 billion from Maine electric ratepayers, selling power for as much as 12.3 cents kwh when wholesale markets were under 5 cents. Of the \$2.6 billion, \$2 billion were above market rates.*" Expressing skepticism about the bailout, she wrote that biomass "*cannot compete in today's energy market and likely will not be able to compete even 2 years out. The*

*cost is expensive and the industry will continue to falter with natural gas and oil prices projected to stay low for the next 5 years.”<sup>65</sup>*

Governor LePage was also conflicted about the bailout. He signed off on it the same day he vetoed a bill that would have increased solar energy deployment in Maine,<sup>66</sup> but later protested that he had only signed the bailout because “99 percent” of the legislature voted for it (in fact the tally was 104-40 in the House and 25-9 in the Senate), stating, *“They’re not putting any money into the plants. They’re antiquated 1980s technologies, they’re taking the subsidy and they’re going to sit on it for two years. And in two years they’re gonna come back and say, ‘Anymore subsidy, guys? If you don’t give us more subsidy we’re going to close.’”<sup>67</sup>*

The bailout did preserve some jobs. For instance, as of March 24, 2017, Stored Solar said it had employed 44 people and purchased more than 112,000 tons of biomass, as well as paying payroll taxes.<sup>68</sup>

## **The ‘industry studying itself’ commission**

Given the abrupt passage and magnitude of the emergency bailout in spring 2016, the Maine legislature might have been advised to take a critical look at the bioenergy industry’s prospects. However, rather than conducting a full evaluation of the costs and benefits of biomass power, the Legislature created a commission to study “the Economic, Environmental and Energy Benefits of the Maine Biomass Industry,”<sup>69</sup> which, despite its remit, did not require any member to have expertise in economics<sup>70</sup> and was comprised largely of representatives from the wood and bioenergy industries. Some Commission members might have been expected to favor ongoing subsidies for bioenergy, having petitioned the state for the \$13.4 million bailout,<sup>71</sup> and three had received significant payments from the federal Biomass Crop Assistance Program. Records obtained from the U.S. Department of Agriculture indicate that Jason Brochu of Pleasant River Lumber received about \$159,000, Robert Linkletter’s company, Linkletter & Sons, received over \$693,000, and Steve Hanington of Hanington Brothers received over \$625,000. Records also indicate that a company called Willard Hanington and Son received over \$250,000.

**Members of Maine’s “biomass benefits” commission received hundreds of thousands in federal biomass fuel delivery subsidies.**

## ***The Commission’s recommendations***

Released in December 2016, the Commission’s report not surprisingly recommended that the state provide even more financial and policy incentives for bioenergy. Some of the legislative commission’s recommendations are summarized below.

### **Subsidize thermal energy under the RPS program**

Using biomass for heat has been widely promoted as the most “sustainable” use of wood because it is more efficient than generating electricity. However, wood-burning boilers can be expensive, particularly when outfitted with the pollution controls they often require. Thus, biomass proponents favor



extending renewable energy subsidies (which are usually allocated only to electricity generation) to thermal energy.

***Response: Thermal biomass won't preserve many jobs but will impact the climate and air quality***

Given the focus on saving jobs in Maine's forestry sector, how many jobs would be created or preserved if thermal bioenergy received subsidies? If upscaled, using wood for heat could consume much more wood than it does now. However, the upscaling would need to be significant to match current wood demand from biomass electricity plants. For instance, the 22 new wood heat facilities in Maine that were funded in 2011 with Stimulus money – mostly schools that were installing biomass burners - were expected to use 2,171 tons of pellets and 3,035 tons of chips per year.<sup>72</sup> Similarly, 42 schools in Vermont with wood-fired boilers were reported as using 25,000 tons of biomass in 2010 - 2011. In contrast, the 39 MW ReEnergy Livermore Falls plant burned about 480,000 tons of wood in 2015, and Maine's industrial and commercial biomass sector as a whole burned more than 4.1 million tons of wood that year<sup>73</sup> – many times the amount of wood utilized by institutional wood boilers installed for heat.

Additionally, thermal bioenergy is not “carbon neutral” as is often claimed, particularly if the fuel source is wood pellets manufactured from whole trees. Pellets can have relatively low net carbon emissions if they are made from sawdust and other wood wastes at sawmills, because these materials are generated as waste products of other industries and using them does not increase forest harvesting. However, there is a limited amount of sawmill waste generated. In contrast, pellets sourced from trees that would otherwise continue growing have a large net CO<sub>2</sub> footprint that includes not only the emissions of the wood burned for energy, but also the lost sequestration capacity of the trees that have been harvested, and the emissions from fossil fuels and wood burned during the pellet manufacturing process. Such pellets, even when burned for heat in high-efficiency boilers, have net carbon emissions that exceed net emissions from natural gas and oil burners for several decades.<sup>74</sup> Further, since even the cleanest-burning pellet burners create air pollution; ratepayers might be justified in wondering why their neighbors receive subsidies for technology that can degrade air quality and impact health. Until there is full consideration of these factors, allocating ever more subsidies toward bioenergy runs the risk of undermining Maine's air quality and climate change goals.

***Increase the amount of energy required under the RPS***

From 2017 onward, Maine energy providers are required to show that they get 10% of energy from “new” (post-2005) renewable energy sources. As discussed above, this requirement is now overwhelmingly met by biomass energy, with over 90% coming from wood-burning power plants. Nonetheless, the Commission recommended increasing the percentage electricity required to be generated from renewable sources in order to increase demand for biomass plants to operate. The Commission also proposed to promote bioenergy by amending the renewable portfolio standard “to explicitly extend new renewable capacity resource portfolio requirements beyond 2017.”

***Response: Continuing subsidies for bioenergy will undermine the RPS***

Extending the RPS would be a worthwhile goal, but if the extension continues to favor bioenergy at the expense of zero-emissions technologies like wind and solar, the net impact will be increased air and climate pollution.

### Offer financial incentives for combined heat and power systems

The Commission’s report notes that currently, the Efficiency Maine Trust provides up to \$1 million to cover energy system conversions to combined heat and power (CHP). The Commission suggests “a more concerted effort” to promote biomass CHP systems, and recommends replicating a Stimulus program that provided millions in public funds for converting schools to wood heat, to provide incentives for institutions to convert to CHP systems. The Commission also discussed enacting a *requirement* that new or renovated public buildings be heated with wood, and starting a public campaign “to encourage the use of Maine wood energy among residents to heat their homes, businesses and public institutions and to promote local forest products locally, nationally and globally.”

#### *Response: CHP is always a good thing*

Combined heat and power is almost always preferable to separate generation, since it can yield energy savings, but this is true for any fuel – not just wood. Incentives for expansion of CHP systems could benefit Maine citizens, but use of wood fuels should not be mandated.

### Legislate bioenergy as “carbon neutral” and exempt it from regulation

To avoid future regulation of biomass CO<sub>2</sub> emissions, such as could occur under the federal Clean Power Plan, the Commission recommends the state should enact a law declaring this carbon pollution to not exist - similar to legislation proposed in Congress by Maine Senators Susan Collins and Angus King that would force EPA to treat bioenergy as carbon neutral under federal regulations.<sup>75</sup>

#### *Response: Don’t legislate against science*

Such legislation would contradict physical reality. Wood-burning power plants not only emit CO<sub>2</sub> – they actually emit more CO<sub>2</sub> per megawatt-hour than coal or gas plants, due to the low energy density of wood per unit carbon, and the low efficiency of wood-burning power plants (at best, around 24 percent – meaning that for every four tons of wood burned, the energy from just one ton is turned into electricity, while the carbon pollution from all four tons is emitted to the atmosphere).

For bioenergy to be instantaneously “carbon neutral,” it would be necessary to *immediately* increase forest CO<sub>2</sub> uptake to offset those emissions, above and beyond the carbon that the forest is already taking up. Even if Maine’s forests are growing more wood than is being cut each year, increasing the amount of wood burned adds more carbon pollution to the atmosphere, while leaving the forests’ uptake of CO<sub>2</sub> unchanged, except in those areas where harvesting has occurred, where trees can grow back over time. Even under the most optimistic scenarios, this takes years to decades – it is not instantaneous. Legislating against this physical reality is similar to legislating that climate change does not exist, and would be deeply counter-productive to efforts to mitigate climate change. Forests are important carbon sinks, and finding ways to pay landowners for this value, and the other ecosystem services forests provide, should be a priority – not legislating away the existence of carbon pollution.

The Commission recommended legislation to declare biomass as “carbon neutral,” even though burning biomass emits more greenhouse gas pollution than coal.

## Another economic assessment for bioenergy in Maine

Possibly in order to counterbalance the “benefits” Commission’s one-sided recommendations, the Governor’s Energy Office has commissioned an additional report on the economics of the Maine biomass industry to inform the state’s Comprehensive Energy Plan. The request for proposals acknowledged the difficulties facing the bioenergy sector:

*“Over the last year, significant changes have occurred in the state’s biomass market, leaving the industry in an economically challenging position. Markets for low value wood (i.e., biomass) have declined significantly in recent months. Loss of several of the state’s paper mills, comparatively low world oil prices, competition from Canadian imports, lower electricity prices, mild weather, and changes in regional Renewable Energy Certificate (REC) markets have all converged to cause a significant decline in local markets for biomass fuel, as well as alter the long term economic viability of biomass electric generators. As part of the energy plan update, and in light of these dramatic market changes, the Energy Office has identified a need for a current assessment of the state’s biomass industry, as well as recommendations for promoting a long-term viable biomass market. The goal of this assessment and analysis is to develop recommendations which, if implemented, would move the industry toward long term economic sustainability.”<sup>76</sup>*

The state has retained Innovative Natural Resource Solutions (INRS), a bioenergy consulting firm, and Meister Consultants Group to complete the assessment, which is due to be unveiled in April 2017. Given that the INRS often works for bioenergy developers, it will be interesting to see if the report provides a rigorous assessment of the bioenergy sector’s outlook.

Any consideration of Maine’s future energy wood sector is likely to include two emerging markets: wood pellets for export, and cellulosic biofuels.

### Maine’s forestry future: Wood chip exports?

While U.S. demand for wood pellet heating has been growing, domestic demand is not large enough to “soak up” the same amount of wood that used to be consumed by Maine paper mills, other wood products industries, and biomass plants. This could change, however, if Maine exported “energy wood” to the UK and Europe.

In the EU, utilities pay to emit CO<sub>2</sub>, but this policy applies only to carbon from fossil fuels, and not CO<sub>2</sub> from burning wood. Coal plants that convert to biomass thus benefit doubly – first from renewable energy subsidies, as in the U.S, but then also by avoiding payments for CO<sub>2</sub> emissions under the EU’s trading scheme. As the amount of renewable energy mandated under European and UK law has increased, demand for North American wood pellets has grown exponentially. So far, demand has been met with wood produced in Canada and the US Southeast – not Maine. However, this is beginning to change, with construction of export woodchip facilities near the deepwater port towns of Eastport and Searsport.

Wood chips exported to Europe as fuel must be decontaminated for pests using natural-gas fired blowers.

Wood chips require less processing than wood pellets, but wood exported overseas has to be heated to kill possible invasive pests,<sup>77</sup> necessitating use of a natural gas-fired blower system for the Eastport plant that will heat chips once they are loaded on board ships, and a separate “phytosanitation” facility for the Searsport plant. The Searsport facility plans to export about 660,000 tons of chips per year.<sup>78</sup> These plants depend on continued subsidies from the EU, which in turn depend on the assumptions that biomass is carbon neutral and is sourced “sustainably” - claims that are vigorously contested by scientists and environmental organizations.<sup>79</sup> Once policymakers understand the real climate impacts of harvesting and burning trees for energy, they sometimes change their minds about subsidies for biomass power, as occurred in Massachusetts. If EU policymakers do the same, this could turn large wood export facilities built in Maine into “stranded assets.”

### *A new sink for bioenergy subsidies – liquid biofuels from wood*

As the biomass power industry has struggled, some bioenergy proponents are hoping the liquid biofuels industry will create markets for Maine wood. As discussed above, one venture, which had received \$30 million in federal funding, was ended after the pilot stage, but a new effort is now underway to convert a closed pulp and paper mill in East Millinocket to a biofuel refinery. Stored Solar, the company that acquired Covanta’s West Enfield and Jonesboro biopower plants, has applied for federal loan guarantee to help cover 70 percent of \$240,000 in development costs associated with transforming the site and acquiring other biomass plants in the region.<sup>80</sup> The company sees support from the Department of Energy (DOE) or a similar agency as essential to the project.<sup>81</sup> Documents filed as part of the loan guarantee at DOE state the biorefinery would require 355,000 dry metric tonnes<sup>82</sup> (about 712,000 green “English” tons) of wood per year to produce about 33,000,000 gallons of biofuel – or about 43 pounds of green wood per gallon. The “biochar” produced as a by-product would be fed to a biomass boiler on site to cover biomass drying and other facility heat needs. The company apparently also wants to use biochar byproduct to fuel other biomass plants,<sup>83</sup> presumably including the West Enfield and Jonesboro plants it recently acquired. Stored Solar has also stated that a potential source of feedstock could be wood “mined” from the pulp and paper mill waste Dolby landfill near East Millinocket, which is described as containing “wastewater sludges, wood room and woodyard waste, wood ash, and general rubbish from the Millinocket and East Millinocket mills stored there since 1979.”<sup>84</sup>

Wood-based ethanol could consume massive amounts of Maine’s forest.

Governor LePage has been selling Maine as a destination for the biofuels industry, as well. Speaking at a biofuels conference in Washington, he said that although Maine has wanted to tap into the Marcellus pipeline project for natural gas, an alternative would be making gas and other fuels from wood. “If you can’t get the natural gas to Maine, we will just have to make our own gas.”<sup>85</sup>

The plans by Stored Solar are reminiscent of many other schemes advanced by the bioenergy industry, which fundamentally still depend on continued subsidies for bioenergy. While the technology is still young, if it is successfully scaled up, it could consume massive amounts of forest wood. Meanwhile, there has been no assessment of greenhouse gas emissions from biofuels made from Maine trees.



## Air pollution from biomass power plants in Maine

While the majority of this report considers economic issues around bioenergy, an important source of costs associated with the industry that is not often considered is air pollution impacts. Maine's biomass fleet is especially polluting. EPA's 2014 "eGRID" database has information on emissions of nitrogen oxides and sulfur dioxide, as well as the greenhouse gases carbon dioxide (CO<sub>2</sub>), methane, and nitrous oxide. Power boilers at Maine's biomass and waste-burning facilities, some of which were eligible for Maine's RPS in 2014, were responsible for the majority of power sector pollution in Maine that year (Table 4). The largest emissions of nitrogen oxides and sulfur dioxide are from power boilers at a paper mills that are burning black liquor, a waste product from the pulping process, but plants that burn only wood can also have large emissions relative to their size.

Air pollution is linked to asthma, which costs almost \$200 million a year in Maine.

Plant name	Plant primary fuel	NOx (tons)	SO <sub>2</sub> (tons)	CO <sub>2</sub> (tons)	Methane (pounds)	N <sub>2</sub> O (pounds)
* Androscoggin Mill	Black liquor	537	2,559	1,668,598	430,471	93,439
* Jonesboro Energy Center	Wood solids	143	28	227,798	155,309	20,386
* West Enfield Energy Center	Wood solids	141	29	237,807	162,257	21,296
* Lincoln Paper & Tissue	Wood solids	113	22	125,545	83,177	10,939
MMWAC Resource Recovery Fac.	Municipal waste	111	38	73,864	51,033	6,697
Penobscot Energy Recovery	Municipal waste	386	6	254,258	177,487	23,311
* ReEnergy Ashland	Wood solids	64	7	53,989	36,837	4,835
* ReEnergy Fort Fairfield	Wood solids	111	39	320,027	218,355	28,659
* ReEnergy Livermore Falls	Wood solids	146	50	415,433	283,156	37,169
* ReEnergy Stratton LLC	Wood solids	140	54	438,913	299,383	39,295
Regional Waste Systems	Municipal waste	212	16	176,570	123,843	16,253
* Rumford Cogeneration	Black liquor	1,145	502	1,637,665	520,638	98,512
* S D Warren Westbrook	Wood solids	530	615	419,584	245,101	32,485
* Scott Paper Somerset Plant	Black liquor	1,141	199	2,021,472	691,490	126,630
	Total biomass, waste	4,919	4,162	8,071,523	3,478,536	559,905
	Total all generation	6,431	7,365	11,745,151	4,079,803	663,169
	<b>Biomass, waste % of total</b>	<b>77%</b>	<b>57%</b>	<b>69%</b>	<b>85%</b>	<b>84%</b>

Table 4. Nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), carbon dioxide (CO<sub>2</sub>), methane, and nitrous oxide (N<sub>2</sub>O) emissions from Maine biomass boilers in 2014.<sup>86</sup> Facilities with \* were qualified for Maine's RPS.<sup>87</sup>

Wood-burning power plants are large sources of particulate matter (PM), which is widely considered the most dangerous common air pollutant for human health. The eGRID database does not include information on facility PM emissions. However, the 2014 National Emissions Inventory<sup>88</sup> has stack test data for a few plants, and shows the ReEnergy Fort Fairfield and Livermore Falls wood-burning plants emitted 29.45 tons and 34.12 tons of particulate matter respectively. This is comparable or higher to

rates for coal plants of the same size, and tens of tons more per year than is emitted by natural gas plants, or, of course, by wind and solar generation.

Air pollution has large direct financial costs, because it exacerbates respiratory illness, can trigger heart attacks, and is linked to cancer. Statistics for just asthma alone show the magnitude of the problem. Maine’s asthma rate is higher than in the US as a whole. The state estimates asthma is responsible for \$14.3 million in lost productivity and nearly \$173 million in direct medical costs each year from deaths, hospitalizations, and thousands of emergency room visits.<sup>89</sup> Biomass power plants – especially the industrial boilers associated with Maine’s forest products industry – are poorly regulated under the federal “boiler” rule, which governs emissions of particulate matter and other pollutants, including air toxics, and many smaller biomass burners, including many those operated for heat, are not regulated by any federal regulation.<sup>90</sup> The EPA estimates benefits from reducing one ton of particulate matter pollution from boilers at \$65,000 to \$290,000, depending on factors including the number of people exposed and discount rate applied.<sup>91</sup> Maine policymakers should not assume that the industrial, utility, or small-scale bioenergy industries are using the best available pollution controls, because they are not. Maine policymakers should consider the pollution impacts of bioenergy in future decisions about subsidies for this industry.

## The value in Maine’s woods

Maine’s forest economy has been impacted by a number of factors, including the decline in building in the mid-2000’s. Data from Maine’s Forest Service show some of the changes that have occurred in forest harvesting since 2000 (Figure 3). Comparing a three-year average for 2000-2003 with the three-year average for 2013-2015, total harvests have declined 10 percent. Within that, pulpwood harvests declined 5 percent, sawtimber harvests declined 44 percent, and biomass chip harvests increased 28 percent.

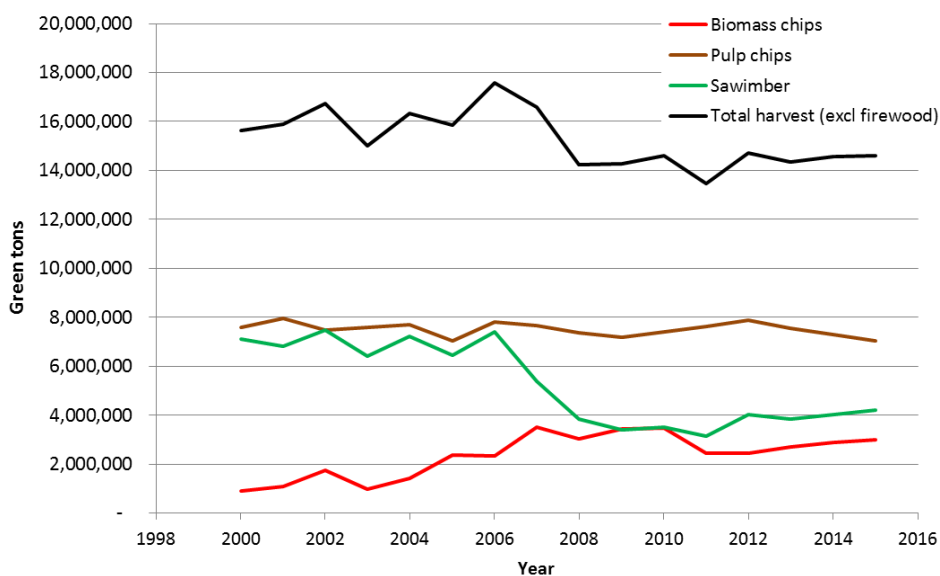


Figure 3. Wood harvested from Maine’s forests for biomass chips, pulp chips, and sawlogs for 2000 through 2015.<sup>92</sup>

Depending on the tree species, the value of a ton of sawtimber is a hundred to several hundred times greater than the value of a ton of biomass,<sup>93</sup> thus even large increases in harvesting of biomass are not going to replace the value that has been sucked out of the market with the decline in sawtimber harvesting. It might help loggers if they could charge more for the biomass they deliver to power plants, but biomass power plants already need subsidies even when fuel prices are low.

Further, even if demand for biomass were increased to match wood demand from traditional forest industries, this would destroy any prospect of realizing a vital but as yet largely unacknowledged value of Maine's forests – the role they can play in mitigating climate change. As acknowledged by the Paris Climate Accord, the world doesn't have a hope of controlling dangerous atmospheric CO<sub>2</sub> rise unless we increase the amount of carbon stored in forests. Maine's forests have been cut to the bone for decades, and thus have potential to store much more carbon than they do now. Yet so far, there has been a great deal of discussion about how to incentivize cutting and burning forests for energy, which sends forest carbon into the atmosphere, and almost no discussion of how to maximize and monetize forest carbon storage.

There are already mechanisms for valuing carbon stored in forests under the Regional Greenhouse Gas Initiative (RGGI),<sup>94</sup> to which Maine is a party, and the California Air Resources Board program,<sup>95</sup> which can utilize offsets in any state. Some forest carbon offset projects have been undertaken in Maine already.<sup>96</sup> Right now, the price utilities must pay to emit one ton of CO<sub>2</sub> under RGGI is similar to the stumpage price landowners receive per ton of biomass – around three dollars.<sup>97</sup> Since the carbon in a ton of green wood is almost exactly equivalent to the carbon in a ton of CO<sub>2</sub>, the value to landowners of selling biomass (which emits carbon), versus growing biomass (which stores carbon), is similar. Meanwhile, well-accepted programs funded by electricity ratepayers purchase renewable energy credit purchases at \$50 to \$60 per REC - credits that are supposed to represent the environmental attributes of a MWh of green electricity, which include the absence of CO<sub>2</sub> emissions. Except when it comes to biomass, ratepayers are actually paying to *emit* carbon pollution, since generating one MWh of biomass electricity emits more than 1.5 tons of CO<sub>2</sub>, yielding a CO<sub>2</sub> dis-benefit of around \$40 per ton. The “environmental attributes” of bioenergy include dis-benefits of PM, NOx, CO, SOx, and hazardous air pollutants, as well.

Expanding forests is critical to fighting climate change, but so far most of the discussion in Maine has been about harvesting them for fuel.

Forest carbon offset prices are too low right now to attract many landowners, but this could change in the future. Would ratepayers be willing to fund programs that stored carbon at a rate around \$40 per ton? Currently, there is no explicit linkage between programs that purchase RECs, and RGGI, which administers carbon trading and offsets. One way to accelerate change might be to redirect some payments that electricity customers currently make for RECs to supporting forest management techniques that maintain forest carbon stocks, such as those being explored at the University of Vermont.<sup>98</sup>

Forest carbon offsets programs are not without controversy, particularly when they are used to allow polluting power plants to keep operating. However, incentives for forest carbon sequestration are only going to grow, because climate change is worsening, and forest expansion is currently the only scalable

way to lock up atmospheric carbon dioxide. Maine will be discussing the future of the forestry sector for some time, but as long as the state keeps asking the same question – how to accelerate burning wood for energy – it will keep getting the same answers. Policymakers can strengthen programs that value building forest carbon stocks, but first they need full information on real costs and benefits. Wouldn't it thus make sense for Maine to commission a truly independent, science-based study that examines *all* the values Maine's forests can provide – including climate mitigation?

## Conclusions

The trajectory of Maine's biomass industry has been downward for a long time, but the industry still has plenty of potential to soak up financial support and public goodwill toward the idea of subsidizing renewable energy. As Maine policymakers deliberate, they should keep in mind:

- Biomass energy started out as a way to burn mill waste and generate onsite energy forest products manufacturing operations. Standalone wood-burning plants were built later, in response to laws that allowed them to charge higher rates for electricity.
- These plants cannot just generate power and make a profit – even the oldest plants need continuing subsidies.
- In the last ten years, the Maine biomass industry has received more than a quarter of a billion dollars in subsidies, grants, loans, and tax credits, culminating most recently in a \$13.4m direct payment from the state that saved jobs at \$77,000 each.
- It is not unusual for people who are advising continued support for biomass to have received grants or subsidy payouts, for instance from the federal Biomass Crop Assistance Program, which allocated over \$35 million to about 150 logging businesses harvesting Maine forests. Ten percent – just 15 operators – received over half the subsidies.
- Massachusetts ended renewable energy subsidies for Maine plants after determining that biomass power plants worsen carbon emissions over timeframes relevant for fighting climate change. Connecticut will be reducing subsidies to Maine plants because allocating funds to old, polluting facilities is holding back development of new zero-emissions renewable energy. This means Maine will carry a disproportionate subsidy load in the future, particularly since Massachusetts and Connecticut subsidies have historically been more lucrative than Maine subsidies.
- Renewable energy subsidies in Maine are already overwhelmingly allocated to aging biomass plants, which according to the Public Utilities Commission is holding prices down and limiting development of zero-emissions renewable energy like wind and solar.
- Unlike zero-emissions technologies, biomass emits carbon pollution and conventional air pollution, with real health impacts that entail real costs. Maine's biomass facilities, many of which get renewable energy subsidies, are the largest polluters in the state.
- Study after study asks how to best prop up Maine's biomass sector – but Maine citizens are shortchanged if policymakers don't examine all the ways Maine's forests can benefit the state. Consumers are willing to pay for clean energy and reduced carbon emissions; this could provide a new way to extract value from Maine forests, by managing them for carbon storage.

Bioenergy will always have a role in Maine where facilities burn forest product manufacturing wastes onsite for heat and power, thus also avoiding disposal costs. However, continued support for low-efficiency wood-burning power plants will prolong the financial bleeding and subsidy dependence by supporting the lowest value use of wood, which is burning it. As atmospheric carbon dioxide continues to increase, and climate change effects deepen, policymakers should allocate resources toward strengthening Maine's forests – not burning them for fuel.



## Appendix I: Recipients of BCAP payments in Maine, 2009 – 2012.

Total: \$35,573,532

NAME	CITY	STATE	Sum payments
PRIME TIMBER COMPANY LLC	BANGOR	ME	\$ 2,924,207
WT GARDNER & SONS INC	LINCOLN	ME	\$ 2,438,490
JAMES B LIBBY	LINCOLN	ME	\$ 2,318,280
J D RAYMOND TRANSPORT INC	DOVER FOXCROFT	ME	\$ 1,485,297
GREAT NORTHWOODS LLC	BANGOR	ME	\$ 1,170,968
PLUM CREEK MAINE MARKETING INC	CROSSETT	AR	\$ 1,139,990
MAINE-LY TREES INC	STRONG	ME	\$ 1,029,435
RICHARD CARRIER TRUCKING INC	SKOWHEGAN	ME	\$ 918,521
TREELINE INC	LINCOLN	ME	\$ 792,121
TIMBER EXPRESS INC	MADISON	ME	\$ 705,409
LINKLETTER & SONS INC	ATHENS	ME	\$ 693,821
GORDON LUMBERING LLC	STRONG	ME	\$ 683,324
HANINGTON BROTHERS INC	MACWAHOC PLT	ME	\$ 625,845
PRENTISS & CARLISLE MANAGEMENT CO	BANGOR	ME	\$ 580,400
ELLIOTT JORDAN & SON INC	WALTHAM	ME	\$ 571,663
DAVIS FORESTRY PRODUCTS INC	DANFORTH	ME	\$ 566,979
S F MADDEN INC	GREENBUSH	ME	\$ 563,550
E J CARRIER INC	JACKMAN	ME	\$ 549,055
DELAITE TRUCKING INC	LINCOLN	ME	\$ 505,520
T R DILLON LOGGING INC	ANSON	ME	\$ 456,390
RC MCLUCAS TRUCKING INC	PORTER	ME	\$ 435,741
JAY MCLAUGHLIN	MEDWAY	ME	\$ 406,799
PALLETONE OF MAINE INC	LIVERMORE FALLS	ME	\$ 383,688
L E TAYLOR & SONS INC	PORTER	ME	\$ 380,621
ERIK L GUPTILL INC	EAST MACHIAS	ME	\$ 375,633
GCA LOGGING INC	AVON	ME	\$ 365,126
JOHN KHIEL III LOGGING & CHIPPING	DENMARK	ME	\$ 362,057
GLEN LUCE LOGGING INC	TURNER	ME	\$ 361,362
WILLIAM A DAY JR & SONS INC	PARSONSFIELD	ME	\$ 352,022
E T TRANSPORT	FORT KENT	ME	\$ 335,859
PORTAGE WOOD PRODUCTS	PORTAGE	ME	\$ 319,904
NATHAN O NORTHRUP FOREST PRODUCTS	JEFFERSON	ME	\$ 283,156
MCGARY FORESTRY	HOULTON	ME	\$ 279,430
DEAN YOUNG FORESTRY	FRANKLIN	ME	\$ 270,696
RED SHIELD ACQUISITION LLC	OLD TOWN	ME	\$ 270,033
M B EASTMAN LOGGING INC	PARSONSFIELD	ME	\$ 253,365
WILLARD HANINGTON & SON INC	REED PLT	ME	\$ 253,248
GARY POMERY INC	HERMON	ME	\$ 248,504
E D BESSEY & SON	HINCKLEY	ME	\$ 245,267
APPLIED FORESTRY INC	CORNVILLE	ME	\$ 239,523
ON THE EDGE CHIPPING INC	PHILLIPS	ME	\$ 235,216
CENTRAL MAINE LOGGING INC	WEST PARIS	ME	\$ 234,700
DARRYL R FLAGG	JEFFERSON	ME	\$ 230,010
F E PEASLEE FOREST PRODUCTS	JEFFERSON	ME	\$ 214,735
MH HUMPHREY & SONS INC	PARSONSFIELD	ME	\$ 209,335
WESTERN MAINE TIMBERLANDS INC	FRYEBURG	ME	\$ 204,932

<b>NAME</b>	<b>CITY</b>	<b>STATE</b>	<b>Sum payments</b>
CARVER BROTHER LOGGING INC	PATTEN	ME	\$ 203,209
MAINE CUSTOM WOODLANDS LLC	DURHAM	ME	\$ 192,742
STRATTON LUMBER INC	STRATTON	ME	\$ 191,151
E R CATON & SON TRUCKING INC	PHILLIPS	ME	\$ 188,905
RICHARD WING & SON LOGGING INC	STANDISH	ME	\$ 187,466
NORMAN WHITE INC	SHAPLEIGH	ME	\$ 185,449
MORRIS LOGGING INC	FORT KENT	ME	\$ 178,267
HASKELL & SONS TRUCKING LLC	PALERMO	ME	\$ 166,884
J L BROCHU INC	STRATTON	ME	\$ 159,400
DMG ENTERPRISES	PEMBROKE	ME	\$ 156,401
MCGEE FARMS II LLC	WEST GARDINER	ME	\$ 153,580
ROBERT W LIBBY & SONS INC	PORTER	ME	\$ 152,729
SEBASTICOOK FARMS/SEBASTICOOK LUM	SAINT ALBANS	ME	\$ 150,912
DAVID ST CLAIR	LIBERTY	ME	\$ 139,404
RONALD KIMBALL DBA KIMBALL LOGGIN	POLAND	ME	\$ 137,207
ERVIN TOWER	PATTEN	ME	\$ 133,579
LOG LAND FOREST PRODUCTS CORP	NORRIDGEWOCK	ME	\$ 130,594
NICOLS BROTHERS LOGGING INC	MEXICO	ME	\$ 127,682
R H WALES & SON	LOVELL	ME	\$ 121,602
HARDWOOD PRODUCTS COMPANY LP	GUILFORD	ME	\$ 116,992
DGD TRUCKING INC	RUMFORD	ME	\$ 115,867
THOMPSON ENTERPRISES	CHINA	ME	\$ 113,843
STEPHEN E HASKELL	PALERMO	ME	\$ 109,655
TREES LIMITED	SIDNEY	ME	\$ 106,251
A W CHAFFEE INC	OAKLAND	ME	\$ 104,842
JOHNNY CASTONGUAY	LIVERMORE	ME	\$ 93,228
CRANES CONTRACT CUTTING INC	LAMOINE	ME	\$ 92,221
BEAULIEU LOGGING	BIDDEFORD	ME	\$ 92,116
A&M CONSTRUCTION INC	WYTOPITLOCK	ME	\$ 91,766
L & L TIMBER	LIVERMORE	ME	\$ 91,232
GARD C TWITCHELL LOGGING & CHIPPI	TURNER	ME	\$ 91,032
CHAPLIN LOGGIN INC	NAPLES	ME	\$ 90,561
HIGHLAND FARMS INC	CORNISH	ME	\$ 87,954
DOUG FALES SELECTIVE CUTTING & LA	THOMASTON	ME	\$ 87,495
MORRISON FOREST PRODUCT INC	HARMONY	ME	\$ 86,232
DONALD A ROAKES INC	BRIDGTON	ME	\$ 85,323
MDP TRANSPORTATION INC	EASTPORT	ME	\$ 82,853
L R HAMILTON LAND SERVICES INC	PRINCETON	ME	\$ 80,805
DANIEL L DUNNELS LOGGING INC	PARSONSFIELD	ME	\$ 76,434
COUSINEAU FOREST PRODUCTS INC	HENNIKER	NH	\$ 75,347
J & S LOGGING	RANGELEY	ME	\$ 74,654
DAY BROTHERS INC	OTISFIELD	ME	\$ 70,023
HICKEY FOREST PRODUCTS	WEST GARDINER	ME	\$ 68,323
EDWARD J BLAKE / EDWARD BLAKE PUL	UNION	ME	\$ 68,242
CARL S HERSOM LOGGING & CHIPPING	LEBANON	ME	\$ 68,170
FRENCH LOGGING INC	MADISON	ME	\$ 67,795

<b>NAME</b>	<b>CITY</b>	<b>STATE</b>	<b>Sum payments</b>
J & M LOGGING INC	AUGUSTA	ME	\$ 64,318
BASKAHEGAN COMPANY	BROOKTON	ME	\$ 64,053
JORDAN TREE HARVESTERS INC	PARSONSFIELD	ME	\$ 58,560
MARK CRESSEY LOGGING INC	PORTER	ME	\$ 57,776
E & L LOGGING	WILTON	ME	\$ 56,300
FREEDOM TIMBER PRODUCTS	FREEDOM	ME	\$ 53,163
FORESTER 2 LLC	EAST MACHIAS	ME	\$ 51,879
MARK HAWKES FORESTRY & CONSTRUCTI	PHIPPSBURG	ME	\$ 49,797
WAGNER CONTRACTING	GORHAM	ME	\$ 49,363
RON DUNNELLS AND SONS INC	PARSONSFIELD	ME	\$ 49,251
EASTMANS FOREST PRODUCTS INC	PORTER	ME	\$ 48,574
MICHAEL KINNEY	DANFORTH	ME	\$ 47,718
TIDE MILL ENTERPRISES	EDMUNDS TWP	ME	\$ 45,268
JAMES DESJARDINS DBA DJR LOGGING	FORT KENT MILLS	ME	\$ 44,828
WILLARD S PIERPONT	WASHINGTON	ME	\$ 43,800
CTL LAND MANAGEMENT SERVICES INC	WASHINGTON	ME	\$ 42,773
LUMBRA HARDWOODS INC	MILO	ME	\$ 41,552
DEWAYNE GOULD	SOUTH CHINA	ME	\$ 40,640
DENNIS FRIGON LOGGING	ROCKWOOD	ME	\$ 39,291
H & S CONSTRUCTION INC	WHITING	ME	\$ 38,957
CLINT L COTE FORESTRY	BOWDOIN	ME	\$ 38,773
FUTURE FORESTS INC	NORTH VASSALBORO	ME	\$ 34,326
HOWARD'S PULP & LOGGING INC	FREEPORT	ME	\$ 32,447
ADAM RICE	WALPOLE	ME	\$ 31,211
JOHN NORED JR	WINDSOR	ME	\$ 30,890
COUSINS SAWMILL	WINDSOR	ME	\$ 29,895
LADD LOGGING	FARMINGTON	ME	\$ 28,875
FOREST COMMODITIES INC	SOUTH PARIS	ME	\$ 28,509
REGINALD RICKE	NEWBURGH	ME	\$ 27,603
CHADBOURNE TREE FARMS LLC	BETHEL	ME	\$ 26,440
DOUGLAS SWIFT	FARMINGDALE	ME	\$ 26,059
JONATHAN B WHEATON INC	ALEXANDER	ME	\$ 22,974
KEVIN HAWES	BELGRADE	ME	\$ 22,247
WADSWORTH WOODLANDS INC	HIRAM	ME	\$ 20,810
DALE E METCALF SR & SONS LOGGING	PORTER	ME	\$ 19,695
MURRAY LAPLANT & SONS INC	PRINCETON	ME	\$ 19,549
S R FOWLER INC	SANFORD	ME	\$ 19,448
ROBERT W CARR & SONS INC	LIMINGTON	ME	\$ 18,559
KARL GUENZEL	NOBLEBORO	ME	\$ 17,671
SCOTT R KINNEY LOGGING	OAKLAND	ME	\$ 17,609
COMPREHENSIVE LAND TECHNOLOGIES I	SOUTH CHINA	ME	\$ 17,486
TUKEY BROTHERS INC	BELGRADE	ME	\$ 17,156
JEAN CASTONGUAY LOGGING AND EXCAV	LIVERMORE FALLS	ME	\$ 16,779
GERRITY INDUSTRIES	LEEDS	ME	\$ 16,110
ROY'S LOGGING LLC	AUBURN	ME	\$ 13,939
PRIDE MANUFACTURING COMPANY LLC	BURNHAM	ME	\$ 13,831

NAME	CITY	STATE	Sum payments
JOHN WILLIAMS CONSTRUCTION INC	EDDINGTON	ME	\$ 10,019
ALAN STEVENS	SIDNEY	ME	\$ 9,320
GEORGE W BABB JR	WINDHAM	ME	\$ 7,932
ERNEST R PALMER LUMBER COMPANY IN	SANGERVILLE	ME	\$ 7,826
JAMIE L PEASLEE	COOPERS MILLS	ME	\$ 5,786
L & A RIDLEY LOGGING INC	JAY	ME	\$ 5,575
WILLIAM B SPARROW INC	PITTSTON	ME	\$ 4,649
ROBERT L CHANDLER	TOPSFIELD	ME	\$ 4,504
MAINE SEA TO TREE LLC	SEDGWICK	ME	\$ 2,264
SWH INC	LINNEUS	ME	\$ 1,440
BRIAN S ELLIS	NEW VINEYARD	ME	\$ 819

## Endnotes

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