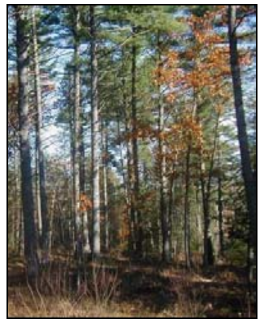
BIOMASS ELECTRICITY

MAINE FUTURE FOREST ECONOMY PROJECT


CURRENT CONDITIONS AND FACTORS INFLUENCING THE FUTURE OF MAINE'S FOREST PRODUCTS INDUSTRY

MARCH 2005

PREPARED FOR:

DEPARTMENT OF CONSERVATION – MAINE FOREST SERVICE
AND
MAINE TECHNOLOGY INSTITUTE

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Biomass Electricity

State of the industry

Maine has ten facilities where biomass energy is the primary or sole product, and a large number of forest product manufacturing facilities that burn wood to generate steam, heat, and electricity for internal use or sale. Maine's biomass energy plants, particularly the stand-alone plants designed solely to produce power for the grid, were constructed and commissioned in the 1980's, when public policy encouraged construction of renewable energy facilities. Under state and federal law, utilities were mandated to provide long-term contracts for electricity from these facilities at rates that, in retrospect, turned out to be significantly above-market. This resulted, largely, from future projections of alternative fuel source costs that proved to be grossly inaccurate. The majority of these contracts have now expired or been terminated, forcing the facilities to sell electricity into the region's wholesale market.

In the competitive market, many biomass facilities have difficulty competing against other forms of generation, including nuclear, coal, natural gas and hydroelectric generation. In a report completed in 2002 for the New Hampshire Department of Resource Economics & Development, it was *estimated* that a typical 15 MW biomass facility in the region ($18/green ton fuel) could generate electricity for $56/megawatt hour (MWH).[95] Current long-term electricity prices in the region are $40 to $44 per MWH, while spot market prices are often temporarily above the $56 per MWH level. In an analysis of electricity prices conducted in New Hampshire, it was forecast that regional electricity prices will reach a level where existing biomass facilities can be profitable, without external support, around 2014.[96]

Some Maine facilities have found ways to succeed, often by controlling fuel costs (including use of wood from non-forestry sources, including construction & demolition debris), taking advantage of "green" power markets, and timing operation to take advantage of fluctuations in the electricity market. However, as many as six biomass plants have been idled for periods of time in recent years, demonstrating that economically viable operation is currently difficult.[97]

Biomass co-generation at forest product companies has proven to be a much more stable venture, with facilities taking process heat and steam from the boiler, as well as making electricity for internal use or sale. A number of Maine pulp and paper mills use biomass to power some or all of their operations, and Georgia Pacific is in the process of adding a biomass facility (formerly located in Athens, Maine) to its operations in Old Town.

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[95] Innovative Natural Resource Solutions and Draper Lennon, Inc. *Identifying and Implementing Alternatives to Sustain the Wood-Fired Electricity Generating Industry in New Hampshire.* Developed for the NH Department of Resources & Economic Development. January 2002.

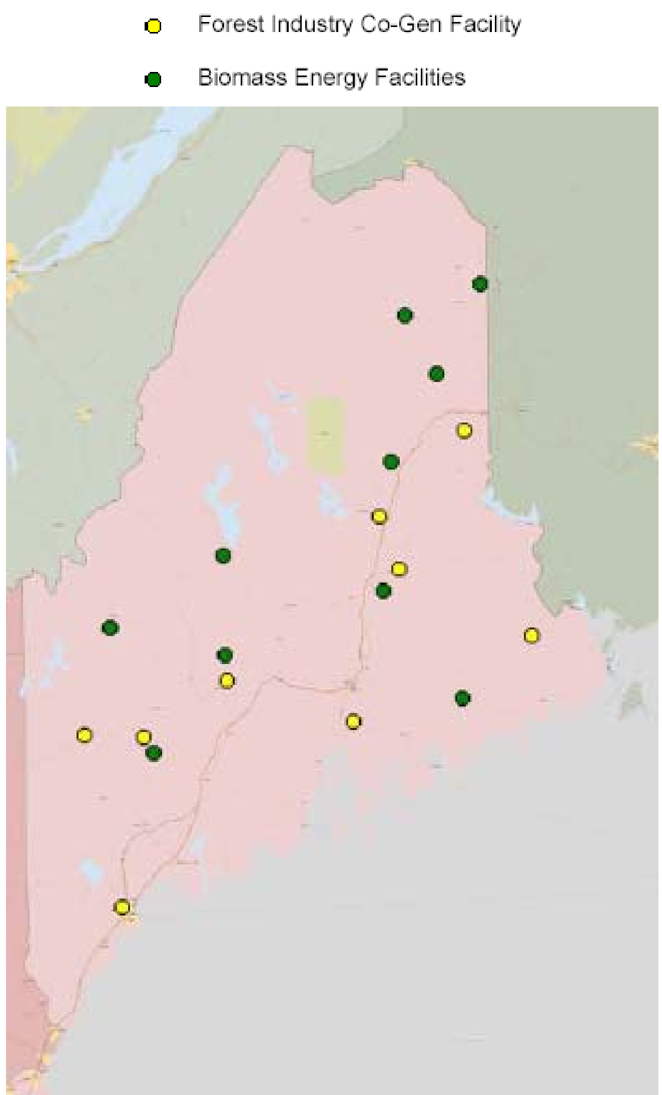
[96] NH Governor's Office of Energy & Community Services. *New Hampshire Energy Plan.* November 2002.

[97] Maine Public Utilities Commission. *Report and Recommendations on the Promotion of Renewable Resources.* December 31, 2003.

Geographic Distribution of Biomass Energy Facilities in Maine

Maine has stand-alone biomass electricity facilities, as well as a number of forest industry firms that use biomass to generate electricity and steam for their own use, and often electricity for sale on the regional electricity grid. The map below shows Maine stand-alone biomass electricity plants that can use at least 100,000 green tons of wood annually (green), and forest industry co-generation sites that used at least 90,000 green tons of wood in 2002 (yellow)[98]. This map does not show the biomass facility in Athens, which is currently being moved for use at Georgia Pacific's pulp and paper mill in Old Town[99].

Figure 86. Biomass Energy Facilities in Maine



[98] Data Source: Personal communication, Becky S. Hodsdon, Air Toxics and Inventory Section, Bureau of Air Quality, Maine Department of Environmental Protection

[99] Maine Department of Environmental Services, *Departmental Findings of Fact and Air Emissions License*, March 2004

Electric Service Areas

Maine is divided into two electricity markets. Much of Maine is located in the ISO-New England region (also known as the NEPOOL region), and is part of the larger New England electricity market, along with all of Connecticut, Rhode Island, Massachusetts, Vermont, and New Hampshire. Formed to manage a restructured and competitive market for wholesale electricity, duties of the ISO include "…providing independent, open and fair access to the region's transmission system", and "facilitating market based wholesale electric rates."[100] Maine's wood-burning biomass facilities in the ISO – New England Region include:

- Boralex – Livermore Falls, 37 MW
- Boralex – Stratton, 45 MW
- Indeck – West Enfield, 26 MW
- Greenville Steam, 14.3 MW,
- Worcester Energy (Deblois)[101], 25 MW,
- Indeck - Jonesboro, 27 MW, and
- GenPower LLC has proposed a 40 MW facility at the site of a former Boralex facility in Athens, Maine.[102]

Parts of Northern Maine are not in the ISO-New England region, and instead are part of the Northern Maine Independent Service Administrator (NMISA) region. This distinction is critical for understanding how Maine firms may participate in the Renewable Portfolio Standards (RPS) of other states. There are currently three biomass facilities in the NMISA region:

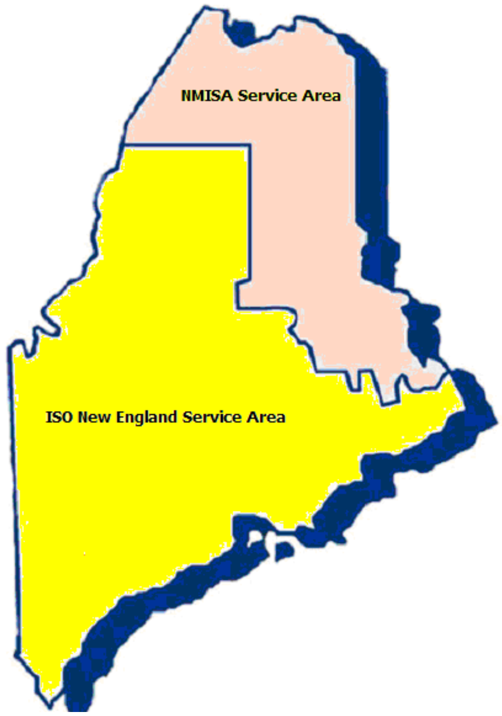
- Wheelabrator - Sherman, 18.1 MW
- Boralex - Fort Fairfield, 32 MW
- Boralex - Ashland (presently idle), 37 MW

[100] ISO New England website, www.isone.org

[101] Worcester Energy is currently re-tooling to burn wood and participate in regional renewable energy certificate markets.

[102] Crowell, Alan. "Athens Voters OK Pine Tree Zone." *Morning Sentinel.* September 26, 2004.

Figure 87. Electricity Service Areas in Maine.



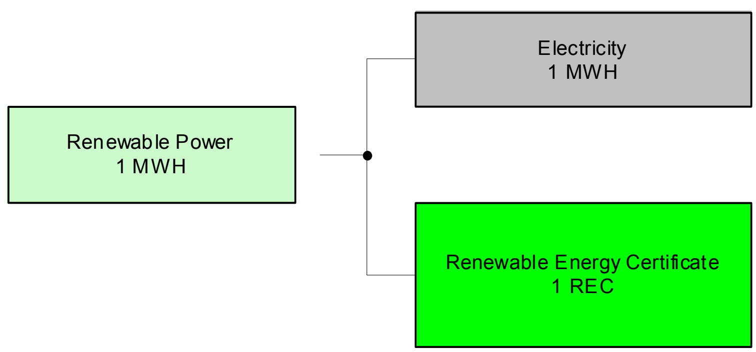
Renewable Portfolio Standards

Firms that produce electricity using biomass power now have renewed opportunity to achieve financial returns, due to state-based public policy initiatives that encourage production of renewable energy. However, these incentives entail a certain amount of risk, and investment is required in most existing biomass facilities in order to qualify for these incentives.

Regional Markets for Renewable Power

Electricity generated from renewable sources produces two separate products – first, the electricity, and, second, the "green" or renewable attributes associated with that electricity. These renewable attributes are referred to as Renewable Energy Certificates, or RECs. For each Megawatt Hour of electricity generated, one REC is generated. These two products, electricity and RECs, can be separated, or unbundled, and sold individually.

Figure 88. Products from Renewable Energy



Three states in New England – Connecticut, Massachusetts and Rhode Island – have "renewable portfolio standards" (RPS) that currently provide meaningful economic opportunities for biomass facilities to operate. Maine has an RPS, but supply exceeds demand by a significant amount, and thus does not currently provide meaningful incentives for generators. An RPS is essentially a mandate that any seller of electricity operating in that state must derive a certain portion of that electricity from renewable sources. Each state defines what qualifies as "renewable" for purposes of their portfolio standard, so that generation that qualifies in one state does not necessarily qualify in other states. Generation based in Maine can sell its renewable energy certificates (RECs) to customers in Connecticut, Massachusetts and Rhode Island, given the limitations described below.

Massachusetts Renewable Portfolio Standard

Massachusetts has a renewable portfolio standard that required 1% of electricity be procured from eligible providers in 2003, with the percentage required climbing annually until at least 2009, when 4% renewable power will be required.

Year	RPS Percentage
2003	1.0
2004	1.5
2005	2.0
2006	2.5
2007	3.0
2008	3.5
2009	4.0

However, the Massachusetts RPS has a number of eligibility criteria that restrict participation by biomass generators.

Eligible Biomass Fuel: In order to participate in the Massachusetts RPS, a facility may use biomass such as "brush, stumps, lumber ends and trimmings, wood pallets, bark, wood chips, shavings, slash and other clean wood that are not mixed with other solid waste."[103]

Qualifying Biomass Generation Unit: In order to participate in the Massachusetts RPS, a biomass generator must use "low-emission, advanced biomass power conversion technologies using an Eligible Biomass Fuel"[104]. This definition goes on to note that "pile burn, stoker combustion or similar technologies shall not constitute an advanced biomass conversion technology."[105] Two Maine biomass facilities, Indeck – Jonesboro and Indeck – West Enfield, currently qualify to participate in the Massachusetts RPS.[106] Worcester Energy has been qualified to participate in the Massachusetts RPS, subject to new emissions limits and continual emissions monitoring.[107] Other facilities would need to make significant capital investments in order to qualify for participation in the Massachusetts RPS.

Use of an Existing Wood-fired Facility: The Massachusetts RPS contains a requirement that qualifying generation not only come from "advanced technology", but also come from a "new" facility. There has been some

[103] 225 CMR 14.02: Definitions – Renewable Portfolio Standard
[104] 225 CMR 14.05 (1)(a)6: Eligibility Criteria for New Renewable Generation Units – Renewable Portfolio Standard
[105] Ibid
[106] These facilities have "vintage" restrictions due to previous operation, and thus cannot *fully* participate in the Massachusetts RPS.
[107] Massachusetts Division of Energy Resources. "Update on Biomass Projects in Massachusetts RPS; MA Biomass Working Group." September 14, 2004.

confusion about whether an existing facility can "re-tool" and qualify for participation in the Massachusetts RPS. Recent guidelines issued by the Massachusetts Division of Energy Resources have eliminated that confusion[108]. In essence, if a facility has been generating electricity in the past using a non-qualifying technology, it can re-tool the facility with newer technology (a fluidized bed, for example), and qualify for the Massachusetts RPS[109]. Maine facilities, including Greenville Steam and Boralex – Stratton (or Boralex – Livermore Falls), have received "Advisory Rulings" from Massachusetts regulators to proceed with a re-tooling from stoker grate combustion to fluidized bed combustion[110], and Worcester Energy is investing in that facility to qualify for the Massachusetts market[111]. A facility proposed by GenPower LLC at the site of a former Boralex facility in Athens has also received a preliminary ruling from Massachusetts[112].

Participation by Maine Facilities: Maine generators that sell electricity onto the grid in the ISO-New England region may participate in the Massachusetts RPS; generators located in the NMISA region may participate if they follow strict rules regarding delivery of electricity to the ISO-New England region[113].

Price Premium: Demand for Massachusetts-qualified RECs currently exceeds supply, and the price reflects this. With a price cap of $50.00 (in 2003 dollars, adjusted annually for inflation[114]), Massachusetts RECs for calendar year 2004 are trading between $45 and $48[115]. This means that <u>in addition to receiving payment for the sale of electricity</u>, a Massachusetts RPS qualified generator could receive between $45 and $48 / megawatt hour ($0.045 to $0.048 per kWh). RECs also trade for forward years. The price history of 2005 RECs is summarized below.

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108 Massachusetts Division of Energy Resources. "Renewable Portfolio Standard: Guideline on the MA RPS Eligibility of Generation Units That Re-Tool With Low-Emission, Advanced Biomass Technology." April 16, 2004.

109 As this report is going to press, the Massachusetts Division of Energy Resources is considering a change in rules that would allow modest changes at existing facilities to qualify for the Massachusetts RPS. Updates on the rules can be found at http://www.mass.gov/doer/rps/index.htm

110 http://www.mass.gov/doer/rps/advisory.htm (accessed July 12, 2004)

111 www.cleavco.com (accessed February 25, 2005)

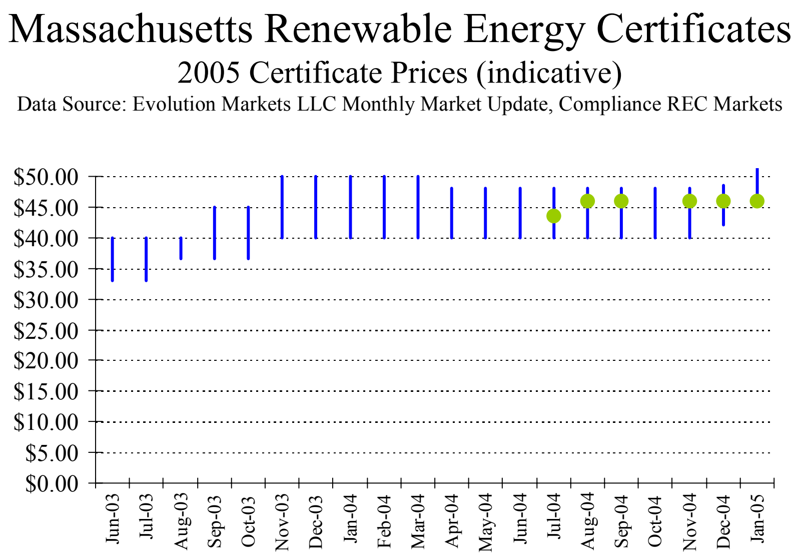
112 Massachusetts Division of Energy Resources. *Renewable Portfolio Standard Advisory Ruling for GenPower LLC's Proposed Biomass-Fueled Generation Units in Maine and New Hampshire.* September 3, 2004.

113 225 CMR 14.05 (5): Special Provisions for a Generation Unit Located Outside of the ISO-NE Control Area.

114 The 2005 Alternative Compliance Payment, which serves as the price cap, is $53.19 per MWh.

115 Evolution Markets LLC. *Monthly Market Update: Compliance REC Markets.* June 2004.

Figure 89. Price of Massachusetts RECs



It should be noted that there is a strong possibility that REC prices will not remain at their current levels, and facilities considering investments in order to participate in the REC market should carefully analyze future supply and demand risks.

Connecticut Renewable Portfolio Standard

Connecticut has a renewable portfolio standard that requires that 6% of electricity sold in the competitive marketplace to come from renewable generation in 2002; increasing annually. Connecticut has two classes of renewables; generation from "new, sustainable biomass" (Class 1, along with wind, landfill gas, and solar) receives preference over some other types of renewable power.

Year	Class 1 RPS Percentage	Class 2 RPS Percentage
2004	1.0	5.5
2005	1.5	5.5
2006	2.0	5.5
2007	3.5	5.5
2008	5.0	5.5
2009	6.0	5.5

For a biomass facility, key components of the Connecticut RPS include definition of an eligible biomass facility, participation by a Maine facility, and price premium.

Eligible Biomass Facility: For purposes of its Class 1 RPS, Connecticut defines an eligible biomass facility as:

> "[Including], but not limited to, a biomass gasification plant that utilizes land clearing debris, tree stumps or other biomass that regenerates or the use of which will not result in a depletion of resources, provided such facility begins operating on or after July 1, 1998, and such biomass is cultivated and harvested in a sustainable manner, except that energy derived from a biomass facility that began operation before July 1, 1998, may be considered a Class I renewable energy source, provided the average emission rate for such facility is equal to or less than .075 pounds of nitrogen oxides per million BTU of heat input for the previous calendar quarter and such biomass is cultivated and harvested in a sustainable manner"[116].

In other words, facilities in operation prior to this date must invest in pollution abatement equipment or new, less polluting boilers. At least two Maine facilities, Greenville Steam[117] and Boralex – Stratton[118] have received advisory rulings from

[116] Connecticut Public Act 03-135. *An Act Considering Revisions to the Electric Restructuring Legislation*.
[117] Connecticut Department of Public Utility Control. Decision: *DOCKET NO. 03-10-18. REQUEST OF GREENVILLE STEAM COMPANY FOR AN ADVISORY RULING FOR RENEWABLE PORTFOLIO STANDARD CLASS I CERTIFICATION FOR THE RETROFITTED WOOD BURNING BOILER IN GREENVILLE, MAINE*. December 18, 2003.
[118] Connecticut Department of Public Utility Control. *Decision: Docket 03-11-10. REQUEST OF BORALEX COMPANY FOR AN ADVISORY RULING FOR RENEWABLE PORTFOLIO STANDARD CLASS I CERTIFICATION FOR THE RETROFITTED WOOD BURNING BOILER IN STRATTON, MAINE*. December 18, 2004.

the Department of Public Utility Control that allow them to participate in the Class 1, provided that they meet necessary fuel and emissions criteria.

For purposes of participation in its Class 2 RPS, Connecticut defines an eligible biomass facility as one that:

> "[Began] operation before July 1, 1998, provided the average emission rate for such facility is equal to or less than .2 pounds of nitrogen oxides per million BTU of heat input for the previous calendar quarter."[119]

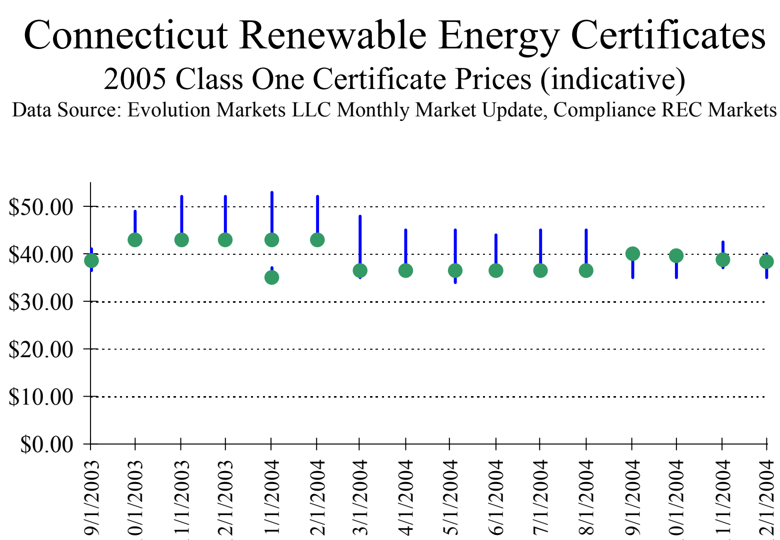
Most existing Maine biomass facilities meet this standard, but the Connecticut Class 2 RECs do not currently offer a meaningful price premium.

Participation by a Maine Facility: Connecticut allows participation in the RPS by any generator operating in the ISO-New England region, as well as the NMISA region.[120]

[119] Connecticut Public Act 03-135. *An Act Considering Revisions to the Electric Restructuring Legislation*.
[120] Connecticut Department of Public Utility Control. *Decision: Docket 04-01-12 Request of UPC Wind Partners, LLC for a Declaratory Ruling on Eligibility for Class 1 Renewable Status.* May 19, 2004.

Price Premium: Demand for Connecticut-qualified Class 1 RECs is currently strong, and the price reflects this. With a price cap of $55.00 (fixed, not adjusted for inflation), Connecticut Class 1 RECs for calendar year 2004 are trading between $35 and $44[121]. This means that in addition to receiving payment for the sale of electricity, a Connecticut Class 1 RPS qualified generator could receive between $35 and $44 / megawatt hour ($0.035 to $0.044 per kWh). RECs also trade for forward years. The price history of 2005 RECs is summarized below.

Figure 90. Price of Connecticut Class 1 RECs



It should be noted that there is a strong possibility that Connecticut Class 1 REC prices will not remain at their current levels, and facilities considering investments in order to participate in the REC market should carefully analyze future supply and demand risks.

There is currently supply in excess of demand for Connecticut Class 2 RECs, which have historically traded for less than $1.00 ($0.001/kWh)[122]. A premium of this level is often of little benefit to generators.

[121] Evolution Markets LLC. *Monthly Market Update: Compliance REC Markets.* June 2004.
[122] According to Evolution Markets LLC *August 2004 REC Monthly Market Update*, Connecticut Class II - qualified RECs trade for $0.65 for 2004 and 2006, and $0.70 for 2005.

Rhode Island Renewable Portfolio Standard

In June, 2004, Rhode Island established a renewable portfolio standard. This RPS begins in 2007, and increases annually until 2019. It contains provisions for both new and existing renewable generation.

Year	Existing	New
2007	2.0%	1.0%
2008	2.0%	1.5%
2009	2.0%	2.0%
2010	2.0%	2.5%
2011	2.0%	3.5%
2012	2.0%	4.5%
2013	2.0%	5.5%
2014	2.0%	6.5%
2015	2.0%	8.0%
2016	2.0%	9.5%
2017	2.0%	11.0%
2018	2.0%	12.5%
2019	2.0%	14.0%

For Maine biomass producers, the definition of eligible facility and the ability to participate in this market are of particular interest.

> **Eligible Biomass Facility:** To qualify as "new" for purposes of the Rhode Island RPS, a biomass facility must have begun operation (or have incremental new renewable output derived through capital investment) after 1997, use "eligible biomass fuels and [maintain] compliance with current air permits"[123]. Eligible biomass means "fuel sources including brush, stumps, lumber ends and trimmings, wood pallets, bark, wood chips, shavings, slash and other clean wood that is not mixed with other solid wastes… [and] neat liquid fuels that are derived from such fuel sources."[124]
>
> For qualification as an "existing" renewable generator for purposes of the Rhode Island RPS, the facility must meet the same definition as above, but would have begun generation prior to or during 1997.
>
> **Ability of Maine Generators to Participate.** Maine biomass facilities that sell into the ISO-New England region are eligible to participate in the RPS, as are facilities in "an adjacent control area outside" of ISO-New England, provided that the electricity is delivered to and used in the ISO-New England region.

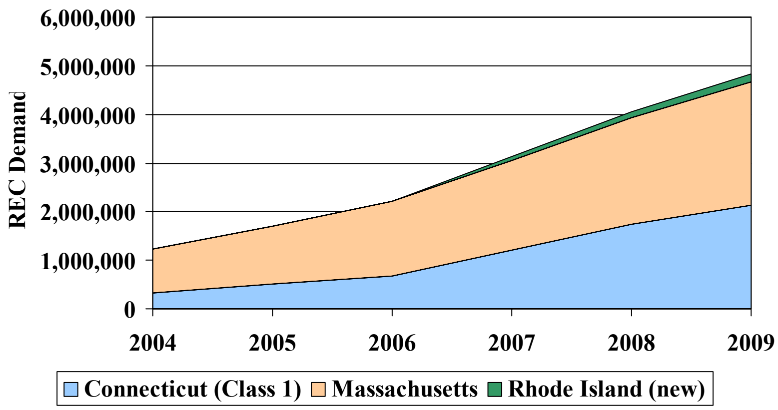
[123] State of Rhode Island General Assembly. *S. 2082. An Act Relating to Public Utilities and Carriers – Renewable Energy Standard.* June 29, 2004.
[124] State of Rhode Island General Assembly. *S. 2082. An Act Relating to Public Utilities and Carriers – Renewable Energy Standard.* June 29, 2004.

Price Premium. As the Rhode Island RPS has just been established, there is no pricing available at this time. There is a price cap of $50.00 per REC (2003 dollars), which will be adjusted annually for inflation.

Total Demand for High-Value RECs

The demand for high-value RECs will grow in coming years, as state renewable requirements increase and overall electricity demand in the region grows. This increase will provide opportunities for Maine biomass facilities, as well as others, to invest in new or more efficient generation and take advantage of REC price premiums.

Figure 91. Anticipated New England High-Value REC Demand 2004 - 2009

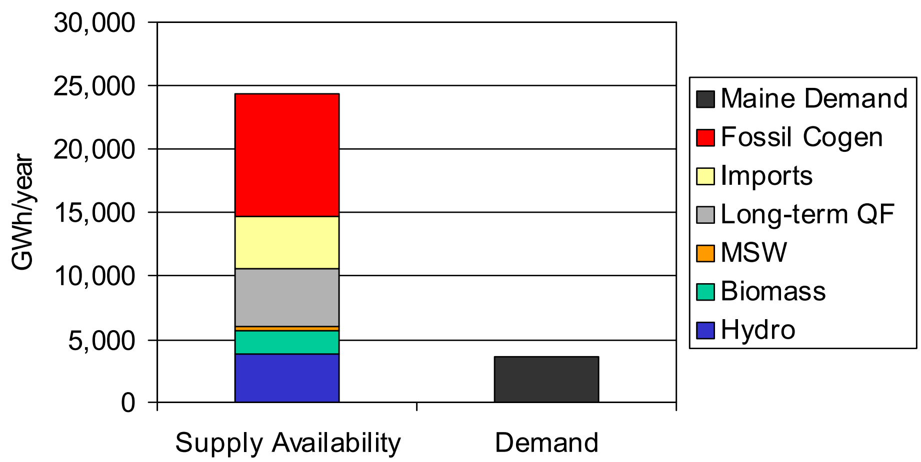


Future REC supply is unknown at this point, and is highly dynamic. A number of biomass, wind and landfill gas facilities may be built or re-tooled, but completion of many of these projects is far from certain. Any firms considering new investment in order to qualify for the REC market should thoroughly analyze anticipated REC demand, and variables that will influence future demand.

Maine Renewable Portfolio Standard

Maine has a renewable portfolio standard that requires that 30% of the electricity sold by suppliers come from either renewable generation or "efficient resources" – the highest such standard in the nation.[125] However, prior to establishment of an RPS, Maine derived roughly 45% of its power from renewable resources, primarily biomass and hydroelectric. Maine's RPS allows a great deal of generation that does not qualify for participation in the renewable portfolio of some other states. According to industry sources, the supply of electricity eligible to participate in Maine's RPS is six to eight times the demand.[126]

Figure 92. Supply and Demand for Maine-Qualified RECs[127]



Data Source: Independent Energy Producers of Maine

Because the supply is well in excess of demand, Maine-qualified RECs have minimal value in the marketplace[128]. According to a recent report by the Maine Public Utilities Commission,

> "Maine's current eligible resource portfolio requirement is not accomplishing the policy goal of promoting the use of renewable, efficient and indigenous resources

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125 www.dsireusa.org
126 Turkel, Tux. "Renewable Energy Back on Front Burner." *Maine Sunday Telegram.* April 6, 2003.
127 Some other analyses show a smaller supply, but all analyses show that supply exceeds demand by several fold.
128 According to Evolution Markets LLC July 2004 REC Monthly Market Update, Maine-qualified RECs trade for $0.65 for 2004, 2005 and 2006.

> that would not otherwise occur. The current mechanism is not providing financial assistance to the designated resources and technologies."[129]

Voluntary Green Energy Market

In addition to the "compliance" markets for renewable power, there exists a growing market for voluntary renewable energy purchases. In this market, individuals who want to purchase renewable power, including biomass, may do so through either selection of a renewable energy product or through purchase of RECs equivalent to some or all of their electricity use. In this market, individual consumers are generally free to enter and leave the market, and are under no regulatory requirement to purchase biomass or other renewable energy.

In Maine, the Maine Green Power Connection offers a variety of renewable energy products to electric consumers. One product, available to residential ratepayers at the price of $0.065/kwh (power only, *not* transmission and distribution charges), provides 100% renewable power from hydroelectric and biomass generation. Demand is only one-fifth of what was hoped for, and this market is not presently providing opportunities for biomass generation[130].

In the voluntary green power market, a number of marketers have found that consumers prefer "zero-emission" generation, such as hydroelectric, wind or solar. This is because most voluntary consumers choose to purchase renewable electricity in order to mitigate their environmental footprint, and prefer to pay extra to see limited or no emissions. In this regard, biomass is at a disadvantage to other renewable generation, as there are emissions associated with combustion.

Federal Production Tax Credit

At the federal level, there is a Production Tax Credit (PTC) of $0.015 (inflation adjusted) for some forms of renewable electricity generation, including wind, poultry waste and "closed-loop" biomass[131], and a tax credit of half that amount for "open-loop" biomass[132] generation that begins generation prior to 2006.[133]

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[129] Maine Public Utilities Commission. *Report and Recommendations on the Promotion of Renewable Resources.* December 31, 2003.
[130] Personal communication, Erika Morgan, Maine Energy Investment Corporation, August 3, 2004.
[131] "Closed loop biomass" is biomass grown specifically as an energy crop. No facility in the country has qualified for this tax credit since its inception in 1992.
[132] Facilities that derive their fuel from sources other than dedicated energy crops, including all biomass facilities in Maine.
[133] Edgecomb, Misty. "Wind power gets federal help." *Bangor Daily News.* October 13, 2004.

Outlook

Maine's biomass industry faces significant challenges, but strong opportunities are present, both for existing facilities and for new, cutting-edge technologies that use wood to produce electricity, chemicals, liquid fuels and other products. Without costly re-tooling to qualify for regional Renewable Portfolio Standards (such as new boilers or major investments in new emissions control devices) or some form of public policy support, Maine's existing wood-fired power plants will continue to often have significant difficulty in a competitive electricity market, where prices are set largely by the cost of generation by natural gas facilities. This will likely result in an unstable wood market, with large swings in wood demand as wood-fired power plants come start and stop electricity production based upon wholesale prices. However, public policy incentives in other jurisdictions (e.g. Connecticut, Massachusetts and Rhode Island) may provide existing biomass power plants with an opportunity to re-invest in their facilities, become more efficient, and secure price supports to cover the above-market cost of biomass electricity generation. These same incentives may provide smaller producers, such as sawmills, an opportunity to develop or improve biomass electricity generation and sell excess power into the region's wholesale market economically.