RENEWABLE ENERGY PORTFOLIO STANDARD-

FOREST IMPACT ASSESSMENT

Massachusetts Department of Energy Resources

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Contents

Tables

Acronyms

CHP	Combined Heat and Power
DOER	Department of Energy Resources
EEA	Executive Office of Energy and Environmental Affairs
FIA	U.S. Forest Service Inventory and Analysis Program
GHG	Greenhouse Gas
RPS	Renewable Portfolio Standard
US	United States
USDA	United States Department of Agriculture

Introduction

Biomass fuel is an important energy source in the region, and it is a fuel source that must be carefully managed due to the impacts that its extraction or creation can have on the environment. The most common biomass fuels produced in the region for local consumption by conventional steam turbine and CHP generating facilities - are woody biomass from forests or manufacturing processes, and liquid biofuels from organic waste feedstocks. Biomass was one of the original renewable energy sources permitted under the Renewable Energy Portfolio Standard (RPS) when the Massachusetts Electric Industry Restructuring Act was enacted in 1997 and the RPS Class I Regulation (225 CMR 14.00) was first promulgated in 2002. In November 2009, the Executive Office of Energy and Environmental Affairs (EEA) commissioned a team to conduct a comprehensive study on sustainability and carbon policies related to biomass. Following extensive stakeholder engagement, the Department of Energy Resources (DOER) issued revised RPS regulations in August 2012, which created woody biomass harvesting requirements, fuel tracking requirements, and established a methodology to account for lifecycle greenhouse gas emissions.

The RPS regulations promulgated in 2012 require DOER, in coordination with the Department of Conservation and Recreation, to undertake a Forest Impact Assessment. The purpose of the assessment is to examine the impact on Massachusetts' and the region's forest from the removal of woody biomass fuel. The regulation also requires DOER to evaluate the greenhouse gas accounting methodology that Generation Units use to report their greenhouse gas emission reductions. The report is structured to examine the baseline forest resources, assess how much wood has been removed and consumed by RPS eligible generators, identify the origins of the wood, and compare the RPS biomass against existing timber harvests.

Forest Resource

Baseline Conditions

The Northeast region is currently one of the most forested areas in the United States, despite the region supporting some of the nation's highest population densities (Foster, 2017) Table 1 provides data on Massachusetts' and Northeast forest demographics. The data are derived from the U.S. Forest Service Inventory and Analysis Program (FIA), which is a federal program with robust protocols that aids in standardizing the data across different states.

Table 1: Forest Demographics

Category	Massachusetts	Northeast *
Forest Land (2015) (acres)	3,024,900	50,937,400
Aboveground Forest Biomass (2015) (green tons)**	435,592,200	5,604,421,000
Annual Forest Growth (green tons/year)**	5,205,165	74,746,876
Tree Mortality (green tons/year)**	2,461,376	36,579,654
Harvest Volume (green tons/year)**	1,010,054	36,651,385

Source: USDA, 2016
*Includes MA, VT, NH, ME, RI, CT, and NY
** Data are converted to green tons.[1]

Massachusetts

According to the FIA data, Massachusetts contains 3,024,900 acres of forest land, representing approximately 61% of the area of the Commonwealth (USDA 2016). This forested land represents 435,592,200 green tons of biomass in the forest[2]. The forests grow by approximately 1.2% (5,205,165 green tons) per year while approximately 0.6% (2,461,376 green tons) per year is lost due to natural death of trees. Additionally, approximately 0.2% (1,010,054 green tons) is harvested for use. The FIA data shows that on average in Massachusetts, the amount of wood grown in the forest is more than five times greater than the amount harvested. A report undertaken on behalf of DOER found a similar annual growth rate at a more local level for the northwestern region of Massachusetts where it is estimated more than 400,000 green tons of biomass is grown annually (INRS, 2016).

In 2016, the Innovative Natural Resource Solution's report was conducted at the time to determine if there is enough low-grade forest-sourced wood fuel to sustainably supply a hypothetical new wood pellet manufacturing mill in the 20-town northwestern Massachusetts Mohawk region. It highlights that a conservative estimate between 193,000 to 234,000 green tons of chipwood could be sustainably harvested annually in the northwest region of Massachusetts and that this could increase to as much as 355,000 green tons annual in 2035 under a business as usual scenario (INRS, 2016). An additional study by the University of Massachusetts also suggests that between 1,000,000 to 1,780,000 green tons can be sustainably harvested in Massachusetts (Kelty, 2008)[3].

[1] The data is presented in green tons, which is the weight of the wood including its water content, which is typically around 50%.
[2] For the purpose of this report, when biomass is referenced, it is referring to woody biomass.
[3] Data converted to green tons by assuming 2 green tons equals 1 dry ton.

Northeast

At a regional level, 50,937,400 acres (62%) in the Northeast are forest land (Table 1), placing it well above the national average of 34% for forest land (Oswalt, 2018). The region's forested lands represent 5,604,421,000 green tons of above ground biomass. It is estimated that 74,746,876 green tons (1.33% of total forest biomass), is grown per year while 36,579,654 green tons (0.65%) per year is lost due to natural death of trees and 36,651,385 green tons (0.65%) is harvested annually.

Forest Value

The region's forests are important resources that provide a wealth of ecosystem services such as habitat to support flora and fauna, recreational activities, clean drinking water, mitigating flooding impacts and sequestering carbon dioxide. It is also estimated that each year, the region's forests remove over 760,000 tons of air pollution which includes ozone, nitrogen oxides, sulfur dioxide, and fine particulates, and provides an estimated $550 million in health benefits (Foster, 2017). Forests also serve an integral role in our economy, providing employment opportunities, materials to manufacture goods, building trade supply chains, and substitutes for more carbon-intensive products such as concrete, plastic, and metals. The Carsey Institute at the University of New Hampshire estimates that forest-based industries and recreation create more than $20 billion in economic activity in the region and support more than 100,000 jobs (Ducey, 2016).

However, the region's forests are facing pressure from development and this pressure is seen as one of the largest threats facing New England forests. Between 1990 and 2010, it is estimated that each year an average of 24,000 acres of forest was permanently lost to development in New England (Foster, 2017). Other studies have also identified the same trend of reduced forest cover in the region and note that it is especially important to protect forest from development near urban areas where pressure is the greatest (Ducey, 2016). If this trend continues, it is estimated that 1.2 million acres, or 3%, of New England forests would be permanently lost due to development in the next 50 years (Foster, 2017).

Forest Use for RPS

The RPS regulation puts restrictions on the type of woody biomass allowed to generate energy. In the regulations, woody biomass is broken down into three types, forest derived, forest salvage and non-

forest derived resources.[4] As its name implies, forest derived biomass is material that in its first instance, originates from the harvesting. Forest Salvage for purposes of the RPS is a tree that has been damaged by a major threat, as determined by a government agency. This type of wood may include trees that have been damaged by a parasitic insect, or trees that have been injured in a significant storm. Non-forest derived resources include biomass that originates from some other purpose, such as but not limited to waste material from a lumber mill or trees removed for maintenance of utility corridors.

The below tables provide a summary of the geographic source (Table 2) and the feedstock source (Table 3) of the biomass used as fuel by RPS Class I Renewable Generation Units from 2013 through 2017. The data are derived from biomass supplier and Generation Unit reports to DOER collected during this same timeframe. In 2017, the most recent year with a complete dataset, biomass use totaled 38,968 green tons, a decline of more than 94% from the high in 2013 of 698,331 green tons. From 2013 to 2017, most of the biomass was sourced from Maine (65%) while biomass sourced from Massachusetts was the second greatest (21%). Over this time, forest derived feedstocks represented 873,611 green tons, which represents 49% of the total biomass feedstock used under the RPS[5]. Fuel used by RPS generators has supported approximately $44.5 million of revenue for biomass suppliers from 2013 to 2017, supplying a positive local economic benefit to loggers and landowners.[6]

Table 2: Source of RPS Biomass Fuel by State/Province (green tons)

State/Province	2013	2014	2015	2016	2017	TOTAL	PERCENT
Massachusetts	169,381	105,007	27,936	32,493	37,198	372,015	21%
Maine	401,285	329,284	419,309	0	0	1,149,878	65%
New Hampshire	109,573	73,907	907	0	303	184,690	10%
New Brunswick	0	9,487	30,688	0	0	40,175	2%
Connecticut	16,534	13,155	659	2,038	1,467	33,853	2%
Rhode Island	1,006	94	0	0	0	1,100	0%
Vermont	551	0	0	0	0	551	0%
Total	698,331	530,934	479,499	34,531	38,968	1,782,263	100%

[4] See 225 CMR 14.02 for a detailed description of the definitions.
[5] See rows 1 and 2 of Table 3.
[6] Assumes an average market price of $25 per ton of green chip (NHTOA, 2017).

Table 3: RPS Biomass by Source (green tons) – New England Including New Brunswick

Feedstock Source	2013	2014	2015	2016	2017	TOTAL	PERCENT
Forest derived - Residues	349,473	138,875	191,993	0	0	680,341	38%
Forest derived - Thinnings	69,315	55,371	68,584	0	0	193,270	11%
Forest salvage	0	9,514	1,887	0	479	11,880	1%
Land use change	133,475	161,508	129,744	17,093	21,299	463,119	26%
Other	0	21,518	9,993	0	0	31,511	2%
Non-forest derived - Residues	16,565	43,166	47,821	6,480	64	114,096	6%
Tree maintenance	107,537	73,910	21,520	0	3,799	206,766	12%
Wood waste (e.g., clean pallets)	21,966	27,072	7,957	10,958	13,327	81,280	5%
Total	698,331	530,934	479,499	34,531	38,968	1,782,263	100%

The sources of biomass fuel under the RPS have changed significantly over the past four years. Most notably in 2016, three of the four Generation Units that had previously been generating Renewable Energy Certificates, Covanta – Jonesboro, Covanta – West Enfield, and Eversource – Schiller had their RPS Statements of Qualification revoked by DOER as the facilities were unable to meet overall efficiency requirements that went into effect at the beginning of that year. While these facilities are no longer eligible for MA RECs some have maintained operation and continue to be eligible for other state's REC markets. Seaman Paper remained eligible under the program and was later joined by Cooley Dickenson Hospital, which was approved under the RPS in 2016. Notably, since 2016, the fuel has almost exclusively been derived from Massachusetts and Connecticut, with 94% of the eligible biomass originating in Massachusetts (Table 2). Additionally, 21,299 green tons of biomass (54%) used in the RPS in 2017 was derived from land use change for development, resulting in a permanent loss of forest cover in the region. The lack of forest-derived biomass in 2016 and 2017 is attributed to the removal of the Generation Units in Maine and New Hampshire, which were no longer eligible for the RPS.

Forest Sustainability

From 2013 through 2017, Massachusetts-qualified RPS generation units consumed 873,611 green tons of forest derived chipwood, of which 6,459 green tons came from sites in Massachusetts (Table 4). When compared to estimates of total annual harvest for all purposes, this accounts for less than 1% of the annual harvest in Massachusetts and the Northeast.

Table 4: Percentage of Annual Harvest from RPS Forest Derived Resources

Area	Category	2013		2014		2015		2016		2017		TOTALS	
		Green Tons	% of annual harvest	Green Tons	% of annual harvest	Green Tons	% of annual harvest	Green Tons	% of annual harvest	Green Tons	% of annual harvest	Green Tons	% of total harvest
Mass.	Forest Derived*	4,503	0.4%	1,956	0.2%	-0-	0%	0	0%	0	0%	6,459	0.1%
	Annual Harvest	1,014,530		1,014,530		1,014,530		1,014,530		1,014,530		5,072,650	
Northeast	Forest Derived*	418,788	1.1%	194,246	0.5%	260,577	0.7%	0	0%	0	0%	873,611	0.5%
	Annual Harvest	36,813,800		36,813,800		36,813,800		36,813,800		36,813,800		184,069,000	

Source for Annual Harvest Data: USDA, 2016
* Includes forest derived residues and forest derived thinnings

The sustainability of the region's forests is a complex topic because the forests provide multiple different values. From an RPS perspective, the data suggests that the impact on the forest sustainability is negligible due to the limited amount of biomass harvested for the program.

Greenhouse Gas Emissions

The RPS regulation requires that any Generation Unit that is using an Eligible Biomass Fuel, including woody biomass, must be able to achieve a 50% reduction in lifecycle greenhouse gas (GHG) emissions over a 20-year period of time. To verify these emission reductions, DOER developed the *Woody Biomass Overall Efficiency and GHG Analysis Guideline* that includes a spreadsheet applicants can use to analyze their expected GHG reductions. The spreadsheet is based on the Biomass Sustainability and Carbon Policy Study, often referred to as the Manomet Study (Walker, 2010). The study was the culmination of extensive stakeholder engagement process and analyzed the lifecycle greenhouse gas emissions from traditional fossil fuels and compares it against the burning of biomass. The Manomet Study included greenhouse gas emissions associated to the processing, transportation and combustion of fossil fuels and biomass resources.

The *Woody Biomass Overall Efficiency GHG Analysis Guideline* spreadsheet categorizes biomass feedstocks as either a residue or a thinning. Residues include branches and tops of trees that are a byproduct of harvesting the timber. Residues also include byproduct materials from the manufacturing of wood products. Thinnings are whole trees that are selectively harvested to encourage growth in a

forest. In accordance with the Manomet Study, the spreadsheet assigns a different level of GHG reductions between residues and thinnings[7].

In 2012, when the RPS regulations went into effect, the four existing and operational woody biomass Generator Units were not required to meet the GHG emission reductions until 2016[8]. As a result, these facilities did not submit any GHG emission reporting during this time. Beginning on January 1, 2016, three of the Generation Units no longer met the eligibility criteria and were no longer eligible to generate Renewable Energy Certificates. Therefore, only one of those facilities, Seaman Paper, began reporting GHG analysis to DOER in 2016. Additionally, DOER received an application in 2016 from Cooley Dickenson Hospital, a combined heat and power (CHP) generation unit utilizing woody biomass, and subsequently issued a Statement of Qualification to the facility. Both Seaman Paper and Cooley Dickinson Hospital have been complying with the GHG requirements since 2016 and are achieving significantly more greenhouse gas emission reductions than the RPS regulation requirement of 50% reduction over a period of 20 years[9]. This is largely due to the heavy reliance both facilities have on using residue feedstocks. Residues have a greater impact of reducing GHG emissions compared to thinnings because they are a byproduct of a harvest activity and do not increase the carbon deficit.

Conclusion

Forests need to be managed to enable the land to provide economic value and ecosystem services that are important to the region. This Forest Impact Assessment reveals that the inclusion of eligible woody biomass fuel in the RPS is having a negligible impact on sustainability of the forest due to the very small percent of forest derived biomass, less than 1%, being utilized in the program. From a greenhouse gas perspective, the program is seeing a significantly larger amount of GHG emissions reductions than what is required by regulations due to the heavy reliance on residues from the Generation Units.

[7] Thinnings which are derived from whole trees are considered to create a carbon debt with the extraction of the biomass from the forest. The use of thinnings as a feedstock results in less GHG reductions.
[8] The four existing facilities were still required meet other eligibility requirements, including forest sustainability and fuel tracking.
[9] On average the facilities have each demonstrated expected lifecycle GHG reductions of more than 80% over 20 years.

References

Ducey, M., et al., Forests in Flux- The Effects of Demographic Change on Forest Cover in New England and New York, Carsey Institute, 2016

Foster, D., et al., New England Landscape, Ecological Legacies and Conservation Patterns Shaped by Agrarian History, Harvard Forest Publication, 2008

Foster, D., et al., Wildlands and Woodlands, Farmlands and Communities- Broadening the Vision for New England, Harvard Forest, Harvard University, 2017

INRS, Mohawk Trail Renewable Heating Initiative – Forest Resource Assessment, 2016

Kelty, M., D'Amato, A., Barten, P., Silvicultural and Ecological Considerations of Forest Biomass Harvesting in Massachusetts, University of Massachusetts, 2008

New Hampshire Timberland Owners Association (NHTOA), Market Pulse, 4th Quarter 2017

Oswalt, S., et al., Forest Resources of the United State, 2017: A technical document supporting the Forest Service 2020 update of the RPA Assessment, USDA, 2018

USDA Natural Resource Conservation Service, New England Cottontail- Working Lands for Wildlife FY16-18 Conservation Strategy, 2016

USDA, Forests of Connecticut 2015, Resource Update FS-83, 2016

USDA, Forests of Maine 2015, Resource Update FS-86, 2016

USDA, Forests of Massachusetts 2015, Resource Update FS-89, 2016

USDA, Forests of New Hampshire 2015, Resource Update FS-71, 2016

USDA, Forests of New York 2015, Resource Update FS-96, 2016

USDA, Forests of Rhode Island 2015, Resource Update FS-90, 2016

USDA, Forests of Vermont 2015, Resource Update FS-80, 2016

Walker, T., et al., Biomass Sustainability and Carbon Policy Study, Manomet Center for Conservation Science, 2010