MassDEP GHG Reporting Program Summary Report
For Retail Sellers of Electricity
Emissions Year 2019

JUNE 2022

The information below summarizes the 2019 greenhouse gas (GHG) emissions and megawatt hours (MWh) of electricity sales in Massachusetts by the 104 retail sellers that sold electricity in Massachusetts during that year. Retail sellers of electricity in Massachusetts are required to report this information to the Massachusetts Department of Environmental Protection (MassDEP) under regulation 310 CMR 7.75.[1] MassDEP uses this information in considering measures to reduce emissions from the electric sector. This was the eleventh[2] year of emissions reporting by retail sellers of electricity, and the second year of reporting under regulation 310 CMR 7.75. Data and comparisons from the first nine reporting years under 310 CMR 7.71 are provided in the summary reports for 2008 and 2010-2017.[3] Changes to the regulation and the methodology for calculating emission factors make data from before 2018 not comparable with data since 2018; therefore, this summary only includes data beginning with 2018.

MassDEP requires retail sellers to report emissions that occur from the generation of the electricity that they sell. The GHGs emitted from power plants during combustion of fuels to generate electricity are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Biogenic and non-biogenic GHG emissions are reported separately. Biogenic GHG emissions are emissions of CO_2 that result from the combustion of biogenic (plant or animal) material, excluding fossil fuels. Non-biogenic GHG emissions include CO_2 released from the combustion of non-biogenic fuel, plus CH_4 and N_2O released from the combustion of any fuel.

The retail seller reporting process consists of 4 steps:

Step 1. Unit-Specific Generation: Retail sellers report the use of MWh from unit-specific generation and any associated emissions.

Step 2. Initial GHG Emission Factors: MassDEP develops initial GHG emission factors in terms of pounds of non-biogenic and biogenic GHGs in carbon dioxide equivalents per megawatt hour (lb CO_2e/MWh) based on all the electricity consumed in Massachusetts.

Step 3. Final GHG Emission Factors: MassDEP develops final GHG emission factors for the electricity consumed in Massachusetts that was not reported in Step 1, by removing the MWh and emissions reported in Step 1 from the initial emission factors developed in Step 2.

Step 4. GHG Emissions: Retail sellers report their GHG emissions by multiplying the final emission factors in Step 3 by their electricity sold and not reported in Step 1, and then adding emissions reported in Step 1.

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[1] Additional information about MassDEP's GHG reporting program is available at https://www.mass.gov/guides/massdep-greenhouse-gas-emissions-reporting-program; see particularly *Retail Seller of Electricity Reporting*.

[2] 2017 was the final reporting year under 310 CMR 7.71. Beginning with 2018 calendar year emissions, retail sellers began reporting under 310 CMR 7.75(9).

[3] The summary reports may be found at: https://www.mass.gov/lists/massachusetts-greenhouse-gas-ghg-reporting-program-data#retail-seller-ghg-emissions-reports-.

This summary document reports data as calculated and/or corrected by MassDEP, and not necessarily as reported by retail sellers (as discussed further below).

Step 1: Unit-Specific Generation Reported by Retail Sellers

The purpose of reporting unit-specific generation is to assign to each retail seller the MWh and associated emissions from the unit-specific electricity claimed by each through ownership of the unit, contract for the power, or the purchase of certificates. Under 310 CMR 7.75, this report is mandatory for electric utilities and competitive suppliers and optional for municipal electric departments and light boards (MEDs).[4] Table 1 shows the number of retail sellers reporting MWh from specific generating units in 2018.

Table 1. Number of Retail Sellers Reporting MWh from Unit-Specific Generation

	Electric Utilities	Competitive Suppliers	Municipal Electric Departments	Total Retail Sellers
2018	all 3	62 of 65	all 40	105 of 108
2019	all 3	56 of 61[5]	all 40	99 0f 104

MWh and emissions from specific electricity generating units retired by electric utilities and competitive suppliers are reported through their annual 'Renewable Portfolio Standard/Alternative Portfolio Standard/Clean Energy Standard (RPS/APS/CES) Workbook' to the Massachusetts Department of Energy Resources (DOER).[6, 7] Retail sellers are then required to include these MWh and emissions in the mandatory GHG Emissions report. The reporting of MWh from specific electricity generating units by MEDs is still done through the submittal of an optional unit-specific generation report to MassDEP.

Figures 1 through 3 show the total retail sales and unit-specific generation by retail seller type for 2018 and 2019: Figure 1 shows the total retail sales; Figure 2 shows the total MWh from unit-specific generation; and Figure 3 shows the ratio of unit-specific generation to total retail sales. Figures 4 and 5 show the amount of emitting and non-emitting unit-specific generation retired by retail seller type for 2019 in MWh and as a percent of total.

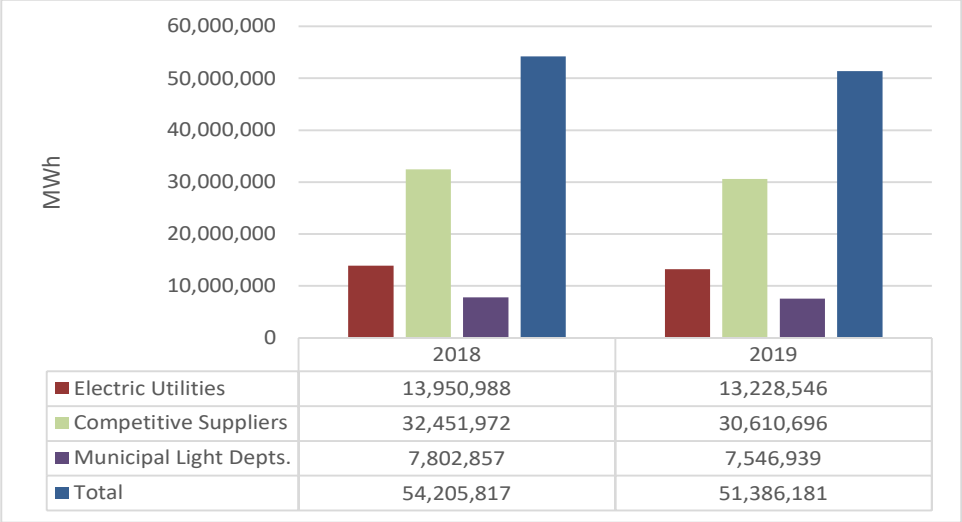
[4] In this document, Municipal Electric Departments and Municipal Light Boards are collectively referred to as municipal electric departments (MEDs).

[5] Sixty-one competitive suppliers sold retail electricity in Massachusetts in 2019. Five of these competitive suppliers (Agera, BPCC/Great Eastern Energy, Hampshire Council of Governments, Summer Energy and Utility Expense Reduction) failed to report their 2019 unit-specific generation. It is MassDEP's understanding that four of these competitive suppliers no longer operate in MA. MassDEP worked with the fifth supplier to improve their future submittals.

[6] Certificates are required for compliance with DOER's Renewable Energy Portfolio Standard (RPS) https://www.mass.gov/renewable-energy-portfolio-standard and Alternative Energy Portfolio Standard (APS) https://www.mass.gov/alternative-energy-portfolio-standard programs, and MassDEP's Clean Energy Standard (CES) program https://www.mass.gov/guides/clean-energy-standard-310-cmr-775.

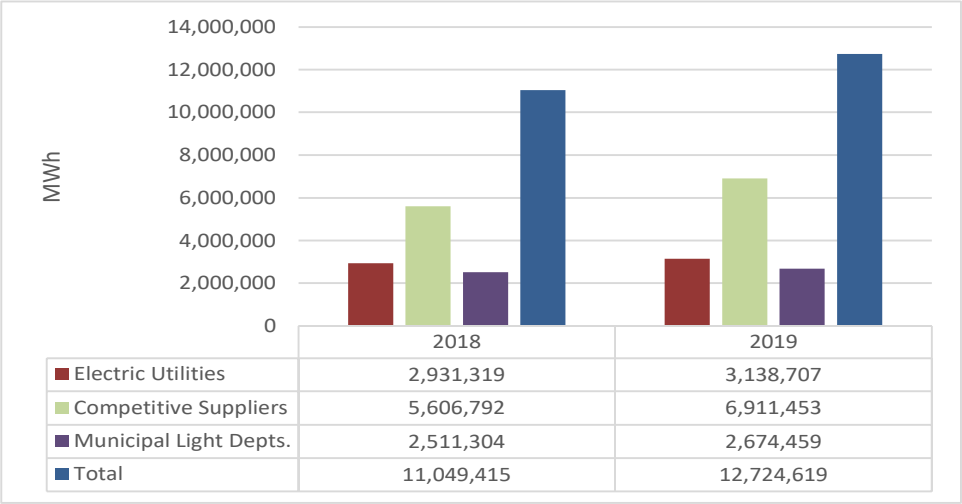
[7] For more details on Step 1 of the GHG reporting process in Massachusetts, see https://www.mass.gov/how-to/aq-31-32-retail-seller-of-electricity-greenhouse-gas-emissions-reporting.

Figure 1. Total MWh of Retail Sales of Electricity



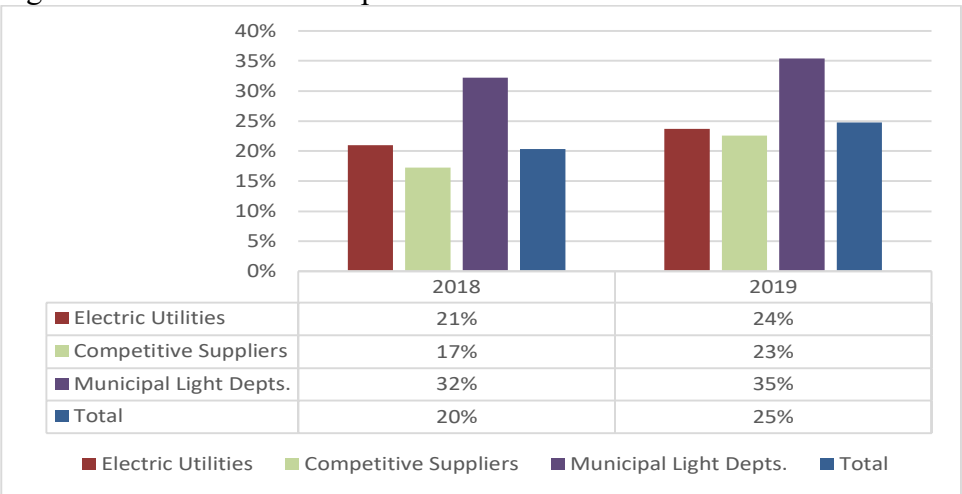
	2018	2019
Electric Utilities	13,950,988	13,228,546
Competitive Suppliers	32,451,972	30,610,696
Municipal Light Depts.	7,802,857	7,546,939
Total	54,205,817	51,386,181

Figure 2. MWh reported from Unit-Specific Generation



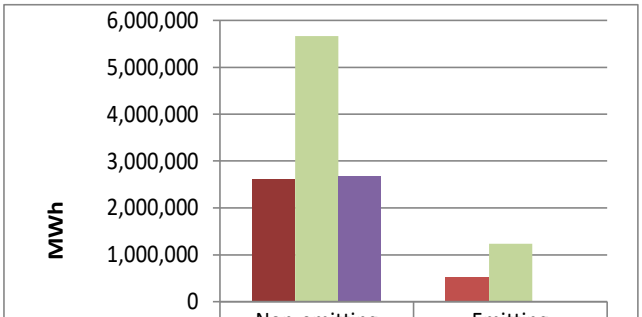
	2018	2019
Electric Utilities	2,931,319	3,138,707
Competitive Suppliers	5,606,792	6,911,453
Municipal Light Depts.	2,511,304	2,674,459
Total	11,049,415	12,724,619

Figure 3. MWh from Unit-Specific Generation as % of Total Retail Sales

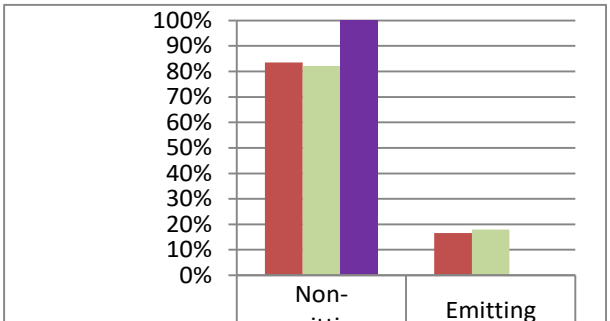


	2018	2019
Electric Utilities	21%	24%
Competitive Suppliers	17%	23%
Municipal Light Depts.	32%	35%
Total	20%	25%

Figures 4 and 5. Unit-Specific Non-emitting and Emitting Generation (as MWh and as Percent of Unit-Specific Generation) Reported for 2019



	Non-emitting	Emitting
Electric Utility	2,619,979	518,728
Competitive Supplier	5,666,988	1,237,848
Municipal Light Depts.	2,674,459	0



	Non-emitting	Emitting
Electric Utility	83.5%	16.5%
Competitive Supplier	82.1%	17.9%
Municipal Light Depts.	100.0%	0.0%

Details on the MWh reported by retail sellers from specific generating units can be found in Appendix 2A: *Optional Unit-Specific Generation Reported by MEDs for 2019* and Appendix 2B: *Unit-Specific Generation from GIS certificates*[8] *Reported by Electric Utilities and Competitive Suppliers for 2019.*

Steps 2 and 3: GHG Emission Factors

Table 2 shows the initial (Step 2) and final (Step 3) emission factors upon which retail seller GHG emissions are based. The combined non-biogenic and biogenic emission factors have been included in this summary report for informational purposes. (Please note that Table 2 presents wholesale emission factors. Consumers of electricity that want to use Massachusetts-specific emission factors to report their GHG emissions from electricity use should see Appendix 3: *2019 Retail Level Emission Factors for Use by Consumers of Electricity to Report Greenhouse Gas Emissions (Massachusetts-based Emission Factors)* for appropriate values.)

For an explanation of the methodology used to calculate the initial emission factors, and of the "Massachusetts-based" and "Regional" approaches used to calculate the emission factors in Table 2, see *Draft 2019 Greenhouse Gas (GHG) Emission Factors to be used by Retail Sellers of Electricity Reporting under 310 CMR 7.75(9)(c) "Greenhouse Gas Emissions Reporting."*[9]

The RPS regulation requires electric utilities and competitive suppliers to retire certificates from emitting unit-specific generation, including municipal solid waste (MSW).[10] Therefore, electric utilities and competitive suppliers are required to claim these certificates in their unit-specific generation reports. Because MSW emissions make up the major portion of biogenic emissions,

[8] Certificates are created and retired through the New England Power Pool Generation Information System (NEPOOL GIS). NEPOOL GIS "issues and tracks certificates for all MWh of generation and load produced in the ISO New England control area, as well as imported MWh from adjacent control areas." One certificate is generated for each MWh. See https://www.nepoolgis.com/.

[9] https://www.mass.gov/doc/technical-support-document-draft-2018-ghg-emission-factors/download.

[10] Massachusetts retail sellers retired approximately 90% of the MWh generated in Massachusetts by MSW in 2019.

particularly in Massachusetts, the result is a decrease from the initial biogenic emission factors to the final biogenic emission factors that are applied to non-unit-specific generation, as shown in Table 2.

Table 2. GHG Emission Factors for Electricity Consumed in Massachusetts, prior to and after accounting for Unit-Specific Generation (lb CO_2e/MWh)

	Massachusetts-based approach			Regional approach		
	Non-Biogenic	**Biogenic**	**Combined**	**Non-Biogenic**	**Biogenic**	**Combined**
Initial Emission Factors: **prior to** accounting for unit-specific generation (Step 2)						
2018	445	72	517	430	134	564
2019	416	62	478	402	119	521
Final Emission Factors: **after** accounting for unit-specific generation (Step 3)						
2018	486	18	504	445	118	563
2019	468	8	476	421	104	525

Step 4: GHG Emissions Reported by Retail Sellers

Most of the 104 retail sellers submitted their GHG emissions reports as shown in Table 3. This summary report reflects the MWh and GHG emissions data for all retail sellers that submitted their emission reports and includes data for the six competitive suppliers that failed to submit either the unit-specific generation report or the GHG emissions report.

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Table 3. Number of Retail Sellers Reporting GHG Emissions

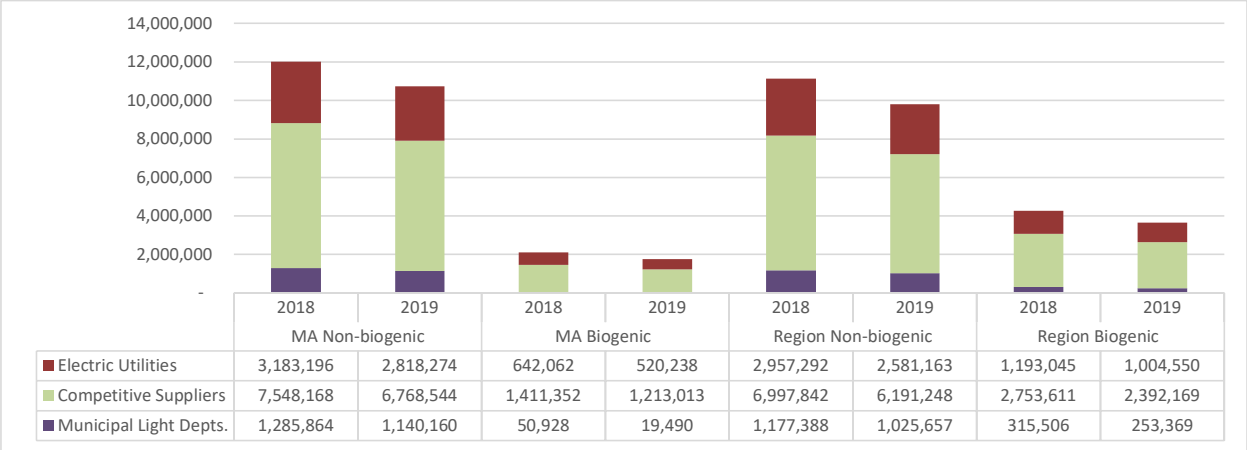
	Electric Utilities	**Competitive Suppliers**	**Municipal Electric Departments**	**Total Retail Sellers**
2018	all 3	58 of 65	all 40	101 of 108
2019	all 3	56 of 61[11]	all 40	99 of 104

Figure 6 shows the total GHG emissions for the three types of retail sellers in 2019. Massachusetts-based and Regional non-biogenic and biogenic GHG emissions decreased from 2018 to 2019. This is due to the decrease in emission factors (see Table 2), the decrease in the total load served in Massachusetts (see Figure 1), and the increase in the amounts of unit-specific generation retired by retail sellers (see Figure 2), much of which is from non-emitting generators.

The information provided in Figures 3, 5 and 6 should not be used to draw comparisons between the three types of retail sellers because electric utilities and competitive suppliers are subject to two requirements that MEDs are not: 1. reporting all unit-specific electricity generation and 2. retiring MSW certificates, which causes electric utilities and competitive suppliers to have higher relative emissions than MEDs.

[11] Five competitive suppliers (Agera, BPCC/Great Eastern Energy, Devonshire, Hampshire Council of Governments, and Utility Expense Reduction) failed to report their 2019 GHG emissions. It is MassDEP's understanding that these competitive suppliers no longer operate in MA.

Figure 6. GHG Emissions Reported by Retail Seller Type and Year using the Massachusetts-based and Regional methodologies (Short Tons CO_2e)



	2018	2019	2018	2019	2018	2019	2018	2019
	MA Non-biogenic		MA Biogenic		Region Non-biogenic		Region Biogenic	
Electric Utilities	3,183,196	2,818,274	642,062	520,238	2,957,292	2,581,163	1,193,045	1,004,550
Competitive Suppliers	7,548,168	6,768,544	1,411,352	1,213,013	6,997,842	6,191,248	2,753,611	2,392,169
Municipal Light Depts.	1,285,864	1,140,160	50,928	19,490	1,177,388	1,025,657	315,506	253,369

The GHG emissions for each retail seller can be found in Appendix 1: *2019 Individual Retail Seller GHG Emissions*.

Appendix 1: 2019 Individual Retail Seller GHG Emissions

Below are GHG emissions for each retail seller calculated by MassDEP based on:

- the final GHG emission factors,
- MWh reported as retail load to MassDEP for compliance with the Clean Energy Standard by electric utilities and competitive suppliers and to the Department of Public Utilities (DPU) by MEDs, less MWh reported from unit-specific generation, and
- GHG emissions reported from unit-specific generation, as adjusted by MassDEP.[12]

Competitive suppliers that failed to submit reports as noted above, or that failed to re-submit corrected reports, are marked with an asterisk. GHG emissions were calculated for these retail sellers.

Table 4. 2019 Massachusetts Retail Seller GHG Emissions (Short Tons CO_2e)

	Massachusetts-based approach			Regional approach		
	Non-Biogenic	Biogenic	Combined	Non-Biogenic	Biogenic	Combined
Electric Utilities						
Unitil (Fitchburg Gas & Electric Co.)	35,665	6,247	41,913	32,680	12,346	45,025
National GRID (Mass. and Nantucket Electric)	1,411,700	277,277	1,688,978	1,292,694	520,354	1,813,048
Eversource/NSTAR Electric Co. and Western MA Electric Cos.	1,370,909	236,714	1,607,622	1,255,789	471,851	1,727,640
Competitive Suppliers						
Agera Energy LLC*	167,792	2,868	170,660	150,941	37,287	188,228
Ambit Northeast, LLC	47,232	12,302	59,534	43,253	20,431	63,683
Astral Energy, LLC	4	0	4	3	1	4
Atlantic Energy LLC	16,838	2,871	19,709	15,420	5,767	21,187
Calpine Energy Solutions LLC	300,229	56,899	357,128	274,876	108,685	383,560
Champion Energy Services	99,014	16,942	115,957	90,683	33,960	124,643
Clean Choice	26,589	4,682	31,271	24,366	9,224	33,589
Clearview Electric, Inc.	19,904	3,405	23,309	18,229	6,826	25,056
Connecticut Municipal Electric Energy Cooperative	25,603	4,196	29,799	23,429	8,636	32,065
Constellation NewEnergy, Inc.	1,612,188	289,279	1,901,467	1,476,482	566,467	2,042,948
Devonshire Energy, LLC*	15,110	4,811	19,921	13,857	7,371	21,228
Direct Energy Business LLC	914,794	161,984	1,076,778	837,392	320,081	1,157,473
Direct Energy Services, LLC	122,648	21,477	144,125	112,258	42,699	154,957
Discount Power, Inc.	4,923	1,056	5,979	4,509	1,902	6,411
Dynegy Energy Services (East), LLC	185,578	30,570	216,148	169,777	62,844	232,621
EDF Energy Services, LLC/ TransCanada	260,676	43,720	304,396	238,648	88,713	327,361
Eligio Energy MA LLC	14,551	2,373	16,924	13,314	4,899	18,213
Energy Plus Holdings	4,787	872	5,659	4,385	1,694	6,078

[12] Alternative Compliance Payments (ACPs) are not considered as part of Retail Seller GHG Reporting, and certificates previously banked with DOER are accounted for in the year they were generated, and therefore result in no MWh being subtracted and no emissions being added to a retail seller's GHG emissions report in Step 4.

	Massachusetts-based approach			Regional approach		
	Non-Biogenic	Biogenic	Combined	Non-Biogenic	Biogenic	Combined
ENGIE Resources, LLC	760,414	140,261	900,675	695,305	273,250	968,555
ENGIE Retail, LLC (dba Think Energy)	25,708	4,230	29,938	23,527	8,685	32,212
Everyday Energy LLC	203	36	239	186	71	257
First Point Power	119,948	21,870	141,818	109,790	42,618	152,408
Great Eastern Energy (aka BBPC, LLC)*	32,036	548	32,583	28,818	7,119	35,937
Green Mountain Energy Company	3,547	603	4,149	3,248	1,213	4,461
Hampshire Council of Governments*	2,841	49	2,890	2,556	631	3,188
Harborside Energy of Massachusetts LLC	1,104	159	1,264	1,008	356	1,364
Harvard Dedicated Energy, Ltd.	32,567	557	33,123	29,296	7,237	36,533
Hudson Energy Services	159,527	32,337	191,865	145,937	60,096	206,033
Inspire Energy Holdings, LLC	34,463	15,401	49,864	31,553	21,344	52,898
Interstate Gas Supply, Inc. (dba IGS Energy)	33,541	6,385	39,926	30,744	12,098	42,842
Just Energy Mass. Corp.	22,352	3,620	25,972	20,450	7,506	27,955
Liberty Power Holdings	83,956	6,133	90,088	76,021	22,340	98,361
Linde-Messer Energy Services*	3,059	537	3,596	2,803	1,060	3,863
Major Energy Electric Service, LLCs	21,269	3,465	24,733	19,461	7,158	26,618
Massachusetts Gas & Electric Co.	26,274	4,525	30,799	24,066	9,034	33,100
Mega Energy Holdings, LLC	12,448	1,970	14,418	11,384	4,144	15,528
National Gas & Electric, Inc.	12,106	1,855	13,961	11,084	3,943	15,027
NextEra Energy	478,915	84,461	563,377	438,187	167,650	605,838
Nordic Energy Services	454	83	537	416	160	577
Oasis Power, LLC	400	7	407	360	89	449
Palmco Power MA, LLC	13,660	3,923	17,583	12,503	6,286	18,789
Provider Power MASS, LLC	152,755	33,112	185,867	139,740	59,696	199,436
Public Power, LLC	451,354	99,436	550,790	413,403	176,953	590,356
Reliant Energy Northeast	93,838	6,237	100,076	85,934	22,382	108,316
Renaissance Power and Gas	3,892	725	4,617	3,571	1,381	4,952
Residents Energy, LLC	29,881	7,760	37,641	27,379	12,872	40,251
SFE Energy Massachusetts	82,313	23,596	105,908	75,448	37,618	113,066
SmartEnergy Holdings, LLC	14,128	2,590	16,718	12,958	4,981	17,939
South Jersey Energy*	2,161	385	2,546	1,981	753	2,733
Spark Energy, LLC	3,063	315	3,378	2,783	886	3,670
Starion Energy, Inc.	40,262	6,838	47,100	36,864	13,778	50,643
Summer Energy*	12,072	2,038	14,110	11,053	4,119	15,172
Sunwave Gas & Power Massachusetts, Inc.	20,445	2,229	22,673	18,590	6,017	24,607
Texas Retail Energy	20,516	4,782	25,299	18,774	8,340	27,115
Titan Gas and Power	1,888	313	2,201	1,728	640	2,368
Town Square Energy, LLC	24,248	5,502	29,750	22,211	9,663	31,874

	Massachusetts-based approach			Regional approach		
	Non-Biogenic	Biogenic	Combined	Non-Biogenic	Biogenic	Combined
Utility Expense Reduction*	95	2	97	86	21	107
Verde Energy USA Massachusetts, LLC	36,143	8,082	44,225	33,051	14,397	47,449
Viridian Energy, LLC	46,468	13,425	59,894	42,566	21,397	63,962
Wattifi, Inc.	6	0	6	6	1	7
Xoom Energy Massachusetts LLC	13,762	2,324	16,085	12,599	4,698	17,297
Municipal Electric Departments						
Ashburnham Muni. Light Dept.	5,382	92	5,474	4,842	1,196	6,038
Belmont Municipal Light Dept.	21,043	360	21,402	18,929	4,676	23,606
Boylston Municipal Light Dept.	4,627	79	4,706	4,162	1,028	5,190
Braintree Electric Light Dept.	50,290	860	51,149	45,239	11,175	56,415
Chester Muni. Electric Light Dept.	1,186	20	1,207	1,067	264	1,331
Chicopee Electric Light Dept.	103,002	1,761	104,763	92,658	22,889	115,547
Concord Municipal Light Plant	20,249	346	20,596	18,216	4,500	22,716
Danvers Electric Division	34,410	588	34,999	30,955	7,647	38,601
Georgetown Municipal Light Dept.	6,283	107	6,390	5,652	1,396	7,048
Groton Electric Light Dept.	12,615	216	12,831	11,348	2,803	14,152
Groveland Municipal Light Dept.	7,554	129	7,684	6,796	1,679	8,475
Hingham Municipal Lighting Plant	26,892	460	27,352	24,191	5,976	30,167
Holden Municipal Light Dept.	11,822	202	12,024	10,635	2,627	13,262
Holyoke Gas & Electric Dept.	9,880	169	10,049	8,888	2,196	11,084
Hudson Light & Power Dept.	5,559	95	5,654	5,001	1,235	6,236
Hull Municipal Lighting Plant	5,281	90	5,371	4,751	1,174	5,924
Ipswich Municipal Light Dept.	20,796	355	21,151	18,707	4,621	23,328
Littleton Electric Light & Water	52,232	893	53,125	46,986	11,607	58,593
Mansfield Municipal Electric Dept.	23,234	397	23,631	20,900	5,163	26,063
Marblehead Municipal Light Dept.	15,570	266	15,836	14,006	3,460	17,466
Merrimac Muni. Light & Water	6,243	107	6,349	5,616	1,387	7,003
Middleborough Gas & Elec. Dept.	40,555	693	41,248	36,482	9,012	45,494
Middleton Muni. Electric Dept.	11,654	199	11,853	10,484	2,590	13,074

	Massachusetts-based approach			Regional approach		
	Non-Biogenic	Biogenic	Combined	Non-Biogenic	Biogenic	Combined
North Attleboro Electric Dept.	35,954	615	36,569	32,343	7,990	40,333
Norwood Municipal Light Dept.	74,764	1,278	76,042	67,255	16,614	83,870
Paxton Municipal Light Dept.	2,402	41	2,443	2,160	534	2,694
Peabody Municipal Light Plant	73,385	1,254	74,640	66,015	16,308	82,323
Princeton Municipal Light Dept.	3,104	53	3,158	2,793	690	3,483
Reading Municipal Light Dept.	126,295	2,159	128,454	113,611	28,065	141,677
Rowley Municipal Lighting Plant	10,186	174	10,361	9,163	2,264	11,427
Russell Municipal Light Dept.	1,042	18	1,059	937	231	1,168
Shrewsbury Electric & Cable Ops.	43,516	744	44,260	39,146	9,670	48,816
South Hadley Electric Light Dept.	3,340	57	3,397	3,005	742	3,747
Sterling Municipal Light Dept.	8,373	143	8,516	7,532	1,861	9,392
Taunton Municipal Lighting Plant	126,691	2,166	128,857	113,968	28,154	142,121
Templeton Muni. Light & Water	7,835	134	7,969	7,048	1,741	8,790
Wakefield Muni. Gas & Light	24,895	426	25,320	22,395	5,532	27,927
Wellesley Municipal Light Plant	49,489	846	50,335	44,519	10,997	55,516
West Boylston Muni. Light. Plant	6,338	108	6,447	5,702	1,409	7,110
Westfield Gas & Electric	46,193	790	46,982	41,554	10,265	51,819
2019 Electric Utility Total	2,818,274	520,238	3,338,512	2,581,163	1,004,550	3,585,713
2019 Competitive Supplier Total	6,768,544	1,213,013	7,981,556	6,191,248	2,392,169	8,583,418
2019 MED Total	1,140,160	19,490	1,159,650	1,025,657	253,369	1,279,026
2019 RETAIL SELLER TOTAL	10,726,978	1,752,741	12,479,719	9,798,068	3,650,089	13,448,157

Appendix 2A: Optional Unit-Specific Generation Reported by MEDs for 2019

Below is a summary of the 2019 data that MEDs chose to submit from unit-specific generation. All unit-specific generation submitted by MEDs in 2019 was non-emitting. Figures 7 and 8 show the unit-specific MWh reported by each MED and the ratio of their unit-specific MWh to their retail sales. MEDs are presented in order of increasing percentage of unit-specific generation reported. Figure 7 compares the unit-specific MWh reported as a percentage of total retail sales. Figure 8 shows the variation in total MWh sales. See Table 5 for individual MED values used in Figures 7 and 8. Table 6 shows the individual MED lb CO_2e/MWh emission rates (GHG emissions divided by retail load).

Figure 7. Unit-specific MWh Reported by MEDs (MWh and Percent of Total Retail Sales)

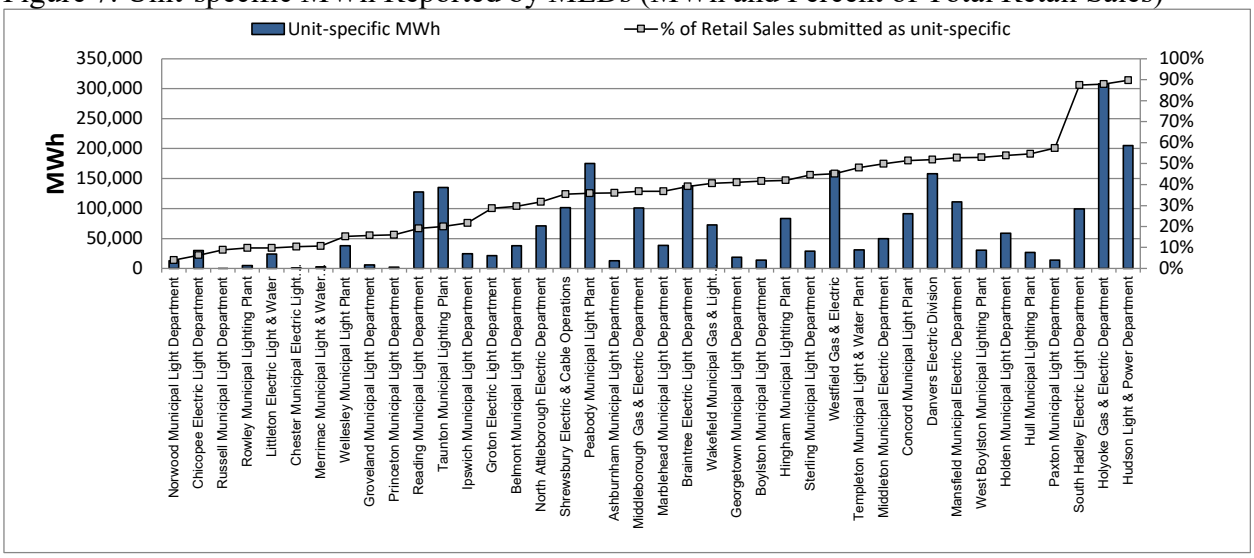


Figure 8. Electricity Sales by MED: Unit-Specific MWh vs. Total Retail Sales MWh

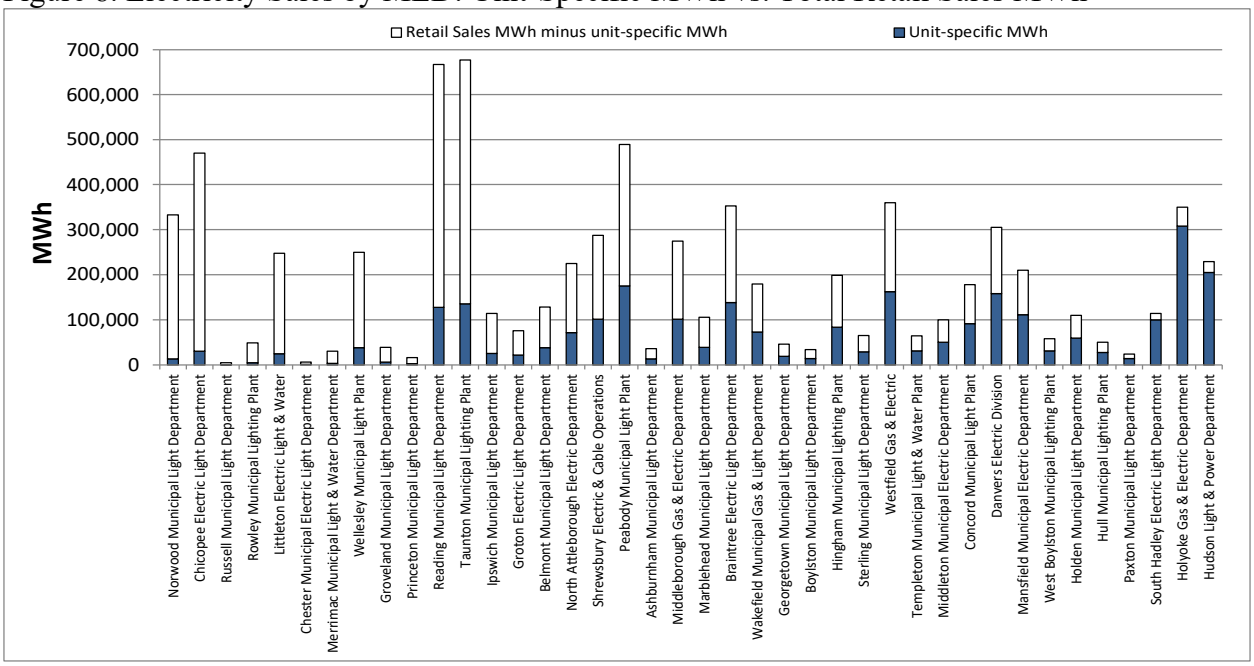


Table 5. Individual 2019 MED Percent of Sales Claimed as Unit-Specific Generation

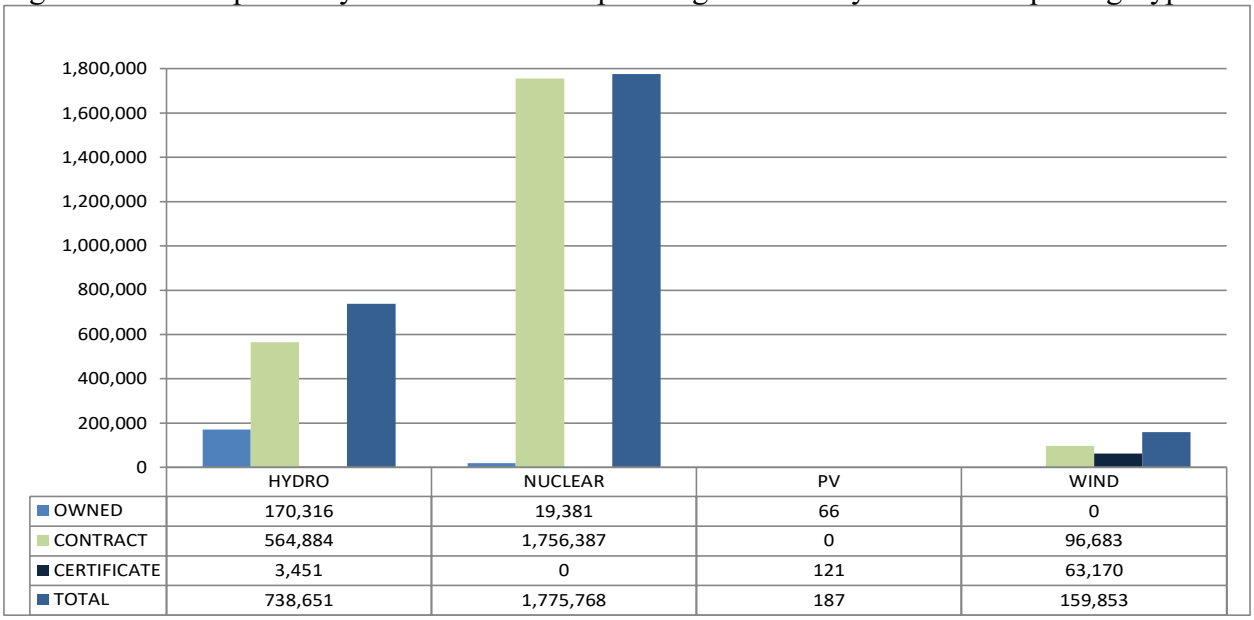
	MWh reported as retail sales	MWh claimed as unit-specific generation		% of sales claimed as unit-specific generation
		non-emitting	emitting	
Ashburnham Muni. Light Dept.	35,904	12,903	0	35.9%
Belmont Municipal Light Department	127,977	38,051	0	29.7%
Boylston Municipal Light Dept.	33,865	14,093	0	41.6%
Braintree Electric Light Dept.	353,025	138,112	0	39.1%
Chester Municipal Electric Light Dept.	5,662	592	0	10.5%
Chicopee Electric Light Dept.	470,264	30,084	0	6.4%
Concord Municipal Light Plant	177,858	91,322	0	51.3%
Danvers Electric Division	305,324	158,271	0	51.8%
Georgetown Municipal Light Department	45,533	18,683	0	41.0%
Groton Electric Light Dept.	75,542	21,631	0	28.6%
Groveland Municipal Light Dept.	38,334	6,050	0	15.8%
Hingham Municipal Lighting Plant	198,423	83,500	0	42.1%
Holden Municipal Light Dept.	109,593	59,071	0	53.9%
Holyoke Gas & Electric Dept.	350,372	308,148	0	87.9%
Hudson Light & Power Dept.	228,853	205,097	0	89.6%
Hull Municipal Lighting Plant	49,638	27,069	0	54.5%
Ipswich Municipal Light Department	113550	24,680	0	21.7%
Littleton Electric Light & Water	247,658	24,445	0	9.9%
Mansfield Municipal Electric Dept.	210,387	111,098	0	52.8%
Marblehead Municipal Light Dept.	105,397	38,859	0	36.9%
Merrimac Municipal Light & Water Dept.	29,893	3,215	0	10.8%
Middleborough Gas & Electric Dept.	274,519	101,208	0	36.9%
Middleton Municipal Electric Dept.	99,544	49,740	0	50.0%
North Attleboro Electric Dept.	224,952	71,302	0	31.7%
Norwood Municipal Light Dept.	332,561	13,058	0	3.9%
Paxton Municipal Light Dept.	24,083	13,820	0	57.4%
Peabody Municipal Light Plant	488,885	175,273	0	35.9%
Princeton Municipal Light Dept.	15,805	2,538	0	16.1%
Reading Municipal Light Dept.	667,139	127,418	0	19.1%
Rowley Municipal Lighting Plant	48,243	4,711	0	9.8%
Russell Municipal Light Department	4,885	434	0	8.9%
Shrewsbury Electric & Cable Ops.	287,612	101,647	0	35.3%
South Hadley Electric Light Dept.	113,767	99,492	0	87.5%
Sterling Municipal Light Dept.	64,591	28,811	0	44.6%
Taunton Municipal Lighting Plant	676,629	135,214	0	20.0%
Templeton Municipal Light & Water	64,469	30,985	0	48.1%
Wakefield Municipal Gas & Light Dept.	179,178	72,790	0	40.6%
Wellesley Municipal Light Plant	249,531	38,041	0	15.2%
West Boylston Municipal Lighting Plant	57,706	30,619	0	53.1%
Westfield Gas & Electric	359,788	162,384	0	45.1%
MED Total	**7,546,939**	**2,674,459**	**0**	**35.4%**

Table 6. Individual 2019 MED Emission Factors (lb CO_2e/MWh)

	Massachusetts-based approach		Regional approach	
	Non-Biogenic	**Biogenic**	**Non-Biogenic**	**Biogenic**
Final 2019 Retail Seller Emission Factors from Table 2 (applied only to non-unit-specific generation - shown for comparison)	**468**	**8**	**421**	**104**
Ashburnham Muni. Light Dept.	300	5	270	67
Belmont Municipal Light Department	329	6	296	73
Boylston Municipal Light Dept.	273	5	246	61
Braintree Electric Light Dept.	285	5	256	63
Chester Municipal Electric Light Dept.	419	7	377	93
Chicopee Electric Light Dept.	438	7	394	97
Concord Municipal Light Plant	228	4	205	51
Danvers Electric Division	225	4	203	50
Georgetown Municipal Light Department	276	5	248	61
Groton Electric Light Dept.	334	6	300	74
Groveland Municipal Light Dept.	394	7	355	88
Hingham Municipal Lighting Plant	271	5	244	60
Holden Municipal Light Dept.	216	4	194	48
Holyoke Gas & Electric Dept.	56	1	51	13
Hudson Light & Power Dept.	49	1	44	11
Hull Municipal Lighting Plant	213	4	191	47
Ipswich Municipal Light Department	366	6	329	81
Littleton Electric Light & Water	422	7	379	94
Mansfield Municipal Electric Dept.	221	4	199	49
Marblehead Municipal Light Dept.	295	5	266	66
Merrimac Municipal Light & Water Dept.	418	7	376	93
Middleborough Gas & Electric Dept.	295	5	266	66
Middleton Municipal Electric Dept.	234	4	211	52
North Attleboro Electric Dept.	320	5	288	71
Norwood Municipal Light Dept.	450	8	404	100
Paxton Municipal Light Dept.	199	3	179	44
Peabody Municipal Light Plant	300	5	270	67
Princeton Municipal Light Dept.	393	7	353	87
Reading Municipal Light Dept.	379	6	341	84
Rowley Municipal Lighting Plant	422	7	380	94
Russell Municipal Light Department	426	7	384	95
Shrewsbury Electric & Cable Ops.	303	5	272	67
South Hadley Electric Light Dept.	59	1	53	13
Sterling Municipal Light Dept.	259	4	233	58
Taunton Municipal Lighting Plant	374	6	337	83
Templeton Municipal Light & Water	243	4	219	54
Wakefield Municipal Gas & Light Dept.	278	5	250	62
Wellesley Municipal Light Plant	397	7	357	88
West Boylston Municipal Lighting Plant	220	4	198	49
Westfield Gas & Electric	257	4	231	57
Average MED Emission Factors	**302**	**5**	**272**	**67**

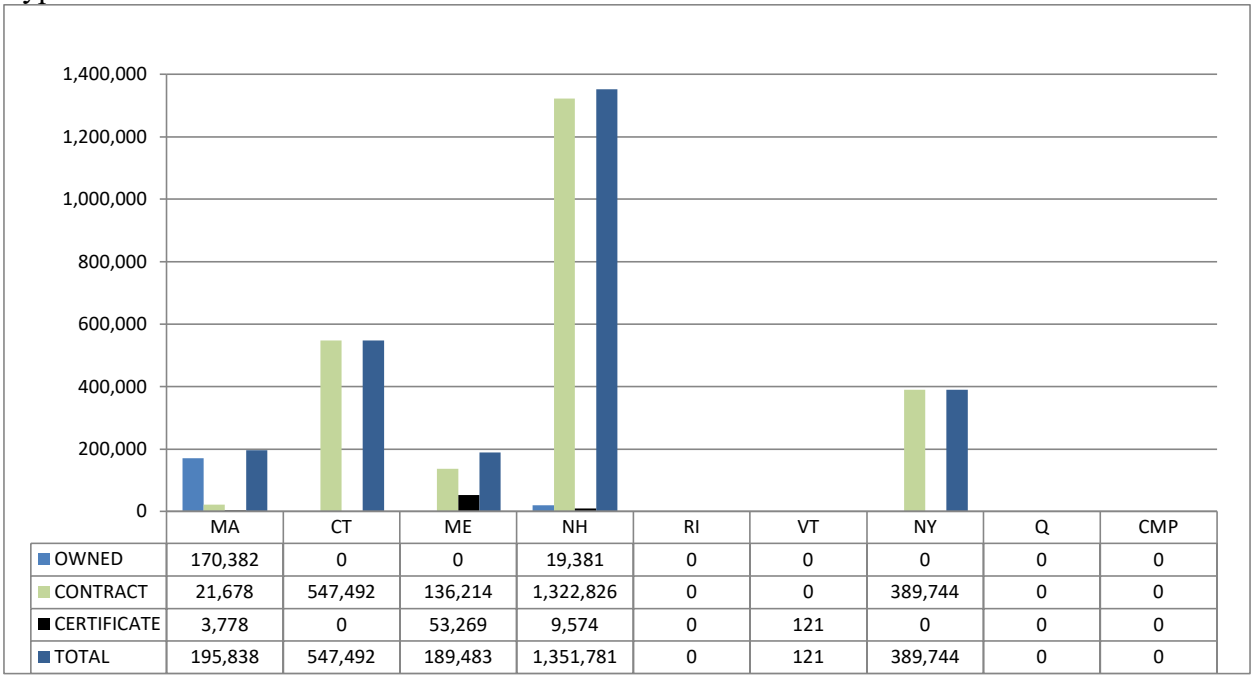
Figures 9 and 10 show the MWh reported by MEDs from unit-specific generation by fuel and reporting type and by location and reporting type. Figures 11, 12 and 13 show the unit-specific generation reported by MEDs as a percent by fuel, by location and by reporting type. Information on GHG emissions of each MED can be found in Appendix 1: *2019 Individual Retail Seller GHG Emissions*.

Figure 9. MWh reported by MEDs from unit-specific generation by Fuel and Reporting Type



	HYDRO	NUCLEAR	PV	WIND
OWNED	170,316	19,381	66	0
CONTRACT	564,884	1,756,387	0	96,683
CERTIFICATE	3,451	0	121	63,170
TOTAL	738,651	1,775,768	187	159,853

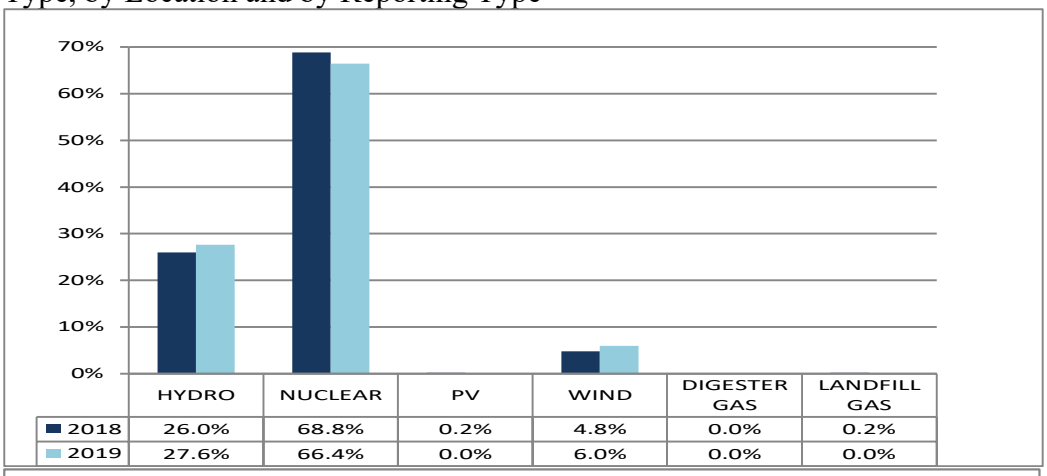
Figure 10. MWh reported by MEDs from unit-specific generation by Location and Reporting Type



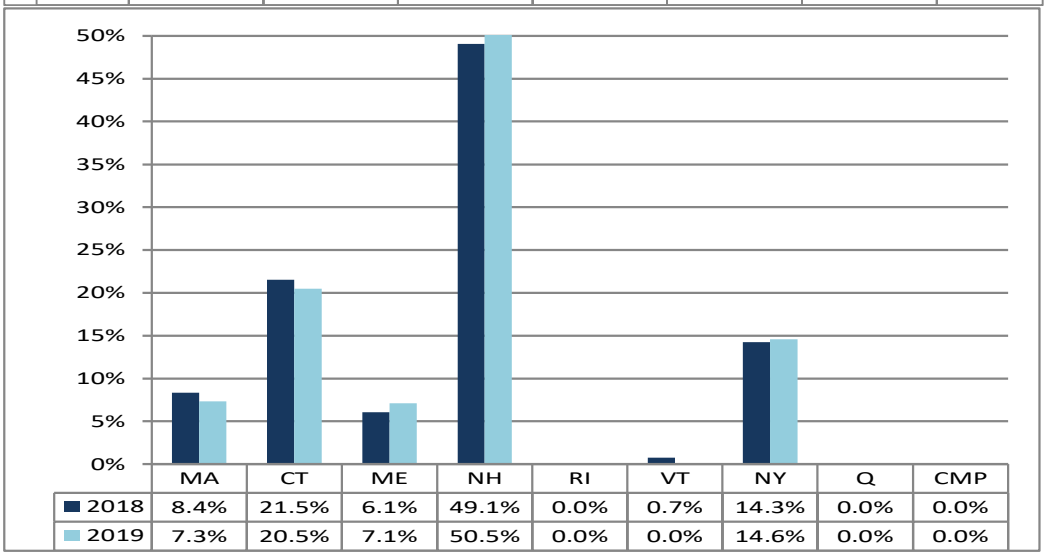
	MA	CT	ME	NH	RI	VT	NY	Q	CMP
OWNED	170,382	0	0	19,381	0	0	0	0	0
CONTRACT	21,678	547,492	136,214	1,322,826	0	0	389,744	0	0
CERTIFICATE	3,778	0	53,269	9,574	0	121	0	0	0
TOTAL	195,838	547,492	189,483	1,351,781	0	121	389,744	0	0

(Q = Quebec; CMP = Canadian Maritime Provinces)

Figures 11, 12 and 13. MWh reported by MEDs from unit-specific generation as Percent by Fuel Type, by Location and by Reporting Type

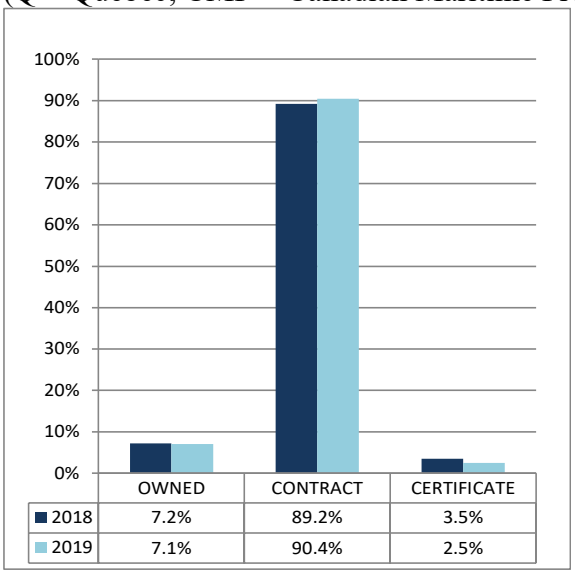


	HYDRO	NUCLEAR	PV	WIND	DIGESTER GAS	LANDFILL GAS
2018	26.0%	68.8%	0.2%	4.8%	0.0%	0.2%
2019	27.6%	66.4%	0.0%	6.0%	0.0%	0.0%



	MA	CT	ME	NH	RI	VT	NY	Q	CMP
2018	8.4%	21.5%	6.1%	49.1%	0.0%	0.7%	14.3%	0.0%	0.0%
2019	7.3%	20.5%	7.1%	50.5%	0.0%	0.0%	14.6%	0.0%	0.0%

(Q = Quebec; CMP = Canadian Maritime Provinces)



	OWNED	CONTRACT	CERTIFICATE
2018	7.2%	89.2%	3.5%
2019	7.1%	90.4%	2.5%

Appendix 2B: Unit-Specific Generation from GIS Certificates Reported by Electric Utilities and Competitive Suppliers for 2019

Below is a summary of the 2019 data reported by electric utilities and competitive suppliers from unit-specific generation. Because the certificates, by state and fuel type, purchased by electric utilities and competitive suppliers for compliance[13] with various programs are already included in the RPS/APS/CES Annual Compliance Reports,[14] that information is not repeated in this summary. The use of banked certificates or payments[15] by electric utilities and competitive suppliers to meet their compliance requirements with these programs are not reflected in this summary.

"N/A" appears in the unit-specific generation columns for competitive suppliers that did not submit any unit-specific information. Competitive suppliers that failed to submit, or to correct, a unit specific or GHG emissions report are marked with an asterisk.

Table 7: Individual 2019 Electric Utility and Competitive Supplier Percent of Sales Claimed as Unit-Specific Generation

	MWh reported as retail sales	MWh claimed as unit-specific generation		% of sales claimed as unit-specific generation
		non-emitting	emitting	
Electric Utilities				
Unitil (Fitchburg Gas & Electric Co.)	168,462	35,409	6,000	24.6%
National GRID (Mass. and Nantucket Electric)	6,561,377	1,211,554	285,728	22.8%
Eversource/NSTAR Electric Co. and Western MA Electric Cos.	6,498,707	1,373,016	227,000	24.6%
Competitive Suppliers				
Agera Energy LLC*	717,060	N/A	N/A	0%
Ambit Northeast, LLC	221,766	38,723	13,705	23.6%
Astral Energy, LLC	15	0	0	0.0%
Atlantic Energy LLC	75,892	12,809	2,750	20.50%
Calpine Energy Solutions LLC	1,323,917	187,144	57,915	18.5%
Champion Energy Services	445,941	75,178	16,231	20.5%
Clean Choice	129,776	30,670	4,500	27.1%
Clearview Electric, Inc.	93,182	18,645	3,262	23.5%
Connecticut Municipal Electric Energy Cooperative	115,491	18,983	4,000	19.9%
Constellation NewEnergy, Inc.	7,789,306	1,730,076	284,486	25.9%
Devonshire Energy, LLC*	71,379	12,301	5,752	25.3%
Direct Energy Business LLC	4,211,537	758,455	159,399	21.8%
Direct Energy Services, LLC	572,390	109,116	21,136	22.8%
Discount Power, Inc.	23,071	4,310	1,128	23.6%
Dynegy Energy Services (East), LLC	845,351	143,636	29,330	20.5%
EDF Energy Services, LLC/ TransCanada	1,189,256	210,112	41,791	21.2%
Eligio Energy MA LLC	67,008	12,114	2,260	21.5%
Energy Plus Holdings	21,424	3,433	862	20.0%
ENGIE Resources, LLC	3,508,858	593,839	144,418	21.0%

[13] Retired certificates from units that produce thermal energy are not reported for the purpose of calculating GHG emissions.
[14] These reports can be found at https://www.mass.gov/service-details/annual-compliance-reports.
[15] See footnote 12.

	MWh reported as retail sales	MWh claimed as unit-specific generation		% of sales claimed as unit-specific generation
		non-emitting	emitting	
ENGIE Retail, LLC (dba Think Energy)	117,170	20,328	4,035	20.8%
Everyday Energy LLC	955	199	34	24.4%
First Point Power	560,036	106,021	21,768	22.8%
Great Eastern Energy (aka BBPC, LLC)*	136,904	N/A	N/A	0%
Green Mountain Energy Company	15,813	2,520	577	19.59%
Hampshire Council of Governments*	12,143	N/A	N/A	0%
Harborside Energy of Massachusetts LLC	4,905	665	149	16.6%
Harvard Dedicated Energy, Ltd.	172,426	33,252	0	19.3%
Hudson Energy Services	736,292	123,551	34,436	21.5%
Inspire Energy Holdings, LLC	161,223	17,406	20,000	23.2%
Interstate Gas Supply, Inc. (dba IGS Energy)	158,111	32,721	6,365	24.7%
Just Energy Mass. Corp.	101,682	17,278	3,446	20.4%
Liberty Power Holdings	393,150	50,498	5,000	14.1%
Major Energy Electric Service, LLCs	99,247	19,007	3,301	22.5%
Massachusetts Gas & Electric Co.	123,920	25,638	4,338	24.2%
Mega Energy Holdings, LLC	53,267	6,105	1,870	15.0%
Messer/Linde Energy Services	14,456	3,042	515	24.6%
National Gas & Electric, Inc.	56,637	11,182	1,946	23.2%
NextEra Energy	2,206,741	389,567	84,064	21.5%
Nordic Energy Services	2,221	539	80	27.9%
Oasis Power, LLC	1,939	229	0	11.8%
Palmco Power MA, LLC	62,766	9,039	4,504	21.6%
Provider Power MASS, LLC	711,556	121,514	36,214	22.2%
Public Power, LLC	2,118,633	396,391	107,302	23.8%
Reliant Energy Northeast	416,338	64,457	15,533	19.2%
Renaissance Power and Gas	18,278	3,903	700	25.2%
Residents Energy, LLC	142,656	27,314	8,836	25.3%
SFE Energy Massachusetts	371,574	51,884	27,558	21.4%
SmartEnergy Holdings, LLC	60,898	8,590	2,500	18.2%
South Jersey Energy*	10,127	2,086	370	24.3%
Spark Energy, LLC	13,224	1,034	279	9.9%
Starion Energy, Inc.	186,345[16]	35,195	6,565	22.4%
Summer Energy*	56,162	10,866	1,950	22.8%
Sunwave Gas & Power Massachusetts, Inc.	92,634	11,717	2,000	14.8%
Texas Retail Energy	92,106	12,643	5,342	19.5%
Titan Gas and Power	8,535	1,432	299	20.3%
Town Square Energy, LLC	115,591	22,905	5,998	25.0%
Utility Expense Reduction*	408	N/A	N/A	0%
Verde Energy USA Massachusetts, LLC	168,351	27,793	8,993	21.9%
Viridian Energy, LLC	218,922	37,020	15,828	24.1%
Wattifi, Inc.	27	0	0	0%
Xoom Energy Massachusetts LLC	60,222	8,530	2,228	17.9%
Electric Utility Total	**13,228,546**	**2,619,979**	**518,728**	**23.7%**
Competitive Supplier Total	**30,610,696**	**5,673,605**	**1,237,848**	**22.6%**

Table 8 shows the individual electric utility and competitive supplier lb CO_2e/MWh emission rates (GHG emissions divided by retail load). The emission factors for individual electric utilities

[16] MassDEP edit made to correct typo in submitted retail sales value.

and competitive suppliers in Table 8 should not be compared to the emission factors calculated for MEDs in Table 6 in Appendix 2A: *Optional Unit-Specific Generation Reported by MEDs for 2019*, because the requirement to retire MSW certificates[17] causes electric utilities and competitive suppliers to have higher emission factors than MEDs.

Table 8: Individual 2019 Emission Factors for Electric Utilities and Competitive Suppliers (lb CO_2e/MWh)

	Massachusetts-based approach		**Regional approach**	
	Non-Biogenic	**Biogenic**	**Non-Biogenic**	**Biogenic**
Final 2019 Retail Seller Emission Factors from Table 2 (applied only to non-unit-specific generation - shown for comparison)	**468**	**8**	**421**	**104**
Electric Utilities				
Unitil (Fitchburg Gas & Electric Co.)	423	74	388	147
National GRID (Mass. and Nantucket Electric)	430	85	394	159
Eversource/NSTAR Electric Co. and Western MA Electric Cos.	422	73	386	145
Competitive Suppliers				
Agera Energy LLC*	468	8	421	104
Ambit Northeast, LLC	426	111	390	184
Astral Energy, LLC	468	8	421	104
Atlantic Energy LLC	444	76	406	152
Calpine Energy Solutions LLC	454	86	415	164
Champion Energy Services	444	76	407	152
Clean Choice	410	72	376	142
Clearview Electric, Inc.	427	73	391	147
Connecticut Municipal Electric Energy Cooperative	443	73	406	150
Constellation NewEnergy, Inc.	414	74	379	145
Devonshire Energy, LLC*	423	135	388	207
Direct Energy Business LLC	434	77	398	152
Direct Energy Services, LLC	429	75	392	149
Discount Power, Inc.	427	92	391	165
Dynegy Energy Services (East), LLC	439	72	402	149
EDF Energy Services, LLC/ TransCanada	438	74	401	149
Eligio Energy MA LLC	434	71	397	146
Energy Plus Holdings	447	81	409	158
ENGIE Resources, LLC	433	80	396	156
ENGIE Retail, LLC (dba Think Energy)	439	72	402	148
Everyday Energy LLC	425	75	389	148
First Point Power	428	78	392	152
Great Eastern Energy (aka BBPC, LLC)*	468	8	421	104
Green Mountain Energy Company	449	76	411	153
Hampshire Council of Governments*	468	8	421	104
Harborside Energy of Massachusetts LLC	450	65	411	145
Harvard Dedicated Energy, Ltd.	378	6	340	84
Hudson Energy Services	433	88	396	163
Inspire Energy Holdings, LLC	428	191	391	265
Interstate Gas Supply, Inc. (dba IGS Energy)	424	81	389	153

[17] See footnote 10.

	Massachusetts-based approach		Regional approach	
	Non-Biogenic	**Biogenic**	**Non-Biogenic**	**Biogenic**
Just Energy Mass. Corp.	440	71	402	148
Liberty Power Holdings	427	31	387	114
Major Energy Electric Service, LLCs	429	70	392	144
Massachusetts Gas & Electric Co.	424	73	388	146
Mega Energy Holdings, LLC	467	74	427	156
Messer/Linde Energy Services	423	74	388	147
National Gas & Electric, Inc.	427	66	391	139
NextEra Energy	434	77	397	152
Nordic Energy Services	409	75	375	144
Oasis Power, LLC	413	7	371	92
Palmco Power MA, LLC	435	125	398	200
Provider Power MASS, LLC	429	93	393	168
Public Power, LLC	426	94	390	167
Reliant Energy Northeast	451	30	413	108
Renaissance Power and Gas	426	79	391	151
Residents Energy, LLC	419	109	384	180
SFE Energy Massachusetts	443	127	406	202
SmartEnergy Holdings, LLC	464	85	426	164
South Jersey Energy*	427	76	391	149
Spark Energy, LLC	463	48	421	134
Starion Energy, Inc.	432	73	396	148
Summer Energy*	430	73	394	147
Sunwave Gas & Power Massachusetts, Inc.	441	48	401	130
Texas Retail Energy	445	104	408	181
Titan Gas and Power	442	73	405	150
Town Square Energy, LLC	420	95	384	167
Utility Expense Reduction*	468	8	421	104
Verde Energy USA Massachusetts, LLC	429	96	393	171
Viridian Energy, LLC	425	123	389	195
Wattifi, Inc.	468	8	421	104
Xoom Energy Massachusetts LLC	457	77	418	156
Average Electric Utility Emission Factors	426	79	390	152
Average Competitive Supplier Emission Factors	442	79	405	156

Appendix 3: 2019 Retail Level Emission Factors for Use by Consumers of Electricity to Report Greenhouse Gas Emissions (Massachusetts-based Emission Factors)

Some electricity consumers have expressed interest in using Massachusetts-specific greenhouse gas (GHG) emission factors (EFs) to report their GHG emissions from use of electricity. The EFs shown earlier in this document are often not appropriate for use by electricity consumers for two reasons: first, the EFs earlier in this document are for the combination of CO_2, CH_4 and N_2O when many electricity consumers seek EFs for the individual gases and, second, the EFs earlier in this document are per wholesale MWh, rather than per retail meter MWh (or kWh) that electricity consumers see on their electric bill. In order to assist electricity consumers in reporting GHGs, this appendix presents the 2019 EFs that consumers of electricity would use to report their GHG emissions at a retail electricity level.

Combined, Biogenic and Non-Biogenic EFs: Progress on achieving the GHG reduction limits in the Global Warming Solutions Act is determined using Massachusetts-based emission calculations. Thus, it is Massachusetts-based EFs that consumers of electricity should use to determine GHG emissions. The Massachusetts-based EFs include all CO_2, CH_4 and N_2O emissions from non-biogenic (fossil) and biogenic (non-fossil) fuels combusted to generate the electricity sold by retail sellers of electricity in Massachusetts. The Combined EF can be determined by adding the Non-Biogenic and Biogenic EFs together.

2019 RS Wholesale Non-Biogenic MA-based EF	416 lb MWh	Non-Biogenic CO_2e/Wholesale
+ 2019 RS Wholesale Biogenic MA-based EF	+ 62 lb	Biogenic CO_2e/Wholesale MWh
2019 RS Wholesale Combined MA-based EF	478 lb	Combined CO_2e/Wholesale MWh

Wholesale v. Retail EFs (line losses): Power lines lose 6%[18] (on average) of the electricity they carry. The amount of wholesale MWh needed to deliver a particular amount of electricity at the retail level is, therefore, 6% greater than the amount shown on a retail meter. The emissions released to produce the electricity can be spread out over either the larger number of wholesale MWh or the smaller number of retail MWh, such that the retail lb/MWh EF will always be higher than the wholesale lb/MWh EF:

Wholesale Combined EF / (100% of MWh – 6% of MWh due to line losses) = Retail Combined EF

Specifically: 478 lb CO_2e/Wholesale MWh / (1 - 0.06) = 509 lb CO_2e/Retail MWh

Table 9. 2018 Massachusetts-based CO_2e GHG Emission Factors

	Retail Seller Wholesale Level (lb CO_2e/Wholesale MWh)	Electricity Consumer Retail Level (lb CO_2e/Retail MWh)
Non-Biogenic	416	443
Biogenic	62	66
Combined	478	509

[18] This value was updated to align with the line loss value used in the Interim Massachusetts Clean Energy and Climate Plan for 2030, dated December 2020.

Individual CO_2, CH_4, and N_2O EFs: If a consumer wants to use EFs by individual gas, then the lb CO_2e/MWh value needs to be separated into the individual components: lb CO_2/MWh, lb CH_4/MWh, and lb N_2O/MWh. MassDEP has separated the three gases by alternately zeroing out the other two gases on the 'Calculating CO2e' tab of the retail seller EF spreadsheet at https://www.mass.gov/lists/massachusetts-greenhouse-gas-ghg-reporting-program-data#massdep-emission-factor-calculations-. For the 2019 retail level Combined EF, this results in 506 lb of CO_2e from CO_2, 1 lb of CO_2e from CH_4, and 2 lb of CO_2e from N_2O. The global warming potential (GWP) of each gas must then be taken into account to determine the EF for each gas. The GWPs used through 2019 by MassDEP are: 1 for CO_2, 25 for CH_4, and 298 for N_2O.[19]

lb CO_2e/MWh = ((lb CO_2 *1) + (lb CH_4 * 25) + (lb N_2O * 298)) / MWh. *Specifically*,
1.1 lb CO_2e from CH_4 / 25 = 0.044 lb CH_4 *and* 1.7 lb CO_2e from N_2O / 298 = 0.006 lb N_2O;
therefore,
509 lb CO_2e/Retail MWh = (506 lb CO_2 + (0.044 lb CH_4 * 25) + (0.006 lb N_2O * 298))/Retail MWh

The breakdown of the 509 lb CO_2e/Retail MWh value from Table 9 into individual gases, at various scales of electricity, is shown in Table 10.

Table 10. 2019 Electricity Consumers Retail-level Massachusetts-based CO_2e GHG Emission Factors by Individual Gas

	CO_2e		
	CO_2	**CH_4**	**N_2O**
lb/Retail kWh	0.506	0.000044	0.000006
lb/Retail MWh	506	0.044	0.006
lb/Retail GWh	506,000	44	6

The lb/Retail kWh values in the upper row of Table 10 may be the values most likely to be used by electricity consumers since most electric bills show kWh use.

The breakdown of the 506 lb CO_2/Retail MWh value from Table 10 into its non-biogenic and biogenic components is shown in Table 8. All CH_4 and N_2O emissions are considered non-biogenic and thus cannot be further broken down.

Table 11. 2019 Electricity Consumers Retail-level Massachusetts-based Non-Biogenic and Biogenic CO_2 Emission Factors

	CO_2	
	Non-Biogenic CO_2	**Biogenic CO_2**
lb/Retail kWh	0.439	0.066
lb/Retail MWh	439	66
lb/Retail GWh	439,000	66,000

[19] Beginning with the 2014 EFs, MassDEP updated the global warming potentials (GWPs) it uses based on the Intergovernmental Panel on Climate Change's (IPCC's) Fourth Assessment Report (AR4), published in 2007, similar to most other reporting programs. The global GWPs used with earlier EFs were from IPCC's Second Assessment Report (SAR) published in 1996.