

# **MASSACHUSETTS 2016 RENEWABLE PORTFOLIO STANDARD (RPS) AND ALTERNATIVE PORTFOLIO STANDARD (APS) ANNUAL COMPLIANCE REPORT**

**December 27, 2018**

**Renewable and Alternative Energy Division  
Department of Energy Resources  
Executive Office of Energy and Environmental Affairs  
Commonwealth of Massachusetts**

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## EXECUTIVE SUMMARY

The Renewable Portfolio Standard (RPS) Class I continued to provide incentives for the development of new renewable generation in 2016. More specifically, the number of Massachusetts-qualified RPS Class I Renewable Generation Certificates, commonly known as Renewable Energy Credits, or RECs, available for compliance increased by 11% over 2015 (this number includes Solar Renewable Energy Credits (SRECs and SREC IIs). This increase derives primarily from newly-qualified wind and landfill gas facilities in New York for export generation to New England and increased solar production in Massachusetts.

The Solar Carve-Out II program (a carve out within the RPS Class I program) also provided for the continued growth of photovoltaic installations. In particular, Massachusetts met its 2020 goal of 1,600 MW of installed capacity by June of 2016. The new SMART program targets another 1,600 MW of solar installation beginning in 2018.

The Alternative Portfolio Standard (APS) has increased the financial viability of new and incremental combined heat and power (CHP) projects, which generate large savings in greenhouse gas emissions when compared with conventional sources of electricity and thermal energy. The number of Alternative Energy Certificates (AECs) increased by 6% from 2015. Revisions to the APS program adopted in 2017 will incentivize more (primarily thermal) alternative fuel sources such as air and ground source heat pumps, solar thermal, biomass, liquid biofuels, biogas, fuel cells, and waste-to-energy thermal.

### Minimum Standards

The RPS requirements began in 2003 with an obligation of 1% of total retail electricity sales, which increased by 0.5% annually until it reached 4% in 2009. The RPS Class I obligation has increased by 1% annually since 2009 (between 2020 and 2029 it will increase by 2% annually). Since 2010, the Class I standard has included a Solar Carve-Out (SCO) obligation for in-state solar photovoltaic generation. The minimum standard obligation for the SCO and its 2014 successor program, Solar Carve-Out II change annually by formulas set in regulation.

The Class II Renewable Energy obligation rises annually per a schedule and formula set in regulation, while the Class II Waste Energy obligation is fixed at 3.5% annually. The APS obligation, which was 4% in 2016, increases by 0.25% per year. The table below shows the 2016 minimum standard for each class, the resultant renewable obligation in MWh, and the total amount of Alternative Compliance Payments collected by class:

**Minimum Standards, Certificates Settled, and Alternative Compliance Payments (ACPs) by RPS/APS Class (2016)**

RPS/APS Class	Minimum Standard	Total Obligation (MWh) **	Certificates Used to Meet Obligations (MWh)	ACP Credits Used to Meet Obligations (MWh)	Alternative Compliance Payments (\$)
RPS CLASS I	11.0000%	4,022,346	4,018,572	269	\$ 18,020.31
RPS SCO *	1.7500%	813,188	812,400	59	\$ 27,848.00
RPS SCO II *	0.7852%	319,589	319,268	5	\$ 1,750.00
RPS CLASS II Renewable	2.5319%	1,186,394	550,624	634,720	\$ 17,454,800.00
RPS CLASS II Waste-to-energy	3.5000%	1,640,016	1,631,658	7,362	\$ 80,982.00
APS	4.0000%	1,874,294	943,999	928,636	\$ 20,429,992.00
<b>TOTAL***</b>	<b>21.0319%</b>	<b>9,855,827</b>	<b>8,276,251</b>	<b>1,571,051</b>	<b>\$ 38,013,392.31</b>

\* Solar carve out requirements are subsets of the overall RPS Class I 11% requirement.

\*\* Total obligation may differ from calculated obligation because of contract exemptions, carveouts, or rounding of individual supplier obligations.

\*\*\* Total number of certificates and ACP credits does not exactly match total obligation due to 1) rounding of individual obligations, and 2) the non-compliance of Abest Power & Gas, LLC (see Appendix Two). Totals of certificates used also includes banked certificates from prior compliance years.

### Eligible Resources

Eligible RPS Class I include post-1997 renewable generation units located in New England or in adjacent electricity control areas.<sup>1</sup> Eligible resources for RPS Class II Renewable Energy include pre-1998 renewable plants

<sup>1</sup> These include New York (NYISO), Quebec, New Brunswick, and Northern Maine (NMISA).

(primarily small hydropower) located in New England or in adjacent electricity control areas. Eligible Class II Waste Energy facilities must be pre-1998 waste-to-energy plants located in Massachusetts. In 2016, resources eligible for APS were Massachusetts plants using certain “alternative energy” technologies, primarily CHP.

### **Renewable Energy Certificates (RECs)**

In order to achieve RPS and APS compliance, each retail electricity supplier must obtain enough renewable energy certificates to satisfy its renewable load obligation or make an Alternative Compliance Payment (ACP).

Each RPS Class I and Class II Renewable Energy Certificate (Class I and II RECs), Solar Carve-Out Renewable Energy Certificate (SREC), Solar Carve-out II Renewable Energy Certificate (SREC II), and Waste Energy Certificate (WEC) represents the renewable generation attributes of one megawatt hour (MWh) of electricity generated during the Compliance Year by a qualified generation unit (however, the MWh value of some SREC-IIs generation is discounted by SREC Factors related to project size and type of location, resulting in only a portion of a facility’s output generating SREC IIs).

An Alternative Energy Certificate (AEC) represents the MWh-equivalent of attributes of the energy from APS-qualified facilities as determined by the APS regulations for each specific alternative energy technology.

### **Total Load Obligation**

The total retail load obligation in 2016 was 46,864,429 megawatt hours (MWh), which was 2.4% less than the retail load obligation of 48,009,723 in 2015. Competitive Retail Electricity Suppliers represented two-thirds of this load obligation. The aggregate compliance obligation for all portfolio standards was equal to 9,855,827 MWh.

### **RPS Class I**

Total Class I RECs generated (net of SRECs and SREC IIs) equaled 5,591,977, a 6% increase over 2015. Not all of these RECs qualified for Massachusetts RPS Class I were used for compliance in Massachusetts as many also qualify to meet renewable standards in other New England states (mostly Connecticut, New Hampshire, and Rhode Island) and were settled in another state in the region. In addition, some were used to meet voluntary green product claims that go above and beyond RPS requirements. Even though much of the available supply was used for purposes other than Massachusetts compliance, supply in 2016 still significantly exceeded demand, with suppliers banking 501,754 Class I RECs for future use. To meet the total compliance obligation of 4,022,346 MWh, only 269 Alternative Compliance Credits were used, which resulted in \$18,020 of ACPs.

Resources located in Massachusetts supplied 32% (mostly solar) of all Class I RECs (including SRECs and SREC IIs) used for compliance, the largest contribution of any state. Maine provided 23% of all RPS Class I RECs (mostly wind) while New York contributed 20% (mostly wind).

Overall, wind accounted for approximately 58% of the total RPS Class I RECs (including SRECs and SREC IIs), an increase of 5% from 2015. This percentage change was driven by both increased wind supply and a sharp reduction in the percentage coming from woody biomass resources, the supply of which declined substantially because of the recission of the Statements of Qualification for three of the five eligible woody biomass generators in early 2016 due to non-compliance with overall efficiency requirements introduced in 2012 and taking effect in 2016. Solar photovoltaic arrays contributed 25%, about the same as last year. Landfill gas supplied 14% of the total RPS Class I REC supply. The remaining 3% of supply came from hydroelectric, anaerobic digester, woody biomass, and hydrokinetic facilities.

### **Solar Carve-Out (SCO)**

For the RPS Solar Carve-Out (SCO), the number of SRECs generated within the Compliance Year exceeded the obligation. In addition, total settlements exceeded the obligation. Suppliers utilized for compliance 49,109 re-minted auction SRECs originally generated in prior years and 9,767 previously banked SRECs. Only 59

ACP credits were used, resulting in \$27,848 in ACPs. One of the primary drivers of the market oversupply was that the average Minimum Standard decreased from 2.0934% to 1.7850% between 2015 and 2016.

### **Solar Carve-Out II (SCO II)**

For the third year of the Solar Carve-Out II program, the supply of SREC-IIs significantly exceeded demand despite the fact that the obligation increased by a factor of over 1.5 between 2015 and 2016. Evidence of the large oversupply exists in that a record total of 243,377 SREC-IIs were deposited into DOER's Solar Carve-out II Clearinghouse Auction Account. Only 5 ACP credits were used towards meeting compliance, resulting in \$1,750 in ACPs, down from \$235,875 in 2015. Suppliers also banked 10,059 vintage 2016 SREC IIs.

### **RPS Class II Renewable and RPS Class II Waste-to-energy**

The number of RPS Class II Renewable Energy RECs settled for compliance were well short of the obligation. In 2016, 543,307 Class II Renewable Energy certificates were utilized towards meeting the obligation of 1,186,394. ACP credits totaled 634,290, or 53% of the obligation. This amounted to ACPs of \$17.5 million.

The supply of WECs settled for the RPS Class II Waste Energy requirement fell slightly short of the obligation. In 2016, 1,631,658 WECs were settled against an obligation of 1,639,978, with 20,556 WECs banked forward and 8,813 ACP credits, resulting in \$80,982 of ACPs.

### **Alternative Portfolio Standard (APS)**

Alternative Energy Certificates (AECs) created by APS eligible facilities come almost exclusively from CHP plants in 2016. The supply of AECs fell short of the 2016 obligation though, with ACPs worth almost \$20.4 million accounting for approximately 50% of compliance.

### **Supplier Compliance**

Sixty-six retail electricity suppliers (including the four state-regulated investor-owned utilities) served Massachusetts retail customers in 2016 and thus had RPS and APS obligations (see Appendix 1). Sixty-five of these suppliers fully discharged their obligations through the purchase of the required number of certificates or by making ACPs. However, one supplier was found by DOER to be in a state of non-compliance as it did not acquire any renewable generation certificates to cover its obligation nor did it make any Alternative Compliance Payments (see Appendix 2).

### **Legislative Background**

The RPS Class I is a statutory obligation created by the Electricity Restructuring Act of 1997 and activated by regulations in 2002. The statute was first revised by the Green Communities Act of 2008, which added a second class of RPS (Class II) and the APS. The RPS and APS statutes were further modified by the Competitively Priced Electricity Act of 2012,<sup>2</sup> the Renewable Thermal Act of 2014,<sup>3</sup> and the Energy Diversity Act of 2016,<sup>4</sup> and the Act to Advance Clean Energy of 2018.<sup>5</sup> The statute requires Massachusetts Retail Electricity Suppliers to obtain each year a certain percentage of their retail customers' electricity supply from resources qualified under each portfolio standard. The RPS and APS requirements do not apply to municipal light districts.

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<sup>2</sup> Chapter 209 of the Acts of 2012

<sup>3</sup> Chapter 251 of the Acts of 2014

<sup>4</sup> Chapter 188 of the Acts of 2016

<sup>5</sup> Chapter 227 of the Acts of 2018

## 1. INTRODUCTION TO THE RENEWABLE PORTFOLIO STANDARD AND ALTERNATIVE ENERGY PORTFOLIO STANDARD

The Electricity Restructuring Act of 1997 mandated the Renewable Energy Portfolio Standard, or RPS, one of the earliest such mandates in the nation. The original RPS obligated Retail Electricity Suppliers (“Suppliers”), which includes regulated distribution utilities and licensed competitive suppliers, to obtain for their retail customers a small but growing percentage of electricity (the “Minimum Standard”) from sources that qualified as new renewable generation sources, i.e., generation that began operation after 1997 and which used eligible renewable resources and technologies, in particular, solar, wind, landfill methane, and low-emission/advanced technology biomass<sup>6</sup>.

The RPS program began with an obligation of 1% in 2003, that increased annually by 0.5% through 2009, when it reached 4%. Under the Green Communities Act of 2008, the RPS was renamed RPS Class I, and the Minimum Standard was increased to a one percent (1%) annual increase beginning in 2009. The RPS Minimum Standard was 11% for 2016. The RPS was further amended by the legislature by Chapter 227 of the Acts of 2018, which increased the Minimum Standard growth rate from 1% per year to 2% per year for the years 2019 through 2029, after which the growth rate will revert to 1% annually.<sup>7</sup>

As a result of the Green Communities Act of 2008, suppliers were required, as of 2009, to comply with three new energy portfolio standards in addition to RPS Class I: it mandated a new RPS Class II for electricity from pre-1998 generation units which is divided into two sub-classes, (1) Renewable Energy and (2) Waste-to-Energy, and it created the Alternative Energy Portfolio Standard that covered thermal generation sources from combined heat and power (CHP), as well as other thermal technologies and flywheel energy storage.

As of 2010, a Solar Carve-Out Minimum Standard was created within Class I<sup>8</sup>, and, as of 2014, an additional Solar Carve-Out II also was created within Class I. All of the Minimum Standards are structured as percentage obligations of retail load for Suppliers, but each Minimum Standard has different eligibility criteria and percentage obligations.

Also as a result of the Green Communities Act of 2008, the list of RPS eligible resources was expanded to include hydroelectricity plants of small size and low environmental impact<sup>9</sup>, as well as geothermal and marine and hydro-kinetic facilities. In addition, as of 2009, behind-the-meter distributed generation units, which formerly had to be located within Massachusetts, could be located anywhere in the ISO New England (“ISO-NE”) control area (the New England grid), but all such generation must be reported to the NEPOOL Generation Information System (“GIS”)<sup>10</sup> by an independent Third Party Meter Reader or Independent Verifier.<sup>11</sup>

Under the **Solar Carve-Out (SCO)** Minimum Standard, each Supplier must demonstrate annually that, *within* its Class I percentage obligation, it has obtained a specified percentage of its electricity from solar

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<sup>6</sup> Since 2012, the regulations for woody biomass have included detailed fuel sourcing and energy conversion efficiency standards based on forest sustainability and life-cycle carbon dioxide emissions, informed by a DOER-commissioned, 2010 study on the relative environmental impacts of woody biomass as a fuel supply. See the [Biomass Sustainability and Carbon Policy Study \(a.k.a. Manomet Study\) webpage](#).

<sup>7</sup> The RPS law and regulations do not include final limits or ending dates except for the Solar Carve-Out & Solar Carve-Out II regulations.

<sup>8</sup> Each year’s Class I obligation equals the obligation scheduled in regulation, 225 CMR 14.07(1), minus the Solar Carve-Out and Solar Carve-Out II obligations that are *calculated* per a method specified in regulation, 225 CMR 14.07(2) and (3). Also see the second paragraph of Section Two of this Report.

<sup>9</sup> Under the 2012 Act, eligible hydroelectricity capacity limits were increased, effective as of November 1, 2012, to 30 MW in Class I and 7.5 MW in Class II. In addition, statutory environmental criteria apply to facilities under both Class I and Class II; these criteria normally are met through certification by the non-profit, [Low Impact Hydropower Institute \(LIHI\)](#). See the details for Class I hydropower in 225 CMR 14.05(1)(a)6 and for Class II hydropower in 225 CMR 15.05(1)(a)6.

<sup>10</sup> See <http://www.nepoolgis.com>, as well as the Generation Certificates paragraph on page 8.

<sup>11</sup> Another substantive change in RPS Class I was the addition of a provision that a qualified plant *not* commit its generation capacity to Control Areas other than ISO-NE, with some exceptions. In addition, non-intermittent generators now must participate in the ISO-NE Forward Capacity Market except to the extent that their capacity is previously committed elsewhere. For details, see 225 CMR 14.05(1)(e). In the case of plants outside of ISO-NE, the import rules now also include a “round-tripping” prohibition (See 225 CMR 14.05(5)(d)).

photovoltaic (“PV”) systems that are connected to the Massachusetts electric grid and that were installed after 2008. The SCO percentage obligation changes annually through a methodology detailed in the Class I Regulations.

Following an interim extension by emergency regulations and then by conventional rulemaking, DOER commenced on April 25, 2014, the Solar Carve-Out II (SCO II or SREC2) within Class I. The start of the SCO II marked the end of the SCO, which eventually qualified a total of 653.3 MW of new solar resources.<sup>12</sup>

The **Solar Carve-Out II (SCO II)** is modeled on the SCO with regard to project eligibility, except that installation has to have commenced after 2012. Within that model, SCO II has three major differences: (1) the Clearinghouse Auction Account prices undergo scheduled reductions to reflect declining development costs; (2) some types and sizes of projects are provided less incentive than others, reflecting public policy priorities; and (3) certain types of large-scale projects are approved under an annual cap within a system of “managed growth” intended to avoid any boom or bust pattern of development.

Approvals of PV systems under the SCO II were originally capped at 946.7 MW of installed capacity, which was designed to meet the Commonwealth’s new capacity goal of 1,600 MW by 2020 (minus the 653.3 MW qualified under the original SCO). However, the market reacted robustly to the SCO II program, and DOER received enough applications for the SCO II program to reach the 1,600 program capacity cap in February 2016.

In response, DOER filed emergency regulations for Class I on April 8, 2016. That rulemaking, which concluded on June 1, 2016, removed the capacity cap, provided conditional construction deadlines, and extended the program until the start of the next solar program. The extension provided lower SREC Factors for projects that were able to achieve certain milestones by established deadlines.

RPS Class II is limited to, and intended to support the continued operation of, two classes of pre-1998 Generation Units. The **RPS Class II Renewable Energy** Generating Units meet the same technology, resource, and location criteria as Class I, but with a lower MW capacity limit (7.5) for hydropower. The Minimum Standard for 2016 was 2.5319%. A Class II regulatory revision in 2014 established a methodology to calculate the Minimum Standard for RPS Class II Renewable Energy in future years.

The **RPS Class II Waste Energy** Minimum Standard of 3.5% provides incentives for pre-1998 Waste Energy generation. The Class II eligibility of Waste Energy Generation Units, also known as trash-to-energy or municipal solid waste plants, is conditioned on recycling and other regulatory criteria specific to Massachusetts.

The **Alternative Energy Portfolio Standard (APS)** is limited to, and intended to support, certain “alternative” but largely non-renewable, technologies and resources which the Legislature deemed worthy of development incentives modeled on RPS.<sup>13</sup> The two APS technologies active in 2016 were Combined Heat and Power (CHP) and Flywheel Storage.

Late in 2014, DOER began to develop changes in the APS regulations to incorporate renewable thermal technologies, pursuant to [Chapter 251 of the Acts of 2014](#). These changes would include a suite of heat transfer, combustion, and heat pump technologies by which thermal energy is derived from sunlight, biomass, and thermal gradients in air, ground, and water. The Act mandated these to go into effect on January 1, 2015, but this diverse set of disparate technologies necessitated extensive stakeholder meetings and internal work in 2014 and 2016. [Chapter 188 of the Acts of 2016](#) further expanded the list of eligible technologies to include fuel cells and waste-to-energy thermal facilities. The final regulations became effective on December 29, 2017.<sup>14</sup>

**Generation Certificates** are the means by which Suppliers meet their annual RPS and APS obligations. Each Supplier must acquire a sufficient quantity of MA RPS Class I and Class II qualified Renewable Energy

<sup>12</sup> For more details about the Solar Carve-Out and Solar Carve-Out II, see footnote 29, and visit the [RPS/APS homepage](#).

<sup>13</sup> The APS statute is at <http://www.malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter25A/Section11F1~2>.

<sup>14</sup> The statute for renewable thermal energy technologies is at <https://malegislature.gov/Laws/SessionLaws/Acts/2014/Chapter251>. The regulatory process for this change, including public documents, is presented at [this webpage](#).



Certificates (RECs), Solar Carve-Out Renewable Energy Certificates (SRECs), Solar Carve-Out II Renewable Energy Certificates (SREC IIs), Class II Waste Energy Certificates (WECs), and APS-qualified Alternative Energy Certificates (AECs) to meet its six Minimum Standards each year.

These certificates are created, recorded (each one receives a unique serial-number), and tracked by the New England Power Pool Generation Information System (GIS). The GIS tracks all electricity generated within the Independent System Operator New England (ISO-NE) control area as well as electricity imported into the ISO-NE control area from adjacent control areas.<sup>15</sup>

For each megawatt-hour (MWh) of electricity generated the GIS creates and deposits one electronic certificate in the account of the generation unit that generated the MWh in ISO-NE or exported the MWh from an adjacent control area. Any Generation Certificate that qualifies for one or more of the New England states' energy portfolio standards is tagged as such, thus becoming a REC, SREC, SREC II, WEC or AEC correspondingly.<sup>16</sup>

Suppliers with Massachusetts RPS and APS obligations purchase the appropriately-coded renewable generation certificate directly from generators holding such certificates, or indirectly via brokers. The certificates are electronically transferred from the generator's GIS account to the Supplier's GIS account. Each GIS certificate qualified for a Massachusetts portfolio standard can be used for compliance with *only* the standard for which it is qualified. For example, a Class II REC can be used only for Class II Renewable Energy compliance. However, since SRECs and SREC-IIs are "carve-outs" within Class I and are encoded at the GIS as a type of Class I REC, they also can be used for Class I Renewable Energy compliance. This is the only exception.

Transition provisions were required when each new Minimum Standard was added to the original RPS. A major but temporary statutory difference between RPS Class I and the newer standards (RPS Class II and APS) was a transition mechanism designed to mitigate, for competitive suppliers, the price impact of adding the newer standards in 2009. Competitive suppliers, unlike regulated utilities, were unable to pass on the additional compliance costs to retail customers with whom they already may have had long term contracts to deliver electricity at prices that did not include the obligation of the new standards for Class II RECs, WECs, and AECs.

A competitive supplier could exempt the quantity of electricity delivered under its pre-2009 contracts (Exempt Load). Only one Supplier still had Exempt Load in 2016. Likewise, the two Solar Carve-Outs have been provided with multiple contract date-based transition provisions.

**Alternative Compliance Payments (ACPs)** serve as an essential mechanism for RPS and APS compliance and overall cost controls. If a Supplier does not acquire sufficient renewable generation certificates to meet a given Minimum Standard, then it can reach compliance by making a payment at the ACP rate in lieu of purchasing certificates. Payments are made to the Massachusetts Clean Energy Center which holds the funds for direction of use for renewable projects by DOER. This is intended to acknowledge that sufficient certificates for a given Minimum Standard may not always be available in the marketplace. The ACP Rate also functions, in effect, as a cost containment mechanism by creating a cap on the value of certificates for each Minimum Standard.<sup>17</sup>

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<sup>15</sup> The ISO-NE "control area", covering most of New England, is a geographic region in which a common control system is used to maintain scheduled interchange of electrical energy within the region and exchanged with adjacent control areas. ISO New England Inc. is the "independent system operator" (ISO) for the ISO-NE control area, operating the New England electric power grid. It also qualifies as the "regional transmission operator" (RTO) under the rules of the Federal Energy Regulatory Commission (FERC).

<sup>16</sup> Each REC is encoded with Attributes that indicate the Generation Unit name, location, and fuel, energy resource or technology, as well as whether or not the Generation Unit and its RECs are qualified for *each* of the several New England state RPSs. A Massachusetts qualified REC that is also qualified for RPS in another New England state can be sold, transferred, and used to meet either state's RPS or other energy portfolio standard obligation. However, by the end of each GIS Certificate trading year (midnight on June 15 of the year following the Compliance Year), each REC can be located in only one state-specific Supplier sub-account at the NEPOOL GIS, which prevents double-counting of RECs. Each state's RPS statute and regulations define the RPS eligibility of generation a bit differently, and those definitions can be changed over time by each state. Thus, not every GIS certificate that is termed a REC is qualified for MA RPS.

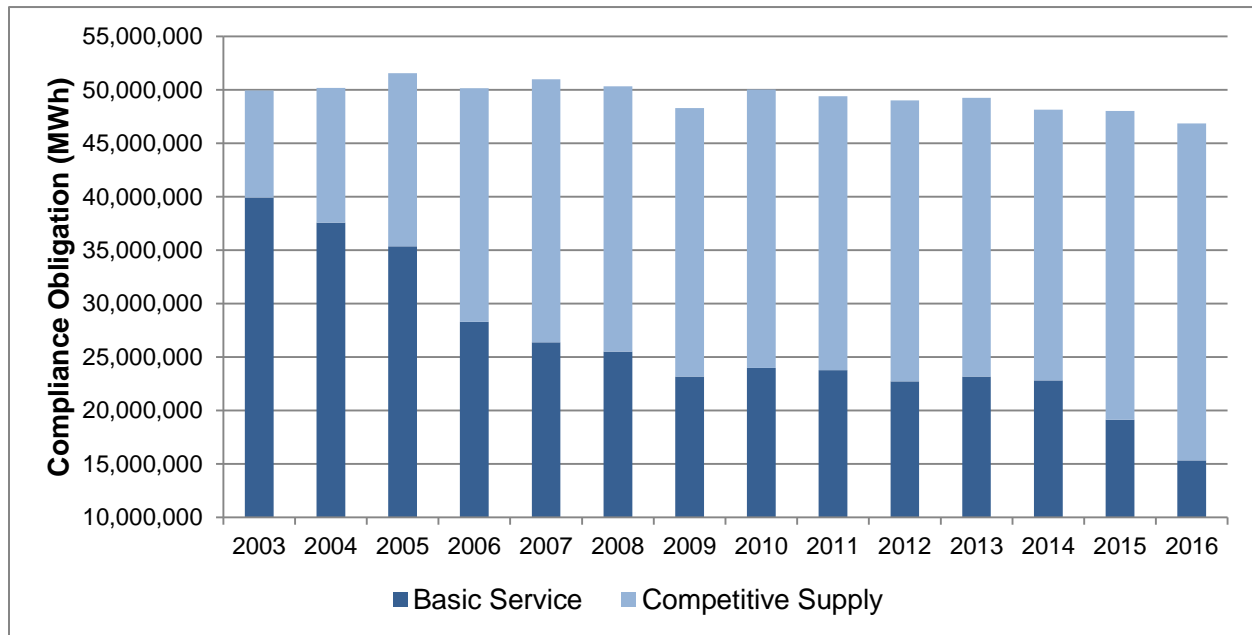
<sup>17</sup> See [the ACP webpage](#) for additional details, and see the regulations in 225 CMR 14.07, 15.07, and 16.07. In addition, see Section Nine of this report for details about ACP collection and expenditure.



**Banking** provides for RPS and APS compliance flexibility. Suppliers that acquire more renewable generation certificates than required by the Minimum Standard can “bank” them for use towards that *same* Minimum Standard<sup>18</sup> in one of the following two Compliance Years. Each class has a different banking limit.

The following figure shows the total **Retail Load Obligation** of Retail Electricity Suppliers (broken down by load served by investor owned utilities and competitive suppliers) since the RPS program began. As can be seen, competitive retail suppliers have been increasingly serving a larger portion of total retail load since the inception of the RPS program(s).

**Figure 1 Retail Load Obligation by Supplier Type, 2003-2016**



The RPS and APS requirements are further detailed in the RPS and APS regulations and guidelines found on DOER’s [website](#). These regulations and guidelines describe how facilities become qualified, list all qualified facilities, explain how Retail Electricity Suppliers demonstrate annually their compliance with RPS and APS, and provide links to the statutes and regulations and to any ongoing regulatory processes.

## 2. RPS CLASS I COMPLIANCE

DOER received Annual Compliance Filings from 66 Retail Electricity Suppliers that sold electricity to retail end users in Massachusetts during 2016 (see Appendix One).<sup>19</sup> The 66 Retail Electricity Suppliers include the four (4) investor-owned, electric distribution utility companies that are regulated by the DPU and 62 Competitive Suppliers that are licensed by the DPU.<sup>20</sup> Ten (10) Suppliers were new to the Massachusetts RPS market in 2016, while four (4) departed.

<sup>18</sup> For example, banked Attributes from excess Class I and Class II certificates are not interchangeable, nor are Class II RECs and WECs. However, banked Attributes from excess Class I SRECs can be used towards either SCO or Class I compliance.

<sup>19</sup> One supplier, Abest Power & Gas LLC, filed its Annual Compliance Filing but did not acquire sufficient renewable Generation Attributes to meet its obligations nor did it make any Alternative Compliance Payments to the Massachusetts Clean Energy Center. Its total obligation (all RPS and APS minimum standards) amounted to \$774,321.95 of unpaid Alternative Compliance Payments. Accordingly, Abest Power & Gas, LLC has been found to be in non-compliance, which is explained in more detail in Appendix Two.

<sup>20</sup> Regulated distribution Utilities provide electricity under “Basic Service” to those customers in their franchise territories that have not chosen to purchase electricity from Competitive Suppliers. Competitive Suppliers compete for and supply electricity to retail customers in any or all of the DPU-regulated distribution Utility territories, and each must be licensed by the DPU, per its regulations [220 CMR 11.05](#). For more information about the “restructured” electricity market in which RPS and APS operate, see [this web page](#).

The 2016 RPS Class I obligation for each Supplier was 11% of its Retail Load Obligation at the NEPOOL GIS, from which the average Solar Carve-Out obligation of 1.7352% and the average Solar Carve-Out II obligation of 0.6819% were subtracted, leaving an average net Class I obligation of 8.5829%.

Note that all figures regarding the quantities and percentages of Class I RECs from different jurisdictions must be understood in the context of a regional market in which many MA-qualified Class I RECs are also qualified and can be used for the RPS compliance of several New England states. Thus, more MA Class I RECs are actually created at the NEPOOL GIS than are reflected in the 2016 MA RPS compliance figures.

In 2016, a total of 6,957,202 MA Class I RECs (including 808,728 SRECs and 556,497 SREC-IIs) were created in the NEPOOL GIS. Of that total, about 75% were submitted for compliance in Massachusetts in the Compliance Filings. The remaining 25% were settled in the accounts for other New England states, deposited in the solar auction (18,248 SRECs and 243,377 SREC IIs), or were used for voluntary “green power product” sales.<sup>21</sup>

The use of Massachusetts-qualified RECs outside the Commonwealth may diminish beginning in 2018 when the Clean Energy Standard (CES), administered by the Massachusetts Department of Environmental Protection, goes into effect.<sup>22</sup> Massachusetts-qualified Class I RECs can be used to meet the CES Minimum Standard which will be 16% in 2018. The Class I Renewable Minimum Standard of 13% in 2018 will go towards meeting the CES Minimum Standard, so the incremental CES Minimum Standard will be 3%. It is anticipated that Class I RECs will be used to meet most or all of the incremental CES Minimum Standard in its first few years.

**Table 1 Aggregated Data from the RPS Class I Annual Filings, 2010-2016 (w/o Solar Carve-Outs)<sup>23</sup>**

Compliance Year	2016	2015	2014	2013	2012	2011	2010
<b>Retail Sales (Retail Load Obligation)</b>	<b>46,864,429</b>	48,009,723	48,129,294	49,252,929	48,992,430	49,386,169	50,026,093
<b>CY Average Net Minimum Standard</b>	<b>8.5829%</b>	7.6498%	8.0081%	7.7140%	6.8370%	5.8373%	4.9321%
<b>Aggregated Compliance Obligation</b>	<b>4,022,346</b>	3,672,667	3,854,245	3,799,402	3,349,611	2,882,823	2,467,336
<b>Available Class I RECs for CY Obligation</b>	<b>4,049,070</b>	3,688,921	3,575,825	3,733,771	2,986,872	2,613,122	2,323,609
<b>minus CY Surplus Class I RECs</b>	<b>(501,754)</b>	(520,378)	(404,133)	(330,272)	(70,022)	(107,805)	(241,062)
<b>Net Class I RECs for CY Obligation</b>	<b>3,547,316</b>	3,168,543	3,575,825	3,733,771	2,986,872	2,505,317	2,082,547
<b>plus Banked from pre-CY Surpluses</b>	<b>471,256</b>	486,857	272,660	31,102	107,351	271,303	380,824
<b>Total Class I RECs used for CY Obligation</b>	<b>4,018,572</b>	3,655,400	3,848,485	3,764,873	3,094,223	2,776,620	2,463,371
<b>plus ACP Credits</b>	<b>269</b>	8,247	5,719	31,642	255,388	106,203	3,965
<b>Total Class I RECs used for CY Obligation</b>	<b>4,018,841</b>	3,663,647	3,854,204	3,796,515	3,349,611	2,882,823	2,467,336
<b>Surplus Attributes Banked Forward</b>	<b>501,754</b>	520,378	403,976	328,984	69,916	107,804	241,061
<b>ACP Receipts</b>	<b>\$18,020</b>	\$553,126	\$378,369	\$2,065,273	\$16,350,132	\$6,598,386	\$241,551

<sup>21</sup> These Class I RECs retired as “Voluntary Renewable Energy (VRE) purchases,” from both the 2016 Filings and NEPOOL GIS Reserved Certificates Report, were reported to the Massachusetts Department of Environmental Protection (MassDEP), which, in turn, will retire a calculated number of allowances for a future vintage year in the Regional Greenhouse Gas Initiative (RGGI). The retired allowances represent the Greenhouse Gas emissions avoided by 34,913 MWh of renewable energy. That quantity will reduce the number of allowances that can be sold in the RGGI Auction for that future year, which will, in turn, slightly reduce the regional allowance cap for non-renewable thermal power plants for that year. DOER’s regulatory basis for this report is the CO<sub>2</sub> Budget Trading Program Auction Regulations, 225 CMR 13.14. More information about RGGI can be found at <http://www.rggi.org/>.

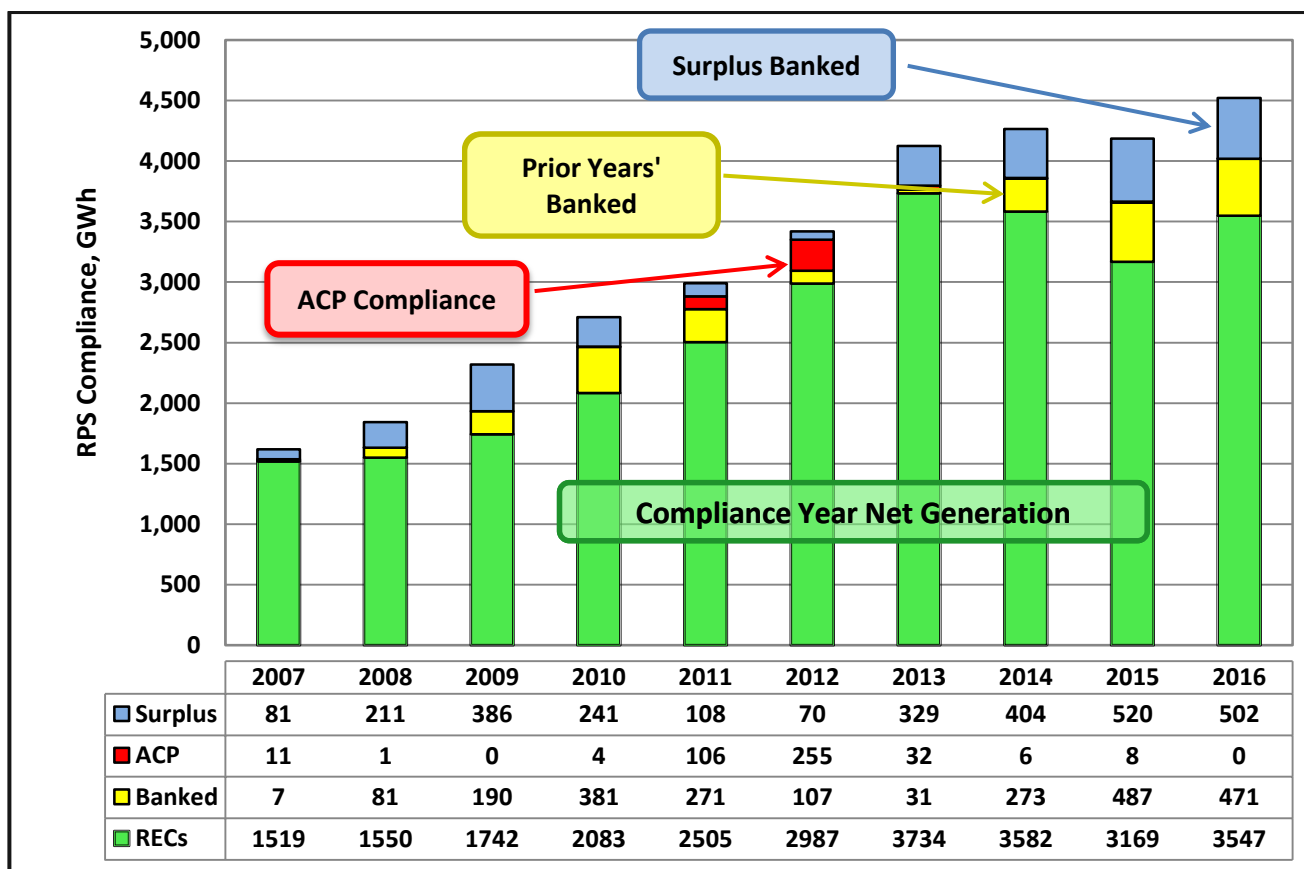
<sup>22</sup> See <https://www.mass.gov/guides/clean-energy-standard-310-cmr-775>

<sup>23</sup> CY is the abbreviation for Compliance Year, coterminous with a calendar year. These are aggregated figures, with compliance calculated separately for each Supplier, and with fractions always rounded upwards. Therefore, if one calculated the RPS Obligation using the total “CY Retail Sales,” the result usually would be less than the “CY Aggregated Compliance Obligation” listed in this table and elsewhere in the report. This is true for all RPS classes and for APS. For data from earlier years, see DOER’s website.

### a. Compliance Details

Changes in the manner of compliance during the last 10 years of the program are shown in Figure 2. One can note that significant Banked Surpluses occurred from 2007-2010 and again from 2013-2016. Only during the years 2011 and 2012 did Suppliers rely more heavily on ACP for compliance. Thus, it appears that the RPS obligation combined with procurements and lower overall renewable pricing have succeeded in accelerating development of new Renewable Generation Units since the original RPS regulations were issued in 2002. In particular, a key driver in successfully meeting the RPS Class I obligations in recent years has been the significant increase in solar generation from the Solar Carve-out and Solar Carve-out II programs, which has slowed the annual increase in demand for non-SREC Class I REC's as each Solar Carve-out obligation is carved out from the total RPS Class I obligation.

**Figure 2 RPS Class I Compliance, 2007-2016 (Excluding Solar Carve-outs)**



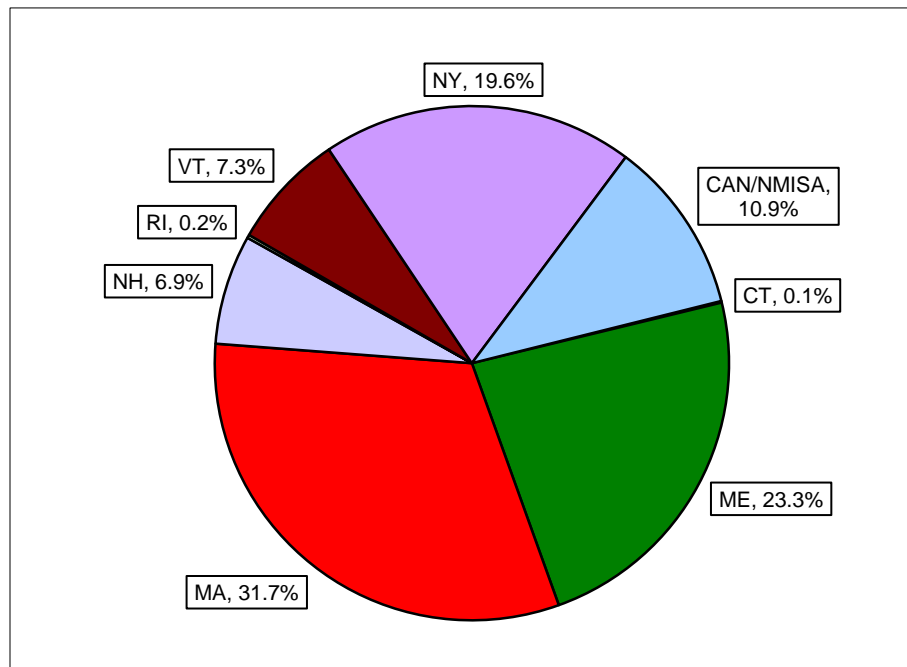
### b. Generation Sources by Location

The percentages of 2016 Class I REC's from the New England states, New York, and adjacent Canadian provinces are illustrated in Figure 3.<sup>24</sup> Figure 4 illustrates the 10-year trend in the location of REC generation. Table G in Appendix Four lists the data from which these graphs were generated.

Massachusetts was the origin of most REC's with 31.7% of the total, down slightly from 32.1% in 2015. New York showed the most growth from 2015 to 2016, with a net increase of 5.7%, mostly from wind.

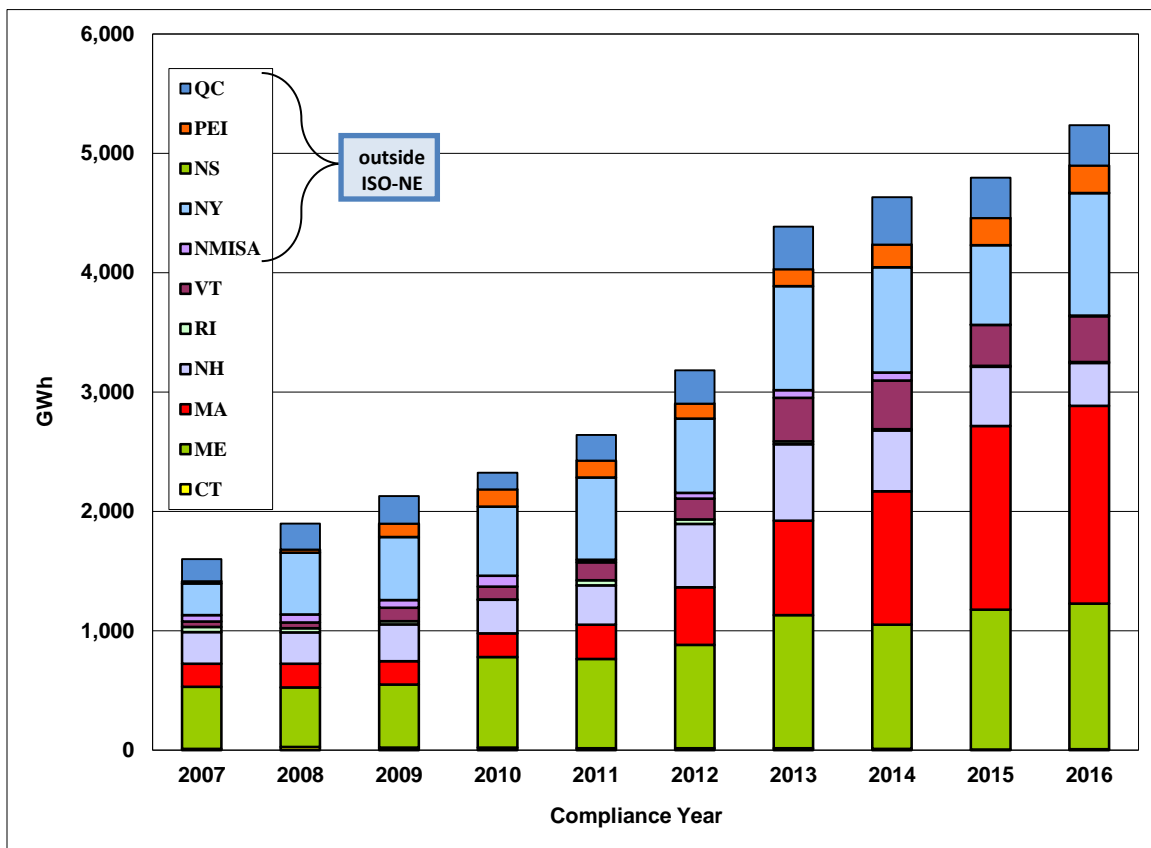
<sup>24</sup> Note that the transmission grid in two northern Maine counties is outside of the ISO New England control area, is separately managed by the [Northern Maine Independent System Administrator](#) ("NMISA"), and connects to the ISO-NE grid via the Maritime Areas grid, which is managed by the [New Brunswick System Operator](#). Therefore, the output of NMISA-located generators must be imported via Canada to ISO-NE in order to earn REC's. DOER has combined the Canadian provinces (New Brunswick, Nova Scotia, Quebec) with NMISA

**Figure 3 2016 RPS Class I Compliance by Generator Location\***



\* Includes the Solar Carve-Outs, all SRECs & SREC-IIs.

**Figure 4 RPS Class I Compliance by Generator Location, 2007-2016\***



\* Includes the Solar Carve-Outs, all SRECs & SREC-IIs.

**c. Generation Sources by Type**

**Table 2 2016 RPS Class I Compliance by Generator Type, 2014 - 2016 (MWh)**

FUEL TYPE	MWh			% of Total		
	2014	2015	2016	2014	2015	2016
Anaerobic Digester	37,872	43,837	42,099	0.8%	0.9%	0.8%
Biomass	375,109	320,801	2,501	8.1%	6.7%	0.0%
Landfill Gas	820,001	587,790	722,539	17.7%	12.3%	13.8%
Solar	681,502	1,194,925	1,324,578	14.7%	24.9%	25.3%
Wind	2,586,416	2,518,915	3,009,326	55.8%	52.5%	57.5%
Hydroelectric	129,790	129,810	133,389	2.8%	2.7%	2.5%
Marine/Hydrokinetic	45	47	48	0.0%	0.0%	0.0%
<b>Total</b>	<b>4,631,645</b>	<b>4,796,125</b>	<b>5,234,480</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Wind power continued to be the largest source of RECs for RPS, representing 57.5% of the 2016 supply, an increase of 5% over 2015 (the magnitude of this shift is mostly due to Biomass falling from 6.7% to nearly 0%, see below). Maine accounted for 38% of total wind supply, while New York represented 22%. This marked the first year that Massachusetts-qualified-RPS Class I Wind Certificates were imported from Nova Scotia (1,173 MWh).<sup>25</sup>

Solar photovoltaic arrays provided the most rapidly increasing share of RECs, amounting to 25.3% of total Class I RECs in 2016. This accelerating growth has been propelled by a number of factors in the last few years, including declining equipment costs, federal and state tax incentives, federal stimulus dollars, state “net metering” policies, and, most notably, the RPS Solar Carve-Out (SCO) launched in January 2010 and SCO II launched in April 2014.<sup>26</sup>

Ninety percent (90%) of the RPS Class I RECs (including SRECs and SREC IIs) generated by solar facilities that were used for compliance originated in Massachusetts.<sup>27</sup>

Landfill methane gas represented 13.8% of Class I RECs, a 1.5% increase over 2015. Most landfill methane Class I RECs originated in New York (51%) and Massachusetts (24%).

Woody biomass supply fell significantly by 99.5% between 2015 and 2016. The decline is attributed to the woody biomass plants in Maine and New Hampshire that no longer met the overall efficiency standard. The overall efficiency standard was established in 2012, however, these Generation Units had been temporarily exempted from the standard until January 1, 2016 due to a regulatory provision.

Hydroelectricity was added to the qualified mix of RPS Class I resources in 2009, with most supply coming from capacity increases and efficiency upgrades that were performed post-1997 at older plants. Hydroelectricity represented 2.6% of Class I RECs in 2016. Maine accounted for 33% of supply while Vermont accounted for 31%. Massachusetts accounted for 23%.

Anaerobic digester supply, which accounted for 0.8% of all Class I RECs in 2016, were mostly generated in Massachusetts (88%). Anaerobic digester potential exists at wastewater treatment plants, at facilities that generate organic waste and locations where organic waste can be easily transported to the Generation Unit. DOER is collaborating with the Massachusetts Department of Agricultural Resources (MDAR), Massachusetts Department of Environmental Protection (MassDEP), and MassCEC to identify and encourage expanded production of digester gas, so long as sufficient feedstocks are available.

Marine and Hydrokinetic projects began in 2013 with small turbines within Massachusetts water supply conduits. Only 48 MWh were generated in 2016, all in Massachusetts.<sup>28</sup>

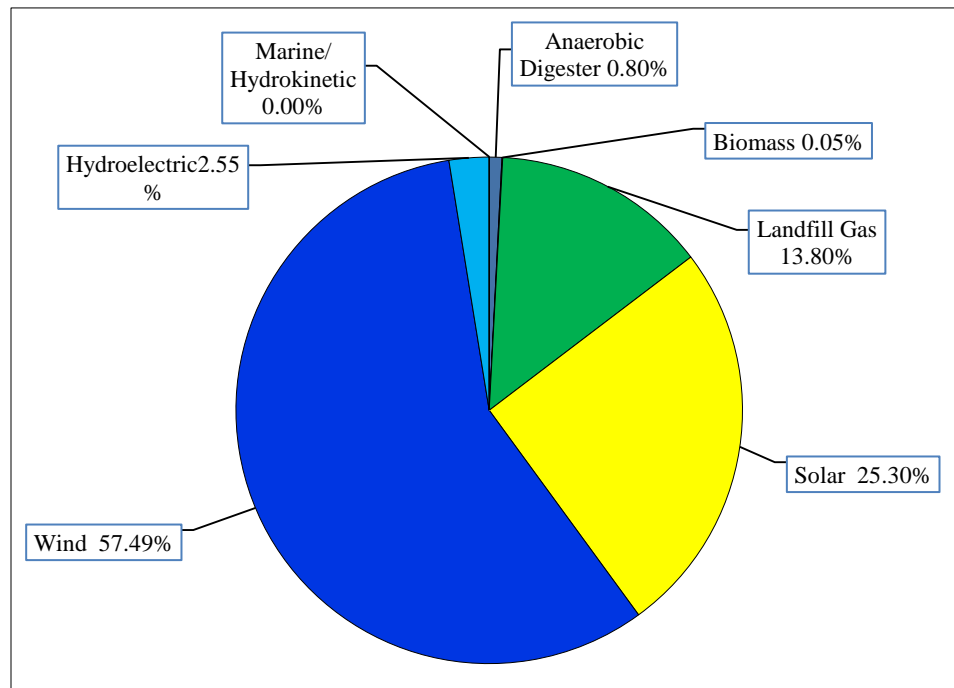
<sup>25</sup> See Table M in Appendix Four

<sup>26</sup> In addition to RPS, MA has other programs helping to drive PV development. See the [Solar page](#) at DOER’s website.

<sup>27</sup> See Table I in Appendix Four.

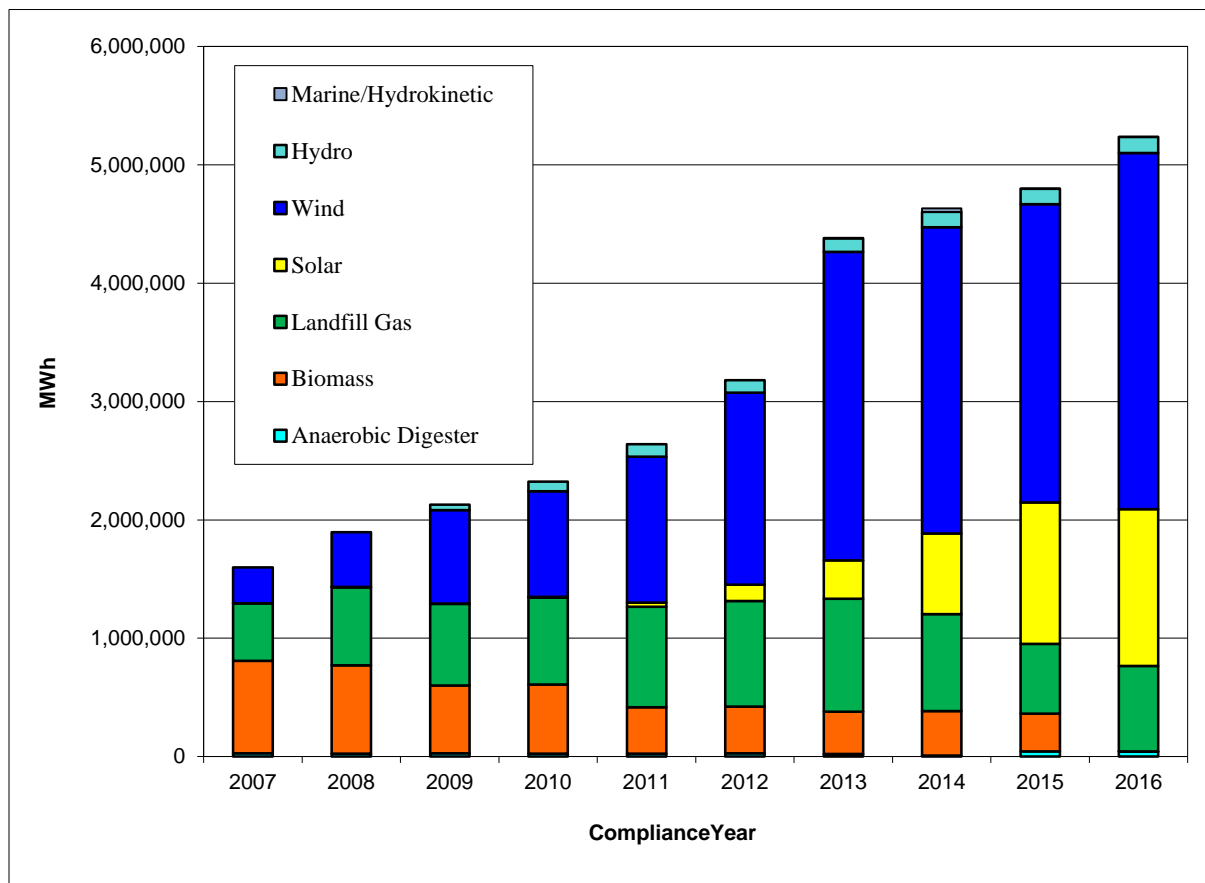
<sup>28</sup> 48 MWh translates to 0.0% in Figure 5, but is actually 0.00092% of the total.

**Figure 5 2016 RPS Class I Compliance by Generator Type\***



\* Includes the Solar Carve-Outs, all SRECs & SREC-IIs

**Figure 6 RPS Class I Compliance by Generator Type, 2007-2016\***



\* Includes the Solar Carve-Outs, all SRECs & SREC-IIs.

### 3. RPS SOLAR CARVE-OUT COMPLIANCE IN 2016

Pursuant to the Green Communities Act of 2008, the Solar Carve-Out (SCO) program, which commenced in 2010, is a “carve-out” of RPS Class I (i.e., the SCO Minimum Standard is subtracted from each year’s overall RPS Class I Minimum Standard). It was originally intended to provide incentive for 400 MW of PV to be installed within Massachusetts by 2017.<sup>29</sup>

The SCO attracted solar business development to Massachusetts beyond expectations. Qualified installations surpassed the original program cap of 400 MW in 2013, four years ahead of the date anticipated by DOER. As the 400 MW cap approached, DOER received a rapid acceleration of applications in the spring of 2013. In order to avoid penalizing a substantial amount of investments made in good faith, DOER issued an emergency revision of the Class I regulations in June, 2013, to set rules for raising the cap.<sup>30</sup> In order to maintain the PV development momentum, DOER subsequently began a rulemaking for a successor Solar Carve-Out II program, described below in Section 4.

**Table 3 Aggregated Data from the Solar Carve-Out (SCO) Compliance Filings, 2010-2016 (MWh)**

Compliance Year	2016	2015	2014	2013	2012	2011	2010
Retail Sales (Retail Load Obligation)	46,864,429	48,009,723	48,129,294	49,252,929	48,992,430	49,386,169	50,026,093
Average Minimum Standard	1.7850%	2.0934%	0.9481%	0.2860%	0.1630%	0.1627%	0.0679%
Aggregated Compliance Obligation	813,188	1,005,024	456,347	140,855	79,882	80,370	33,988
SRECs for CY Obligation	839,614	755,018	480,744	143,589	77,491	26,580	2,738
minus CY Total Surplus SRECs	(36,981)	(12,231)	(36,222)	(8,334)	(963)	(13)	0
Net CY SRECs for CY Obligation	802,633	742,787	444,522	135,255	76,259	26,567	2,738
plus Banked from pre-CY Surpluses	9,767	36,161	8,159	1,294	13	0	0
Total SRECs Used for CY Obligation	812,400	999,373	452,690	136,549	76,272	26,567	2,738
Plus Total ACP Credits	59	3,084	3,657	4,206	3,787	53,803	31,250
Total SRECs and ACP Used for CY Obligation	812,459	1,002,457	456,347	140,755	80,059	80,370	33,988
Surplus Attributes Banked Forward	36,979	12,231	36,222	8,066	961	13	0
ACP Receipts	\$27,848	\$1,529,664	\$553,512	\$306,518	\$245,360	\$23,887,474	\$11,682,793

Note: the “Surplus Attributes Banked Forward” does not equal the “CY total surplus SRECs” because some Suppliers had excess SRECs over their Banking Limits.

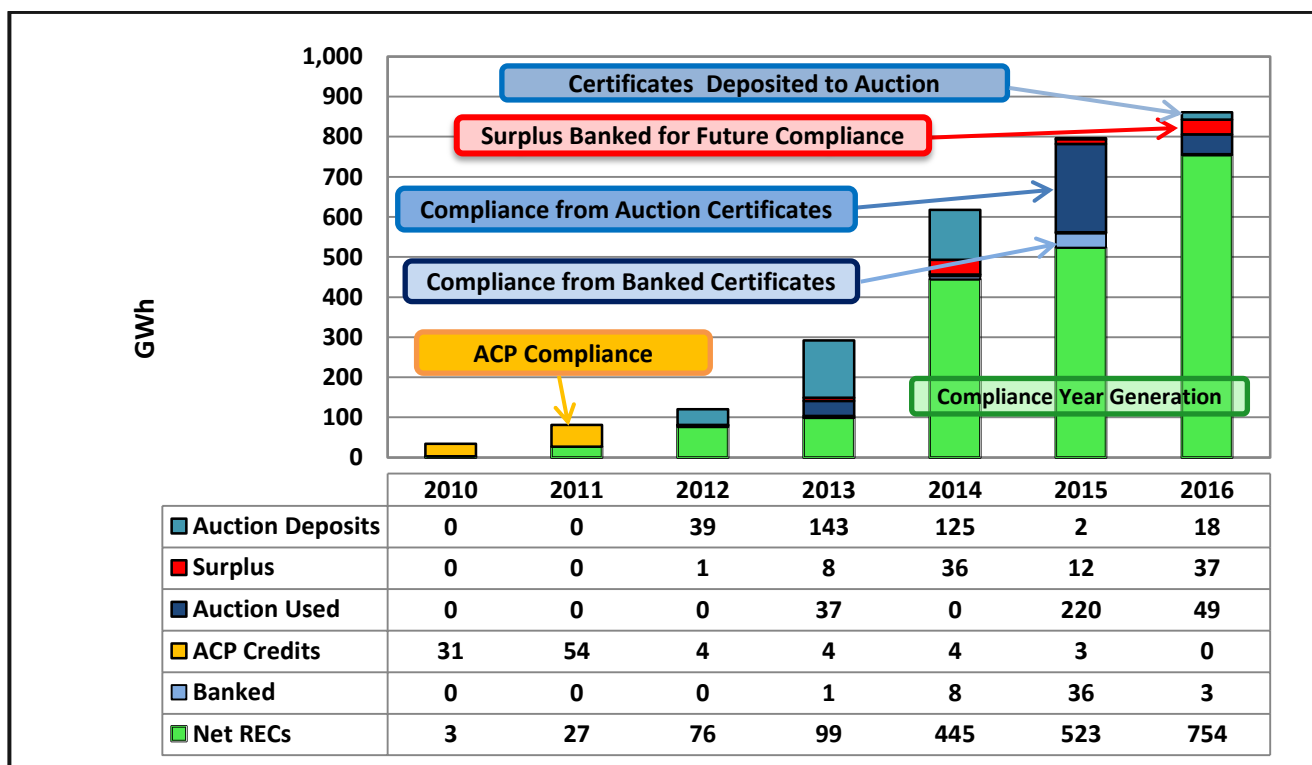
In 2016, the Compliance Obligation fell by 19% from 2015 because the Average Net Minimum Standard fell from 2.0934% in 2015 to 1.7850% in 2016 and Retail Sales fell as well. The number of SRECs available to meet the Obligation exceeded the Compliance Obligation by 26,426 SRECs, a change from 2015 when there was a shortfall of 250,006, but re-minted SRECs were used to meet the Obligation and make up for the shortfall. Changes in the manner of compliance during the first six years of the program are shown in Figure 6.

<sup>29</sup> The eligibility requirements for a PV system to qualify include the following: (a) interconnection with the Massachusetts electricity grid, (b) at least a minimal use of some electricity on-site with the balance of the output connected to the grid, and (c) nameplate, direct current capacity limited to no more than 6 MW on a single parcel of land. In addition, a system is not eligible if it had received funding by certain other government programs. See DOER’s [Solar Carve-out/SREC-I webpages](#) for additional information on the program.

<sup>30</sup> The revised cap became 653.3 MW. For a detailed list of SCO projects, visit <http://www.mass.gov/eea/docs/doer/rps-aps/solar-carve-out-units.xlsx>.



**Figure 7 RPS Class I Solar Carve-Out Certificate Disposition, 2010-2016**



#### 4. RPS SOLAR CARVE-OUT II COMPLIANCE IN 2016

The Solar Carve-Out II Minimum Standard was established by revised regulations for RPS Class I promulgated on April 25, 2014. The SCO II Minimum Standard set a capacity cap for qualified solar carve-out installations at 1,600 MW in the state, inclusive of the prior Solar Carve-Out capacity (653.3 MW), with a goal of reaching that overall cap by 2020. In 2016, the SCO II Minimum Standard applies only to retail load served under contracts on or after April 25, 2014. Retail load served under contracts executed prior to April 25, 2014, are exempt.

The Solar Carve-Out II differs from the Solar Carve-Out in the creation of “Market Sectors” and “SREC Factors” for qualifying projects. Under the Solar-Carve-Out II, the highest incentive, namely an SREC Factor of one SREC-II per MWh of output, is given to small (25 kW or less) projects, solar canopies, community shared solar, projects providing 100% of their power to low income housing, and emergency power sites. The Solar Carve-Out II gives slightly lower SREC Factors to larger building-mounted projects, those that mostly serve an on-site load, and those built on eligible landfills and qualified “brownfields”.<sup>31</sup>

For 2016, the Minimum Standard was calculated to be 0.7851% of each Supplier’s non-exempt Retail Load Obligation.<sup>32</sup>

<sup>31</sup> See [Current Status of the Solar Carve-Out II Program](#) for more details.

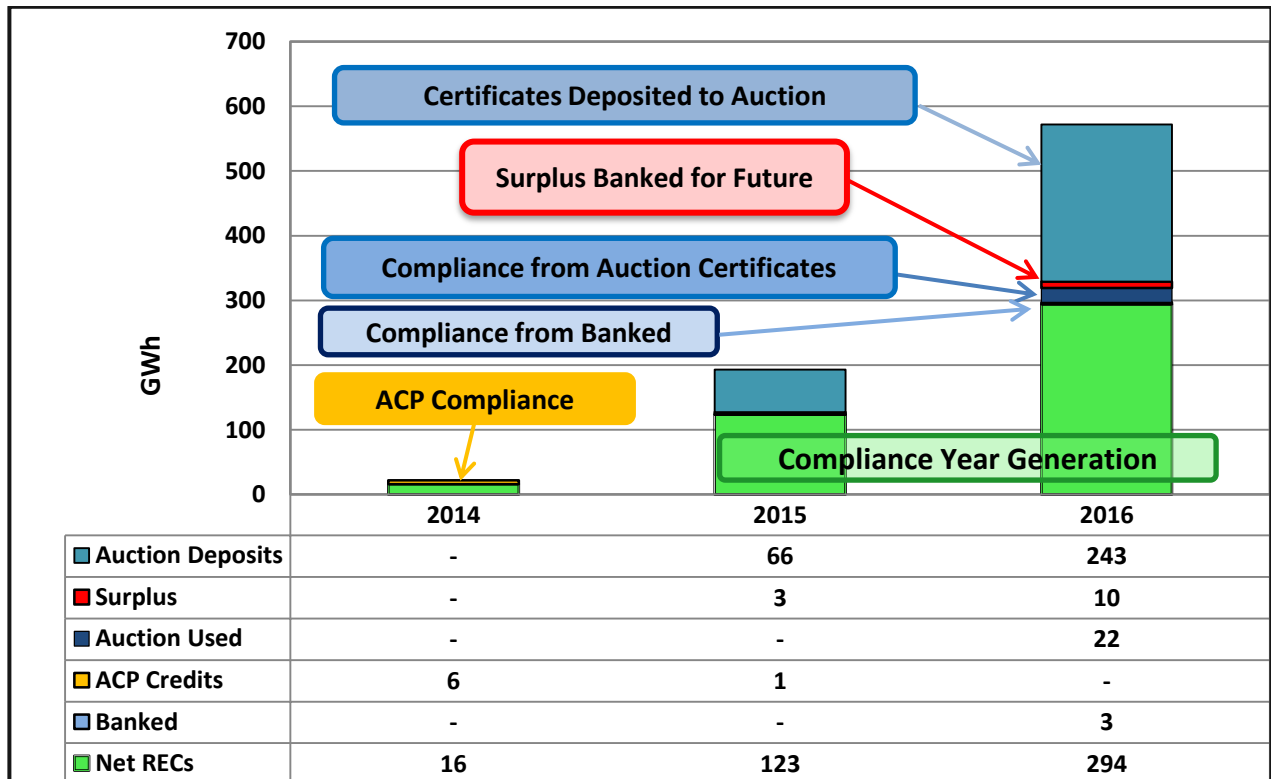
<sup>32</sup> See 225 CMR 14.07(3), especially (3)(a) and (3)(c).

**Table 4 Aggregated Data from the Solar Carve-Out II Compliance Filings, 2014-2016**

Compliance Year	2016	2015	2014
Retail Sales (Retail Load Obligation)	46,864,429	48,009,723	48,129,294
Exempt Load	6,162,098	10,516,104	23,163,408
Net Load	40,702,331	37,493,621	24,965,886
Minimum Standard	0.7852%	0.3288%	0.0843%
CY Aggregated SCO II Obligation	319,589	123,317	21,076
Total SREC-IIs from CY Generation	326,308	125,294	15,633
<i>minus CY Total Surplus SRECIIs</i>	<b>(10,059)</b>	<b>(3,021)</b>	<b>(187)</b>
Net CY SREC-IIs for CY Obligation	316,249	122,273	15,446
<i>plus Banked from pre-CY Surpluses</i>	3,019	20	0
Total SRECIIs Used for CY Obligation	319,268	122,293	15,446
<i>plus Total ACP Credits</i>	5	629	5,476
Total SREC II s Used for CY Obligation	319,273	122,922	20,922
Surplus Attributes Banked Forward	10,059	3,018	21
ACP Receipts	\$1,750	\$235,875	\$2,115,001

Note: the "Surplus Attributes Banked Forward" does not equal the "CY total surplus SREC IIs" because some Suppliers had excess SREC IIs over their Banking Limits.

**Figure 8 RPS Class I Solar Carve-Out II Certificate Disposition, 2014-2016**



By February, 2016, DOER had received sufficient SREC II applications to reach the 1,600 MW program capacity cap. It responded in April, 2016, by filing emergency regulations to extend the program. Consequently, a second exemption period was created for Retail Sellers' contracts executed after April 24, 2014, but on or before

May 8, 2016. These exempted contracts are subject to a Minimum Standard that is less than the Minimum Standard for contracts executed after May 8, 2016. This exemption period will go into effect in 2017 (see Section 8c).

DOER has since promulgated a regulation establishing the framework for a new program, as required by an Act Relative to Solar Energy.<sup>33</sup> The Solar Massachusetts Renewable Target (SMART) Program is designed to create long-term, sustainable, incentives that promote solar PV development in Massachusetts via a declining block tariff incentive framework. The SMART rulemaking commenced on June 5, 2017, with the final regulation promulgated on August 25, 2017.<sup>34</sup> On September 12, 2017, the Commonwealth's investor owned electric distribution companies jointly filed a model tariff with the Massachusetts Department of Public Utilities ("DPU") for its review and approval. On September 26, 2018, the DPU approved the model tariff filed by the distribution companies, allowing the final steps of the transition process to begin. The official transition to SMART occurred in November 2018 and marked the close of new solar projects qualifying for the SREC II Program.

## 5. RPS CLASS II RENEWABLE ENERGY COMPLIANCE IN 2016

RPS Class II was established in the Green Communities Act of 2008 with the purpose of providing incentives for the continued operation of pre-1998 renewable energy plants and waste energy plants located in Massachusetts. RPS Class II Renewable Energy is generated by the same resources and technologies as Class I. However, hydroelectric plants in Class II are limited to 7.5 MW (versus 30 MW in Class I), pursuant to the [Competitively Priced Electricity Act of 2012](#).

The quantity of pre-1998 renewable energy generation that DOER originally had projected to qualify did not materialize as anticipated during the early years of the program. Class II Renewable Energy has experienced REC shortfalls, so it relies heavily on the ACP mechanism. DOER reacted to this situation with a Class II regulatory revision that reduced the original 3.6% Minimum Standard to 1.5% for 2013, 1.75% for 2014 and 2.0% for 2016, following which the Standard is set annually by a formula that responds to changing market conditions. For 2016, the Class II Minimum Standard was 2.5319%.

**Table 5 Aggregated Data from the RPS Class II Renewable Energy Filings, 2010-2016**

Compliance Year	2016	2015	2014	2013	2012	2011	2010
<b>Retail Sales (Retail Load Obligation)</b>	<b>46,864,429</b>	48,009,723	48,129,294	49,252,929	48,992,430	49,386,169	50,026,093
<b>Exempt Load</b>	<b>7,892</b>	34,578	79,801	973,011	1,584,015	3,799,666	8,233,703
<b>Net Load</b>	<b>46,856,537</b>	47,975,145	48,049,493	48,279,918	47,408,415	45,586,504	41,792,390
<b>Minimum Standard</b>	<b>2.53%</b>	2.00%	1.75%	1.5%	3.6%	3.6%	3.6%
<b>CY aggregated Obligation</b>	<b>1,186,394</b>	959,531	840,893	724,222	1,706,727	1,641,134	1,504,544
<b>Total Class II RECs from CY Generation</b>	<b>561,324</b>	539,399	526,415	509,609	246,665	236,472	103,837
<b>minus CY total surplus Class II RECs</b>	<b>(18,017)</b>	(18,488)	(62,401)	(167,874)	(874)	(1,757)	(63)
<b>Net CY RECs for CY Obligation</b>	<b>543,307</b>	520,911	464,014	351,735	245,791	234,715	103,774
<b>plus Banked from pre-CY Surpluses</b>	<b>7,317</b>	102,901	104,498	919	1,739	63	653
<b>Total Class II RECs used for CY Obligation</b>	<b>550,624</b>	623,812	568,512	342,654	247,530	234,778	104,427
<b>plus total ACP Credits</b>	<b>634,720</b>	333,322	268,337	381,007	1,459,197	1,406,356	1,400,117
<b>Total Class II RECs used for CY Obligation</b>	<b>1,185,344</b>	957,134	836,849	723,661	1,706,727	1,641,134	1,504,544
<b>Surplus Attributes Banked Forward</b>	<b>18,017</b>	18,288	42,035	167,874	874	1,749	63
<b>ACP Receipts</b>	<b>\$17,454,800</b>	\$9,176,355	\$7,288,033	\$10,207,169	\$38,347,723	\$35,862,072	\$35,002,925

<sup>33</sup> "An Act Relative to Solar Energy" is at <https://malegislature.gov/Laws/SessionLaws/Acts/2016/Chapter75>.

<sup>34</sup> Both the 2016 Emergency rulemaking for SCO II and the development of the new solar PV incentive are linked from [this web page](#).

Class II RECs derive almost solely from New England older hydroelectric plants (94%), with the majority generated by facilities located in Massachusetts (32%). Only 550,624 RECs were available to meet the obligation of 1,186,360, or 45% of the total required. The remainder (55%) was met with ACPs.

## 6. RPS CLASS II WASTE ENERGY COMPLIANCE IN 2016

RPS Class II Waste Energy is a separate sub-class within RPS Class II. Each Supplier must comply separately with both the Renewable Energy subclass and the Waste Energy subclass. Qualification is limited to plants that meet the Massachusetts Department of Environmental Protection regulations for such facilities.<sup>35</sup> The MassDEP regulations provide for enhanced sorting and recycling and for the owner of each plant to remit to the MassDEP 50% of the proceeds from selling its RPS Class II Waste Energy Credits (WECs). The MassDEP uses those funds to help support municipal recycling programs.

**Table 6 Aggregated Data from RPS Class II Waste Energy Compliance, 2010-2016**

Compliance Year	2016	2015	2014	2013	2012	2011	2010
Retail Sales (Retail Load Obligation)	46,864,429	48,009,723	48,129,294	49,252,929	48,992,430	49,386,169	50,026,093
Exempt Load	7,892	34,578	79,801	973,011	1,584,015	3,799,666	8,233,703
Net Load	46,856,537	47,975,145	48,049,493	48,279,918	47,408,415	45,586,504	41,792,390
CY Aggregated WEC Obligation	1,640,016	1,679,161	1,681,759	1,689,821	1,659,318	1,595,546	1,462,750
Total WECs from CY Generation	1,651,769	1,620,112	1,440,670	1,703,780	1,710,117	1,568,127	1,378,219
minus CY total surplus WECs	(20,111)	(15,706)	(13,873)	(307,868)	(282,023)	(212,565)	(251,554)
Net CY WECs for CY Obligation	1,631,658	1,604,406	1,426,797	1,395,912	1,428,094	1,355,562	1,126,665
plus Banked from pre-CY Surpluses	0	53,440	251,993	278,771	207,057	237,620	330,288
Total WECs used for CY Obligation	1,631,658	1,657,846	1,678,790	1,674,682	1,635,151	1,593,182	1,456,953
plus total ACP Credits	7,362	17,120	2,968	13,828	24,167	2,364	5,797
Total Class II WECs used for CY Obligation	1,639,020	1,674,966	1,681,758	1,688,511	1,659,318	1,595,546	1,462,750
Surplus Attributes Banked Forward	20,566	0	0	305,433	278,990	207,041	237,667
ACP proceeds (rounded)	\$80,982	\$188,491	\$32,232	\$148,236	\$253,993	\$24,113	\$57,970

In order to eliminate what DOER had earlier concluded to be a permanent and inherently large WEC surplus that Suppliers were carrying forward (banking) from year-to-year, DOER, through its RPS Class II rulemaking in 2014, enacted a banking moratorium for Compliance Years 2014 and 2015. It then lowered the banking limit from 30% to 5% in subsequent years, beginning in 2016.

## 7. ALTERNATIVE ENERGY PORTFOLIO STANDARD COMPLIANCE IN 2016

The Alternative Energy Portfolio Standard (APS) was established as of January 1, 2009, under the Green Communities Act of 2008, now codified at M.G.L. c. 25A, § 11F½ (statute). DOER first promulgated the regulations of 225 CMR 16.00: Alternative Energy Portfolio Standards in 2009 to implement the Statute.

In general, the APS offers an opportunity for Massachusetts individuals, businesses, institutions, and governments to receive an incentive for using certain types of alternative energy technologies. These alternative energy technologies contribute to the Commonwealth's clean energy goals by increasing energy efficiency and reducing the need for conventional fossil fuel-based power generation.

<sup>35</sup> The MassDEP regulations are in 310 CMR 7.08(2) and 310 CMR 19.000.

The APS requires a certain percentage of the state's electric load to be met by these eligible technologies. In 2016, the Minimum Standard was 4.00%, and is set to increase 0.25% for each following year.

As Table 8 shows below, historically the market has not had enough certificates to meet the annual obligation, resulting in the collection of ACPs each year. In 2016, ACP credits made up 50% of the APS compliance obligation.

A revised APS regulation was promulgated in 2017, which expands eligible technologies to include renewable thermal, fuel cell, and waste-to-energy thermal projects.

**Table 7 Aggregated Data from the APS Compliance Filings, 2010-2016 (MWh)**

Compliance Year	2016	2015	2014	2013	2012	2011	2010
<b>Retail Sales (Retail Load Obligation)</b>	<b>46,864,429</b>	48,009,723	48,129,294	49,252,929	48,992,430	49,386,169	50,026,093
<b>Exempt Load</b>	<b>7,892</b>	34,578	79,801	973,011	1,584,015	3,799,666	8,233,703
<b>Net Load</b>	<b>46,856,537</b>	47,975,145	48,049,493	48,279,918	47,408,416	45,586,504	41,792,390
<b>CY average net Minimum Standard</b>	<b>4.00%</b>	3.75%	3.50%	3.00%	2.50%	2.0%	1.5%
<b>Aggregated Compliance Obligation</b>	<b>1,874,294</b>	1,799,094	1,681,759	1,448,421	1,185,236	911,748	626,902
<b>Available AECs for CY Obligation</b>	<b>945,003</b>	894,602	831,080	531,781	351,179	324,922	227,134
<b>minus CY Surplus AECs</b>	<b>(3,873)</b>	(2,869)	(261)	(7,347)	(1,239)	(7,636)	(520)
<b>Net AECs for CY Obligation</b>	<b>941,130</b>	891,733	830,819	524,434	349,940	317,286	226,614
<b>plus Banked from Prior Year Surpluses</b>	<b>2,869</b>	261	7,347	1239	7,635	515	8,818
<b>Total AECs used for CY Obligation</b>	<b>943,999</b>	891,994	838,166	525,673	357,575	317,801	235,432
<b>plus ACP Credits</b>	<b>928,636</b>	902,605	835,505	921,626	827,661	593,947	391,470
<b>Total AECs used for CY Obligation</b>	<b>1,872,635</b>	1,794,599	1,673,671	1,447,299	1,185,236	911,748	626,902
<b>Surplus Attributes Banked Forward</b>	<b>3,873</b>	2,869	261	7,347	1,239	7,636	515
<b>ACP Receipts</b>	<b>\$20,429,992</b>	\$19,875,362	\$18,147,169	\$19,750,452	\$17,397,429	\$12,116,514	\$7,829,400

## 8. PROJECTION OF FUTURE RPS AND APS COMPLIANCE OBLIGATIONS AND SUPPLY

DOER projects future RPS and APS compliance obligations through 2021. These projections are based on the ISO-NE "reference case" for load growth in the 2018 CELT Report.<sup>36</sup> This process follows the approach of the RPS/APS Annual Compliance Reports for 2009 through 2015. These forecasts assume normalized weather and normalized economic drivers.

Table 8 lists six years of actual total retail sales (2012-2017) and four years of projected total retail sales (2018-2021) with the resulting actual and projected RPS Class I obligation. SCO and SCO II Minimum Standards are only available through 2019 at the time of this report's publication.

Table 8 also shows actual and projected retail load obligations for RPS Class II and APS. However, electricity sold under pre-2009 contracts is exempt from the Class II and APS standards. DOER does not anticipate any exempt load beyond 2016.

<sup>36</sup> The ISO-NE figures are from Tab 2C, (Energy (GWh)) in the 2018 CELT Report document titled "Forecast Data 2018", dated 5/1/2018, which is listed at <http://www.iso-ne.com/system-planning/system-plans-studies/celt>. They have been adjusted for the exempt municipal load.

**Table 8 MA RPS Class I Actual and Projected Retail Load and Compliance Obligations<sup>37</sup>**

Year	Actual/ Projected Retail Load Obligation	RPS Class I (including Solar Carve-Outs)		Solar Carve-Out and Solar Carve-Out II			RPS Class I – net of the SCO & SCO II	
		Minimum Standard	REC Obligation	SREC Obligation	SREC-II Obligation	Total Obligations	Net REC Obligation	Net Minimum Standard
2012	48,992,430	7.00%	3,429,493	79,882	N/A	79,882	3,349,611	6.8370%
2013	49,252,929	8.00%	3,940,234	140,801	N/A	140,801	3,799,434	7.7141%
2014	48,129,294	9.00%	4,331,636	456,347	N/A	456,347	3,854,245	8.0081%
2015	48,009,723	10.00%	4,800,972	1,005,024	123,317	1,128,341	3,672,631	7.6498%
<b>2016</b>	<b>46,864,429</b>	<b>11.00%</b>	<b>5,155,087</b>	<b>813,188</b>	<b>319,589</b>	<b>1,132,777</b>	<b>4,022,346</b>	<b>8.5829%</b>
2017	45,722,855	12.00%	5,486,742	742,932	1,094,075	1,837,007	3,649,735	7.9823%
2018	46,982,458	13.00%	6,107,720	840,713	1,724,016	2,636,405	3,471,315	7.3885%
2019	46,067,666	14.00%	6,449,474	803,984	1,731,326	2,535,310	3,914,614	8.4966%
2020	45,047,645	16.00%	7,207,623	TBD	TBD	TBD	TBD	TBD
2021	44,327,277	18.00%	7,978,910	TBD	TBD	TBD	TBD	TBD

**a. Projection of Class I Renewable Generation Supply**

Projecting future RPS Class I REC supply is particularly difficult for various reasons. Much of the uncertainty derives from forces external to the program itself, including but certainly not limited to the following:

- renewable energy and climate policies, regulations, and incentives at the federal level;
- generation resulting from the clean energy procurements that have been or are expected to be issued by certain New England States, especially solar farms, onshore, and offshore wind farms.
- approval and installation of new electricity transmission lines to link large wind farms in northern New England and adjacent Canadian provinces to load centers in southern New England;
- decisions by owners of renewable generation in adjacent regions to export power into New England to earn RECs;
- the continued development of in-state solar PV under the SMART Program;
- development of anaerobic digester gas projects supplied from agricultural, food processing, food service, and wastewater treatment facilities, for which Massachusetts provides incentives; and
- interaction between the RPS Class I Minimum Standard and the Clean Energy Standard regulation recently promulgated by the MassDEP.<sup>38</sup>

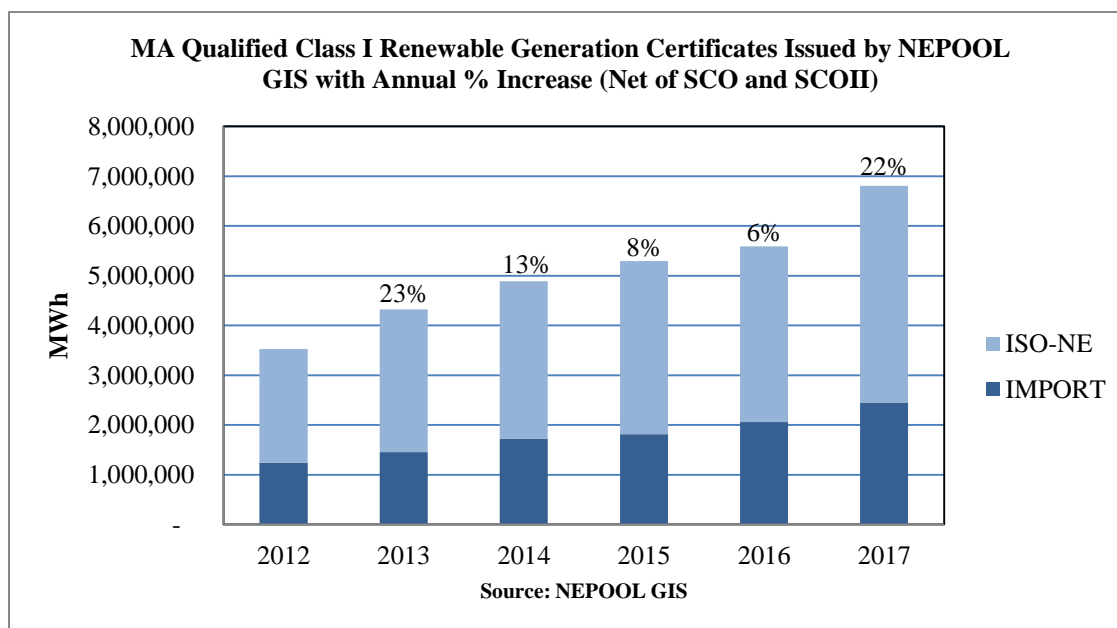
However, Figure 9 shows that steady growth has occurred in the generation of Class I Renewable Generation Certificates (net of the solar carve-outs), mostly from wind and solar in recent years.

<sup>37</sup> Actual Retail Load Obligation through 2017. Actual compliance figures through 2017 are from RPS annual compliance filings. The retail load obligation projections starting in 2018 are based on the ISO-NE load growth projections in its *CELT Report* (see footnotes 36)), not including the load attributable to the RPS/APS-exempt municipally owned companies. In this table, the SREC and SREC-II annual obligations are deducted from the total Class I obligations to show the net Class I REC obligations. The SREC and SREC II obligations take into account actual and projected exempt loads and Minimum Standards that are based on retail contract dates.

<sup>38</sup> See the [MassDEP Clean Energy Standard webpage](#).



**Figure 9 MA Class I Renewable Generation Certificates with Annual Percent Increase<sup>39</sup>**



**b. Projection of SCO I and SCO II Generation Supply**

Accelerated solar PV development began to emerge in the RPS market in 2010 and has been increasing rapidly since. DOER expects further strong growth of solar PV in the years ahead, boosted by the new SMART Program,<sup>40</sup> but anticipates that the supply of SCO and SCO II certificates will begin to level off and possibly decline, as both programs will have reached their cap by 2018 and equipment degradation will likely lead to slightly reduced output on average.

In Table 9, DOER projects that the SCO Load Obligation will remain relatively constant over the next three years. The SCO Load Obligation will slightly increase in 2018 as a result of diminishing Exempt Load (prior to 6/28/13) and an increased Minimum Standard for the remaining load. It will decrease again in 2019 due to lower forecasted supply totals.

**Table 9 Solar Carve-Out Actual and Projected Load Obligations\***

Year	Retail Sales	Load Served Under pre-6/28/13 Retail Contracts	Minimum Standard for pre-6/28/13 Retail Contracts	Pre-6/28/13 SCO Load Obligation	Load Served Under post 6/28/13 Retail Contracts	Minimum Standard for post-6/28/13 Retail Contracts	Post-6/28/13 SCO Load Obligation	SCO Total Load Obligation
2015	48,009,723	4,019,550	1.5359%	61,749	43,990,173	2.1442%	943,275	1,005,024
2016	46,864,429	1,308,729	0.9801%	12,833	45,555,700	1.7568%	800,355	813,188
2017	45,722,855	456,458	0.9861%	4,501	45,266,397	1.6313%	738,431	742,932
2018	46,982,458	109,134	1.4110%	1,540	46,873,324	1.7903%	839,173	840,713
2019	46,067,666	26,585	1.0967%	292	46,067,394	1.7446%	803,692	803,984

\* 2015, 2016 and 2017 represent actual Retail Sales and Load Obligations per LSE Filings.

<sup>39</sup> Note that not all certificates issued by NEPOOL GIS are settled in MA for compliance as many are settled elsewhere, voluntarily retired, or if SRECs or SREC IIs, deposited into DOER's SREC Clearinghouse Auction Accounts.

<sup>40</sup> See [Chapter 75 of the Acts of 2016](#) and DOER's webpage, [Development of the Next Solar Incentive](#).



**c. Projection of SCO II Generation Supply**

The Solar Carve-Out II commenced on April 25, 2014, providing the incentive for continued PV development. Total SCO IIs generated in NEPOOL-GIS grew from 15,908 in 2014 to 556,497 in 2016.

Demand for SREC IIs will be affected over the next few years by the “exempt load” provisions in the regulations, meant to avoid any undue penalty for Suppliers’ retail contracts already in force when this Minimum Standard became effective. Since the program officially started on April 25, 2014, partway into the Compliance Year, the regulations provided that all retail load under contracts on or before that date would be exempt from Solar Carve-Out II compliance.

Emergency regulations enacted on April 8, 2016, expanded the total size of the SCO II program. It also provided for three Minimum Standards effective with Compliance Year 2017: the first for load served prior to April 25, 2014, the second for contracts entered after April 25, 2014, but on or before May 8, 2016, and a third for load served under contracts entered after May 8, 2016.<sup>41</sup> The projection of future Load Obligations with these three different Minimum Standards is shown in Table 10. Note that the Load Obligation will increase substantially in 2017 and 2018 because of diminishing Exempt Loads and higher Minimum Standards.

**Table 10 Solar Carve-Out II Actual and Projected Load Obligations\***

Year	Retail Sales	Exempt Load Served Under pre-4/26/14 Retail Contracts	Minimum Standard #1: Load Served Under pre-5/9/16 Retail Contracts	Minimum Standard #2: pre-5/9/16 Retail Contracts	Pre-5/9/16 SCOII Load Obligation	Load Served Under post-5/8/16 Retail Contracts	Minimum Standard #3: post-5/8/16 Retail Contracts	Post-5/8/16 SCOII Load Obligation	Total SCOII Load Obligation
2014	48,129,294	23,171,635	N/A	N/A	N/A	24,838,088	0.0843%	21,076	21,076
2015	48,009,723	10,516,104	N/A	N/A	N/A	37,493,619	0.3288%	123,317	123,317
2016	46,864,429	6,162,098	N/A	N/A	N/A	40,702,331	0.7851%	319,589	319,589
2017	45,722,855	3,499,290	17,697,344	2.0197%	357,434	24,526,221	2.8628%	702,137	1,059,571
2018	46,982,458	1,958,809	7,769,315	2.6823%	208,397	37,254,334	4.0683%	1,515,619	1,724,016
2019	46,067,666	1,414,568	4,486,014	2.3139%	103,802	41,581,052	3.9141%	1,627,524	1,731,326

\* 2015, 2016 and 2017 represent actual Retail Sales and Load Obligations per LSE Filings.

**d. Projection of the Generation Supply for the SMART Program**

DOER is in the final stages of designing a new solar incentive program pursuant to Chapter 75 of the Acts of 2016. The purpose of the Solar Massachusetts Renewable Target (SMART) program is to establish a statewide solar incentive program to encourage the continued use and development of generating units that use solar photovoltaic technology by residential, commercial, governmental and industrial electricity customers throughout the Commonwealth. The continued use and development of these generating units has the potential to reduce peak demand, system losses, the need for investment in new infrastructure, and distribution congestion; increase grid reliability; improve public health and safety; and diversify the Commonwealth's energy supply. Further, it will also contribute to the Commonwealth's environmental protection goals concerning air emissions including, but not limited to, those required by the Global Warming Solutions Act, M.G.L. c. 21N, §§ 1 through 9, by displacing non-renewable generating resources.

The SMART Program will support 1,600 MW of new solar generating capacity. SMART facilities must use solar photovoltaic technology and be interconnected with the electric grid in the Commonwealth of

<sup>41</sup>See the Minimum Standards links from this [web page](#).

Massachusetts. The aggregate maximum capacity of a SMART facility shall be five MW. DOER expects that the majority of this new supply will be installed within the next 4-5 years, if not sooner.

All Solar Tariff Generation Units with capacities larger than 25 kW AC will be eligible to receive compensation for 20 years from the Solar Tariff Generation Unit's RPS Effective Date. All Solar Tariff Generation Units with capacities less than or equal to 25 kW AC will be eligible to receive compensation for 10 years from the Solar Tariff Generation Unit's RPS Effective Date.

**e. Projection of Renewable Class II Supply**

Renewable Class II Generation Certificates have been in short supply since the beginning of this program in 2009. The limiting factor is that the total pre-1998 installed capacity cannot rise, but some additional portion of that capacity is expected to qualify for Class II over time. DOER notes that out-of-region hydroelectric generation units have begun to apply for Massachusetts Class II qualification beginning in 2018.

The unknown factors for future supply are (a) how much of that capacity, mostly from hydroelectric plants, will succeed in the future to meet the MA RPS Class II environmental criteria, and (b) how much of the MA Class II REC qualified supply will be used for compliance with classes of RPS in other New England states for which they are also qualified. Some of the other New England states have higher ACP rates for pre-1998 capacity. In early 2018, DOER qualified its first Class II hydroelectric facilities outside of the New England grid (New York), which could result in an increase in supply from new imported certificates. In 2016, 94% of Massachusetts-qualified Class II RECs generated were settled in Massachusetts for compliance.<sup>42</sup>

**Table 11 Class II and APS Actual and Projected Compliance Obligations**

Year	Actual/ Projected Load Obligation	Actual/ Projected Exempt Load Obligation	Actual/ Projected Net Load Obligation	RPS Class II REC Minimum Standard	RPS Class II RECs Net Compliance Obligation	RPS Class II WECs at 3.5% of Net Compliance Obligation	APS Minimum Standard	APS Compliance Obligation (AECs)
<b>2012</b>	48,992,430	1,584,015	47,408,416	3.6000%	1,706,727	1,659,318	2.50%	1,185,236
<b>2013</b>	49,252,929	973,011	48,279,918	1.5000%	724,222	1,689,821	3.00%	1,448,421
<b>2014</b>	48,129,294	79,801	48,049,493	1.7500%	840,866	1,681,732	3.50%	1,681,732
<b>2015</b>	48,009,723	34,578	47,975,145	2.0000%	959,503	1,679,130	3.75%	1,799,068
<b>2016</b>	<b>46,864,429</b>	<b>7,892</b>	<b>46,856,537</b>	<b>2.5319%</b>	<b>1,186,361</b>	<b>1,639,979</b>	<b>4.00%</b>	<b>1,874,261</b>
<b>2017</b>	45,722,855	0	45,722,855	2.5909%	1,184,634	1,600,300	4.25%	1,943,222
<b>2018</b>	46,982,458	0	46,982,458	2.6155%	1,228,827	1,644,386	4.50%	2,114,211
<b>2019</b>	46,067,666	0	46,067,666	2.6833%	1,236,134	1,612,368	4.75%	2,188,215
<b>2020</b>	45,047,645	0	45,047,645	3.2056%	1,444,047	1,576,668	5.00%	2,252,383
<b>2021</b>	44,327,277	0	44,327,277	TBD	TBD	1,551,455	5.25%	2,327,183

**f. Projection of Renewable Class II Waste Energy Supply**

The total number of qualified Waste Energy Generation Certificates (WECs) in 2016 closely matched the Waste Energy Standard as shown in Table 6. Banking resumed in 2016 with Suppliers banking 20,566 WECs; however banking is now limited to 5% of a Supplier's WEC obligation while it was 30% before a regulatory change reduced it to 0% in 2014 and 2015. DOER expects the Exempt Load to reach zero by 2017. DOER expects that supply will continue to exceed demand in future years due to the static nature of the 3.5% Minimum Standard, the continued decline in total retail load, and the fact that supply is expected to remain relatively constant.

<sup>42</sup> The percentages of MA Class II RECs settled in other states are based on data from a confidential Regulator's Report at the NEPOOL GIS.

### **g. Projection of Alternative Energy Supply**

As mentioned earlier, historically there have not been enough AECs in the market for Suppliers to meet their obligations and as a result, the Suppliers had to purchase ACPs. However, since 2016 there have been several large APS-qualified combined heat and power systems (CHP) approved and renewable thermal, fuel cell and waste-to-energy facilities began contributing to the APS. This growing supply of AECs should lower and possibly eliminate entirely the shortfall in AECs in 2017. However, much of the supply from renewable thermal and waste-to-energy is a result of AECs minted based on generation from 2015 and 2016. Accordingly, this likely represents a one-time large injection of supply into the market. In 2018 and beyond, DOER expects that new supply from CHP, renewable thermal, and fuel cells will grow at a more predictable and steady pace.

## **9. USES OF THE ALTERNATIVE COMPLIANCE PAYMENT FUNDS**

The Alternative Compliance Payment mechanism for meeting RPS and APS obligations in CY 2016 resulted in total ACP proceeds of slightly more than \$38 million, which represents an increase of about \$6.5 million, or 20%, over 2015 (see Table 12 below). The RPS Class II and the APS accounted for 99.7% of the Alternative Compliance Payments, mostly due to a shortage of qualified generation certificates in each category.

For APS, the annual increase in ACP totals from 2014 through 2016 has primarily been due to the annual increases in the Minimum Standard and a slow movement of projects through the development pipeline. However, the large supply shortfall will likely decline over the coming years with new technologies, such as renewable thermal, waste-to-energy thermal, and fuel cells, entering the market and supplying AECs. Continued increases in the adoption rate of CHP should also contribute to an increase in supply.

**Table 12 ACP Proceeds per Portfolio Standard, 2010-2016 (rounded to the nearest dollar)**

<b>PORTFOLIO STANDARD</b>	<b>2016</b>	<b>2015</b>	<b>2014</b>	<b>2013</b>	<b>2012</b>	<b>2011</b>	<b>2010</b>
<b>RPS CLASS I</b>	\$18,020	\$553,126	\$378,369	\$2,065,273	\$16,350,132	\$6,598,386	\$241,551
<b>RPS SCO</b>	\$27,848	\$1,529,664	\$553,512	\$306,518	\$245,360	\$23,887,474	\$11,682,793
<b>RPS SCO II</b>	\$1,750	\$235,875	\$2,115,001	\$0	\$0	\$0	\$0
<b>RPS CLASS II</b>	\$17,454,800	\$9,176,355	\$7,288,033	\$10,207,169	\$38,347,723	\$35,862,072	\$35,002,925
<b>RPS CLASS II WECS</b>	\$80,982	\$188,491	\$32,232	\$148,236	\$253,993	\$24,113	\$57,970
<b>APS</b>	\$20,429,992	\$19,875,362	\$18,147,169	\$19,750,452	\$17,397,429	\$12,116,514	\$7,829,400
<b>TOTAL</b>	<b>\$38,013,392</b>	<b>\$31,558,873</b>	<b>\$28,514,316</b>	<b>\$32,477,648</b>	<b>\$72,594,637</b>	<b>\$78,488,559</b>	<b>\$54,814,639</b>

The proceeds from Alternative Compliance Payments are held in a bank account by the Massachusetts Clean Energy Center (MassCEC), which is separate from other funds of the MassCEC. DOER oversees the expenditure of this fund under terms of agreements between DOER and MassCEC and under any limitations specified in the regulations.<sup>43</sup>

The regulations provide that the expenditure of ACP funds from RPS Class I and the Solar Carve-Out must “further the commercial development of RPS Class I Renewable Generation Units and Solar Carve-Out Renewable Generation Units.” The expenditure of ACP funds from APS must “further the commercial development of Alternative Generation.” Although the statute and regulations for RPS Class II do not place any restrictions, DOER generally uses Class II ACP funds to support or promote the development of renewable and other clean energy, including, among other things, local and state-level clean energy projects and activities of DOER’s Green Communities Division.

<sup>43</sup>These provisions are found in the Regulations for RPS Class I, RPS Class II, and APS respectively, as follows: 225 CMR 14.08(3)(d), 225 CMR 15.08(3)(b), 225 CMR 15.08(4)(b), and 225 CMR 16.08(3)(b).

## 10. ESTIMATED RATEPAYER COSTS OF COMPLIANCE

The costs of RPS compliance are passed on to ratepayers through their energy supply rates through a variety of mechanisms, including 1) a bilateral contract with a competitive retail supplier, 2) participation in a municipal energy aggregation, or 3) their basic service rate (should their retail supplier also be their local distribution company). These costs are not broken out as a separate line item on electric bills for the vast majority of ratepayers, but are rather embedded into the cost of energy supply and change from time to time as compliance obligations increase or decrease annually or certificate values fluctuate due to changes in the market supply and demand.

Table 13 represents DOER's attempt to estimate the costs of compliance for ratepayers by estimating low and high values for certificates by class, multiplying those values by the number of certificates purchased, and adding the total amount of ACP collected by class. As can be seen, the estimated total cost impact of all of the portfolio standards to ratepayers in 2016 likely fell somewhere between \$515 million and \$645 million. When compared to the annual retail load for 2016, this translates to an estimated average ratepayer impact of \$0.011/kWh and \$0.014/kWh. SREC I accounted for nearly half of these estimated costs in both the low and high cost scenarios, with SREC II and RPS Class I accounting for the second highest proportion of the total in the low and high scenarios, respectively. In each scenario, RPS Class II and APS collectively accounted for 14-15% of the estimated total cost impact.

**Table 13 Estimated RPS Compliance Costs (Low and High Cost Scenarios), 2016**

Scenario	RPS/APS Class	ACP Collected (\$)	Estimated Certificate Value (\$/MWh)	Estimated Total Value of Certificates (\$)	Estimated Total Cost Impact (\$)	Estimated Average Ratepayer Impact (\$/kWh)	% of Total
<b>Low Certificate Cost Scenario</b>	RPS Class I	\$18,020	\$20.00	\$80,981,400	\$80,999,420	\$0.0017	15.7%
	SREC I	\$27,848	\$320.00	\$268,676,480	\$268,704,328	\$0.0057	52.1%
	SREC II	\$1,750	\$270.00	\$88,103,160	\$88,104,910	\$0.0019	17.1%
	RPS Class II Renewable	\$17,454,800	\$24.00	\$13,471,776	\$30,926,576	\$0.0007	6.0%
	RPS Class II Waste	\$80,982	\$5.00	\$8,258,845	\$8,339,827	\$0.0002	1.6%
	APS	\$20,429,992	\$19.00	\$17,955,057	\$38,385,049	\$0.0008	7.4%
	<b>TOTAL</b>	<b>\$38,013,392</b>	<b>N/A</b>	<b>\$477,446,718</b>	<b>\$515,460,110</b>	<b>\$0.0110</b>	<b>100%</b>
<b>High Certificate Cost Scenario</b>	RPS Class I	\$18,020	\$40.00	\$161,962,800	\$161,980,820	\$0.0035	25.1%
	SREC I	\$27,848	\$360.00	\$302,261,040	\$302,288,888	\$0.0065	46.9%
	SREC II	\$1,750	\$280.00	\$91,366,240	\$91,367,990	\$0.0019	14.2%
	RPS Class II Renewable	\$17,454,800	\$27.00	\$15,155,748	\$32,610,548	\$0.0007	5.1%
	RPS Class II Waste	\$80,982	\$10.00	\$16,517,690	\$16,598,672	\$0.0004	2.6%
	APS	\$20,429,992	\$21.00	\$19,845,063	\$40,275,055	\$0.0009	6.2%
	<b>TOTAL</b>	<b>\$38,013,392</b>	<b>N/A</b>	<b>\$607,108,581</b>	<b>\$645,121,973</b>	<b>\$0.0138</b>	<b>100%</b>

Table 14 represents DOER's attempt to estimate the range of total costs of compliance for ratepayers during the period of 2011 through 2016 using the same methodology that was used to estimate the 2016 costs.

**Table 14 Estimated Total RPS/APS Compliance Costs (Low and High Cost Scenarios), 2011 - 2016**

Scenario	RPS/APS Class	2011	2012	2013	2014	2015	2016
<b>Low Certificate Cost Scenario</b>	RPS Class I	\$111,123,266	\$135,825,012	\$151,416,113	\$143,411,369	\$148,109,966	\$80,999,420
	SREC I	\$37,177,474	\$15,743,560	\$36,203,768	\$130,354,392	\$341,287,764	\$268,704,328
	SREC II	N/A	N/A	N/A	\$7,430,221	\$32,812,315	\$88,104,910
	RPS Class II Renewable	\$41,064,456	\$44,021,018	\$21,928,176	\$19,921,993	\$22,121,931	\$30,926,576
	RPS Class II Waste	\$7,864,748	\$8,804,578	\$8,667,136	\$7,235,582	\$8,289,051	\$8,339,827
	APS	\$17,965,110	\$23,718,651	\$29,854,291	\$33,937,689	\$36,872,800	\$38,385,049
	<b>TOTAL</b>	<b>\$215,195,054</b>	<b>\$228,112,819</b>	<b>\$248,069,484</b>	<b>\$342,291,246</b>	<b>\$589,493,827</b>	<b>\$515,460,110</b>
<b>High Certificate Cost Scenario</b>	RPS Class I	\$163,385,706	\$195,562,452	\$226,091,533	\$214,927,869	\$221,888,386	\$161,980,820
	SREC I	\$38,506,474	\$19,618,110	\$39,075,548	\$144,776,712	\$363,938,304	\$302,288,888
	SREC II	N/A	N/A	N/A	\$7,899,211	\$37,824,075	\$91,367,990
	RPS Class II Renewable	\$41,773,872	\$44,761,013	\$23,457,003	\$21,501,238	\$23,740,128	\$32,610,548
	RPS Class II Waste	\$15,705,383	\$17,355,163	\$17,186,036	\$14,438,932	\$16,389,611	\$16,598,672
	APS	\$18,614,954	\$24,421,009	\$30,917,853	\$35,599,849	\$38,662,004	\$40,275,055
	<b>TOTAL</b>	<b>\$277,986,389</b>	<b>\$301,717,747</b>	<b>\$336,727,973</b>	<b>\$439,143,811</b>	<b>\$702,442,508</b>	<b>\$645,121,973</b>

Table 15 represents DOER's attempt to estimate the range of the average \$/kWh cost of compliance for ratepayers during the period of 2011 through 2016. While estimated costs have more than doubled since 2011, the programs now collectively support significantly more renewable and alternative energy generation. It is also noteworthy that estimated cost impacts also likely declined between 2015 and 2016.

**Table 15 Estimated \$/kWh RPS/APS Compliance Costs (Low and High Cost Scenarios), 2011 - 2016**

Scenario	RPS/APS Class	2011	2012	2013	2014	2015	2016
<b>Low Certificate Cost Scenario</b>	RPS Class I	\$0.0023	\$0.0028	\$0.0031	\$0.0030	\$0.0031	\$0.0017
	SREC I	\$0.0008	\$0.0003	\$0.0007	\$0.0027	\$0.0071	\$0.0057
	SREC II	N/A	N/A	N/A	\$0.0002	\$0.0007	\$0.0019
	RPS Class II Renewable	\$0.0008	\$0.0009	\$0.0004	\$0.0004	\$0.0005	\$0.0007
	RPS Class II Waste	\$0.0002	\$0.0002	\$0.0002	\$0.0002	\$0.0002	\$0.0002
	APS	\$0.0004	\$0.0005	\$0.0006	\$0.0007	\$0.0008	\$0.0008
	<b>TOTAL</b>	<b>\$0.0044</b>	<b>\$0.0047</b>	<b>\$0.0050</b>	<b>\$0.0071</b>	<b>\$0.0123</b>	<b>\$0.0110</b>
<b>High Certificate Cost Scenario</b>	RPS Class I	\$0.0033	\$0.0040	\$0.0046	\$0.0045	\$0.0046	\$0.0035
	SREC I	\$0.0008	\$0.0004	\$0.0008	\$0.0030	\$0.0076	\$0.0065
	SREC II	N/A	N/A	N/A	\$0.0002	\$0.0008	\$0.0019
	RPS Class II Renewable	\$0.0008	\$0.0009	\$0.0005	\$0.0004	\$0.0005	\$0.0007
	RPS Class II Waste	\$0.0003	\$0.0004	\$0.0003	\$0.0003	\$0.0003	\$0.0004
	APS	\$0.0004	\$0.0005	\$0.0006	\$0.0007	\$0.0008	\$0.0009
	<b>TOTAL</b>	<b>\$0.0056</b>	<b>\$0.0062</b>	<b>\$0.0068</b>	<b>\$0.0091</b>	<b>\$0.0146</b>	<b>\$0.0138</b>

## APPENDIX ONE: 2016 Massachusetts Retail Electricity Suppliers<sup>44</sup>

### Distribution Utilities

Fitchburg Gas & Electric Co. (Unitil)	NSTAR Electric Co. dba NSTAR
Massachusetts & Nantucket Electric Companies dba National Grid	Western Mass Electric Company dba National Grid

### Competitive Suppliers

Abest Power & Gas, LLC	<b>Eligo Energy MA, LLC</b>	Oasis Power, LLC
Agera Energy LLC	Energy Plus Holdings	Palmco Power MA, LLC
Ambit Northeast, LLC	ENGIE Resources LLC	Perigee Energy, LLC
<b>Atlantic Energy MA LLC</b>	ENGIE Retail, LLC, dba Think Energy	Provider Power MASS, LLC
<b>Blue Rock Energy, Inc.</b>	First Point Power, LLC	Public Power, LLC
<b>Calpine Energy Solutions, LLC</b>	Great Eastern Energy (BBPC, LLC)	Reliant Energy Northeast LLC
Champion Energy Services, LLC	Green Mountain Energy Company	REP Energy, LLC
Clean Choice	Hampshire Council of Governments	SFE Energy Massachusetts Inc.
Clearview Electric, Inc.	<b>Harborside Energy of Massachusetts, LLC</b>	SmartEnergy Holdings, LLC
<b>Connecticut Municipal Electric Energy Cooperative (CMEEC)</b>	Harvard Dedicated Energy Limited	South Jersey Energy Company
Consolidated Edison Solutions, Inc.	Hudson Energy Services, LLC	Spark Energy, LP
Constellation Energy Power Choice, Inc.	Interstate Gas Supply, Inc., dba IGS Energy	Starion Energy, Inc.
Constellation Energy Services, Inc.	Inspire Energy Holdings, LLC	Sunwave Gas & Power Massachusetts, Inc.
Constellation New Energy, Inc.	Just Energy Massachusetts Corp.	Texas Retail Energy, LLC.
Devonshire Energy LLC	Liberty Power Holdings LLC	Town Square Energy, LLC
Direct Energy Business, LLC	Major Energy Electric Service, LLC	TransCanada Power Marketing Ltd
Direct Energy Business Marketing, LLC	Massachusetts Gas & Electric Co.	<b>Union Atlantic Electricity, LLC</b>
Direct Energy Services, LLC	Mega Energy Holdings, LLC	Verde Energy USA Massachusetts, LLC
Discount Power, Inc.	Mint Energy, LLC	Viridian Energy, LLC
East Avenue Energy	NextEra Energy Services Massachusetts, LLC	Xoom Energy Massachusetts, LLC
<b>EDF</b>	<b>Nordic Energy Services, LLC</b>	

<sup>44</sup> All new Suppliers since 2015 are shown in **bold**.

**APPENDIX TWO: COMPLIANCE FILINGS, REVIEW, AND VERIFICATION**

Abest Power and Gas, LLC (Abest) submitted a compliance filing for 2016 but did not show sufficient acquisition of certificates sufficient to cover its Minimum Standard obligations, nor did Abest make any Alternative Compliance Payments to cover the remainder of its RPS and APS compliance obligations for 2016. Abest's outstanding ACP obligation as of the date this report was released is \$774,321.95. Accordingly, DOER has found Abest to be in non-compliance pursuant to the non-compliance provisions of 225 CMR 14.12, 225 CMR 15.12 and 225 CMR 16.11. DOER filed a petition with the Department of Public Utilities (DPU), requesting that Abest's license to sell electricity be revoked or suspended pursuant to 220 CMR 11.07(4)(c)1.: *Licensure Action*, due to their state of non-compliance. The DPU responded to DOER by noting that Abest's license was revoked shortly after DOER filed its petition due to an unrelated matter, rendering DOER's petition moot. DOER continues to explore other potential avenues to obtain the ACP that it is owed by Abest.



**APPENDIX THREE: 2016 RPS and APS Compliance Summaries<sup>45</sup>**

**TABLE A RPS CLASS I COMPLIANCE SUMMARY, 2016 (MWh)<sup>46</sup>**

	RETAIL SALES	CLASS I RENEWABLE GENERATION ATTRIBUTES					8.4581% RPS CLASS I NET OBLIGATION	BANKING FOR FUTURE COMPLIANCE		
RETAIL ELECTRICITY SUPPLIERS	Load Obligation from Filing	2016 Class I RECs	2014 Banked Attributes	2015 Banked Attributes	Alternative Compliance Credits	Total RPS Class I Attributes		Excess Attributes	Banking Limit (30%)	Banked Attributes
DISTRIBUTION COMPANIES										
Fitchburg Gas & Electric	178,949	15,137	-	-	-	15,137	15,136	1	4,541	1
National Grid	6,993,476	620,692	-	41,107	-	661,799	591,515	70,284	177,455	70,284
NSTAR	6,736,412	519,072	-	50,721	-	569,793	569,772	21	170,932	21
W Mass Electric	1,427,710	120,755	-	2	-	120,757	120,757	-	36,228	-
SUBTOTALS	15,336,547	1,275,656	-	91,830	-	1,367,486	1,297,180	70,306	389,156	70,306
COMPETITIVE SUPPLIERS										
SUBTOTALS	31,527,882	2,773,414	10,751	368,675	3,774	3,156,614	2,725,166	431,448	817,579	431,448
TOTALS	46,864,429	4,049,070	10,751	460,505	3,774	4,524,100	4,022,346	501,754	1,206,735	501,754

**TABLE B RPS SOLAR CARVE-OUT RENEWABLE ENERGY COMPLIANCE SUMMARY, 2016 (MWh)**

	RETAIL SALES	SOLAR CARVE-OUT RENEWABLE GENERATION ATTRIBUTES					1.7850% avg RPS SCO Obligation	BANKING FOR FUTURE COMPLIANCE		
RETAIL ELECTRICITY SUPPLIERS	Load Obligation from Filing	2016 SRECs	2014 Banked Attributes	2015 Banked Attributes	Alternative Compliance Credits	Total RPS SCO Attributes		Excess Attributes	Banking Limit (10%)	Banked Attributes
DISTRIBUTION COMPANIES										
Fitchburg Gas & Electric	178,949	3,176	-	-	-	3,176	3,144	32	315	32
National Grid	6,993,476	133,124	-	-	-	133,124	122,862	10,262	12,287	10,262
NSTAR	6,736,412	117,951	-	395	-	118,346	118,346	-	11,835	-
W Mass Electric	1,427,710	25,077	-	6	-	25,083	25,083	-	2,509	-
SUBTOTALS	15,336,547	279,328	-	401	-	279,729	729	-	73	-
COMPETITIVE SUPPLIERS										
SUBTOTALS	31,527,882	560,286	97	9,269	788	570,440	812,459	36,981	81,275	36,979
TOTALS	46,864,429	839,614	97	9,670	788	850,169	813,188	36,981	81,348	36,979

<sup>45</sup> All data for the Competitive Suppliers is aggregated in these four tables in accordance with the provision for confidentiality of product-specific data in the RPS Class I Regulations, 225 CMR 14.09(2)(b). Data for the regulated distribution utility companies are made public in filings at the MA Department of Public Utilities. Names of all Retail Electricity Suppliers are listed in Appendix Two.

<sup>46</sup> Solar Carve-Out and Solar Carve-Out II are netted out from the Class I table, although included in Tables G, H, and I of Appendix Four.

**TABLE C RPS SOLAR CARVE-OUT II RENEWABLE ENERGY COMPLIANCE SUMMARY, 2016**

	RETAIL SALES			SOLAR CARVE-OUT II RENEWABLE GENERATION ATTRIBUTES						0.7852% RPS SCO II Obligation	BANKING FOR FUTURE COMPLIANCE		
RETAIL ELECTRI- CITY SUPPLI- ERS	Load Obligation from Filing	Exempt Retail Load (under pre- 4/25/14 contracts)	Net Retail Load	2016 SREC-II's	2014 Banked	2015 Banked	Alternative Compliance Credits	Total RPS SCO II Attributes	Excess Attributes		Banking Limit (10%)	Banked Attributes	
DISTRIBUTION COMPANIES													
Fitchburg Gas & Electric	178,949	-	178,949	1,370	-	62	-	1,432	1,405	27	141	27	
National Grid	6,993,476	-	6,993,476	54,906	-	-	-	54,906	54,906	-	5,491	-	
NSTAR	6,736,412	-	6,736,412	51,157	-	1,784	-	52,941	52,888	53	5,289	53	
W. Mass Electric	1,427,710	-	1,427,710	11,220	-	-	-	11,220	11,209	11	1,121	11	
SUB- TOTALS	15,336,547	-	15,336,547	118,653	-	1,846	-	120,499	120,408	91	12,042	91	
COMPETITIVE SUPPLIERS													
SUB- TOTALS	31,527,882	6,162,098	25,365,784	207,655	1	1,172	331	209,159	199,181	9,978	19,943	9,968	
TOTALS	46,864,429	6,162,098	40,702,331	326,308	1	3,018	331	329,658	319,589	10,069	31,985	10,059	

**TABLE D RPS CLASS II RENEWABLE ENERGY COMPLIANCE SUMMARY, 2016 (MWh)**

	RETAIL SALES			CLASS II RENEWABLE ENERGY ATTRIBUTES					2.5319% RPS Class II RE Obligation	BANKING FOR FUTURE COMPLIANCE		
RETAIL ELECTRI- CITY SUPPLI- ERS	Load Obligation from Filing	Exempt Retail Load	Net Retail Load	2016 Class II RECs	2013 Banked	2014 Banked Attributes	Alternative Compliance Credits	Total RPS Class II RE Attributes		Excess Attributes	Banking Limit (30%)	Banked Attributes
DISTRIBUTION COMPANIES												
Fitchburg Gas & Electric	178,949	0	178,949	2,752	0	0	1,779	4,531	4,531	0	1,360	0
National Grid	6,993,476	0	6,993,476	177,616	0	0	0	177,616	177,068	548	53,121	548
NSTAR	6,736,412	0	6,736,412	6,419	0	0	164,141	170,560	170,560	0	51,168	0
W. Mass Electric	1,427,710	0	1,427,710	1,360	0	0	34,789	36,149	36,149	0	10,845	0
SUB- TOTALS	15,336,547	0	15,336,547	188,147	0	0	200,709	388,856	388,308	548	116,494	548
SUB- TOTALS	31,527,882	7,892	31,519,984	373,177	0	7,317	435,061	815,555	798,086	17,469	239,455	17,469
TOTALS	46,864,429	7,892	46,856,531	561,324	0	7,317	635,770	1,204,411	1,186,394	18,017	355,949	18,017

**TABLE E RPS CLASS II WASTE ENERGY COMPLIANCE SUMMARY, 2016 (MWH)**

	RETAIL SALES			CLASS II WASTE ENERGY ATTRIBUTES					3.5% RPS Class II WE Obligation	BANKING FOR FUTURE COMPLIANCE		
RETAIL ELECTRICITY SUPPLIERS	Load Obligation from Filing	Exempt Retail Load	Net Retail Load	2016 Class II WECs	2013 Banked Attributes	2014 Banked Attributes	Alternative Compliance Credits	Total RPS Class II WE Attributes		Excess Attributes	NO Banking in 2014 or 2016	Banked Attributes
DISTRIBUTION COMPANIES												
Fitchburg Gas & Electric	178,949	0	178,949	6,000	0	0	264	6,264	6,264	0	314	0
National Grid	6,993,476	0	6,993,476	245,000	0	0	0	245,000	244,772	228	12,239	228
NSTAR	6,736,412	0	6,736,412	236,011	0	0	0	236,011	235,775	236	11,789	236
W. Mass Electric	1,427,710	0	1,427,710	50,020	0	0	0	50,020	49,970	50	2,499	50
SUB-TOTALS	15,336,547	0	15,336,547	537,031	0	0	264	537,295	536,781	514	26,841	514
SUB-TOTALS	31,527,882	7,892	31,519,984	1,114,738	0	0	8,549	1,123,287	1,103,235	20,052	55,191	19,597
TOTALS	46,864,429	7,892	46,856,531	1,651,769	0	0	8,813	1,660,582	1,640,016	20,566	82,032	20,111

**TABLE F APS ALTERNATIVE ENERGY COMPLIANCE SUMMARY, 2016 (MWH)**

	RETAIL SALES			APS ALTERNATIVE ENERGY ATTRIBUTES						4.00% APS Obligation	BANKING FOR FUTURE COMPLIANCE		
RETAIL ELECTRICITY SUPPLIERS	Load Obligation from Filing	Exempt Retail Load	Net Retail Load	2016 APS AECs	2013 Banked	2014 Banked Attributes	Alternative Compliance Credits	Total APS Attributes	Excess Attributes		Banking Limit (30%)	Banked Attributes	
DISTRIBUTION COMPANIES													
Fitchburg Gas & Electric	178,949	0	178,949	3,500	0	0	3,658	7,158	7,158	0	2,148	0	
National Grid	6,993,476	0	6,993,476	234,720	0	0	45,020	279,740	279,740	0	83,922	0	
NSTAR	6,736,412	0	6,736,412	219,475	0	0	49,982	269,457	269,457	0	80,838	0	
W. Mass Electric	1,427,710	0	1,427,710	46,515	0	0	10,594	57,109	57,109	0	17,133	0	
SUB-TOTALS	15,336,547	0	15,336,547	504,210	0	0	109,254	613,464	613,464	0	184,041	0	
COMPETITIVE SUPPLIERS													
SUB-TOTALS	31,527,882	7,892	31,519,985	440,793	0	2,869	821,041	1,264,703	1,260,830	3,873	378,276	3,873	
TOTALS	46,864,429	7,892	46,856,532	945,003	0	2,869	930,295	1,878,167	1,874,294	3,873	562,317	3,873	

#### APPENDIX FOUR: Data Tables for Compliance by Generation Location and Type<sup>47</sup>

The first three tables below provide the data from which the Class I graphs in Figures 2 through 6 were generated. Those graphs and these tables include SREC data (both SREC and SREC II) for the SCO and SCO II programs, which are within Class I. SREC data beginning in 2012 also includes SRECs that were transferred to the Auction Account at the GIS, becoming Reminted Auction SRECs, which are available to use for SCO compliance in the two or three years after their generation year.

**TABLE G RPS CLASS I COMPLIANCE BY GENERATION LOCATION, 2007-2016**

	2007 MWh	2008 MWh	2009 MWh	2010 MWh	2011 MWh	2012 MWh	2013 MWh	2014 MWh	2015 MWh	2016 MWh %	
CT	10,180	25,333	21,371	20,146	16,414	16,070	16,452	11,397	5,973	6,829	0.1%
ME	520,821	500,479	526,906	760,476	746,648	864,227	1,114,355	1,039,509	1,170,728	1,219,261	23.3%
MA	192,200	197,949	197,530	197,748	286,115	483,925	791,088	1,118,406	1,538,702	1,659,136	31.7%
NH	265,062	261,468	307,309	282,308	331,996	531,430	640,808	508,841	495,212	358,956	6.9%
RI	42,562	34,484	26,061	1,182	41,952	37,131	23,288	11,059	9,496	8,210	0.2%
VT	46,915	49,207	112,670	108,849	149,505	173,191	364,691	407,497	342,023	382,949	7.3%
NMISA <sup>48</sup>	54,079	66,418	66,071	89,405	22,742	49,144	64,629	67,369	353	5,166	0.1%
NY	265,299	517,427	527,751	580,683	688,039	620,904	870,508	880,859	666,330	1,025,674	19.6%
NS	0	0	0	0	0	0	0	0	0	1,173	0.0%
PEI	16,922	28,111	113,282	144,549	142,688	125,713	142,478	189,578	227,942	230,705	4.4%
QC	185,493	215,935	230,367	138,263	213,713	278,794	356,139	397,130	339,366	336,421	6.4%
<b>Total</b>	<b>1,599,533</b>	<b>1,896,811</b>	<b>2,129,318</b>	<b>2,323,609</b>	<b>2,639,812</b>	<b>3,141,663</b>	<b>4,384,436</b>	<b>4,631,645</b>	<b>4,796,125</b>	<b>5,234,480</b>	<b>100%</b>

**TABLE H RPS CLASS I COMPLIANCE BY GENERATION TYPE, 2007-2016**

Type <sup>49</sup>	2007 MWh	2008 MWh	2009 MWh	2010 MWh	2011 MWh	2012 MWh	2013 MWh	2014 MWh	2015 MWh	2016 MWh %	
Anaerobic Digester Gas	27,511	26,328	28,204	24,292	25,115	27,373	22,853	9,868	43,837	42,099	0.8%
Other Biomass	782,315	743,882	571,757	584,505	392,629	394,754	357,575	375,109	320,801	2,501	0.0%
Hydroelectric	0	0	47,490	80,823	105,484	105,326	113,936	129,790	129,810	133,389	2.5%
Landfill Gas	486,558	660,937	690,851	736,298	848,229	891,798	954,656	820,001	587,790	722,539	13.8%
Marine & Hydrokinetic	0	0	0	0	0	0	6,837	28,959	47	48	0.0%
Solar PV	803	1,799	2,420	4,116	36,688	138,159	323,164	681,502	1,194,925	1,324,578	25.3%
Wind	302,346	463,865	789,196	893,575	1,231,667	1,623,119	2,605,415	2,586,416	2,518,915	3,009,326	57.5%
<b>Totals</b>	<b>1,599,533</b>	<b>1,896,811</b>	<b>2,129,918</b>	<b>2,323,609</b>	<b>2,639,812</b>	<b>3,180,529</b>	<b>4,384,436</b>	<b>4,631,645</b>	<b>4,796,172</b>	<b>5,234,480</b>	<b>100%</b>

<sup>47</sup> Note that regularly updated tables listing all RPS and APS qualified Generation Units, including their locations and types, are available for viewing and downloading via DOER's RPS/APS [Qualified Generation Units webpage](#).

<sup>48</sup> NMISA is the Northern Maine Independent System Administrator.

<sup>49</sup> Note that the Massachusetts RPS statute and regulations include "biogas" (including anaerobic digestion gas) within the list of Eligible Biomass Fuels. However, DOER tracks anaerobic digester generation separately. Landfill gas, which is included within "biomass" in some state RPS programs, is listed separately from Biomass in the Massachusetts RPS statute and regulations. Note that, as of 2012, the Solar PV figures include SRECs that were transferred to the Auction and became Reminted Auction SRECs.

**TABLE I RPS CLASS I COMPLIANCE BY GENERATION LOCATION AND TYPE, 2016 (MWh)**

Location	Digester Gas	Biomass	Hydro-Electric	Landfill Gas	Marine/Hydrokinetic	Solar PV	Wind	Total
CT	0	0	154	5,055	0	1,620	0	6,829
ME	3,121	0	43,575	20,231	0	5,934	1,146,400	1,219,261
MA	37,109	2,501	31,859	186,800	48	1,196,966	203,853	1,659,136
NH	0	0	16,675	48,630	0	5,975	287,676	358,956
RI	0	0	0	160	0	2,833	5,217	8,210
VT	1,869	0	41,126	55,715	0	111,250	172,989	382,949
NY	0	0	0	361,112	0	0	664,562	1,025,674
NMISA	0	0	0	0	0	0	5,166	5,166
NS	0	0	0	0	0	0	1,173	1,173
PEI	0	0	0	0	0	0	230,705	230,705
QC	0	0	0	44,836	0	0	291,585	336,421
<b>TOTAL</b>	42,099	2,501	133,389	722,539	48	1,324,578	3,009,326	5,234,480

**TABLE J RPS CLASS II RENEWABLE ENERGY COMPLIANCE BY GENERATION LOCATION, 2010-2016**

Location	Year	2010 MWh	2011 MWh	2012 MWh	2013 MWh	2014 MWh	2015 MWh	2016 MWh	%
Connecticut		2,378	11,178	2,933	5,848	6,557	4,410	14,461	2.6%
Maine		18,605	42,540	72,014	171,754	110,517	104,395	112,269	20.0%
Massachusetts		14,711	21,200	61,082	97,982	184,538	213,229	180,920	32.2%
New Hampshire		29,369	69,674	55,454	86,931	96,101	94,336	87,538	15.6%
Rhode Island		3,040	3,524	1,448	1,597	2,524	1,709	2,777	0.5%
Vermont		28,837	30,610	53,106	145,497	126,143	119,155	151,251	26.9%
New York		6,897	57,856	0	0	0	0	12,108	2.2%
<b>Total</b>		103,837	236,582	246,037	509,609	526,380	537,234	561,324	100.0%

**TABLE K RPS CLASS II RENEWABLE ENERGY COMPLIANCE BY GENERATION TYPE, 2010-2016**

Type	Year	2010 MWh	2011 MWh	2012 MWh	2013 MWh	2014 MWh	2015 MWh	2016 MWh	%
Hydropower		96,552	172,051	246,037	509,462	526,097	535,799	525,392	93.6%
Landfill Methane		0	7,285	64,531	0	0	0	26,965	4.8%
Marine/Hydrokinetic		0	0	0	147	240	242	244	0.0%
Solar PV		0	0	0	0	36	0	0	0.0%
Wind		0	0	0	0	7	1,193	8,723	1.6%
<b>Total</b>		96,552	179,336	310,568	509,609	526,380	537,234	561,324	100.0%

**TABLE L RPS CLASS II COMPLIANCE BY GENERATION LOCATION AND TYPE, 2016 (MWh)**

Location	Hydro-Electric	Landfill Methane Gas	Marine/Hydrokinetic	Wind	Total
CT	5,581	8,880	0	0	14,461
ME	112,269	0	0	0	112,269
MA	180,676	0	244	0	180,920
NH	81,653	5,885	0	0	87,538
RI	2,777	0	0	0	2,777
VT	142,436	92	0	8,723	151,251
NY	0	12,108	0	0	12,108
<b>TOTAL</b>	<b>525,392</b>	<b>26,965</b>	<b>244</b>	<b>8,723</b>	<b>561,324</b>

**TABLE M APS COMPLIANCE BY GENERATION TYPE, 2010-2016**

Type <sup>50</sup>	Year							
	2010 MWh	2011 MWh	2012 MWh	2013 MWh	2014 MWh	2015 MWh	2016 MWh	%
CHP – Biomass	0	0	0	2,689	2,797	3,138	2,548	0.3%
CHP – Natural Gas	225,104	324,619	347,993	529,462	826,966	890,835	938,838	99.3%
CHP – Waste to Energy	0	0	0	0	855	531	893	0.1%
Flywheel Storage	2,030	303	3,186	489	377	98	2,724	0.3%
<b>Total</b>	<b>227,134</b>	<b>324,922</b>	<b>351,179</b>	<b>532,640</b>	<b>830,995</b>	<b>894,602</b>	<b>945,003</b>	<b>100%</b>

**TABLE N VOLUNTARY RENEWABLE ENERGY CERTIFICATES RETIRED FOR RGGI BY GENERATION LOCATION AND TYPE, 2016 (MWh)<sup>51</sup>**

Type	Anaerobic Digester Gas	Other Biomass	Hydro-electric	Landfill Methane Gas	Marine & Hydro-kinetic	Solar Photo-voltaic	Wind	Total
Location								
Connecticut	0	0	0	0	0	0	0	0
Maine	0	0	0	0	0	0	11,834	11,834
Massachusetts	1,773	0	0	84	0	2,584	15,505	19,946
New Hampshire	0	0	0	0	0	0	0	0
Rhode Island	0	0	0	0	0	0	0	0
Vermont	0	0	0	0	0	101	191	292
No. Maine ISA (NMISA)	0	0	0	0	0	0	0	0
New York	0	0	0	651	0	0	1,682	2,333
Nova Scotia	0	0	0	0	0	0	483	483
Prince Edward Island	0	0	0	0	0	0	0	0
Quebec	0	0	0	0	0	0	25	25
<b>TOTAL</b>	<b>1,773</b>	<b>0</b>	<b>0</b>	<b>735</b>	<b>0</b>	<b>2,685</b>	<b>29,720</b>	<b>34,913</b>

<sup>50</sup> CHP = Combined Heat and Power.

<sup>51</sup> These RPS Class I RECs were documented in the Filings and/or NEPOOL GIS reports and are qualified to be retired by the MassDEP for the Regional Greenhouse Gas Initiative. For additional details, see footnote 21.