STATE OF MARYLAND

PUBLIC SERVICE COMMISSION

February 1, 2018

The Honorable Thomas V. "Mike" Miller, Jr.
President of the Senate
State House, H-107
Annapolis, Maryland 21401

The Honorable Michael E. Busch
Speaker of the House of Delegates
State House, H-101
Annapolis, Maryland 21401

Re: ***Renewable Energy Portfolio Standard Report With Data for Calendar Year 2016 in Compliance with § 7-712 of the Public Utilities Article, Annotated Code of Maryland (MSAR #2554)***

Dear President Miller and Speaker Busch:

Pursuant to § 7-712 of the Public Utilities Article, *Annotated Code of Maryland*, enclosed is the Public Service Commission's *Renewable Energy Portfolio Standard Report With Data for Calendar Year 2016.*

By Direction of the Commission,

David J. Collins
Executive Secretary

DJC:tlj

Enclosure

cc: Sarah T. Albert (5 copies)

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PUBLIC SERVICE COMMISSION OF MARYLAND

RENEWABLE ENERGY PORTFOLIO STANDARD REPORT

With Data for Calendar Year 2016

In compliance with Section 7-712 of
the Public Utilities Article,
Annotated Code of Maryland

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January 2018

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I. INTRODUCTION

This document constitutes the annual report of the Public Service Commission of Maryland ("Commission") regarding the implementation of the Maryland Renewable Energy Portfolio Standard ("RPS") Program, with data for calendar year 2016. This report is submitted pursuant to § 7-712 of the Public Utilities Article, *Annotated Code of Maryland* ("PUA"), which requires the Commission to report to the General Assembly on the status of the implementation of the RPS Program on or before February 1 of each year.[1] The Maryland RPS Program is designed to support a stable and predictable market for energy generated from renewables, and to lower the cost to consumers of electricity produced from these resources. Implementation of the RPS Program assists in overcoming market barriers seen as impediments to the development of the industry. Moreover, increasing reliance upon renewable energy technologies to satisfy electric power requirements can result in long-term emission reductions, increased fuel diversity, and economic benefits to the State.[2]

The calendar year 2016 electricity supplier compliance reports, as verified by the Commission, indicate that the State of Maryland RPS obligations were almost entirely fulfilled through the submission of the appropriate level of Tier 1 and Tier 2 Renewable Energy Credits ("RECs").[3] The remaining balance of calendar year 2016 RPS obligations was satisfied by a small reliance on compliance fees, also known as alternative compliance payments ("ACPs").

A. Objectives of the Program

The objective of PUA § 7-701 *et seq.* (hereinafter, "RPS Statute") is to recognize and to develop the benefits associated with a diverse portfolio of renewable energy resources to serve Maryland. The State's RPS Program does this by recognizing the environmental and consumer benefits associated with renewable energy. The RPS Program requires electricity suppliers to supply a prescribed minimum portion of their retail electricity sales with various renewable energy sources, which have been classified within the RPS Statute as Tier 1 and Tier 2 renewable sources. The program is implemented through the creation, sale, and transfer of RECs.

The development of renewable energy resources is further promoted by requiring electricity suppliers to pay an ACP for failing to acquire sufficient RECs to satisfy the RPS as set forth in PUA § 7-703. Compliance fees are deposited into the Maryland Strategic Energy Investment Fund ("SEIF") as dedicated funds to provide for loans and grants that spur the creation of new Tier 1 renewable energy resources in the State. Responsibility for developing renewable energy resources is vested with the Maryland Energy Administration ("MEA").

[1] Electricity suppliers must file an RPS compliance report with the Commission for the prior calendar year by April 1st of the subsequent year. Consequently, this report, which is due to the General Assembly in February 2018, highlights data from electricity suppliers' 2016 compliance reports and other relevant 2016 data. In compliance with PUA § 7-712, topics addressed in this report include the availability of Tier 1, Tier 1 Solar, and Tier 2 renewable energy sources, compliance fees collected to support in-State renewable projects, and other pertinent information.

[2] *See* PUA § 7-702, which describes the legislative intent and legislative findings in support of the enactment of the Maryland Renewable Energy Portfolio Standard.

[3] *See* Section I.B.2 for a description of eligible Tier 1 and Tier 2 resources and requirements.

B. Overview of the Maryland RPS Program

Under the RPS Program, Maryland electricity suppliers are required to demonstrate compliance on an annual basis with an escalating renewable energy portfolio standard. This requirement applies to both competitive retail suppliers and electric companies in the State – including those that provide Standard Offer Service.[4] Electricity suppliers must file annual compliance reports with the Commission verifying that the renewable requirement for each entity has been satisfied.

Each electricity supplier must document annually the retirement of RECs equal to the percentage specified by the RPS Statute,[5] or pay an ACP commensurate with any shortfalls. A REC constitutes the renewable attributes associated with the production of one megawatt-hour ("MWh") of electricity generated using eligible renewable resources. As such, a REC is a uniquely-identified tradable commodity equal to one MWh of electricity generated or obtained from an eligible renewable energy resource. Generators and electricity suppliers may trade RECs using a Commission-approved system known as the Generation Attributes Tracking System ("GATS"). The GATS system is operated by PJM Environmental Information Services, Inc. ("PJM-EIS") and is designed to track the ownership and trading of generation attributes.[6] A REC has a three-year lifespan during which it may be transferred, sold, or redeemed.

1. Registration of Renewable Energy Facilities

Facilities eligible for the Maryland RPS Program must be located in PJM (the wholesale bulk power control area in which Maryland resides)[7] or in a control area that is adjacent to the PJM region,[8] so long as the electricity produced is delivered into the PJM region. However, facilities generating electricity from solar energy, geothermal, poultry litter–to–energy, waste–to–energy, or refuse–derived fuel are eligible only if the facility is connected with the electric distribution grid serving Maryland.

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[4] Standard Offer Service ("SOS") is electricity supply purchased from an electric company by the company's retail customers who cannot or choose not to transact with a competitive supplier operating in the retail market. *See* PUA §§ 7-501(n), 7-510(c).

[5] Using the Tier 2 RPS requirement as an example, assume a hypothetical electricity supplier operating in the State had 100,000 MWh in retail electricity sales for 2016. In 2016, the Tier 2 requirement was 2.5%; therefore the electricity supplier would have to either verify the purchase of 2,500 Tier 2 RECs in satisfaction of the Tier 2 RPS obligation or pay an ACP for deficits. Similar requirements apply to Tier 1 and Tier 1 Solar, although the percentage obligation and ACP denomination differs depending on the tier and calendar year, as outlined by the RPS Statute.

[6] An attribute is "a characteristic of a generator, such as location, vintage, emissions output, fuel, state RPS Program eligibility, etc." PJM-EIS, *GATS Operating Rules* (May 2014) at 3.

[7] The PJM wholesale market includes all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia.

[8] A control area is an "electric system or systems, bounded by interconnection metering and telemetry, capable of controlling generation to maintain its interchange schedule with other Control Areas and contributing to frequency regulation. For the purposes of this document, a Control Area is defined in broad terms to include transmission system operations, market, and load-serving functions within a single organization. A Control Area operator may be a system operator, a transmission grid operator, or a utility." PJM-EIS, *GATS Operating Rules* (Sept. 2016) at 5. For example, the multi-state area controlled by the PJM Regional Transmission Operator is one control area, as is the adjacent Midwest Independent System Operator ("ISO") multi-state area, and the adjacent New York ISO.

Before recommending certification of a Renewable Energy Facility ("REF"), Commission Staff must determine whether the facility meets the standards set forth by the RPS Statute and by COMAR 20.61 – the Commission regulation by which the RPS Statute is implemented. REF applicants who may qualify under Maryland's RPS Program initially work with Commission Staff and must complete the appropriate application for REF certification posted on the Commission's RPS website.[9] In addition to the geographic requirements, applicants must also meet the fuel source requirements associated with Tier 1 or Tier 2 REC creation. Verification of the fuel source is completed with the aid of Energy Information Administration Form 860 ("EIA-860") to validate each facility's rated nameplate capacity, fuel source(s), location, and commercial operation in-service date.[10] Facilities that co-fire a REC-eligible renewable fuel source with non-eligible fuel sources must in addition submit a formula or methodology to account for the proportion of total electricity generated by the eligible fuel sources, which then may be credited with RECs. In addition to obtaining Commission certification, all REFs must register with GATS to create and transact business related to RECs. The GATS account must be established with the State facility certification number issued by the Commission upon approval of the REF application.

2. Maryland RPS Annual Percentage Requirements

To comply with the Maryland RPS Program, electricity suppliers must acquire RECs derived from Maryland-certified Tier 1 and Tier 2 renewable sources. Eligible fuel sources for Tier 1 RECs and Tier 2 RECs are listed in Table 1; solar has its own standard within Tier 1.

Table 1: Eligible Tier 1 and Tier 2 Sources

Tier 1 Renewable Sources	Tier 2 Renewable Sources
• Solar, including energy from photovoltaic technologies and solar water heating systems • Wind • Qualifying Biomass • Methane from a landfill or wastewater treatment plant • Geothermal • Ocean • Fuel Cell that produces electricity from a Tier 1 source • Hydroelectric power plant less than 30 MW capacity • Poultry litter-to-energy • Waste-to-energy • Refuse–derived fuel • Thermal energy from a thermal biomass system	• Hydroelectric power other than pump storage generation *(Note: Tier 1 RECs may be used to satisfy Tier 2 obligations)*

[9] REF applications are maintained by the Commission and are accessible online, *available at*: http://www.psc.state.md.us/electricity/wp-content/uploads/sites/2/Application-for-Certification-as-a-Renewable-Energy-Facility.pdf.

[10] Submitting Form EIA-860 is a requirement under Section 13(b) of the Federal Energy Administration Act of 1974 ("FEAA") (Public Law 93-275) for generating plants, regulated and unregulated, which have a nameplate rating of 1 MW or more, are operating or plan to operate within 5 years, and are connected to the transmission grid.

As shown in the table below, there is a different percentage schedule corresponding to each tier and set-aside requirement of which the Maryland RPS Program is comprised.

- The Tier 1 requirements gradually increase until peaking in 2020, and are subsequently maintained at those levels in 2023 and beyond.

- The Tier 1 Solar set-aside requirement increases from 0.70% in 2016, to 2.50% by 2020.[11] This ramp-up period for the solar carve-out corresponds in part with the implementation of the three-year pilot program on community solar energy generating facilities, which was established by the passage of Senate Bill 398 and House Bill 1087 and signed into law in May, 2015. There is a potential that Solar Renewable Energy Credits ("SRECs") generated by eligible community solar facilities could serve to offset the increasing Tier 1 Solar set-aside in the coming years.

- Beginning in 2017, a Tier 1 Offshore Wind set-aside of up to 2.5% commences as part of the Tier 1 portfolio.[12] In Order No. 88192, issued on May 11, 2017, the Commission established specific offshore wind carve-outs applicable between 2021 through 2042, ranging from 0.60% to 2.03%.[13]

- Maryland's Tier 2 requirement remains constant at 2.5% through compliance year 2018, after which time the Tier 2 obligation sunsets.

Table 2: Annual RPS Requirements by Tier

Compliance Year	Tier 1 Non-Solar	Tier 1 Solar	Offshore Wind	Tier 2	Total
2016	12.00%	0.70%	N/A	2.50%	15.20%
2017	11.95%	1.15%	0.0%	2.50%	15.60%
2018	14.30%	1.50%	0.0%	2.50%	18.30%
2019	18.45%	1.95%	0.0%	N/A	20.40%
2020	22.50%	2.50%	0.0%	N/A	25.00%
2021+	20.47% - 21.90%	2.50%	0.60% - 2.03%	N/A	25.00%

[11] "Tier 1 Solar set-aside" refers to the requirement to obtain RECs for energy derived from qualified solar energy facilities. The Tier 1 Solar set-aside requirement applies to retail electricity sales in the State by electricity suppliers and is a sub-set of the Tier 1 standard.

[12] The Maryland Offshore Wind Energy Act of 2013 (2013 Md. Laws, Ch. 003) established an offshore wind set-aside within the Tier 1 requirement. Beginning in 2017, Tier 1 may include a Commission-determined amount of offshore wind RECs ("ORECs"), not to exceed 2.5%. The project must be generating RECs in order for the obligation to begin. In the absence of a Commission-determined OREC obligation, electricity suppliers must satisfy the carve-out using RECs derived from other Tier 1 renewable sources.

[13] Order No. 88192 (May 11, 2017) at 81. As explained in the Order, the OREC percentage obligation fluctuates annually because it is derived from the dynamic Maryland energy sales forecast, and to some degree because the two qualified offshore wind projects have different projected commercial operation dates.

At certain renewable procurement cost thresholds, an electricity supplier can request that the Commission consider a delay in scheduled Tier 1 and Tier 1 Solar RPS percentages.[14] To date, no such request has been made by electricity suppliers operating in the Maryland marketplace.

3. Maryland RPS Alternative Compliance Payment Requirements

Electricity suppliers who do not meet their RPS obligation through the retirement of eligible RECs must submit an ACP for every unit of shortfall. Table 3 presents the ACP schedule separated by tiers for each compliance year of the RPS Program moving forward.

Table 3: ACP Schedule ($/MWh)

Compliance Year	Tier 1 Non-Solar	Tier 1 Solar	Tier 2	IPL[15] Tier 1
2016	$40	$350	$15	$2.50
2017	$37.50	$195	$15	$2
2018	$37.50	$175	$15	$2
2019	$37.50	$150	N/A	$2
2020	$37.50	$125	N/A	$2
2021	$37.50	$100	N/A	$2
2022	$37.50	$75	N/A	$2
2023	$37.50	$60	N/A	$2
2024 +	$37.50	$50	N/A	$2

ACPs are remitted to the Maryland SEIF as dedicated funds to provide for loans and grants that spur the creation of new Tier 1 renewable energy resources.[16] As outlined by statute, compliance fees may only be used to support the creation of new Tier 1 renewable energy resources in the State; the use of ACPs remitted to satisfy the Tier 1 Solar RPS obligation are further restricted to support the creation of new *solar* energy resources in Maryland.[17]

[14] PUA § 7-705(e)-(f).

[15] Industrial Process Load ("IPL") means the consumption of electricity by a manufacturing process at an establishment classified in the manufacturing sector under the North American Industry Classification System. Under PUA § 7-705(b)(2) and COMAR 20.61.01.06 E(5), a supplier sale for IPL is required to meet the entire Tier 1 obligation for electricity sales, including solar. However, the ACP for an IPL Tier 1 non-solar shortfall and a Tier 1 Solar shortfall is the same. For IPL, there is no ACP for Tier 2 shortfalls.

[16] As a special, non-lapsing fund, the SEIF is also the depository of revenues generated through the sale of CO_2 allowances under the Regional Greenhouse Gas Initiative, the first market-based regulatory program in the United States to reduce greenhouse gas emissions.

[17] State Gov't § 9-20B-05(i).

II. ELECTRICITY SUPPLIER COMPLIANCE REPORTS

Calendar year 2016 marked the eleventh compliance year for the Maryland RPS, and the ninth year for electricity suppliers to comply with the Tier 1 Solar set-aside. The RPS compliance reports submitted to the Commission by electricity suppliers, along with information obtained from GATS, provide information regarding the retired RECs and the underlying REFs (*e.g.*, type and location of generators) utilized by electricity suppliers to comply with Maryland RPS obligations.[18] RPS compliance reports were filed by 92 electricity suppliers, including: 71 competitive retail suppliers; 10 brokers or competitive electricity suppliers with zero retail electricity sales; and 11 electric companies, of which four are investor-owned utilities.

According to the filed compliance reports, there were approximately 61.2 million MWh of total retail electricity sales in Maryland for 2016 (down from 62.4 million MWh in 2015); 60.0 million MWh of retail electricity sales were subject to RPS compliance, and 1.2 million MWh were exempt.[19] Maryland electricity suppliers retired over 9.1 million RECs in 2016, slightly less than the calculated obligation for the year but greater than the 8.0 million RECs retired in 2015. The total cost of RECs retired in 2016 amounted to $135.2 million, up from $126.7 million in 2015.

Table 4 displays the average cost per REC retired in each tier since 2008. The decrease in Tier 1 REC prices between 2015 and 2016 likely reflects an increase in the number of renewable energy facilities capable of providing Tier 1 RECs. Similarly, the drop in SREC prices may be attributable to decreasing solar technology costs and an increasing number of solar facilities eligible to meet the SREC requirements as compared to when the solar carve-out was first initiated.

[18] According to PUA § 7-709, a REC can be diminished or extinguished before the expiration of three years by: the electricity supplier that received the credit; a non-affiliated entity of the electricity supplier that purchased or otherwise received the transferred credit; or demonstrated noncompliance by the generating facility with the requirements of PUA § 7-704(f). In the PJM region, the regional term of art is "retirement," which describes the process of removing a REC from circulation by the REC owner, *i.e.,* the owner "diminishes or extinguishes the REC." PJM-EIS, *GATS Operating Rules* (May 2014) at 54-56.

[19] According to PUA § 7-703(a)(2), exceptions for the RPS requirement may include: IPL which exceeds 300,000,000 kWh by a single customer in a year; regions where residential customer rates are subject to a freeze or cap (*see* PUA § 7-505); or electric cooperatives under a purchase agreement that existed on October 1, 2004, until the expiration of the agreement, as the agreement may be renewed or amended. COMAR 20.61.01.06(D) exempts any sale of electricity that is marketed or otherwise represented to customers as renewable or having characteristics of a Tier 1 renewable source or Tier 2 renewable source.

Table 4: Average Cost of RECs per Tier (2008 – 2016)

Year	Tier 1 Non-Solar	Tier 1 Solar	Tier 2
2008	$0.94	$345.45	$0.56
2009	$0.96	$345.28	$0.43
2010	$0.99	$328.57	$0.38
2011	$2.02	$278.26	$0.45
2012	$3.19	$201.92	$0.44
2013	$6.70	$159.71	$1.81
2014	$11.64	$144.06	$1.81
2015	$13.87	$130.39	$1.71
2016	$12.53	$110.51	$1.25

As demonstrated by the table below, the aggregated cost of compliance with the Maryland RPS Program increased exponentially between 2011 and 2014, but displayed a declining growth rate over the past two years as REC prices have stabilized and then decreased. In the span of six compliance years, the total cost of RECs has risen from $14.7 million in 2011 to $135.2 million in 2016. The increased compliance costs are attributable to both an increasing RPS percentage requirement in-State, as well as a greater demand for RECs within the surrounding region.[20]

Table 5: Total Cost of RECs per Year (2011 – 2016)

	Tier	2011	2012	2013	2014	2015	2016
Total REC Costs	Tier 1	$6,241,710	$12,453,493	$32,664,171	$70,630,620	$85,054,001	$88,200,121
	Solar	$7,769,279	$11,346,967	$21,417,989	$29,372,737	$39,055,714	$45,556,987
	Tier 2	$645,332	$664,220	$2,751,643	$3,987,557	$2,617,917	$1,441,416
	Total	**$14,656,321**	**$24,464,680**	**$56,833,803**	**$103,990,914**	**$126,727,632**	**$135,198,523**
Total RECs Retired	Tier 1	3,083,141	3,902,221	4,871,586	6,062,135	6,134,653	7,216,439
	Solar	27,972	56,194	134,124	203,884	299,525	411,787
	Tier 2	1,565,945	1,522,297	1,526,789	1,521,022	1,531,279	1,501,587
	Total	**4,677,058**	**5,480,712**	**6,532,499**	**7,787,041**	**7,965,457**	**9,129,813**
RPS % Required	Tier 1	4.95%	6.40%	7.95%	9.95%	10.00%	12.00%
	Solar	0.05%	0.10%	0.25%	0.35%	0.50%	0.70%
	Tier 2	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
	Total	**7.50%**	**9.00%**	**10.70%**	**12.80%**	**13.00%**	**15.20%**

[20] In addition to Maryland, 7 other PJM states (DE, IL, MI, NJ, NC, OH, and PA) plus the District of Columbia have a RPS mandate outlined in statute, while an additional 2 PJM states (IN, VA) have a voluntary RPS goal.

Of the $135.2 million of total RPS compliance costs in 2016, ACPs accounted for only $33,933. The reliance on ACPs increased slightly in 2016 (compared to $24,515 in 2015). The majority of ACPs paid in 2016 were made in lieu of purchasing Tier 1 RECs to satisfy Industrial Process Load obligations.[21]

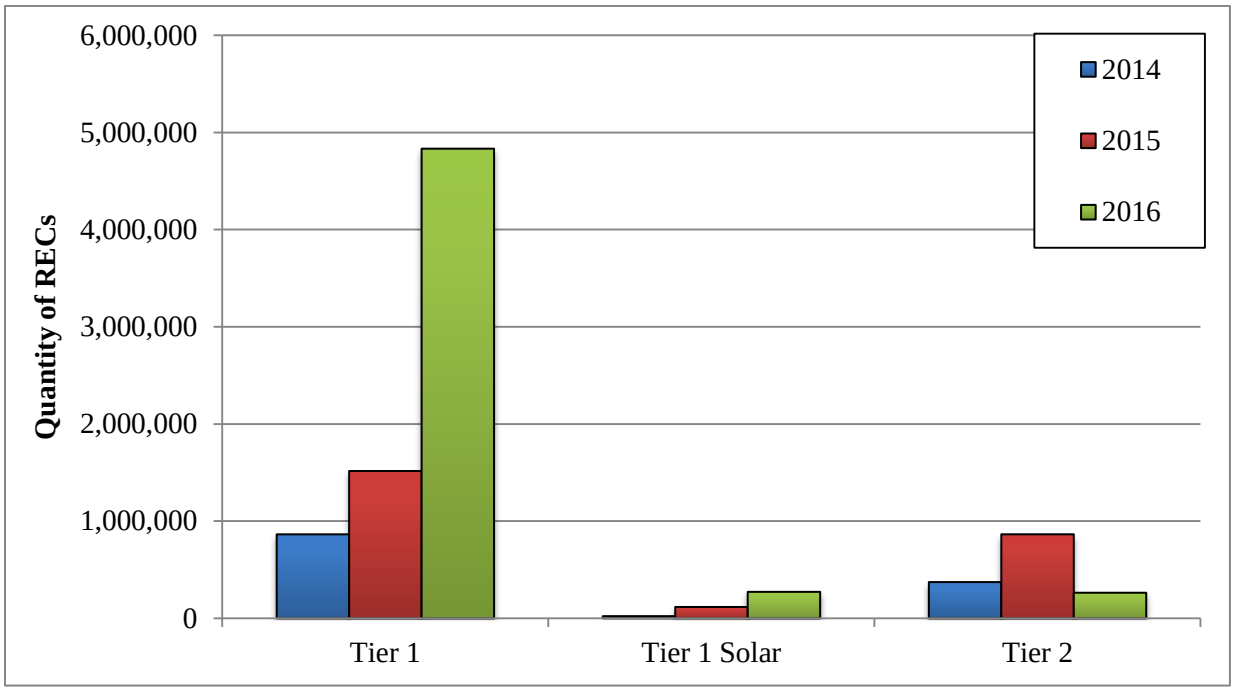
Table 6: Results of the 2016 RPS Compliance Reports

RPS Compliance Year		Tier 1 Non-Solar	Tier 1 Solar	Tier 1 IPL	Tier 2	Total
2016	RPS Obligation	7,210,870	411,466	13,353	1,500,440	**9,136,129**
	Retired RECs	7,216,439	411,787	0	1,501,587	**9,129,813**
	ACP Required	$520	$0	$33,383	$30	**$33,933**

Note: Some electricity suppliers retired more RECs than required.

RECs are valid to demonstrate RPS compliance for the calendar year in which they were generated and in the following two calendar years.[22] Figure 1 aggregates the Maryland RPS tiers on the basis of generation year. In 2016, 58.8% of the RECs retired for compliance were generated in 2016; 27.4% in 2015; and the balance (13.8%) in 2014.

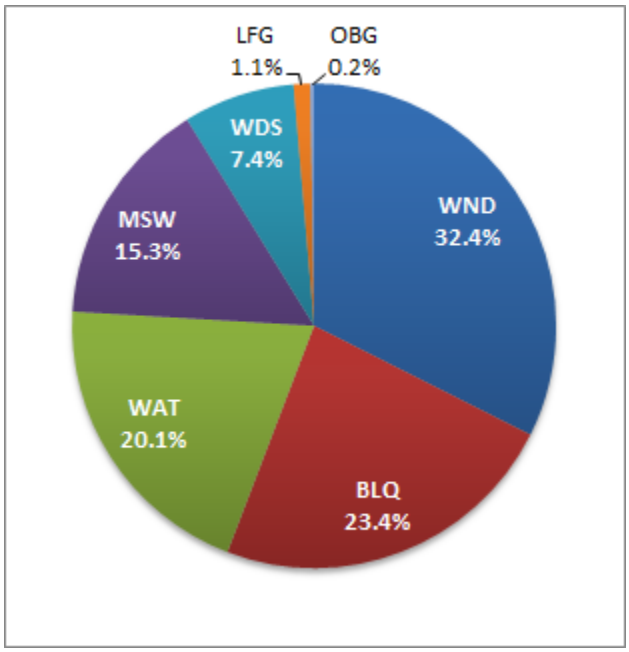
Figure 1: RECs Retired in 2016 by Generation Year



[21] The ACP for Tier 1 IPL obligations is $2 per MWh, significantly lower than the average non-solar Tier 1 REC price of $12.53.
[22] COMAR 20.61.03.01 C (unless the REC is diminished or extinguished before expiration).

Figure 2 illustrates the fuel sources used to satisfy Tier 1 RPS requirements for the 2016 RPS compliance year. Of the Tier 1 RECs retired for 2016, the resources from which the RECs were sourced consisted primarily of wind, black liquor, and small hydroelectric plants. Although not pictured, Tier 2 RPS requirements for the 2016 RPS compliance year were satisfied exclusively by RECs derived from hydroelectric power.

Figure 2: 2016 Tier 1 Retired RECs by Fuel Source[23]

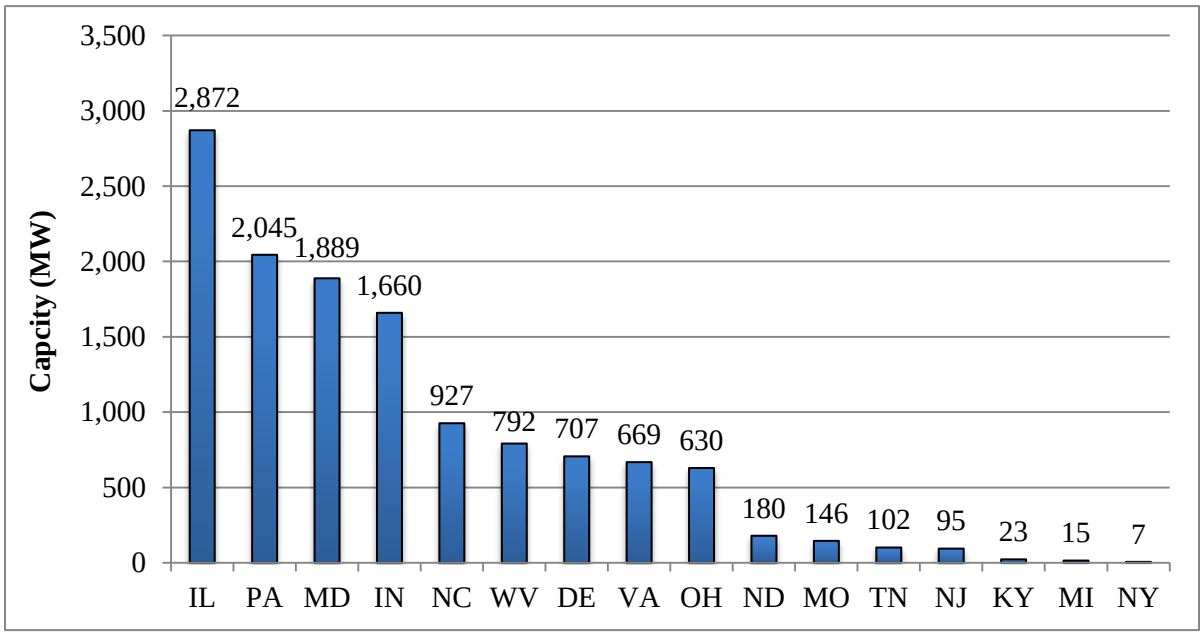


Abbreviations: BLQ, Black Liquor; LFG, Landfill Gas; MSW, Municipal Solid Waste; OBG, Other Biomass Gas; WAT, Small Hydroelectric; WDS, Wood and Waste Solids; WND, Wind.

[23] WAT includes Tier 1 only; SUN includes PV and solar hot water. Qualifying biomass sourced from agricultural crops and geothermal contributed too few RECs to be seen on the chart.

Figure 3 presents the geographical location and the total generating capacity (12,759 MW, an increase from 12,025 MW in 2015) for all Maryland RPS-certified facilities regardless of tier classification. RPS requirements also exist in the surrounding states, which generally support out-of-state and regional market participation. Of the renewable facilities that are eligible to participate in the Maryland RPS Program, 37.2% of the corresponding capacity is located in the Mid-Atlantic States. The locations of the remaining eligible resources span 11 states and in total contribute the other 62.8% of the State's eligible renewable resource capacity.

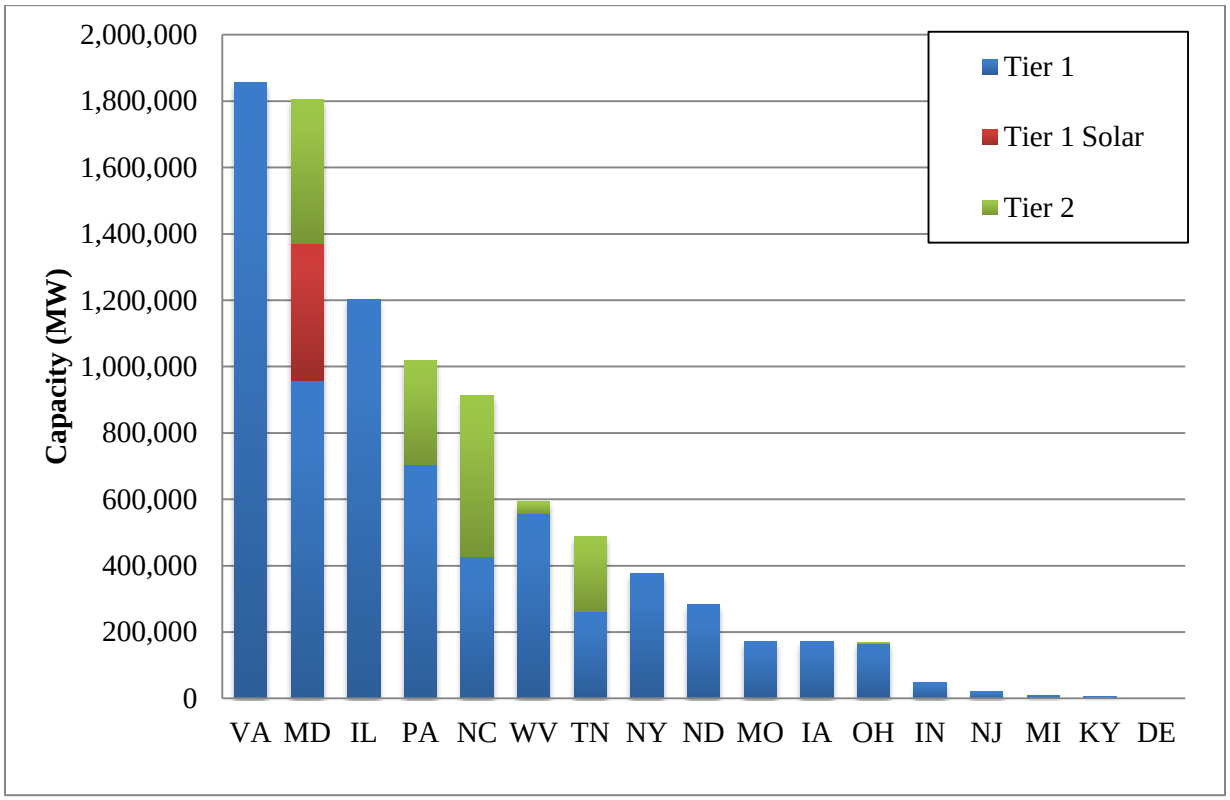
Figure 3: Total Rated Capacity by State (MW) [24]



[24] PJM-EIS, *GATS Database Query* (June 29, 2016). The information in this figure does not include Commission-authorized REFs that have not yet established a REC account with PJM GATS.

For the 2016 compliance year, Figure 4 provides a visual display of aggregated REC data to convey general relationships among the States that contributed RECs. Virginia supplied the largest number of RECs purchased by retail electricity suppliers (20.3%), closely followed by RECs generated in Maryland (19.8%). REFs located in the remaining 15 states contributed a total of 59.9% of all RECs retired in 2016. The majority of RECs from in-State generators were sourced from municipal solid waste (44.5%), hydroelectric (25.9%), and solar photovoltaic (22.7%).

Figure 4: Number of RECs Retired by Facility Location (2016)



Tables 7 and 8 provide the quantitative data in support of the previous figure. Table 7 provides the reported levels of RECs retired by Maryland electricity suppliers in 2016 on a tier and aggregate basis, whereas Table 8 provides the information on a percentage basis. As noted above, Virginia-generated RECs, followed by Maryland, Illinois, and Pennsylvania, were used in the largest aggregate amounts by Maryland electricity suppliers for 2016 RPS compliance.

Table 7: 2016 REC Retirement by State

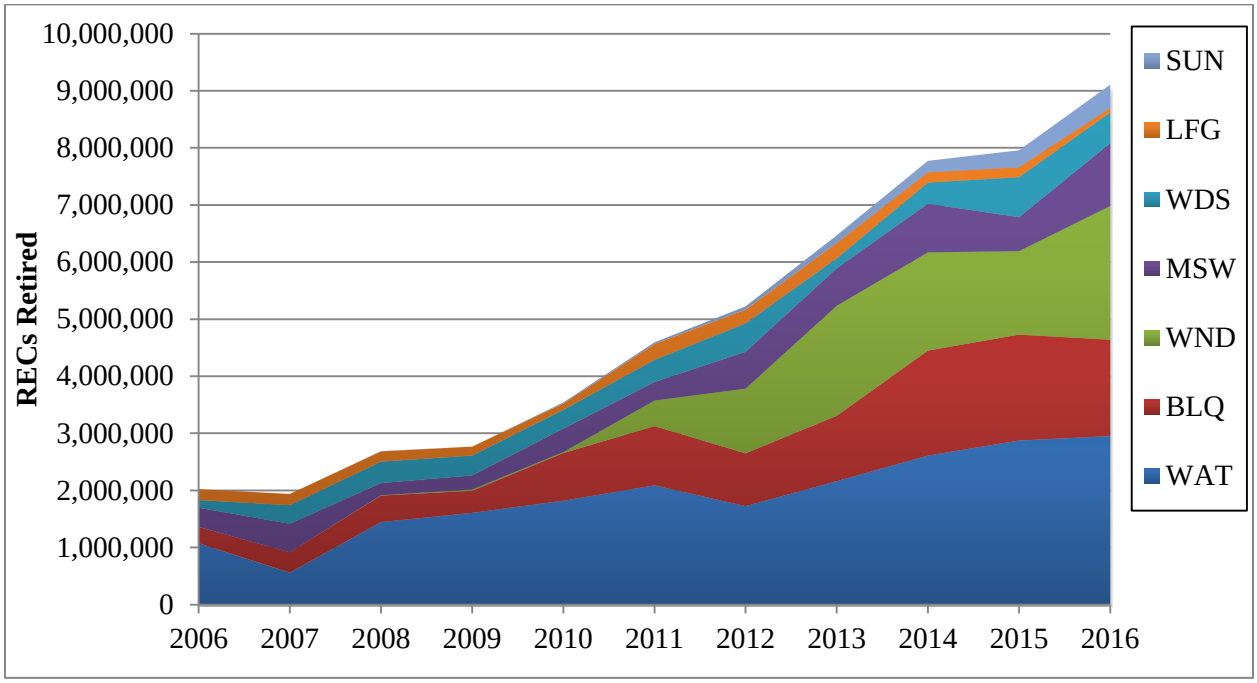
State	Tier 1 Non-Solar	Solar	Tier 2	Total
VA	1,855,133	-	-	1,855,133
MD	957,948	411,787	435,449	1,805,184
IL	1,203,431	-	-	1,203,431
PA	704,067	-	313,565	1,017,632
NC	426,281	-	485,139	911,420
WV	556,048	-	37,487	593,535
TN	262,385	-	224,853	487,238
NY	375,825	-	-	375,825
ND	282,055	-	-	282,055
MO	171,742	-	-	171,742
IA	171,230	-	-	171,230
OH	165,002	-	5,094	170,096
IN	48,908	-	-	48,908
NJ	19,883	-	-	19,883
MI	10,277	-	-	10,277
KY	5,474	-	-	5,474
DE	750	-	-	750
Total	**7,216,439**	**411,787**	**1,501,587**	**9,129,813**

Table 8: 2016 REC Retirement by State (%)

State	Tier 1 Non-Solar	Solar	Tier 2	All Tiers
VA	25.7%	0.0%	0.0%	20.3%
MD	13.3%	100.0%	29.0%	19.8%
IL	16.7%	0.0%	0.0%	13.2%
PA	9.8%	0.0%	20.9%	11.1%
NC	5.9%	0.0%	32.3%	10.0%
WV	7.7%	0.0%	2.5%	6.5%
TN	3.6%	0.0%	15.0%	5.3%
NY	5.2%	0.0%	0.0%	4.1%
ND	3.9%	0.0%	0.0%	3.1%
MO	2.4%	0.0%	0.0%	1.9%
IA	2.4%	0.0%	0.0%	1.9%
OH	2.3%	0.0%	0.3%	1.9%
IN	0.7%	0.0%	0.0%	0.5%
NJ	0.3%	0.0%	0.0%	0.2%
MI	0.1%	0.0%	0.0%	0.1%
KY	0.1%	0.0%	0.0%	0.1%
DE	0.0%	0.0%	0.0%	0.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Figure 5 illustrates the growth in RECs retired in total and by fuel type from the beginning of the RPS requirement in 2006. Hydroelectric ("WAT") has been the largest contributor in each of the eleven years of the RPS, while wind ("WND") has accounted for a significant portion only since 2011. Note that the contributions from qualifying biomass sourced from agricultural crops, geothermal, other biomass liquid and gas, blast furnace gas, and solar thermal are too small to be seen on this chart.

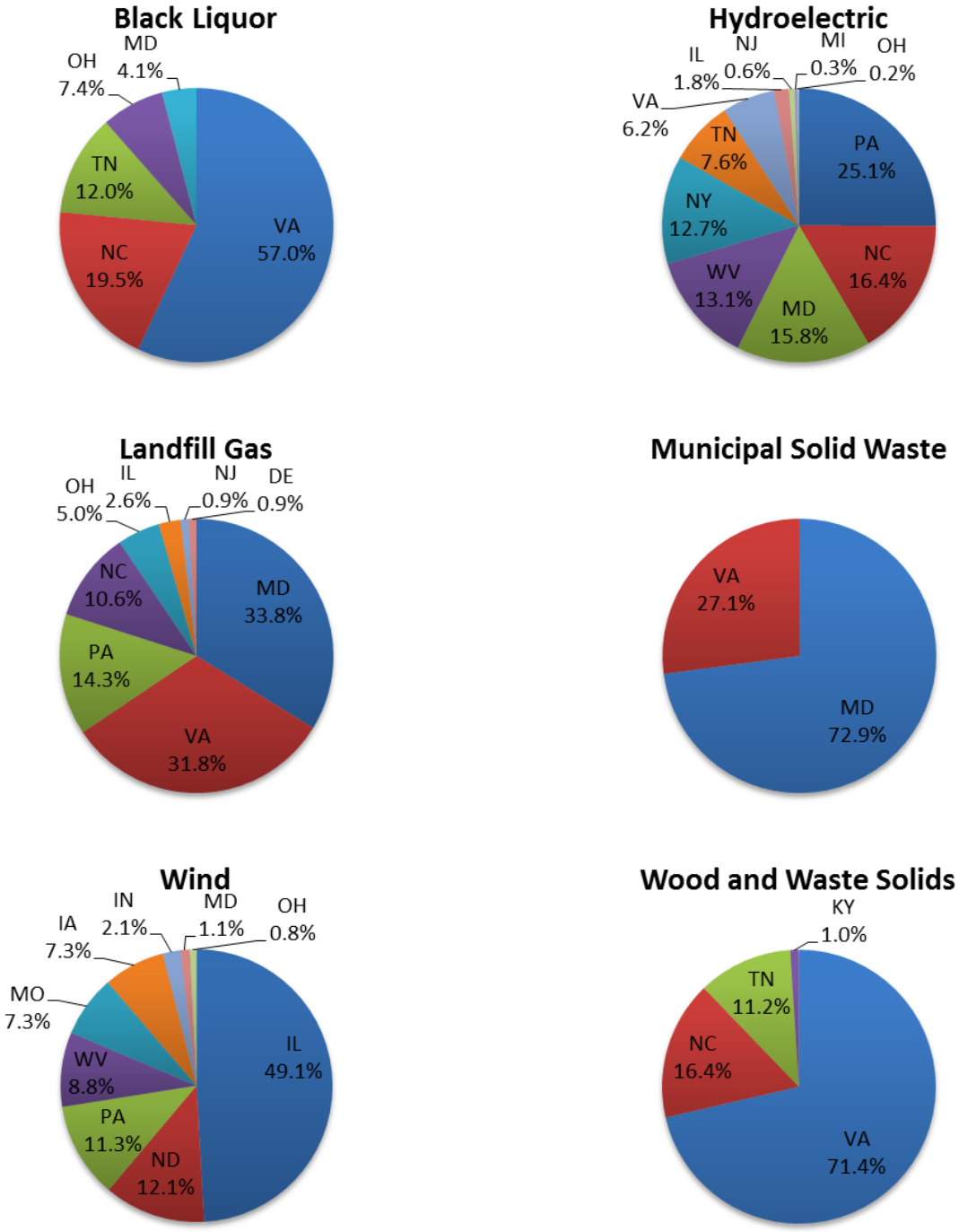
Figure 5: RECs Retired by Fuel Type (2006 – 2016)



Abbreviations: BLQ, Black Liquor; LFG, Landfill Gas; MSW, Municipal Solid Waste; SUN, Solar Photovoltaic; WAT, Hydroelectric; WDS, Wood and Waste Solids; WND, Wind.

In 2016, all of the RECs retired from geothermal and solar sources were located in Maryland; while all of the "other biomass gas" sources were located in Ohio, and all of the qualifying biomass sourced from agricultural crops was located in North Carolina. The six remaining fuels used to comply with Maryland's 2016 RPS requirements corresponded to RECs generated in multiple other states, and Figure 6 shows the percentage contribution of RECs from each state for each of these remaining six fuels. Facilities located in Maryland provided the majority of municipal solid waste RECs, along with the largest percentage contribution of landfill gas RECs. In-State facilities also provided a meaningful portion of hydroelectric RECs retired for compliance in 2016. Conversely, Maryland resources provided only 4.1% of black liquor RECs, 1.1% of the wind RECs, and none of the RECs derived from wood and waste solids submitted for compliance in 2016.

Figure 6: Percentage of RECs Generated in Each State, by Fuel (2016) [25]



[25] Additional information pertaining to the source of renewable energy used to meet Maryland's 2016 RPS compliance requirements is presented in Appendices A and B. Appendix A provides a breakdown of the *number of RECs* used by electricity suppliers according to tier, fuel type, and facility location, while Appendix B presents the *number of facilities* by tier, fuel type, and facility location that provided RECs for compliance with the 2016 RPS Program.

III. MARYLAND RENEWABLE ENERGY FACILITIES

Implementation of the Maryland RPS Program can provide an incentive for renewable generators to locate in Maryland and generate electricity. The renewable requirement establishes a market for renewable energy, and to the extent Maryland's geography and natural resources can be utilized to generate renewable electricity, developers may locate projects within the State. This section of the report provides information about the REFs located in Maryland in 2016.[26] Renewable energy generated in the State can be used both in Maryland and in other states for RPS compliance purposes, and also can be sold in support of competitive retail electricity supplier product offerings (*i.e.*, green power products).[27] Green power products are offered to the public with higher concentrations of renewable energy than required by State RPS requirements.

The number of renewable energy facilities actually installed in Maryland as a result of the Maryland RPS Program is of continuing concern. Although the statutory Tier 1 solar carve out has had some success developing solar PV generator facilities within the state, other renewable generator sources have not developed within Maryland to the same extent as solar. As shown in Tables 7 and 8 above, approximately 80.2% of all RECs were generated from facilities out-of-state in 2016, which continues a long term trend. This trend represents a flow of economic activity from Maryland, as shown in Table 5 above, and is estimated to be more than $80 million from Maryland ratepayers to out-of-state renewable energy facilities in 2016. This is a long-term continuing trend of transfer of dollars to retire RECs from Maryland's economy into the economies of the supplier states. In 2017, the General Assembly passed and Governor Hogan signed into law HB1414. This legislation will produce a study which will, amongst other things, provide comprehensive analysis and information on the effectiveness and economic impacts of the implementation of the Maryland RPS program. The interim and final studies produced by this legislation should fully explore this issue and provide insight as to potential future action.

As shown in Table 9, almost 2.1 million Tier 1 RECs and approximately 1.4 million Tier 2 RECs were generated by eligible sources located within Maryland in 2016. Additional analysis pertaining to the Maryland-based renewable generators is presented in Appendices C through E. Appendix C shows the disposition of RECs generated in Maryland in 2016. Appendix D provides the number of renewable energy facilities by county that are both located in Maryland, and registered with GATS to participate in any one of the PJM States' RPS programs. Appendix E provides the total capacity of these facilities, broken out by county and by tier.

[26] Specific information pertaining to the State's REFs as described herein was made available by PJM-EIS in the GATS State Agency Report.

[27] Facilities located in Maryland are not necessarily registered by the Commission for the Maryland RPS; rather, certain facilities may seek certification out-of-state in support of a long-term contract for the RECs from an out-of-state counterparty. Counterparties can include an electricity supplier operating in a different state and purchasing the RECs to satisfy the RPS requirement for another state or other entities, such as brokers that purchase the REC output for resale.

Table 9: 2016 Maryland Generated RECs by Fuel Source

Fuel Type		RECs (Quantity)	RECs (Percent)
Tier 1	Black Liquor	99,937	2.9%
	Geothermal	1,541	0.0%
	Land Fill Gas	85,440	2.5%
	Municipal Solid Waste	721,509	20.8%
	Solar Thermal	15	0.0%
	Small Hydro	24,831	0.7%
	Wood Waste	16,176	0.5%
	Wind	509,154	14.7%
Tier 1 Solar	Solar Thermal	634,963	18.3%
	Solar PV	4,456	0.1%
Tier 2	Large Hydro	1,369,003	39.5%
	Total	**3,467,025**	**100.0%**

Table 10 presents additional detail regarding the disposition of Maryland-generated RECs in calendar year 2016. Approximately 71% of the RECs generated by renewable facilities located within Maryland during 2016 are available for potential future sale in Maryland or in other states in subsequent compliance years. Just over 28% of the RECs generated in Maryland were retired in 2016 to meet the RPS requirements in Maryland and various other PJM states. Labeled as "Other" in Table 10, just 1.3% of RECs were used for other purposes or may represent pending transfers between parties.

Table 10: Disposition of 2016 Maryland Generated RECs

REC Tier	Available	RPS Compliance	Other	Total
Tier 1 Non-Solar	762,335	692,560	3,708	1,458,603
Tier 1 Solar	364,714	274,562	143	639,419
Tier 2	1,318,041	10,105	40,857	1,369,003
Total	**2,445,090**	**977,227**	**44,708**	**3,467,025**
(%)	**70.5%**	**28.2%**	**1.3%**	**100.0%**

Source: PJM-EIS

On the following page, Table 11 presents, on a state-by-state basis, the distribution of the 977,227 RECs generated in-State during 2016 and subsequently retired for RPS compliance purposes. In 2016, Maryland-generated RECs were retired for compliance purposes in five jurisdictions: the District of Columbia, Delaware, Maryland, New Jersey, and Pennsylvania. Of those RECS generated by in-State facilities in 2016 that were retired for compliance purposes,

91% were retired in Maryland, which constituted a 7.8% increase from 2015 levels. In previous years, a much lower percentage of Maryland-generated RECs were used for in-State compliance purposes.[28]

Table 11: 2016 Maryland Generated RECs Retired for RPS Compliance by State

Tier	Fuel Type	DC	DE	MD	NJ	PA	Total
Tier 1 Non-solar	Black Liquor	-	-	62,540	-	-	62,540
	Land Fill Gas	-	-	10,397	16,695	1,001	28,093
	Municipal Solid Waste	-	-	527,060	-	-	527,060
	Small Hydro	-	-	7,887	-	-	7,887
	Wind	-	46,640	118	20,222	-	66,980
	Subtotal	**-**	**46,640**	**608,002**	**36,917**	**1,001**	692,560
	Percentage	**-**	**6.7%**	**87.8%**	**5.3%**	**0.1%**	**100.0%**
Tier 1 Solar	Solar PV	1,913	-	270,798	-	95	272,806
	Solar Thermal	-	-	1,756	-	-	1,756
	Subtotal	**1,913**	**-**	**272,554**	**-**	**95**	274,562
	Percentage	**0.7%**	**0.0%**	**99.3%**	**-**	**0.0%**	**100.0%**
Tier 2	Large Hydro	-	-	10,105	-	-	10,105
	Subtotal	**-**	**-**	**10,105**	**-**	**-**	**10,105**
	Percentage	**-**	**-**	**100.0%**	**0.0%**	**0.0%**	**100.0%**
All Tiers	**Grand Total**	**1,913**	**46,640**	**890,661**	**36,917**	**1,096**	**977,227**
	Percentage	**0.2%**	**4.8%**	**91.1%**	**3.8%**	**0.1%**	**100.0%**

Source: PJM-EIS.

IV. CONCLUSION

The electricity supplier compliance reports for 2016, verified by the Commission, indicate that nearly all of the Maryland RPS obligations were met via the purchase and retirement of RECs, with only $33,933 in ACPs remitted for compliance purposes. Approximately 20% of RECs used for RPS compliance in 2016 came from in-State resources. RECs derived from three fuel types – wind (32.4%), black liquor (23.4%), and small hydroelectric (20.1%) – were the predominant sources of Tier 1 compliance in 2016, with those RECs sourced primarily from Illinois, Virginia, and Pennsylvania, respectively. In 2016, the Tier 1 Solar carve-out was met by the retirement of RECs generated exclusively in Maryland. Companies demonstrated Tier 2 compliance by purchasing RECs derived from large hydroelectric sources, with approximately 29% of the Tier 2 RECs sourced from Maryland REFs.

Throughout this next year, the Commission will continue to: review applications from facilities requesting certification as a Maryland REF; oversee the RPS Program; and verify that the electricity suppliers in Maryland procure adequate renewable resources.

[28] For example, only 50.3% of RECs generated by in-State facilities in 2011 were retired for Maryland RPS purposes; and only 2.3% in 2010.

APPENDICES

Appendix A: 2016 Retired RECs by Facility

Tier 1*

Facility Name	Fuel	State	Quantity	BLQ %	Tier 1
AEP W Kingsport	BLQ	TN	202,205	11.96%	2.80%
Chillicothe	BLQ	OH	125,564	7.43%	1.74%
Covington	BLQ	VA	341,348	20.20%	4.73%
Domtar Paper	BLQ	NC	170,969	10.12%	2.37%
Franklin Mill	BLQ	VA	208,420	12.33%	2.89%
Hopewell	BLQ	VA	159,444	9.43%	2.21%
Kapstone Kraft	BLQ	NC	158,729	9.39%	2.20%
Luke Mill	BLQ	MD	68,855	4.07%	0.95%
West Point	BLQ	VA	254,582	15.06%	3.53%
		Total	**1,690,116**	**100.00%**	**23.42%**

Facility Name	Fuel	State	Quantity	GEO %	Tier 1
Bird, J.	GEO	MD	72	10.40%	0.00%
Bird, W.	GEO	MD	29	4.19%	0.00%
Dixon	GEO	MD	21	3.03%	0.00%
Hendrickson	GEO	MD	69	9.97%	0.00%
Hucht	GEO	MD	6	0.87%	0.00%
Kawalek	GEO	MD	7	1.01%	0.00%
Keeney	GEO	MD	46	6.65%	0.00%
Loudermilk	GEO	MD	97	14.02%	0.00%
MacInnes	GEO	MD	16	2.31%	0.00%
McWilliams	GEO	MD	36	5.20%	0.00%
Menning	GEO	MD	31	4.48%	0.00%
Overstreet	GEO	MD	70	10.12%	0.00%
Parlegreco	GEO	MD	41	5.92%	0.00%
Patel	GEO	MD	27	3.90%	0.00%
Ryan	GEO	MD	12	1.73%	0.00%
Shriner	GEO	MD	13	1.88%	0.00%
Verde	GEO	MD	16	2.31%	0.00%
Vorhauer	GEO	MD	47	6.79%	0.00%
Wissel	GEO	MD	36	5.20%	0.00%
		Total	**692**	**100.00%**	**0.01%**

Facility Name	Fuel	State	Quantity	LFG %	Tier 1
AP Arden	LFG	PA	5,294	6.59%	0.07%
BC Alpha Ridge	LFG	MD	57	0.07%	0.00%
BC Millersville	LFG	MD	5,803	7.22%	0.08%
Broad Mountain	LFG	PA	4,207	5.23%	0.06%
BWWTP	LFG	MD	4,707	5.86%	0.07%
CID	LFG	IL	724	0.90%	0.01%
Martinsville	LFG	VA	4,040	5.03%	0.06%
Croda Atlas Pt	LFG	DE	750	0.93%	0.01%
DPL NWLND	LFG	MD	5,923	7.37%	0.08%
Fairless Hills	LFG	PA	1,330	1.65%	0.02%
FE Erie County	LFG	OH	3,026	3.76%	0.04%
FE Geneva	LFG	OH	3	0.00%	0.00%
FE Mahoning	LFG	OH	1,022	1.27%	0.01%
Lakeview Gas	LFG	PA	683	0.85%	0.01%
Mallard Lake	LFG	IL	1,356	1.69%	0.02%
Monmouth	LFG	NJ	752	0.94%	0.01%
New Bern	LFG	NC	8,496	10.57%	0.12%
Ritchie Brown	LFG	MD	10,267	12.77%	0.14%
PEP Ritchie PG	LFG	MD	403	0.50%	0.01%
VP Amelia	LFG	VA	6	0.01%	0.00%
VP Bethel	LFG	VA	3,230	4.02%	0.04%
VP Charles City	LFG	VA	2,258	2.81%	0.03%
VP Chester	LFG	VA	1,221	1.52%	0.02%
VP King	LFG	VA	3,623	4.51%	0.05%
VP Northeast	LFG	VA	11,194	13.93%	0.16%
		Total	**80,375**	**100.00%**	**1.11%**

Tier 1*

Facility Name	Fuel	State	Quantity	MSW %	Tier 1
Covanta Fairfax	MSW	VA	298,320	27.09%	4.13%
Harford	MSW	MD	876	0.08%	0.01%
Montgomery	MSW	MD	345,089	31.34%	4.78%
Wheelabrator	MSW	MD	456,793	41.49%	6.33%
		Total	**1,101,078**	**100.00%**	**15.26%**

Facility Name	Fuel	State	Quantity	OBG %	Tier 1
Buckeye BioGas	OBG	OH	2,433	14.22%	0.03%
Central Ohio	OBG	OH	3,678	21.50%	0.05%
French Creek	OBG	OH	1,225	7.16%	0.02%
Haviland	OBG	OH	2,062	12.05%	0.03%
Van Erk Dairy	OBG	OH	1,209	7.07%	0.02%
Wooster	OBG	OH	5,906	34.53%	0.08%
Zanesville	OBG	OH	593	3.47%	0.01%
		Total	**17,106**	**100.00%**	**0.24%**

Facility Name	Fuel	State	Quantity	WAT %	Tier 1
AEP Buck	WAT	VA	55,920	3.86%	0.77%
AEP Fries	WAT	VA	30,141	2.08%	0.42%
AEP Glen Ferris	WAT	WV	23,790	1.64%	0.33%
Allegheny	WAT	PA	51,679	3.56%	0.72%
Allegheny Lock	WAT	PA	47,429	3.27%	0.66%
Allegheny River	WAT	PA	168,865	11.64%	2.34%
AP Misc Hydro	WAT	WV	52,599	3.63%	0.73%
Beardslee	WAT	NY	39,734	2.74%	0.55%
Beebee Island	WAT	NY	37,137	2.56%	0.51%
Big Shoals	WAT	VA	1,394	0.10%	0.02%
Black River	WAT	NY	9,096	0.63%	0.13%
Brasfield	WAT	VA	12,268	0.85%	0.17%
Coleman Falls	WAT	VA	6,055	0.42%	0.08%
Conemaugh	WAT	PA	20,000	1.38%	0.28%
Cushaw	WAT	VA	7,535	0.52%	0.10%
Deep Creek	WAT	MD	26,735	1.84%	0.37%
Deferiet	WAT	NY	35,402	2.44%	0.49%
Dixon	WAT	IL	26,075	1.80%	0.36%
E.J. West	WAT	NY	37,485	2.58%	0.52%
French paper	WAT	MI	10,277	0.71%	0.14%
Granby	WAT	NY	26,297	1.81%	0.36%
Great Falls	WAT	NJ	19,131	1.32%	0.27%
Halifax	WAT	VA	4,014	0.28%	0.06%
Holcomb Rock	WAT	VA	11,513	0.79%	0.16%
Inghams	WAT	NY	5,987	0.41%	0.08%
KC Brighton	WAT	MD	5,285	0.36%	0.07%
Lakeview	WAT	VA	997	0.07%	0.01%
Lockport	WAT	IL	16,983	1.17%	0.24%
London	WAT	WV	92,532	6.38%	1.28%
Lyons Falls	WAT	NY	14,670	1.01%	0.20%
Marmet	WAT	WV	66,784	4.60%	0.93%
Niagara	WAT	VA	718	0.05%	0.01%
Prospect	WAT	NY	39,700	2.74%	0.55%
Schoolfield	WAT	VA	28,126	1.94%	0.39%
Snowden	WAT	VA	17,495	1.21%	0.24%
Soft Maple	WAT	NY	21,832	1.51%	0.30%
Trenton	WAT	NY	108,485	7.48%	1.50%
Upper Sterling	WAT	IL	9,068	0.63%	0.13%
VP Emporia	WAT	VA	7,843	0.54%	0.11%
Winfield	WAT	WV	113,815	7.85%	1.58%
York Haven	WAT	PA	139,416	9.61%	1.93%
		Total	**1,450,307**	**100.00%**	**20.10%**

Appendix A: 2016 Retired RECs by Facility (Cont'd)

Tier 1 (Cont'd)*

Facility Name	Fuel	State	Quantity	WND %	Tier 1
Adam	WND	IL	438	0.02%	0.01%
AEP Blue Creek	WND	OH	10,451	0.45%	0.14%
AEP Fowler Ridge	WND	IN	31,336	0.89%	0.29%
AEP Meadow Lake	WND	IN	17,252	0.16%	0.05%
AP Beech Ridge	WND	WV	9,699	0.41%	0.13%
AP Greenland	WND	WV	24,501	1.05%	0.34%
AP Laural	WND	WV	770	0.03%	0.01%
AP Pinnacle	WND	WV	171,558	7.33%	2.38%
AP Roth Rock	WND	MD	26,322	1.13%	0.36%
AP South Chestnut	WND	PA	1,153	0.05%	0.02%
Big Sky	WND	IL	12,076	0.52%	0.17%
Bishop Hill	WND	IL	597,150	25.52%	8.27%
Camp Grove	WND	IL	6,353	0.27%	0.09%
Cayuga Ridge	WND	IL	406,542	17.38%	5.63%
Crystal Lake	WND	IA	76,429	3.27%	1.06%
Crystal Lake Wind	WND	IA	94,801	4.05%	1.31%
Eco Grove	WND	IL	1,051	0.04%	0.01%
Farmer City	WND	MO	171,742	7.34%	2.38%
Findlay	WND	OH	2,904	0.12%	0.04%
Fowler Ridge	WND	IN	320	0.01%	0.00%
Grand Ridge	WND	IL	5,526	0.12%	0.04%
Harpster	WND	OH	724	0.03%	0.01%
High Trail	WND	IL	80,016	3.42%	1.11%
Klondike Rd	WND	MD	141	0.01%	0.00%
Meyersdale	WND	PA	10,481	0.45%	0.15%
Minonk	WND	IL	16,246	0.69%	0.23%
PL Locust Ridge	WND	PA	6,014	0.26%	0.08%
PN Allegheny Ridge	WND	PA	38,251	1.63%	0.53%
PN Armenia Mtn	WND	PA	7,362	0.31%	0.10%
PN Highland North	WND	PA	3,323	0.14%	0.05%
PN Lookout	WND	PA	81,762	3.49%	1.13%
PN Mehoopany	WND	PA	69,081	2.95%	0.96%
PN Patton	WND	PA	1,812	0.08%	0.03%
PN Sandy Ridge	WND	PA	441	0.02%	0.01%
PN Stony Creek	WND	PA	42,709	1.83%	0.59%
Providence Heights	WND	IL	11,838	0.51%	0.16%
SP Twin Ridges	WND	PA	2,775	0.12%	0.04%
Tatanka	WND	ND	282,055	12.06%	3.91%
Top Crop	WND	IL	11,989	0.51%	0.17%
Zephyr	WND	OH	4,202	0.18%	0.06%
		Total	**2,339,596**	**100.00%**	**32.42%**

Facility Name	Fuel	State	Quantity	AB %	Tier 1
Kapstone Kraft	AB	NC	95	100.00%	0.00%
		Total	**95**	**100.00%**	**0.00%**

Tier 1 (Cont'd)*

Facility Name	Fuel	State	Quantity	WDS %	Tier 1
AEP W Kingsport	WDS	TN	60,180	11.21%	0.83%
Covington	WDS	VA	58,940	10.97%	0.82%
Cox Waste	WDS	KY	5,474	1.02%	0.08%
Domtar Paper	WDS	NC	87,669	16.32%	1.21%
Hopewell	WDS	VA	10,355	1.93%	0.14%
Kapstone Kraft	WDS	NC	323	0.06%	0.00%
Multitrade	WDS	VA	43,268	8.06%	0.60%
VP South Boston	WDS	VA	265,009	49.34%	3.67%
West Point	WDS	VA	5,856	1.09%	0.08%
		Total	**537,074**	**100.00%**	**7.44%**

Tier 2

Facility Name	Fuel	State	Quantity	WAT %	Tier 2
AEP Summerville	WAT	WV	183	0.01%	0.01%
Conowingo	WAT	MD	435,449	29.00%	29.00%
Covanta	WAT	WV	37,304	2.48%	2.48%
Falls	WAT	NC	32,790	2.18%	2.18%
Gaston	WAT	NC	10,945	0.73%	0.73%
High Rock	WAT	NC	87,241	5.81%	5.81%
Lake Lynn	WAT	PA	92,262	6.14%	6.14%
Narrows	WAT	NC	62,677	4.17%	4.17%
Piney	WAT	PA	9,509	0.63%	0.63%
Racine	WAT	OH	5,094	0.34%	0.34%
Roanoke	WAT	NC	13,378	0.89%	0.89%
Safe Harbor	WAT	PA	211,794	14.10%	14.10%
Tuckertown	WAT	NC	53,322	3.55%	3.55%
XIC Calderwood	WAT	TN	224,853	14.97%	14.97%
XIC Cheoah	WAT	NC	224,786	14.97%	14.97%
		Total	**1,501,587**	**100.00%**	**100.00%**

Tier 1 REC Total	7,216,439
SREC Total	411,787
Tier 2 REC Total	1,501,587
Grand Total	9,129,813

*Solar facilities are not represented in this table. In 2016, 28,582 facilities produced 411,787 SRECs.

Resource Definitions

Agriculture Waste	AB	Municipal Solid Waste	MSW
Black Liquor	BLQ	Other Biomass Gas	OBG
Geothermal	GEO	Wood/Waste Solids	WDS
Landfill Gas	LFG	Wind	WND
Hydroelectric	WAT		

Appendix B: Location of Facilities that Provided RECs for 2016 RPS Compliance

	DE	IA	IL	IN	KY	MD	MI	MO	NC	ND	NJ	NY	OH	PA	TN	VA	WV	Total
Tier 1 Non-solar																		
Agricultural Byproduct	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	**1**
Black Liquor	-	-	-	-	-	1	-	-	2	-	-	-	1	-	1	4	-	**9**
Geothermal	-	-	-	-	-	19	-	-	-	-	-	-	-	-	-	-	-	**19**
Land Fill Gas	1	-	2	-	-	6	-	-	1	-	1	-	3	4	-	7	-	**25**
Municipal Solid Waste	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	1	-	**4**
Other Biomass Gas	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	**7**
Solar Thermal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Solar PV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Small Hydro	-	-	3	-	-	2	1	-	-	-	1	11	-	6	-	13	5	**42**
Wood Waste	-	-	-	-	1	-	-	-	2	-	-	-	-	-	1	5	-	**9**
Wind	-	2	14	6	-	2	-	1	-	1	-	-	4	12	-	-	4	**46**
Tier 1 Solar																		
Solar PV	-	-	-	-	-	27,993	-	-	-	-	-	-	-	-	-	-	-	**27,993**
Solar Thermal	-	-	-	-	-	589	-	-	-	-	-	-	-	-	-	-	-	**589**
Tier 2																		
Large Hydro	-	-	-	-	-	1	-	-	7	-	-	-	1	3	1	-	2	**15**
Total	**1**	**2**	**19**	**6**	**1**	**28,616**	**1**	**1**	**13**	**1**	**2**	**11**	**16**	**25**	**3**	**30**	**11**	**28,759**

Note: In order to prevent double counting, facilities using multiple fuels are only listed under their primary fuel.

Appendix C: Disposition of 2016 Vintage RECs Generated in Maryland

Fuel Type and Tier	RECs Retired for RPS Compliance by State						Available	Other	Total RECs Generated
	DC	DE	MD	NJ	PA	Total			
Black Liquor	-	-	62,540	-	-	**62,540**	37,397	-	**99,937**
Geothermal	-	-	-	-	-	**-**	1,541	-	**1,541**
Land Fill Gas	-	-	10,397	16,695	1,001	**28,093**	54,097	3,250	**85,440**
Municipal Solid Waste	-	-	527,060	-	-	**527,060**	194,449	-	**721,509**
Small Hydro	-	-	7,887	-	-	**7,887**	16,944	-	**24,831**
Solar Thermal	-	-	-	-	-	**-**	15	-	**15**
Wind	-	46,640	118	20,222	-	**66,980**	441,716	458	**509,154**
Wood Waste	-	-	-	-	-	**-**	16,176	-	**16,176**
Tier 1 Non-solar Total	**-**	**46,640**	**608,002**	**36,917**	**1,001**	**692,560**	**762,335**	**3,708**	**1,458,603**
Solar PV	1,913	-	270,798	-	95	**272,806**	362,014	143	**634,963**
Solar Thermal	-	-	1,756	-	-	**1,756**	2,700	-	**4,456**
Tier 1 Solar Total	**1,913**	**-**	**272,554**	**-**	**95**	**274,562**	**364,714**	**143**	**639,419**
Large Hydro	-	-	10,105	-	-	**10,105**	1,318,041	40,857	**1,369,003**
Tier 2 Total	**-**	**-**	**10,105**	**-**	**-**	**10,105**	**1,318,041**	**40,857**	**1,369,003**
Grand Total	**1,913**	**46,640**	**890,661**	**36,917**	**1,096**	**977,227**	**2,445,090**	**44,708**	**3,467,025**

Appendix D: Number of Renewable Energy Facilities Located in Maryland

Maryland County	Tier 1 Non-Solar	Tier 1 Solar	Tier 2	Total
Allegany	1	42	-	43
Anne Arundel	29	6,561	-	6,590
Baltimore	9	5,083	-	5,092
Baltimore City	1	880	-	881
Calvert	-	632	-	632
Caroline	-	192	-	192
Carroll	-	1,677	-	1,677
Cecil	-	796	-	796
Charles	-	2,095	-	2,095
Dorchester	-	187	-	187
Frederick	6	2,249	-	2,255
Garrett	6	49	-	55
Harford	6	3,036	1	3,043
Howard	12	2,757	-	2,769
Kent	1	256	-	257
Montgomery	13	7,686	1	7,700
Prince George's	6	12,326	-	12,332
Queen Anne's	2	481	-	483
Somerset	8	137	-	145
St Mary's	-	1,082	-	1,082
Talbot	3	156	-	159
Washington	3	929	-	932
Wicomico	3	599	-	602
Worcester	1	337	-	338
Total	**110**	**50,225**	**2**	**50,337**

Note: This list includes all renewable generators that are both: 1) located within Maryland, and 2) registered to participate in any one of the PJM states' renewable energy programs as of July 19, 2017.

Appendix E: Capacity of Renewable Energy Facilities Located in Maryland (MW)

Maryland County	Tier 1 Non-Solar	Tier 1 Solar	Tier 2	Total
Allegany	65.0	0.5	-	65.5
Anne Arundel	3.9	63.0	-	66.9
Baltimore	192.5	67.1	-	259.6
Baltimore City	0.1	12.2	-	12.3
Calvert	-	7.1	-	7.1
Caroline	-	6.7	-	6.7
Carroll	-	19.8	-	19.8
Cecil	-	22.6	-	22.6
Charles	-	40.2	-	40.2
Dorchester	-	4.1	-	4.1
Frederick	4.1	66.0	-	70.1
Garrett	210.0	1.0	-	211.0
Harford	1.3	34.0	474.0	509.4
Howard	1.3	31.8	-	33.1
Kent	3.0	11.9	-	14.9
Montgomery	81.9	82.8	42.0	206.7
Prince George's	13.5	131.1	-	144.6
Queen Anne's	0.1	31.8	-	31.8
Somerset	375.1	8.3	-	383.4
St Mary's	-	11.8	-	11.8
Talbot	69.3	7.8	-	77.1
Washington	6.5	62.7	-	69.2
Wicomico	6.0	32.4	-	38.5
Worcester	0.0	6.8	-	6.8
Total	**1,033.4**	**763.6**	**516.0**	**2,313.0**

Note: This list includes all renewable generators that are both: 1) located within Maryland, and 2) registered to participate in any one of the PJM states' renewable energy programs as of July 19, 2017.