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PUBLIC SERVICE COMMISSION

December 10, 2019

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

The Honorable Adrienne A. Jones
Speaker of the House of Delegates
State House, H-101
Annapolis, Maryland 21401

Re: Renewable Energy Portfolio Standard Report With Data for Calendar Year 2018 in Compliance with § 7-712 of the Public Utilities Article, Annotated Code of Maryland (MSAR #11726)

Dear President Miller and Speaker Jones:

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 2018*.

By Direction of the Commission,

A handwritten signature in black ink, appearing to read "Andrew S. Johnston".

Andrew S. Johnston
Executive Secretary

ASJ:tj

Enclosure

cc: Sarah T. Albert, Department of Legislative Services (5 copies)

**PUBLIC SERVICE COMMISSION
OF MARYLAND**

**RENEWABLE ENERGY PORTFOLIO
STANDARD REPORT**

With Data for Calendar Year 2018

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

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December 2019

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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 2018. 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 December 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 2018 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 Remaining calendar year 2018 RPS obligations were satisfied by compliance fees, also known as alternative compliance payments (“ACPs”). One supplier went out of business without satisfying its 2018 RPS obligations.⁴

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 a 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 December 2019, highlights data from electricity suppliers’ 2018 compliance reports and other relevant 2018 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.

⁴ The supplier failed to retire the required RECs or pay ACPs. Retail electric sales by this supplier represented less than 0.0004% of total 2018 sales subject to compliance.

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.⁵ Electricity suppliers must file annual compliance reports with the Commission verifying that the renewable requirement for each entity has been satisfied.

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. However, each electricity supplier must document annually the retirement of RECs equal to the percentage specified by the RPS Statute,⁷ or pay an ACP commensurate with any shortfalls.

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)⁸ or in a control area that is adjacent to the PJM region,⁹ 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

⁵ 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).

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 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 2018. In 2018, the Tier 2 requirement was 2.5%; therefore, the electricity supplier would have to either verify the purchase of 2,500 Tier 2 RECs 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.

⁸ 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.

⁹ 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, *Generation Attribute Tracking System (GATS) Operating Rules* (April 2018) 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.

distribution grid serving Maryland. Finally, energy from a thermal biomass system must be generated in Maryland to qualify for the RPS program.¹⁰

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 Commission Regulations (COMAR 20.61). REF applicants who qualify under Maryland’s RPS Program must complete the appropriate application for REF certification posted on the Commission’s RPS website.¹¹ In addition to the geographic requirements, applicants must also meet the fuel source requirements associated with Tier 1 or Tier 2 (*see* Table 1, below). 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.¹² Facilities that co-fire a REC-eligible renewable fuel source with non-eligible fuel sources must also 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 track and transact business related to RECs. The GATS account must be established with the 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, as defined in PUA § 7-701. Eligible fuel sources for Tier 1 RECs and Tier 2 RECs are listed in Table 1; solar has its own standard within Tier 1.

¹⁰ There are currently no thermal biomass facilities in Maryland.

¹¹ 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>.

¹² 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.

Table 1 Eligible Tier 1 and Tier 2 Sources

Tier 1 Renewable Sources	Tier 2 Renewable Sources
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Hydroelectric power other than pump storage generation <p><i>(Note: Tier 1 RECs may be used to satisfy Tier 2 obligations)</i></p>

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

- The Tier 1 requirements gradually increase until peaking in 2030, after which they are maintained at those levels.
- The Tier 1 Solar set-aside requirement increases from 1.5 percent in 2018, to 14.5 percent by 2030.¹³ This ramp-up period for the solar carve-out corresponds in part with the implementation of the 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. The three-year pilot program was extended through 2024 by House Bill 683, enacted in May, 2019. There is a potential that Solar Renewable Energy Credits (“SRECs”) generated by eligible community solar facilities could serve to help meet the increasing Tier 1 Solar set-aside in the coming years.
- Beginning in 2017, a constant Tier 1 Offshore Wind set-aside of up to 2.5 percent commenced as part of the Tier 1 portfolio.¹⁴ In Order No. 88192, the Commission

¹³ “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.

¹⁴ 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

established specific offshore wind carve-outs from 2021 through 2042 ranging from 0.60 percent to 2.03 percent. Senate Bill 516, enacted in May, 2019, increased the RPS requirements to 50% by 2030, and established additional offshore wind carve-outs beginning in 2027. The Commission will incorporate these increased carve-outs into the offshore wind RPS obligations as part of its review of Round 2 offshore wind project applications.

- Maryland’s Tier 2 requirement was eliminated at the end of compliance year 2018. Senate Bill 516 re-established a 2.5 percent requirement beginning October 1, 2019 and extending through compliance year 2020, after which the Tier 2 obligation again sunsets.

Table 2 Annual RPS Requirements by Tier

Compliance Year	Tier 1 Non-Solar	Tier 1 Solar	Offshore Wind¹⁵	Tier 2	Total
2018	14.3%	1.5%	0.0%	2.5%	18.3%
Pre-SB516 2019 ¹⁶	18.45%	1.95%	0.0%	N/A	20.4%
Post-SB516 2019 ¹⁷	15.2%	5.5%	0.0%	2.5%	23.2%
2020	22.0%	6.0%	0.0%	2.5%	30.5%
2021	21.93%	7.5%	1.37%	N/A	30.8%
2022	23.24%	8.5%	1.36%	N/A	33.1%
2023	23.87%	9.5%	2.03%	N/A	35.4%
2024	25.19%	10.5%	2.01%	N/A	37.7%
2025	26.49%	11.5%	2.01%	N/A	40.0%
2026	28.01%	12.5%	1.99%	N/A	42.5%
2027	30.02%	13.5%	1.98%	N/A	45.5%
2028	31.04%	14.5%	1.96%	N/A	47.5%
2029	33.06%	14.5%	1.94%	N/A	49.5%
2030+	33.56% - 34.9%	14.5%	0.60% - 1.94%	N/A	50.0%

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.

¹⁵ As defined by PUA § 7-703(b), beginning in 2017 the RPS requirements include “an amount set by the Commission...not to exceed 2.5%, derived from offshore wind energy.” The Commission set the offshore wind energy carve-out in Order No. 88192. As “a payment may not be made for an OREC [Offshore Renewable Energy Credit] until electricity supply is generated by the offshore wind project,” and as the RPS obligation must be established at least three years in advance of the calendar year in which the purchase obligation takes effect, the carve-out may begin no sooner than January 1, 2021.

¹⁶ Senate Bill 516, enacted into law in May, 2019, increased RPS targets beginning October 1, 2019.

¹⁷ *Id.*

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.¹⁸ 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	IPL¹⁹ Tier 1
2018	\$37.50	\$175	\$15	\$2
Pre-SB516 2019 ²⁰	\$37.50	\$150	N/A	\$2
Post-SB516 2019 ²¹	\$30	\$100	\$15	\$2
2020	\$30	\$100	\$15	\$2
2021	\$30	\$80	N/A	\$2
2022	\$30	\$60	N/A	\$2
2023	\$30	\$45	N/A	\$2
2024	\$27.50	\$40	N/A	\$2
2025	\$25	\$35	N/A	\$2
2026	\$24.75	\$30	N/A	\$2
2027	\$24.50	\$25	N/A	\$2
2028	\$22.50	\$25	N/A	\$2
2029	\$22.50	\$22.50	N/A	\$2
2030+	\$22.35	\$22.35	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.²² As outlined by statute, compliance fees may only be used to support the creation of new Tier 1 renewable energy

¹⁸ PUA § 7-705(e)-(f).

¹⁹ 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.

²⁰ Senate Bill 516, enacted into law in May, 2019, modified the ACP schedule beginning October 1, 2019.

²¹ *Id.*

²² As a special, non-lapsing fund, the SEIF is also the depository of revenues generated through the sale of CO₂ allowances under the Regional Greenhouse Gas Initiative, the first market-based regulatory program in the United States to reduce greenhouse gas emissions.

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.²³

II. ELECTRICITY SUPPLIER COMPLIANCE REPORTS

Calendar year 2018 marked the 13th compliance year for the Maryland RPS, and the 11th 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.²⁴ RPS compliance reports were filed by 103 electricity suppliers, including 77 competitive retail suppliers; 15 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 61.5 million MWh of total retail electricity sales in Maryland for 2018 (up from 59.1 million MWh in 2017); 60.0 million MWh of retail electricity sales were subject to RPS compliance, and 1.5 million MWh were exempt.²⁵ Maryland electricity suppliers retired about 11.1 million RECs in 2018, more than both the calculated obligation for the year and the 9.0 million RECs retired for compliance in 2017. The total cost of RECs retired in 2018 totaled \$84.8 million, up from \$72.0 million in 2017.

Table 4 displays the average cost per REC retired in each tier since 2008. The decline in Tier 1 and Tier 2 REC prices likely reflects a combination of an increase in the number of renewable energy facilities capable of providing RECs and downward price pressure coming from cheaper SRECs. 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.

²³ State Gov't § 9-20B-05(i).

²⁴ 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 nonaffiliated 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.

²⁵ 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 prior to October 1, 2004, until the expiration of the agreement. 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 – 2018)

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	\$12.22	\$110.63	\$0.96
2017	\$7.14	\$38.18	\$0.47
2018	\$6.54	\$31.91	\$0.66

As demonstrated by the table below, the aggregated cost of compliance with the Maryland RPS Program displayed a declining growth rate from 2013 through 2016, peaking at \$136.2 million in 2016. In spite of increasing RPS percentage requirements in-State and greater demand for RECs within the surrounding region,²⁶ total REC costs in 2017 fell approximately 47 percent between 2017 and 2016. Tier 1 and Solar REC prices fell an additional 8 percent and 16 percent in 2018, respectively, while Tier 2 REC prices increased by approximately 40 percent.

Table 5 Total Cost of RECs per Year (2013 – 2018)

	Tier	2013	2014	2015	2016	2017	2018
Total REC Costs	Tier 1	\$32,664,171	\$70,630,620	\$85,054,001	\$88,200,121	\$50,045,621	\$56,406,247
	Solar	\$21,417,989	\$29,372,737	\$39,055,714	\$45,556,987	\$21,275,664	\$27,351,388
	Tier 2	\$2,751,643	\$3,987,557	\$2,617,917	\$1,441,416	\$687,785	\$1,049,293
	Total	\$56,833,803	\$103,990,914	\$126,727,632	\$135,198,523	\$72,009,071	\$84,806,928
Total RECs Retired	Tier 1	4,871,586	6,062,135	6,134,653	7,216,439	7,006,113	8,627,737
	Solar	134,124	203,884	299,525	411,787	557,224	857,232
	Tier 2	1,526,789	1,521,022	1,531,279	1,501,587	1,448,567	1,599,819
	Total	6,532,499	7,787,041	7,965,457	9,129,813	9,011,904	11,084,788
RPS % Required	Tier 1	7.95%	9.95%	10.00%	12.00%	12.15%	14.30%
	Solar	0.25%	0.35%	0.50%	0.70%	0.95%	1.50%
	Tier 2	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
	Total	10.70%	12.80%	13.00%	15.20%	15.60%	18.30%

ACPs accounted for only a small fraction (\$67,796) of the total \$84.8 million RPS compliance costs in 2018. Reliance on ACPs increased slightly in 2018 (compared to \$55,032 in

²⁶ 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.

2017). The majority of ACPs paid in 2018 were made in lieu of purchasing Tier 1 RECs to satisfy Industrial Process Load (“IPL”) obligations.²⁷

Table 6 Results of the 2018 RPS Compliance Reports

RPS Compliance Year		Tier 1 Non-Solar	Tier 1 Solar	Tier 1 IPL	Tier 2	Total
2018	RPS Obligation	8,627,719	857,023	32,293	1,500,715	11,017,750
	Retired RECs	8,627,737	857,232	-	1,599,819	11,084,788
	ACP Required	\$2,280	\$795	\$64,586	\$135	\$67,796

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.²⁸ Figure 1 aggregates the Maryland RPS tiers on the basis of generation year. For the 2018 compliance year, 44.9 percent of RECs retired were generated in 2018; 40.8 percent in 2017; and the remaining 14.3 percent were generated in 2016.

Figure 1 RECs Retired in 2018 by Generation Year

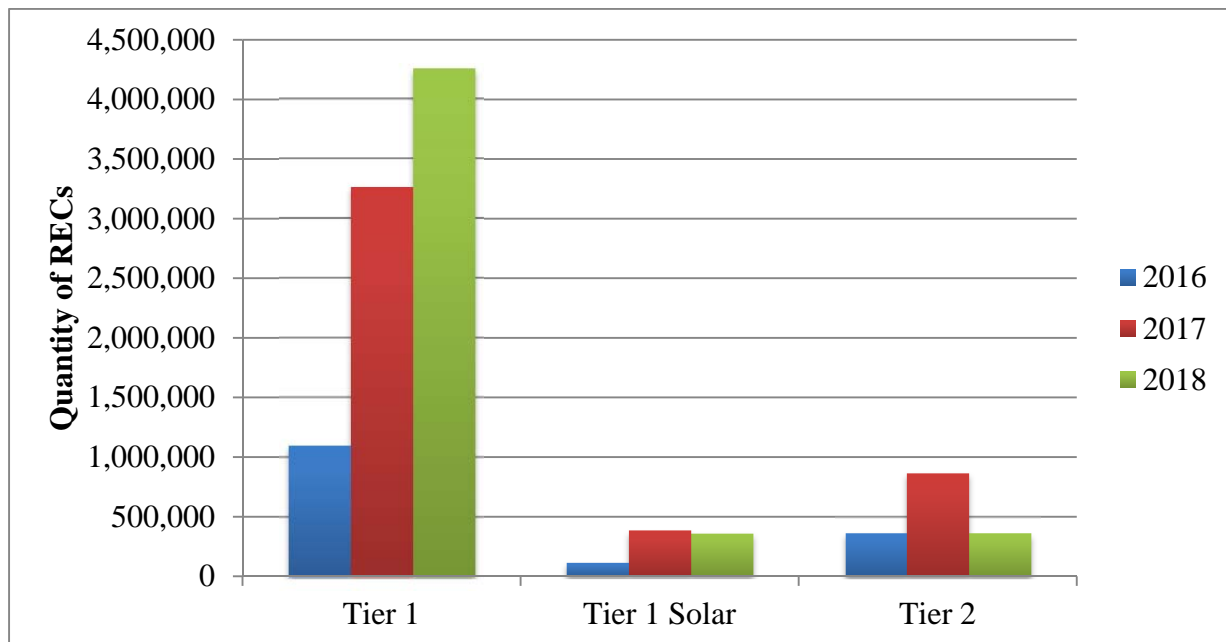
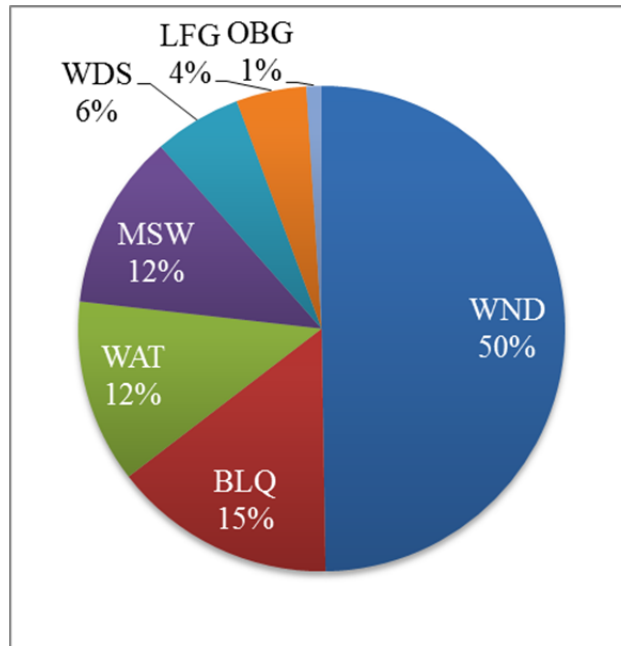


Figure 2 illustrates the fuel sources used to satisfy Tier 1 RPS requirements for the 2018 RPS compliance year. Of the Tier 1 RECs retired for 2018, the resources from which the RECs were sourced consisted primarily of wind, black liquor, and small hydroelectric plants. Although not pictured, Tier 2 RPS requirements for the 2018 RPS compliance year were satisfied exclusively by RECs derived from hydroelectric power.

²⁷ The ACP for Tier 1 IPL obligations is \$2 per MWh, significantly lower than the average non-solar Tier 1 REC (\$6.54) and solar Tier 1 REC (\$31.91).

²⁸ COMAR 20.61.03.01 C (unless the REC is diminished or extinguished before expiration).

Figure 2 2018 Tier 1 Retired RECs by Fuel Source²⁹

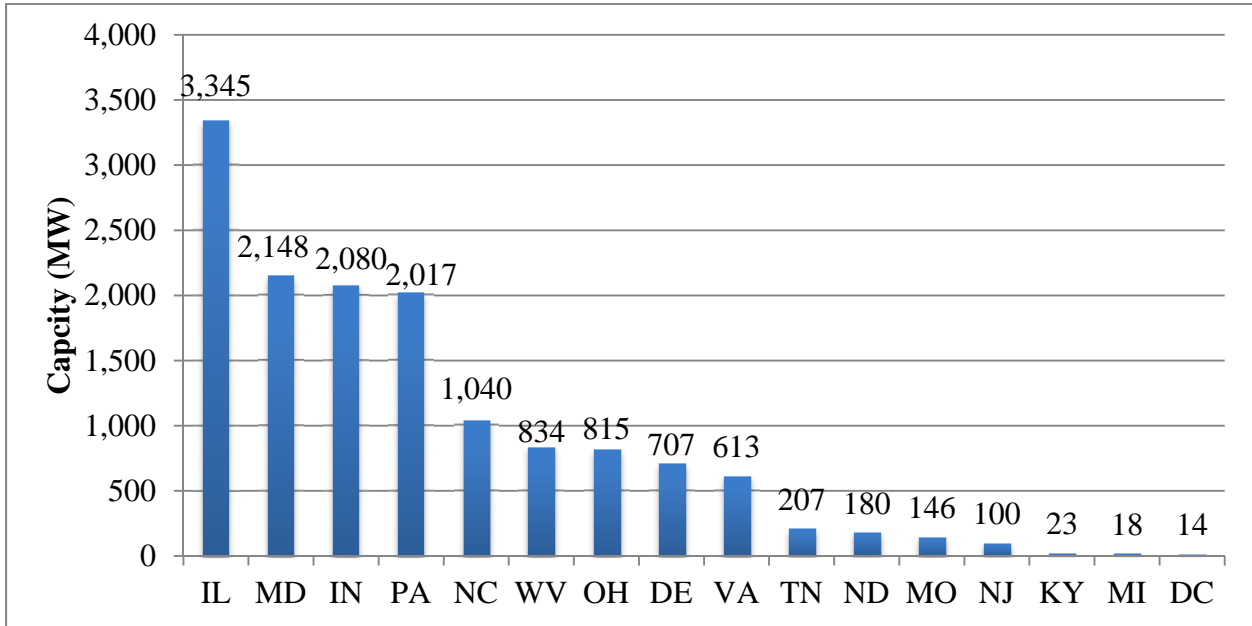


Abbreviations: BLQ, Black Liquor; LFG, Landfill Gas; MSW, Municipal Solid Waste; OBG, Other Biomass Gas; WAT, Small Hydroelectric; WDS, Wood and Waste Solids; WND, Wind.

Figure 3 presents the geographical location and the total generating capacity (14,288 MW, an increase from 13,764 MW in 2017) for all Maryland RPS-certified facilities regardless of Tier. 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, 45 percent of the corresponding capacity is located in the Mid-Atlantic States. The remaining eligible resource capacity is distributed across 9 other states.

²⁹ WAT includes Tier 1 only. Qualifying biomass sourced from agricultural crops, geothermal, and solar thermal contributed too few RECs to be seen on the chart.

Figure 3 Total Rated Capacity by State (MW) ³⁰



For the 2018 compliance year, Figure 4 displays aggregated REC data to convey general relationships among the States that contributed RECs. Illinois supplied the largest number of RECs purchased by retail electricity suppliers (22.9 percent), followed by Maryland (21.6 percent), Pennsylvania (13.8 percent), and Virginia (10.2 percent). The remaining 13 states contributed a total of 31.4 percent of all RECs retired in 2018. The majority of RECs from in-State generators were sourced from large hydroelectric (22.9 percent) and solar photovoltaic (35.8 percent).

³⁰ PJM-EIS, Generation Attribute Tracking System, Database query, (June 1, 2018). The information in this figure does not include Commission-authorized REFs that have not established a REC account with PJM GATS.

Figure 4 Number of RECs Retired by Facility Location (2018)

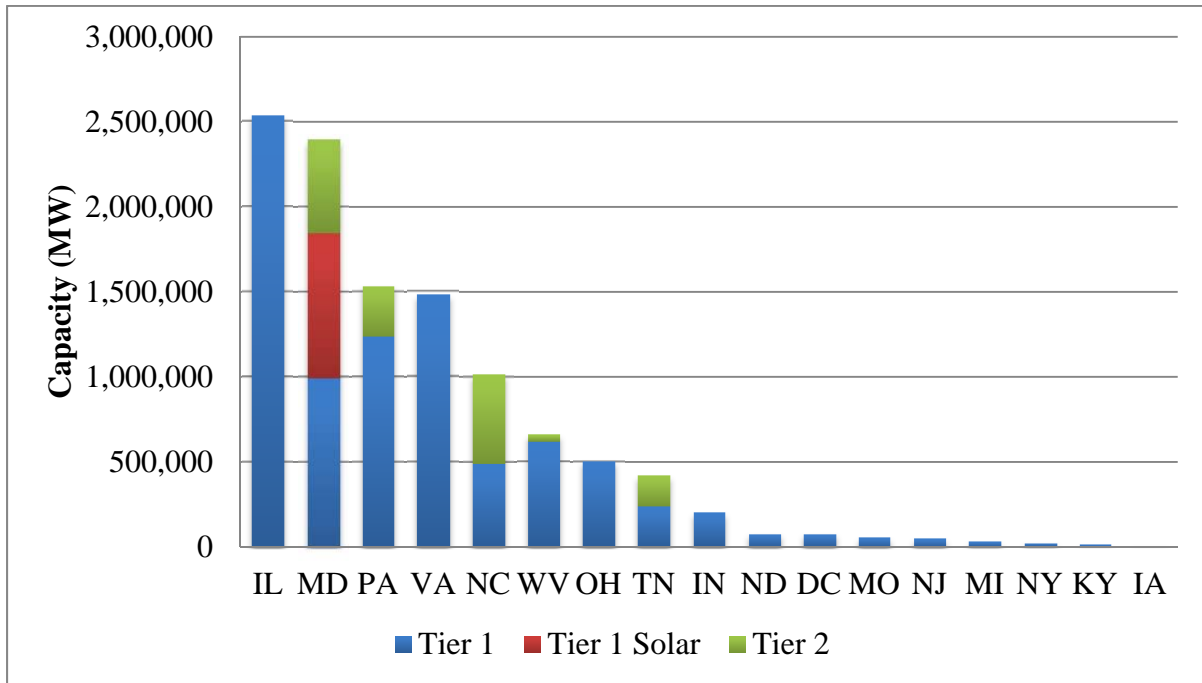


Table 7 and Table 8 provide the quantitative data in support of the previous figure. Table 7 provides the reported levels of RECs retired by Maryland electricity suppliers in 2018 on a Tier and aggregate basis, whereas Table 8 provides the information on a percentage basis. As noted above, Illinois-generated RECs, followed by Maryland, Pennsylvania, and Virginia were used in the largest aggregate amounts by Maryland electricity suppliers for 2018 RPS compliance.

Table 7 2018 REC Retirement by State

State	Tier 1 Non-Solar	Tier 1 Solar	Tier 2	All Tiers
IL	2,535,224	-	-	2,535,224
MD	990,339	857,232	548,309	2,395,880
PA	1,235,555	-	298,753	1,534,308
VA	1,482,081	-	-	1,482,081
NC	488,645	-	529,003	1,017,648
WV	618,354	-	38,958	657,312
OH	501,336	-	4,132	505,468
TN	241,441	-	180,664	422,105
IN	199,349	-	-	199,349
ND	80,079	-	-	80,079
DC	78,538	-	-	78,538
MO	57,257	-	-	57,257
NJ	49,256	-	-	49,256

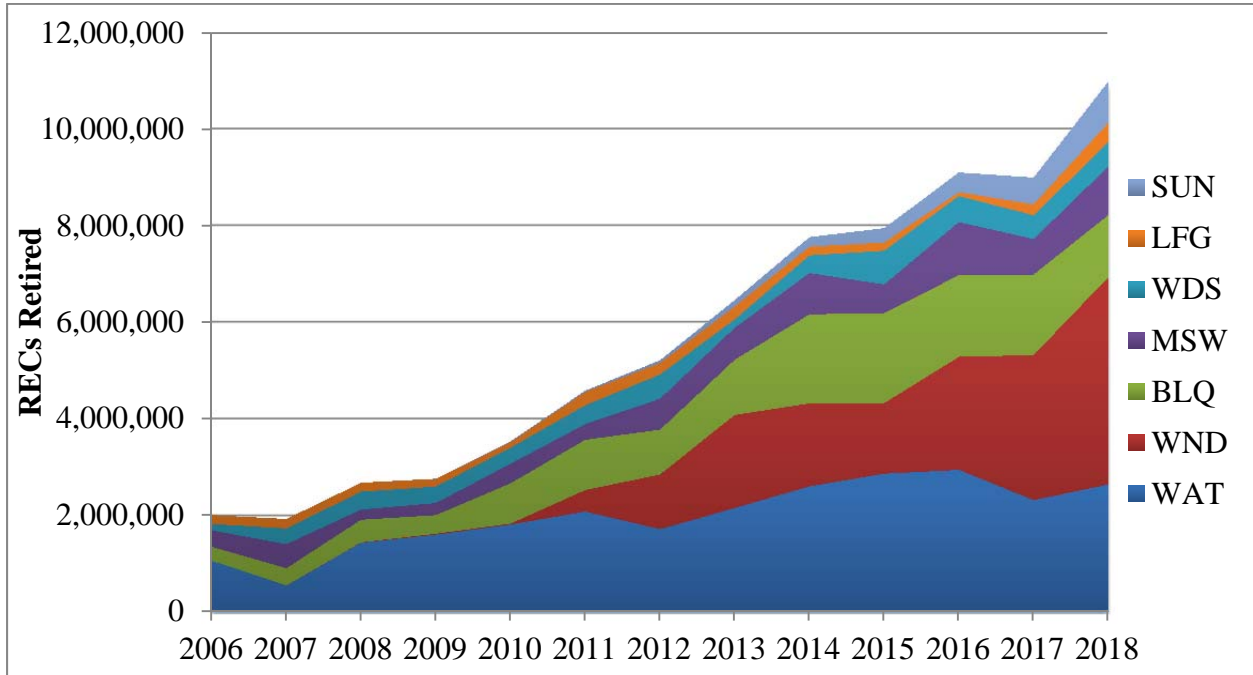
State	Tier 1 Non-Solar	Tier 1 Solar	Tier 2	All Tiers
MI	31,434	-	-	31,434
NY	22,897	-	-	22,897
KY	11,414	-	-	11,414
IA	4,538	-	-	4,538
Total	8,627,737	857,232	1,599,819	11,084,788

Table 8 2018 REC Retirement by State (%)

State	Tier 1 Non-Solar	Tier 1 Solar	Tier 2	All Tiers
IL	29.4%	0.0%	0.0%	22.9%
MD	11.5%	100.0%	34.3%	21.6%
VA	14.3%	0.0%	18.7%	13.8%
PA	17.2%	0.0%	0.0%	13.4%
NC	5.7%	0.0%	33.1%	9.2%
WV	7.2%	0.0%	2.4%	5.9%
OH	5.8%	0.0%	0.3%	4.6%
TN	2.8%	0.0%	11.3%	3.8%
IN	2.3%	0.0%	0.0%	1.8%
ND	0.9%	0.0%	0.0%	0.7%
NJ	0.9%	0.0%	0.0%	0.7%
IA	0.7%	0.0%	0.0%	0.5%
DC	0.6%	0.0%	0.0%	0.4%
MI	0.4%	0.0%	0.0%	0.3%
MO	0.3%	0.0%	0.0%	0.2%
NY	0.1%	0.0%	0.0%	0.1%
KY	0.1%	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. For the second year in a row, wind (“WND”) was the largest contributor of RECs. Total wind RECs retired for compliance have nearly tripled since 2015, and year-over-year wind REC retirements increased by approximately 43 percent. In contrast, black liquor (BLQ) REC retirements have fallen to the lowest levels since 2013, with a year-over-year decrease of about 23 percent. Note that the contributions from qualifying biomass sourced from agricultural crops, geothermal, other biomass liquid and gas, and solar thermal are too small to be seen on this chart.

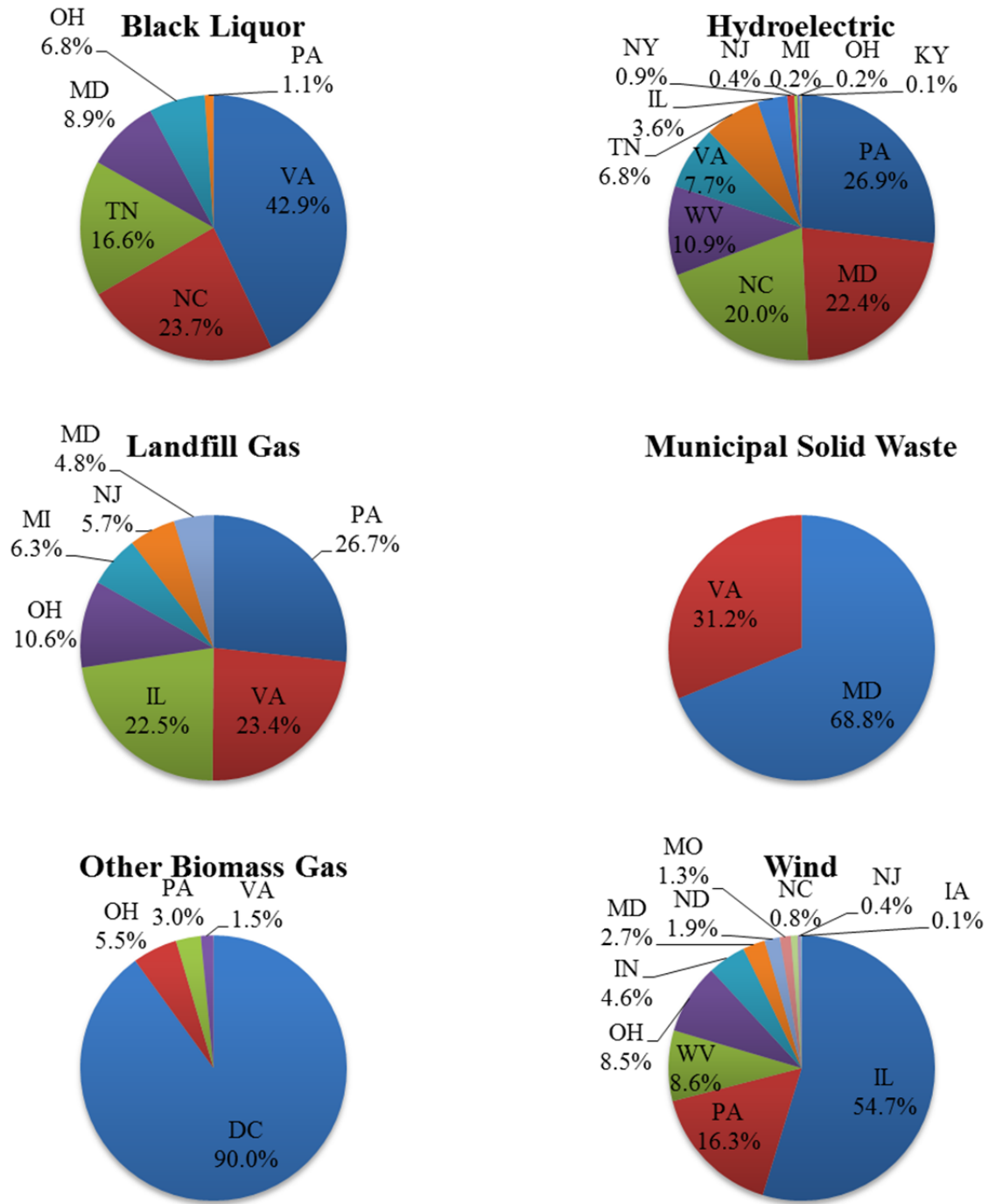
Figure 5 RECs Retired by Fuel Type (2006 – 2018)



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

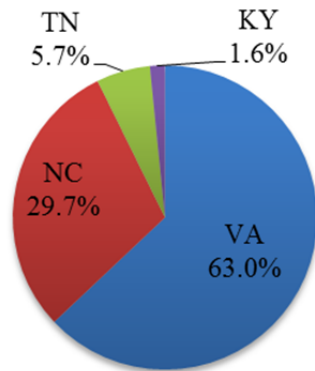
In 2018, all of the RECs retired from geothermal and solar sources originated in Maryland, while all of the qualifying biomass sourced from agricultural crops was located in North Carolina. The seven remaining fuels used to comply with Maryland’s 2018 RPS requirements corresponded to RECs generated in multiple other states, and Figure 6 shows the percentage contribution from each state for each of these seven fuels. Facilities located in Maryland provided the majority of municipal solid waste RECs and the second largest percentage of hydroelectric RECs retired for compliance in 2018. Conversely, Maryland resources provided only 8.9 percent of black liquor RECs, 4.8 percent of landfill gas RECs, and 2.7 percent of wind RECs. No other biomass gas or wood and waste solids RECs derived from in-state facilities were retired for RPS compliance.

Figure 6 Percentage of RECs Generated in Each State, by Fuel (2018)³¹



³¹ Additional information pertaining to the source of renewable energy used to meet Maryland’s 2018 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.

Wood & Waste Solids



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 2018.³² Renewable energy generated in Maryland 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).³³ Green power products are generally offered to the public with higher concentrations electricity generated by renewable energy resources (*e.g.*, 50 or 100%) than required by State RPS requirements.

As shown in Table 9, in 2018 eligible sources located within Maryland generated approximately 1.5 million Tier 1 non-solar RECs, 1.1 million Tier 1 SRECs, and 2.8 million Tier 2 RECs. 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 2018. 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 tier.

³² Specific information pertaining to the State's REFs as described herein was made available by PJM-EIS in the GATS State Agency Report.

³³ 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 2018 Maryland Generated RECs by Fuel Source

Fuel Type		RECs (Quantity)	RECs (Percent)
Tier 1	Black Liquor	86,619	1.6%
	Geothermal	1,999	0.0%
	Land Fill Gas	82,072	1.5%
	Municipal Solid Waste	721,572	13.4%
	Solar Thermal ³⁴	15	0.0%
	Small Hydro	42,268	0.8%
	Wood Waste	16,504	0.3%
	Wind	570,087	10.6%
Tier 1 Solar	Solar PV	1,072,423	19.9%
	Solar Thermal	3,844	0.1%
Tier 2	Large Hydro	2,788,413	51.8%
Total		5,385,816	100.0%

Table 10 presents additional detail regarding the disposition of Maryland-generated RECs in calendar year 2018. Approximately 47 percent of the RECs generated by renewable facilities located within Maryland during 2018 are available for potential future sale in Maryland or in other states in subsequent compliance years. Slightly over half of all RECs generated in Maryland were retired in 2018 to meet the RPS requirements in Maryland and various other PJM states. Labeled as “Other” in Table 10, just 1.1 percent of RECs were used for other purposes, which may include pending transfers between parties.

Table 10 Disposition of 2018 Maryland Generated RECs

REC Tier	Available	RPS Compliance	Other	Total
Tier 1 Non-Solar	591,767	926,355	3,014	1,521,136
Tier 1 Solar	714,722	361,380	165	1,076,267
Tier 2	1,232,753	1,489,387	66,273	2,788,413
Total	2,539,242	2,777,122	69,452	5,385,816
(%)	47.1%	51.6%	1.3%	100.0%

Source: PJM-EIS

Table 11 presents, on a state-by-state basis, the distribution of the RECs both generated in-State and retired for RPS compliance purposes. In 2018, Maryland-generated RECs were retired for compliance purposes in six jurisdictions: the District of Columbia, Delaware, Illinois, Maryland, New Jersey, and Pennsylvania. Approximately 33 percent of the RECs generated by in-State facilities in 2018 were retired for compliance purposes in Maryland, a 49 percent decrease from 2017 levels. This decline was principally driven by larger exports of Maryland-generated wind and large hydroelectric RECs as compared to prior years. It is also worth noting that compliance year 2017 was an outlier for the proportion of Maryland-generated RECs retired

³⁴ Tier 1 Solar RECs may be used to satisfy Tier 1 obligations.

in-State for compliance; a much lower percentage of Maryland-generated RECs have historically been retired for compliance.³⁵

Table 11 2018 Maryland Generated RECs Retired for RPS Compliance by State

Tier	Fuel Type	DC	DE	IL	MD	NJ	PA	Total
Tier 1 Non-solar	Black Liquor	-	-	-	50,356	-	-	50,356
	Geothermal	-	-	-	64,572	-	-	64,572
	Land Fill Gas	-	-	-	1,636	-	-	1,636
	Municipal Solid Waste	-	-	-	13,958	31,968	2,522	48,448
	Small Hydro	-	-	-	380,220	-	-	380,220
	Solar Thermal	-	-	-	3	-	-	3
	Wood Waste	-	-	-	35,570	-	-	35,570
	Wind	-	109,026	-	68,180	218,700	-	395,906
	Subtotal	-	109,026	-	564,136	250,668	2,522	926,355
	Percentage	0.0%	11.8%	0.00%	60.9%	27.1%	0.3%	100.0%
Tier 1 Solar	Solar PV	1,636	-	2	358,857	-	-	360,495
	Solar Thermal	-	-	-	885	-	-	885
	Subtotal	1,636	-	2	359,742	-	-	361,380
	Percentage	0.5%	0.0%	0.00%	99.5%	0.0%	0.0%	100.0%
Tier 2	Large Hydro	-	-	1,233,393	-	-	255,994	1,489,387
	Subtotal	-	-	1,233,393	-	-	255,994	1,489,387
	Percentage	0.0%	0.0%	82.8%	0.0%	0.0%	17.2%	100.0%
All Tiers	Grand Total	1,636	109,026	1,233,395	923,878	250,668	258,516	2,777,122
	Percentage	0.1%	3.9%	44.41%	33.3%	9.0%	9.3%	100.0%

Source: PJM-EIS.

IV. CONCLUSION

The electricity supplier compliance reports for 2018, verified by the Commission, indicate that nearly all of the Maryland RPS obligations were met via the purchase and retirement of RECs, with only \$67,796 in ACPs remitted for compliance purposes. Nearly 41 percent of RECs used for compliance in 2018 came from in-State resources, up from approximately 25 percent in 2017. RECs derived from three fuel types—wind (39.7 percent), black liquor (14.8 percent), and small hydroelectric (12.2 percent)—were the predominant sources of Tier 1 compliance in 2018, with those RECs sourced primarily from Illinois, Virginia, and Pennsylvania, respectively. 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 34.3 percent 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

³⁵ For example, 50.3% of RECs generated by in-State facilities in 2011 were retired for Maryland RPS purposes, and only 2.3% in 2010.

the electricity suppliers in Maryland procure a sufficient amount of electricity generated by renewable resources.

APPENDICES

Appendix A 2018 Retired RECs by Facility

Tier 1*						Tier 1*					
Facility Name	Fuel	State	Quantity	GEO %	Tier 1	Facility Name	Fuel	State	Quantity	LFG %	Tier 1
Baratta	GEO	MD	31	1.13%	0.00%	ACE Cumberland	LFG	NJ	2,024	0.50%	0.02%
Benigni, C.	GEO	MD	29	1.06%	0.00%	AEP Cloyds	LFG	VA	4,703	1.17%	0.05%
Bird, J.	GEO	MD	134	4.89%	0.00%	AP Arden	LFG	PA	3,291	0.82%	0.04%
Bird, W.	GEO	MD	27	0.99%	0.00%	AP Reichs Ford	LFG	MD	536	0.13%	0.01%
Brenny, M.	GEO	MD	24	0.88%	0.00%	Archbald	LFG	PA	15,268	3.78%	0.18%
Cipriani, A. 1	GEO	MD	26	0.95%	0.00%	Blue Ridge	LFG	PA	7,391	1.83%	0.09%
Cipriani, A. 2	GEO	MD	19	0.69%	0.00%	Broad Mountain	LFG	PA	3,704	0.92%	0.04%
Custer, C.	GEO	MD	35	1.28%	0.00%	BWWTWP	LFG	MD	3,786	0.94%	0.04%
Daly, M.	GEO	MD	38	1.39%	0.00%	CID LFG	LFG	IL	7,010	1.74%	0.08%
Dickerson, L.	GEO	MD	40	1.46%	0.00%	Countryside	LFG	IL	2,911	0.72%	0.03%
Dixon, T.	GEO	MD	67	2.45%	0.00%	Dixon Lee	LFG	IL	1,856	0.46%	0.02%
Dorman, K.	GEO	MD	59	2.15%	0.00%	Easton LFG	LFG	MD	5,869	1.45%	0.07%
Field, J.	GEO	MD	127	4.64%	0.00%	Fairless Hills	LFG	PA	63,771	15.80%	0.74%
Gilotra, R.	GEO	MD	73	2.67%	0.00%	FE Carbon Alum	LFG	OH	29,393	7.28%	0.34%
Graziani	GEO	MD	54	1.97%	0.00%	FE Erie County	LFG	OH	1,244	0.31%	0.01%
Gugerty, B.	GEO	MD	86	3.14%	0.00%	FE Lorain	LFG	OH	5,551	1.38%	0.06%
Harding, A.	GEO	MD	38	1.39%	0.00%	FE Mahoning	LFG	OH	6,633	1.64%	0.08%
Harrison, H.	GEO	MD	21	0.77%	0.00%	Greene Valley	LFG	IL	21,426	5.31%	0.25%
Hendrickson	GEO	MD	46	1.68%	0.00%	Lake Gas	LFG	IL	11,564	2.87%	0.13%
Hucht	GEO	MD	24	0.88%	0.00%	Lakeview Gas	LFG	PA	5,189	1.29%	0.06%
Jack	GEO	MD	35	1.28%	0.00%	Livingston	LFG	IL	13,179	3.27%	0.15%
Jackson, C.	GEO	MD	60	2.19%	0.00%	Mallard Lake	LFG	IL	15,000	3.72%	0.17%
Jarboe	GEO	MD	55	2.01%	0.00%	Martinsville	LFG	VA	3,328	0.82%	0.04%
Jocic, B.	GEO	MD	19	0.69%	0.00%	ME Lebanon	LFG	PA	58	0.01%	0.00%
Kawalek, J.	GEO	MD	46	1.68%	0.00%	Monmouth	LFG	NJ	473	0.12%	0.01%
Keeney, A.	GEO	MD	74	2.70%	0.00%	Morris	LFG	IL	986	0.24%	0.01%
Kosydar	GEO	MD	28	1.02%	0.00%	Newland Park	LFG	MD	1,943	0.48%	0.02%
Lee, A.	GEO	MD	33	1.21%	0.00%	Edgeboro	LFG	NJ	991	0.25%	0.01%
Lehr, M.	GEO	MD	64	2.34%	0.00%	Orchard Hills	LFG	MI	25,374	6.29%	0.29%
Leung	GEO	MD	78	2.85%	0.00%	PEP Ritchie Bwn	LFG	MD	4,467	1.11%	0.05%
Loudermilk, G.	GEO	MD	163	5.95%	0.00%	PEP Ritchie PG	LFG	MD	2,831	0.70%	0.03%
MacInnes	GEO	MD	22	0.80%	0.00%	PL Pine Grove	LFG	PA	18	0.00%	0.00%
Martin, D.	GEO	MD	31	1.13%	0.00%	PN Northern Tier	LFG	PA	5,503	1.36%	0.06%
McPartland, K.	GEO	MD	77	2.81%	0.00%	PN Shippensburg	LFG	PA	2,275	0.56%	0.03%
McWilliams	GEO	MD	59	2.15%	0.00%	Prairie View	LFG	IL	3,916	0.97%	0.05%
Menning, J.	GEO	MD	55	2.01%	0.00%	PS Pennsauken	LFG	NJ	1,324	0.33%	0.02%
Mignini, A.	GEO	MD	45	1.64%	0.00%	Rochelle Energy	LFG	IL	10,031	2.49%	0.12%
Overstreet	GEO	MD	118	4.31%	0.00%	Sayrevil	LFG	NJ	18,054	4.47%	0.21%
Parker	GEO	MD	30	1.10%	0.00%	Settlers Hill	LFG	IL	2,985	0.74%	0.03%
Parlegreco, D.	GEO	MD	67	2.45%	0.00%	Suffolk Energy	LFG	VA	1,751	0.43%	0.02%
Patel, K.	GEO	MD	52	1.90%	0.00%	Tullytown	LFG	PA	1,231	0.30%	0.01%
Richardson, J.	GEO	MD	26	0.95%	0.00%	VP Amelia	LFG	VA	2,195	0.54%	0.03%
Ryan, J.	GEO	MD	19	0.69%	0.00%	VP Bethel	LFG	VA	11,226	2.78%	0.13%
Santin, D.	GEO	MD	24	0.88%	0.00%	VP Brunswick	LFG	VA	4,343	1.08%	0.05%
Scheihing, P.	GEO	MD	9	0.33%	0.00%	VP Charles City	LFG	VA	18,758	4.65%	0.22%
Shriner	GEO	MD	22	0.80%	0.00%	VP Chesterfield	LFG	VA	10,921	2.71%	0.13%
Smith, H.	GEO	MD	87	3.18%	0.00%	VP King Queen	LFG	VA	380	0.09%	0.00%
Smith, J.	GEO	MD	27	0.99%	0.00%	VP King George	LFG	VA	18,902	4.68%	0.22%
Snyderman, C.	GEO	MD	64	2.34%	0.00%	VP Northeast	LFG	VA	13,538	3.35%	0.16%
Sotzen	GEO	MD	60	2.19%	0.00%	VP Peninsula	LFG	VA	4,401	1.09%	0.05%
Traber, T.	GEO	MD	19	0.69%	0.00%	VP VA Beach	LFG	VA	123	0.03%	0.00%
Verde, J.	GEO	MD	26	0.95%	0.00%						
Vorhauer	GEO	MD	37	1.35%	0.00%						
Wissel, J.	GEO	MD	70	2.56%	0.00%						
Yarrington, M.	GEO	MD	39	1.42%	0.00%						
Total			2,738	100.00%	0.03%	Total			403,625	100.00%	4.68%

Appendix A 2018 Retired RECs by Facility (Cont'd)

Tier 1 (Cont'd)*					
Facility Name	Fuel	State	Quantity	WND %	Tier 1
Adam	WND	IL	2,898	0.07%	0.03%
AEP Blue Creek	WND	OH	144,960	3.38%	1.68%
AEP Bluff Point	WND	IN	55,712	1.30%	0.65%
AEP Fowler R1A	WND	IN	9,645	0.22%	0.11%
AEP Fowler R3	WND	IN	28,444	0.66%	0.33%
AEP Fowler R4	WND	IN	10,000	0.23%	0.12%
AEP Hog Creek	WND	OH	195,116	4.55%	2.26%
AEP Meadow L3	WND	IN	920	0.02%	0.01%
AEP Meadow L4	WND	IN	6,141	0.14%	0.07%
AEP Meadow L5	WND	IN	50,505	1.18%	0.59%
AEP Paulding	WND	OH	25,243	0.59%	0.29%
AEP Wildcat	WND	IN	27,982	0.65%	0.32%
AP Beech Ridge	WND	WV	18,313	0.43%	0.21%
AP Criterion	WND	MD	25,118	0.59%	0.29%
AP Fair Wind	WND	MD	34,725	0.81%	0.40%
AP 4-Mile Ridge	WND	MD	28,807	0.67%	0.33%
AP Greenland	WND	WV	118,046	2.75%	1.37%
AP Pinnacle	WND	WV	196,407	4.58%	2.28%
AP Roth Rock	WND	MD	27,262	0.64%	0.32%
AP Twin Ridges	WND	PA	124,428	2.90%	1.44%
Big Sky	WND	IL	102,081	2.38%	1.18%
Bishop Hill	WND	IL	756,083	17.62%	8.76%
Camp Grove 1	WND	IL	46,986	1.10%	0.54%
Cayuga Ridge	WND	IL	309,883	7.22%	3.59%
Crescent Ridge	WND	IL	67,829	1.58%	0.79%
Crystal Lake III	WND	IA	99	0.00%	0.00%
Eco Grove	WND	IL	49,530	1.15%	0.57%
Farmer City	WND	MO	57,257	1.33%	0.66%
Findlay	WND	OH	810	0.02%	0.01%
Fowler Ridge	WND	IN	10,000	0.23%	0.12%
FPL Crystal Lake	WND	IA	4,439	0.10%	0.05%
Grand Ridge 1	WND	IL	46,512	1.08%	0.54%
Grand Ridge 2	WND	IL	39,199	0.91%	0.45%
Grand Ridge 3	WND	IL	42,100	0.98%	0.49%
Harpster	WND	OH	387	0.01%	0.00%
High Trail	WND	IL	204,484	4.77%	2.37%
Jersey-Atlantic	WND	NJ	16,390	0.38%	0.19%
Kelly Creek	WND	IL	218,754	5.10%	2.54%
Mendota Hills	WND	IL	29,717	0.69%	0.34%
Meyersdale	WND	PA	52,445	1.22%	0.61%
Minonk	WND	IL	19,982	0.47%	0.23%
Old Trail	WND	IL	32,498	0.76%	0.38%
Pilot Hill	WND	IL	64,069	1.49%	0.74%
PL Locust Ridge	WND	PA	9,651	0.22%	0.11%
PN Armenia Mtn.	WND	PA	7,457	0.17%	0.09%
PN Highland N.	WND	PA	42,466	0.99%	0.49%
PN Laurel Hills	WND	PA	801	0.02%	0.01%
PN Lookout	WND	PA	116,807	2.72%	1.35%
PN Mehoopany 1	WND	PA	132,582	3.09%	1.54%
PN Patton	WND	PA	30,206	0.70%	0.35%
PN Ringer Hill	WND	PA	41,748	0.97%	0.48%
PN Sandy Ridge	WND	PA	62,959	1.47%	0.73%
PN Stony Creek	WND	PA	76,128	1.77%	0.88%
Providence Hgt.	WND	IL	62,618	1.46%	0.73%
Radfords Run	WND	IL	68,236	1.59%	0.79%
Sublette	WND	IL	88,413	2.06%	1.02%
Talbot County	WND	MD	70	0.00%	0.00%
Tatanka	WND	ND	80,079	1.87%	0.93%
Top Crop 1	WND	IL	59,062	1.38%	0.68%
Top Crop 2	WND	IL	37,302	0.87%	0.43%

Tier 1 (Cont'd)*					
Facility Name	Fuel	State	Quantity	WND %	Tier 1
VP Desert	WND	NC	35,267	0.82%	0.41%
VP New Creek	WND	WV	36,305	0.85%	0.42%
Zephyr	WND	OH	68	0.00%	0.00%
	Total		4,290,431	100.00%	49.73%
Facility Name	Fuel	State	Quantity	WAT %	Tier 1
AEP Buck	WAT	VA	86,017	8.18%	1.00%
AEP Fries	WAT	VA	29,662	2.82%	0.34%
AEP Glen Ferris	WAT	WV	13,887	1.32%	0.16%
Allegheny	WAT	PA	5,447	0.52%	0.06%
Allegheny Rvr 6	WAT	PA	4,291	0.41%	0.05%
Allegheny Rvr 8	WAT	PA	121,072	11.51%	1.40%
Allegheny Rvr 9	WAT	PA	113,126	10.76%	1.31%
AP Misc	WAT	WV	14,231	1.35%	0.16%
BC Brighton	WAT	MD	607	0.06%	0.01%
Beardslee	WAT	NY	55	0.01%	0.00%
Beebee Island	WAT	NY	1,836	0.17%	0.02%
Big Shoals	WAT	VA	1,487	0.14%	0.02%
Black River	WAT	NY	1,372	0.13%	0.02%
Brasfield	WAT	VA	11,435	1.09%	0.13%
Upper Sterling	WAT	IL	10,664	1.01%	0.12%
Coleman Falls	WAT	VA	6,372	0.61%	0.07%
Conemaugh	WAT	PA	34,079	3.24%	0.39%
Cushaw	WAT	VA	717	0.07%	0.01%
Deep Creek 32	WAT	MD	43,958	4.18%	0.51%
Deferiet	WAT	NY	4,180	0.40%	0.05%
Dixon	WAT	IL	18,446	1.75%	0.21%
E.J. West	WAT	NY	120	0.01%	0.00%
French Paper	WAT	MI	6,060	0.58%	0.07%
Great Falls	WAT	NJ	10,000	0.95%	0.12%
Halifax	WAT	VA	4,286	0.41%	0.05%
Holcomb Rock	WAT	VA	9,085	0.86%	0.11%
Lakeview Hydro	WAT	VA	542	0.05%	0.01%
Lockport	WAT	IL	67,014	6.37%	0.78%
London	WAT	WV	81,294	7.73%	0.94%
Lyons Falls	WAT	NY	2,777	0.26%	0.03%
Marmet	WAT	WV	79,232	7.53%	0.92%
Moomaws Dam	WAT	VA	2,181	0.21%	0.03%
Mother Ann Lee	WAT	KY	3,455	0.33%	0.04%
Niagara	WAT	VA	4,413	0.42%	0.05%
Prospect	WAT	NY	3,193	0.30%	0.04%
Reusens	WAT	VA	19,128	1.82%	0.22%
Schoolfield	WAT	VA	17,724	1.69%	0.21%
Snowden	WAT	VA	4,607	0.44%	0.05%
Soft Maple	WAT	NY	1,834	0.17%	0.02%
Trenton	WAT	NY	7,530	0.72%	0.09%
VP Emporia	WAT	VA	7,769	0.74%	0.09%
Winfield	WAT	WV	60,639	5.77%	0.70%
York Haven	WAT	PA	106,204	10.10%	1.23%
Yough	WAT	PA	29,576	2.81%	0.34%
	Total		1,051,604	100.00%	12.19%
Facility Name	Fuel	State	Quantity	MSW %	Tier 1
Covanta Fairfax	MSW	VA	315,012	31.24%	3.65%
Montgomery	MSW	MD	308,910	30.63%	3.58%
Wheelabrator	MSW	MD	384,595	38.13%	4.46%
	Total		1,008,517	100.00%	11.69%

Appendix A 2018 Retired RECs by Facility (Cont'd)

Tier 1 (Cont'd)*						Tier 2					
Facility Name	Fuel	State	Quantity	AB %	Tier 1	Facility Name	Fuel	State	Quantity	WAT %	Tier 2
Kapstone Kraft	AB	NC	40	100.00%	0.00%	Summersville	WAT	WV	5,645	0.35%	0.35%
Total			40	100.00%	0.00%	Conowingo	WAT	MD	548,309	34.27%	34.27%
Facility Name	Fuel	State	Quantity	BLQ %	Tier 1	Covanta	WAT	WV	33,313	2.08%	2.08%
AEP W Kingsport	BLQ	TN	212,627	16.60%	2.46%	Falls	WAT	NC	21,431	1.34%	1.34%
Chillicothe	BLQ	OH	87,172	6.81%	1.01%	Gaston	WAT	NC	2,921	0.18%	0.18%
Covington	BLQ	VA	172,964	13.51%	2.00%	High Rock	WAT	NC	85,676	5.36%	5.36%
Domtar Paper	BLQ	NC	245,086	19.14%	2.84%	Lake Lynn	WAT	PA	48,495	3.03%	3.03%
Franklin Mill	BLQ	VA	98,762	7.71%	1.14%	Narrows	WAT	NC	138,885	8.68%	8.68%
Hopewell	BLQ	VA	110,064	8.59%	1.28%	Piney	WAT	PA	2,736	0.17%	0.17%
Johnsonburg Mill	BLQ	PA	13,741	1.07%	0.16%	Racine	WAT	OH	4,132	0.26%	0.26%
Kapstone Kraft	BLQ	NC	58,840	4.59%	0.68%	Roanoke	WAT	NC	6,653	0.42%	0.42%
Luke Mill	BLQ	MD	114,111	8.91%	1.32%	Safe Harbor 1	WAT	PA	247,522	15.47%	15.47%
West Point	BLQ	VA	167,341	13.07%	1.94%	Tuckertown	WAT	NC	117,264	7.33%	7.33%
Total			1,280,708	100.00%	14.84%	XIC Calderwood	WAT	TN	180,664	11.29%	11.29%
Facility Name	Fuel	State	Quantity	OBG %	Tier 1	XIC Cheoah	WAT	NC	156,173	9.76%	9.76%
Allentown	OBG	PA	2,642	3.03%	0.03%	Total			1,599,819	100.00%	100.00%
Atlantic Trtmnt	OBG	VA	1,334	1.53%	0.02%	Summary					
Buckeye BioGas	OBG	OH	585	0.67%	0.01%	Tier 1 REC Total	8,627,737				
Central Ohio	OBG	OH	228	0.26%	0.00%	SREC Total	857,232				
DC Water Bailey	OBG	DC	78,538	89.99%	0.91%	Tier 2 REC Total	1,599,819				
Haviland	OBG	OH	3,909	4.48%	0.05%	Grand Total	11,084,788				
Zanesville	OBG	OH	37	0.04%	0.00%	*Solar facilities are not represented in this table. In 2018, 54,026 facilities produced 857,232 SRECs.					
Total			87,273	100.00%	1.01%	Resource Definitions					
Facility Name	Fuel	State	Quantity	WDS %	Tier 1	Agriculture Waste	AB	Municipal Solid Waste	MSW		
AEP W Kingsport	WDS	TN	28,814	5.73%	0.33%	Black Liquor	BLQ	Other Biomass Gas	OBG		
Covington	WDS	VA	60,343	12.00%	0.70%	Geothermal	GEO	Wood/Waste Solids	WDS		
Cox Waste	WDS	KY	7,959	1.58%	0.09%	Hydroelectric	WAT	Wind	WND		
Domtar Paper	WDS	NC	148,200	29.48%	1.72%	Landfill Gas	LFG				
Hopewell	WDS	VA	8,111	1.61%	0.09%						
Kapstone Kraft	WDS	NC	1,212	0.24%	0.01%						
Pittsylvania	WDS	VA	9,148	1.82%	0.11%						
VP South Boston	WDS	VA	227,507	45.25%	2.64%						
West Point	WDS	VA	11,501	2.29%	0.13%						
Total			502,795	100.00%	5.83%						

Appendix B Location of Facilities that Provided RECs for 2018 RPS Compliance

	DC	IA	IL	IN	KY	MD	MI	MO	NC	ND	NJ	NY	OH	PA	TN	VA	WV	Total
<i>Tier 1 Non-solar</i>																		
Agricultural Byproduct	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Black Liquor	-	-	-	-	-	1	-	-	2	-	-	-	1	1	1	4	-	10
Geothermal	-	-	-	-	-	55	-	-	-	-	-	-	-	-	-	-	-	55
Landfill Gas	-	-	11	-	-	6	1	-	-	-	5	-	4	11	-	13	-	51
Municipal Solid Waste	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	1	-	3
Other Biomass Gas	1	-	-	-	-	-	-	-	-	-	-	-	4	1	-	1	-	7
Solar Thermal	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Small Hydro	-	-	3	-	1	2	1	-	-	-	1	9	-	7	-	15	5	44
Wood Waste	-	-	-	-	1	-	-	-	2	-	-	-	-	-	1	5	-	9
Wind	-	2	21	9	-	5	-	1	1	1	1	-	6	12	-	-	4	63
<i>Tier 1 Solar</i>																		
Solar PV	-	-	-	-	-	53,252	-	-	-	-	-	-	-	-	-	-	-	53,252
Solar Thermal	-	-	-	-	-	774	-	-	-	-	-	-	-	-	-	-	-	774
<i>Tier 2</i>																		
Large Hydro	-	-	-	-	-	1	-	-	7	-	-	-	1	3	1	-	2	15
Total	1	2	35	9	2	54,099	2	1	13	1	7	9	16	35	3	39	11	54,285

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

Appendix C Disposition of 2018 Vintage RECs Generated in Maryland

Fuel Type and Tier	RECs Retired for RPS Compliance by State							Available	Other	Total RECs Generated
	DC	DE	IL	MD	NJ	PA	Total			
Black Liquor	-	-	-	64,572	-	-	64,572	22,047	-	86,619
Geothermal	-	-	-	1,636	-	-	1,636	363	-	1,999
Landfill Gas	-	-	-	13,958	31,968	2,522	48,448	32,191	1,433	82,072
Municipal Solid Waste	-	-	-	380,220	-	-	380,220	341,352	-	721,572
Small Hydro	-	-	-	35,570	-	-	35,570	6,698	-	42,268
Solar Thermal	-	-	-	3	-	-	3	12	-	15
Wind	-	109,026	-	68,180	218,700	-	395,906	172,600	1,581	570,087
Wood Waste	-	-	-	-	-	-	-	16,504	-	16,504
<i>Tier 1 Non-solar Total</i>	-	109,026	-	564,139	250,668	2,522	926,355	591,767	3,014	1,521,136
Solar PV	1,636	-	2	358,857	-	-	360,495	711,763	165	1,072,423
Solar Thermal	-	-	-	885	-	-	885	2,959	-	3,844
<i>Tier 1 Solar Total</i>	1,636	-	2	359,742	-	-	361,380	714,722	165	1,076,267
Large Hydro	-	-	1,233,393	-	-	255,994	1,489,387	1,232,753	66,273	2,788,413
<i>Tier 2 Total</i>	-	-	1,233,393	-	-	255,994	1,489,387	1,232,753	66,273	2,788,413
<i>Grand Total</i>	1,636	109,026	1,233,395	923,881	250,668	258,516	2,777,122	2,539,242	69,452	5,385,816

Appendix D Number of Renewable Energy Facilities Located in Maryland

Maryland County	Tier 1 Non-Solar	Tier 1 Solar	Tier 2	Total
Allegany	1	53	-	54
Anne Arundel	32	8,272	-	8,304
Baltimore	9	7,155	-	7,164
Baltimore City	1	1,095	-	1,096
Calvert	-	790	-	790
Caroline	-	289	-	289
Carroll	-	2,149	-	2,149
Cecil	-	1,429	-	1,429
Charles	-	2,681	-	2,681
Dorchester	-	293	-	293
Frederick	5	2,665	-	2,670
Garrett	6	57	-	63
Harford	7	3,797	1	3,805
Howard	13	3,538	-	3,551
Kent	-	322	-	322
Montgomery	14	10,291	-	10,305
Prince Georges	6	16,925	-	16,931
Queen Annes	4	612	-	616
Somerset	1	266	-	267
St Marys	-	1,355	-	1,355
Talbot	4	217	-	221
Washington	2	1,081	-	1,083
Wicomico	2	1,009	-	1,011
Worcester	1	489	-	490
Total	108	66,830	1	66,939

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 November 1, 2019.

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	2.7	-	67.7
Anne Arundel	4.0	96.7	-	100.6
Baltimore	66.5	87.9	-	154.4
Baltimore City	0.1	14.7	-	14.8
Calvert	-	8.9	-	8.9
Caroline	-	9.6	-	9.6
Carroll	-	30.7	-	30.7
Cecil	-	35.0	-	35.0
Charles	-	45.6	-	45.6
Dorchester	-	12.9	-	12.9
Frederick	2.1	86.8	-	88.8
Garrett	210.0	3.6	-	213.6
Harford	1.4	69.8	474.0	545.1
Howard	1.3	45.8	-	47.1
Kent	-	12.8	-	12.8
Montgomery	81.1	117.7	-	198.8
Prince George's	13.5	194.3	-	207.8
Queen Anne's	0.1	40.9	-	41.0
Somerset	3.8	109.7	-	113.5
St. Mary's	-	14.8	-	14.8
Talbot	70.3	12.7	-	83.0
Washington	0.1	66.7	-	66.8
Wicomico	6.0	40.7	-	46.7
Worcester	0.0	9.1	-	9.1
Total	525.1	1,170.2	474.0	2,169.3

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 November 1, 2019.