SHINING A LIGHT ON MARYLAND'S SOLAR ENERGY MARKET & ITS RENEWABLE ENERGY POLICIES

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In early 2017, state lawmakers voted overwhelmingly to override Maryland Governor Larry Hogan's veto of a bill to increase the use of renewable energy in the state. The legislation, titled "The Clean Energy Jobs Act," which requires utility companies in Maryland to buy more energy from renewable sources, became law when the Democratic-controlled General Assembly voted to override the Republican governor. Hogan and GOP lawmakers objected to the cost to consumers. But, the Democrats argued that the new law will save the environment as well as create jobs.

The environment is an important topic in Maryland, and has become a partisan issue that touches on voter's values, philosophies, and beliefs about how human activity balances with our natural resources. This is an issue that is playing out across the nation, and Maryland has become a microcosm and a model jurisdiction for this debate, with both sides battling over what the law should be.

A primary renewable source of energy is solar energy.[1] Solar power "represents about 1% of the electricity the U.S. utilities generate today," but that could grow as major electric utilities begin to promote solar technology traditionally left to non-profits.[2] In addition, "the plunging cost of solar power is leading U.S. electric companies to capture more of the sun," despite changes in energy policy under the Trump administration that aspire to boost fossil fuel production.[3] In 2016, renewable energy such as wind and solar "expected to account for about two-thirds of the new electricity generation capacity added to the nation's

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[1] *Energy Sources*, ENERGY.GOV, https://perma.cc/A9XQ-D6QC (last visited Nov. 11, 2018) (mentioning that other primary renewable sources include wind, geothermal, and hydropower).

[2] Emery P. Dalesio, *US utilities seek sun as Trump sides with coal, fossil fuels,* ASSOCIATED PRESS (Feb. 4, 2017), https://perma.cc/6ZMA-C2VS.

[3] *Id.*

power grid."[4] As a result, according to the Department of Energy, wind and solar will outpace fossil fuel development for a third straight year.[5] As the solar trend becomes increasingly popular, it is important to understand how solar technology works and how efficient it is compared to other sources of energy such as nuclear, and fossil energy; like oil, coal and natural gas.

This article will analyze Maryland's approach as a leading jurisdiction in the solar energy market. First, the article will explore the science and technology behind solar, and how that compares with other sources of energy. Second, the article will provide an overview of how Maryland's solar energy market has developed since the restructuring of the electrical markets in the late 1990s to the policies and laws that have shaped it since, including net metering and the renewable portfolio standard. Third, the article will analyze Maryland's primary environmental policy report.[6] The report lays out Maryland's plan to combat climate change and has set out environmental policy goals and initiatives that have become law. The goals and initiatives in this report has led to a fierce debate about the future of Maryland's energy policy, which has divided voters, and culminated with the "Clean Energy Jobs Act". Lastly, the article will make a prediction where Maryland's energy policy is headed.

I. SOLAR ENERGY

A. How does solar energy work?

The sun provides "ample energy to fulfill all the world's power needs many times over. It doesn't give off carbon emissions; it won't run out; and its free."[7] The goal is to turn the sunbeams into electricity.[8] Normally, the energy contained in the sunlight turns to heat when it hits an object.[9] However, with certain material that energy can be turned into power by creating an electric current.[10]

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[4] *Id.*

[5] *Id.*

[6] *See* MD DEP'T OF ENV'T, *Greenhouse Gas Emissions Reduction Act Plan Update (2015),* https://perma.cc/6554-7ANQ (last visited Nov. 11, 2018).

[7] Susannah Locke, *How does solar power work?,* SCI. AM. (Oct. 20, 2008), https://perma.cc/4ZJQ-VXFW.

[8] *Id.*

[9] *Id.*

[10] *Id.*

Solar panels primarily use the photovoltaic effect to generate electricity. When the sunlight meets the solar cell, which is made of silicon, it acts as a semiconductor.[11] The solar cells that comprise a solar panel "are constructed with a positive and negative layer, which together [produces electricity], like a battery.[12] When the sunlight is absorbed by the solar cell, "the electrons are knocked loose from their atoms."[13] On the condition that "conductors are attached to the positive and negative sides of a cell, it forms an electric circuit."[14] The electrons will "flow through such a circuit and generate electricity."[15] This process is compounded as "multiple cells make up a solar panel, and multiple panels (modules) can be wired together to form a solar array. The more panels that you can deploy, the more energy you can expect to generate."[16]

The next step is to link the electricity to the grid for transmission. The electricity that the solar panels are generating is known as direct current (DC) electricity.[17] With this type of electricity, "electrons flow in one direction around a circuit."[18] Conversely, "with alternating current (AC) electricity, electrons are pushed and pulled, periodically reversing direction."[19] The AC electricity is created by generators "when a coil of wire is spun next to a magnet."[20] There are different sources of energy that can "'turn the handle' of a generator, [including] gas or diesel fuel, hydroelectricity, nuclear, coal, wind, or solar."[21] The U.S. power grid accepts AC electricity because of its cost to transmit over long distances.[22] Thus, in order to link the DC electricity to the AC grid, it requires an inverter.[23]

The inverter works by turning the DC electricity from the solar array and creating AC electricity.[24] The inverters are characterized as the brains

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[11] Martin DeBono, *What is Solar Energy and How Do Solar Panels Work?,* SUNPOWER: BLOG (Oct. 25, 2017), https://perma.cc/3VJK-EEWB.

[12] *Id.*

[13] *Id.*

[14] *Id.*

[15] *Id.*

[16] *Id.*

[17] DeBono, *supra* note 11.

[18] *Id.*

[19] *Id.*

[20] *Id.*

[21] *Id.*

[22] *Id.*

[23] DeBono, *supra* note 11.

[24] *Id.*

of the system.[25] In addition to converting electricity, inverters "provide ground fault protection and system stats including voltage and current on AC and DC circuits, energy production, and maximum power point tracking."[26] In the past, the solar industry was dominated by central inverters.[27] However, a big technological shift has occurred in the PV industry with the introduction of micro-inverters.[28] The micro-inverter focuses on "optimizing each individual solar panel, and not an entire system, as central inverts do."[29] As a result, micro-inverters "enable every solar panel to perform at maximum potential. One solar panel will not drag down the performance of the entire solar array, as opposed to central inverters that optimize for the weakest link."[30]

Typically, a photovoltaic solar panel system is installed on a residential home. In a normal scenario, the solar panel captures sunlight creating DC current, which then flows to an inverter.[31] The inverter will take the electricity generated and convert it from DC to AC, which now can be transmitted to power a home.[32] It's a straightforward process that depends on sunlight. But, what if the sun is not shining? In this case, the solar panel system benefits from a system called net metering.[33]

A photovoltaic solar system tied to a grid has no batteries. So, when the sun is shining and the solar user does not use up all the energy generated in a day, excess power is sent out of the house to neighbors' houses.[34] This is called "back feeding" the grid.[35] At night, the grid will provide energy for lights and other appliances as usual, so solar users are covered in exchange for the excess energy they shared with the grid during the day.[36] This process uses a net meter to compare the energy sent to the grid with the energy received.[37]

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25 *Id.*
26 *Id.*
27 *Id.*
28 *Id.*
29 DeBono, *supra* note 11.
30 *Id.*
31 *Id.*
32 *Id.*
33 *Id.*
34 *Id.*
35 DeBono, *supra* note 11.
36 *Id.*
37 *Id.*

II. HOW EFFICIENT IS SOLAR ENERGY?

Under the Federal Power Act, "for the purpose of assuring an abundant supply of electric energy with the greatest possible economy, and with regard to the proper utilization and conservation of natural resources," there are three fundamental requirements that comprise the standard of efficiency: Reliability, Adequacy, and Cost.[38] Thus, solar energy should be measured according to that standard (i.e., an interrelated triangle).[39]

A. Reliability

An energy supply needs to be reliable, and there are two significant elements of reliability.[40] The first element of reliability is the capability of meeting baseload demand consistently.[41] The second element is the flexibility to increase power if necessary to supply predicted peaks.[42] Wind and solar are considered intermittent energy sources.[43] These source's power generation can change depending on the factors and conditions that are outside the operating company's control.[44] The characterization of wind and solar as intermittent is "because their electric output depends on environmental conditions – [such as] the speed of the wind and how much sunlight strikes a solar panel."[45] This output can be "difficult to predict or control, which can make matching electricity supply to consumer demand problematic."[46] To ensure demand can be met, back-up energy sources are required if environmental conditions are not conducive to electricity generation.[47]

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[38] Interview with James Gekas, Partner, Earth Sky Community Solar, LLC, in University Park, Md. (Jan. 4, 2018); *See* 16 U.S.C. §§ 824a(a), 824o(g) (2012) (requiring assessments of reliability and adequacy of the bulk power system in North America at the greatest possible economy).

[39] *Id.*

[40] *Energy Challenges: Reliability,* EDFENERGY, https://perma.cc/TEB9-RT6H (last visited Nov. 11, 2018).

[41] *Id*.

[42] *Id*.

[43] *Id*.

[44] *Id*.

[45] *Id*.

[46] Energy Challenges: Reliability, *supra* note 40.

[47] *Id*.

B. Adequacy

The essential factor is the reserve margin of supply of energy.[48] For example, if the peak load is 1000mw, the reserve margin would be roughly 20% more than the peak load.[49] Here, "solar power cannot effectively meet electricity demand because it is . . . variable."[50] The industry does not consider solar and wind on par with traditional generation sources under a capacity reserve calculation.[51] The primary reason for this discrepancy is due to its reliance on "non-dispatchable" or "intermittent" (i.e., uncontrollable) resources.[52]

C. Cost

To measure the cost of different energy sources, "estimates for electricity production are typically given in the form of a Levelized Cost of Electricity (LCOE)."[53] The LCOE "measures a power plant's costs over a lifetime, including its construction, fuel, operations, maintenance, and efficiency."[54] According to a study by the U.S. Energy Information Administration, "the levelized cost of solar power is $125.3 per megawatt-hour for a PV plant and $239.7 per megawatt-hour for solar thermal (CSP) plants."[55] In comparison the study reports, "conventional coal plants cost $95.1 per megawatt hour, natural gas combined cycle plants cost $75.2 per megawatt hour, and advanced nuclear plants cost $95.2 per megawatt-hour."[56] Under this cost analysis, "solar is a more expensive electricity source than traditional alternatives like coal or natural gas."[57] This analysis reflects that despite "zero fuel costs, electricity from [solar power plants] still comes at a high price compared

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48 Gekas, *supra* note 38.

49 *Id*.

50 Jordan Lofthouse et al., *Reliability of Renewable Energy: Solar,* UTAH ST. U. 1 (Dec. 3, 2015), https://perma.cc/DZ5T-PYL4.

51 FED. ENERGY REG. COMM'N, RESOURCE ADEQUACY REQUIREMENTS: RELIABILITY AND ECONOMIC IMPLICATIONS 73 (2013), https://perma.cc/N8TK-8JNW.

52 *Id*.

53 Lofthouse, *supra* note 50.

54 *Id*.

55 *Id*.; U.S. ENERGY INFO. ADMIN., LEVELIZED COST AND LEVELIZED AVOIDED COST OF NEW GENERATION RESOURCES IN THE ANNUAL ENERGY OUTLOOK 2015, 6 (2015), https://perma.cc/8VP9-HDN5.

56 *Id*.

57 *Id*.

to other electricity sources when lifetime costs are taken into consideration."[58]

The cost of operation and maintenance of PV solar panels is relatively simple. PV solar panels can be guaranteed for twenty-five years or longer.[59] The panels are durable and are "designed to stand up to the elements – including zero moving part components and a lack of sub-components that could be prone to failure."[60] Because of their durability, "solar panels can last for thirty years or longer and even failing modules could still generate electricity, albeit with lower output."[61] Reports have shown that panels created forty years ago can still generate a significant portion of their original power.[62] In addition, solar panels require relatively low maintenance.[63] This is attributed to "solar panels not having moving parts that can rust or break down (unlike generators which are composed of moving components which require repair or replacement)."[64] A primary maintenance task is to make sure the solar panels are clean.[65] If the area is dusty, then cleaning needs to be more frequent.[66] Inspection and cleaning also make sure that debris and other rubbish do not block the panels from absorbing sunlight.[67]

In addition to the LCOE and the operation and maintenance of solar panels, is the cost of backing up the solar panels due to their intermittent nature. The LCOE number illustrates solar is a relatively expensive source of energy, but it still does not account for all the costs that arise with solar.[68] Here, it is argued that "LCOEs are inaccurate assessments of intermittent energy sources because they do not include the costs of balancing intermittency."[69] Further, "when intermittent power sources are added to a [grid], conventional power plants have to be held on standby so they can be ramped up when an intermittent plant is not

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[58] *Id*.

[59] Seth Atchue, *How Reliable is Solar Power?,* SUNWORKS (Oct. 5, 2015), https://perma.cc/D7ZQ-TYNF.

[60] *Id*.

[61] *Id*.

[62] *Id*.

[63] *Professional Solar Panel Maintenance*, SPARKLING SOLAR, https://perma.cc/N6D7-EFHD (last visited Nov. 11, 2018).

[64] *Id*.

[65] *Id*.

[66] *Id*.

[67] *Id*.

[68] Lofthouse, *supra* note 50.

[69] *Id*.

generating enough power."[70] As a result, intermittent energy sources such as solar and wind are shown to be more economical than expected because the LCOEs do not reflect the costs of using back-up traditional power plants.[71]

D. Efficiency under the interrelated triangle

Under the three elements of the interrelated triangle that measures the efficiency of an energy source (i.e., Reliability, Adequacy, and Cost), solar panels are generally inefficient. Solar's output is variable and subject to factors outside the control of an operator; the technology cannot provide an adequate supply of energy and requires back-up generators; the cost of solar is expensive relative to other sources of energy, though it is low maintenance and can last a long time.

New materials need to be researched and developed by scientists if there is a chance of replacing fossil fuels.[72] These materials must be economical and capable of creating sufficient electricity to be worth the investment.[73] Solar technology uses large crystals made of silicon.[74] Silicon is expensive because of the cost of growing large crystals but can convert a worthwhile amount of sunlight into electricity.[75] Scientists have tried developing newer synthetic materials that utilize cheaper crystals, such as copper-indium-gallium-selenide, that can be shaped into flexible films.[76] Unfortunately, this technology is not as efficient as silicon at generating electricity.[77]

As a result of its relative inefficiency, "solar power's growth is driven mainly by government policies rather than market forces."[78] Under these policies, "state mandates attempt to increase solar energy production by requiring utilities to provide a certain amount of power from solar energy."[79] Moreover, "despite mandates and billions of taxpayer dollars in subsidies, solar power only supplied 0.4% of the

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70 *Id*.
71 *Id*.
72 Locke, *supra* note 7.
73 *Id*.
74 *Id*.
75 *Id*.
76 *Id*.
77 *Id*.
78 Lofthouse, *supra* note 50.
79 *Id*.

United States' electricity in 2014."[80] Thus, to appreciate the current debate over Maryland's energy policy and the push for renewables, it will be important to understand how Maryland's solar energy market is created.

III. THE DEVELOPMENT OF MARYLAND'S SOLAR ENERGY MARKET

A. Restructuring of the wholesale transmission markets

In 1996, the Federal Energy Regulatory Commission (FERC) Order 888 laid the foundation upon which to build a transmission system aimed at opening the wholesale energy industry to competition.[81] The reason was because the public interest would be best served by a competitive electricity wholesale market.[82] This would be accomplished by encouraging the formation of Independent System Operators (ISOs).[83]

Pursuant to Order 888, "FERC stated ISOs should:

1) Operate independently of all market participants;

2) Provide open access to the transmission system;

3) Administer a single region-wide tariff that eliminates 'rate pancaking';

4) Maintain the reliability of the transmission grid; and

5) Control the operation of all of the transmission facilities within the region."[84]

In the past, there was generally not a lot of public interest in the U.S. wholesale transmission market.[85] However, sentiments may change when the wholesale electricity markets are affected by "price spikes, supply shortages, and reliability concerns."[86]

FERC Order 888 changed the wholesale transmission market. The wholesale transmission market before Order 888

[W]as dominated by vertically integrated utilities that owned the generation sources, transmission lines, and distribution systems required to produce and transport electricity. Under this system, utilities could

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[80] *Id*.

[81] Gekas, *supra* note 39.

[82] *Id*.

[83] *Id*.

[84] Christine Marshall et al., *What FERC Orders Really mean*, Energy User News, Jan. 2002, at 10.

[85] *Id*.

[86] *Id*.

restrict access to their private transmission grids and favor their own generation and load when transmission resources were constrained. To facilitate competition in electricity markets, federal regulators took steps to guarantee open access to the transmission grid.[87]

Under Order 888, the "FERC supported the formation of Independent System Operators – independent entities designated to control the operations of some generators and all transmission facilities."[88] Moreover, "Order 888 resulted in the formation of several ISOs—California ISO, PJM[89], New York ISO, and ISO New England."[90]

FERC followed up with Order 2000 to further define the wholesale transmission market. In 1999, Order 2000 was promulgated "to further encourage transmission owners to join together into larger Regional Transmission Organizations (RTOs)."[91] Under FERC Order 2000, general principles for RTOs were developed and "four minimum characteristics for RTOs were outlined:

1) Independence from market participants;

2) Appropriate scope and regional configuration;

3) Possession of operational authority for all transmission facilities under RTO's control; and

4) Exclusive authority to maintain short-term reliability of the grid.

In addition, seven major RTO functions were laid out in FERC Order 2000:

i) Tariff administration and design;

ii) Congestion management;

iii) Management of parallel path flows;

iv) Provision of last resort for ancillary services;

v) Development of an Open Access Same-Time Information System (OASIS);

vi) Market monitoring; and

vii) Responsibility for planning and expanding facilities under its control."[92]

Each public utility that owned, operated, or controlled facilities for the transmission of electric energy in interstate commerce was directed to make certain filings with respect to forming and participating in an

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87 *Id*.

88 *Id.*

89 Pennsylvania-New Jersey-Maryland Interconnection or PJM.

90 Marshall, *supra* note 84.

91 *Id.*

92 *Id.*

RTO.[93] The goal of the principles outlined in Order 2000 was to promote efficiency in wholesale electricity markets and ensure that electric consumers pay the lowest price possible for reliable service.[94] The guidelines presented by FERC were broad and gave participants a variety of ways to comply.[95] Also, RTO participation was not mandatory. However, the Order required all transmission owners to report on their plans to participate (or reasons for not participating) in an RTO by the beginning of 2001.[96]

B. Formation of RTO PJM Interconnection

Historically, PJM was a predecessor to the ISO concept that FERC was encouraging.[97] In 1927, PJM was created when three utilities formed the world's first continuous power pool after realizing the advantages of sharing their generating resources.[98] Additional utilities, including PEPCO (a public utility now owned by Exelon as of 2014) which services Washington D.C. and surrounding communities in Maryland, joined.[99] In 1993, PJM started the move toward independent status with the creation of the PJM Interconnection Association, which was tasked with administering the power pool.[100] Thereafter, PJM became fully independent in 1997.[101] Later that year, FERC authorized PJM as the first independent system operator (ISO).[102] Soon, under Order 2000, FERC encouraged the creation of RTOs to "operate the transmission system in multi-state areas and to advance the development of competitive wholesale power markets."[103] In 2002, PJM formed the first fully functioning RTO.[104] Subsequently, PJM incorporated a number of transmission systems into its organization.[105] These include Allegheny Power, Commonwealth Edison, American Electric Power, Dayton Power

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93 *Id.* at 10, 13.
94 *Id.* at 10.
95 *Id.*
96 *Id.*
97 Gekas, *supra* note 38.
98 *PJM History*, PJM, https://perma.cc/SU5F-XNRT (last visited Nov. 11, 2018).
99 *Id.*
100 *Id.*
101 *Id.*
102 *Id.*
103 *Id.*
104 *Id.*
105 *Id.*

& Light, Duquesne Light Co., Dominion Virginia Power, First Energy, and Duke Energy.[106] Today, PJM, headquartered in Valley Forge, PA, is the world's largest wholesale electricity market.[107] More than 990 companies are members of PJM, which serves 65 million customers and has 176.6 megawatts of generating capacity.[108] There are 1,373 generating sources and 82,000 miles of transmission lines that annually deliver more than 792 million-megawatt hours.[109]

C. Maryland's Renewable Portfolio Standard

In the past, states and not the federal government monitored local or regional companies that generated power for their ratepayers in assigned territories.[110] Traditionally, under the Federal Power Act (FPA), state authority was reserved over power plants and sales to consumers and FERC only oversaw only limited wholesale electricity transactions.[111] However, with the restructuring of the markets under the FERC Orders and the EPA Act of 1992, the RTOs now operate auction markets that determine which power plants generate energy, operate the high-voltage grid, and engage in long-term transmission planning.[112] Thus, under the FPA, the FERC has assumed jurisdiction to regulate these entities.[113] Today, there are increasing disputes between state and federal policies that relate to factors like generation mix and resources adequacy because of increased federal oversight.[114]

Generally, state's authority over generation facilities imposes requirements that utilities "procure renewable energy, meet energy efficient and demand response targets, and undertake long-term resource planning."[115] Further, some states "have also set rates for distributed resources (e.g., rooftop solar); mandated that utilities procure energy storage; considered proposals for supporting existing resources (e.g.,

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106 *Id.*

107 *PJM MARKETS*, PJM (Mar.16, 2017), https://perma.cc/NE9K-CPK4.

108 *PJM STATISTICS*, PJM (Apr. 11, 2017), https://perma.cc/87UP-H74T.

109 *Id.*

110 Jonas Monast et al., *Illuminating the Energy Policy Agenda: Electricity Sector Issues Facing the Next Administration*, DUKE UNIV. 4 (Oct. 2016), https://perma.cc/2W29-ME4B.

111 *Id.*

112 *Id.*

113 *Id.*

114 *Id.* at 3.

115 *Id.* at 6.

nuclear and coal-fired power plants at risk of retirement); and initiated pilot projects to test new technologies."[116] State policies and initiatives have made states "'the test beds for the evolution of the grid of the future'."[117] One of these policies is the renewable portfolio standard, a regulation that requires the increase generation of electricity from renewable energy sources, such as wind, solar, biomass, and geothermal.[118]

In 2004, Maryland established its Renewable Portfolio Energy Standard to capture the benefits of renewable energy.[119] Maryland's RPS Program does this by gradually increasing the amount of renewable energy electricity suppliers must procure from renewable sources by 2020 to 25%.[120] The RPS mechanism imposes obligations on utility companies (such as PEPCO) to generate a portion of their electricity from renewable sources.[121] Renewable energy generators earn certificates (Renewable Energy Certificates or RECs) for units of electricity they produce which can be sold (along with excess electricity) to utility companies.[122] Supply companies will normally purchase the RECs to comply with their regulatory obligations.[123]

D. Maryland's Net Metering Law

States also have enacted net metering laws. Net metering is a method that "refers to [the] measurement of electricity on the basis that is net of energy used and produced by an eligible customer-generator during a single billing period, e.g., one month."[124] Any excess generation can be

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116 *Id.*

117 *Id.*

118 *Most States have Renewable Portfolio Standards*, U.S. ENERGY INFO. ADMIN. (Feb. 3, 2012), https://perma.cc/54HC-H3EZ.

119 *Renewable Energy,* MD PUB. SERV. COMM'N, https://perma.cc/EU64-CAEV (last visited Nov. 11, 2018).

120 *Database of st. incentives for renewables & efficiency*, https://perma.cc/S4WK-7M9Y (last updated July 9, 2018).

121 *What solar acronyms and organization definitions are necessary to know?,* SEIA.ORG, https://perma.cc/WR5W-5VU4 (last visited Nov. 11, 2018).

122 *Id.*

123 *Id.*

124 Md Pub. Serv. Comm'n, *REPORT ON THE STATUS OF NET METERING IN THE STATE OF MARYLAND*, 1 (Jan. 2016), https://perma.cc/N6PL-QW6R.

fed back into the grid and the customer can receive payment from the supply company.[125]

Originally enacted in 1997, the net metering law in Maryland has been expanded several times.[126] In Maryland, "residents, businesses, schools or government entities with systems that generate electricity using solar, wind, biomass, fuel cell, closed-conduit hydroelectric, and other sources are eligible for net metering."[127] Maryland's law authorizes net metering for customers who generate their own electricity and third-party owners (i.e., using leases and power purchase agreements).[128]

During the 2010 Legislative Session, the Maryland General Assembly amended the original net metering law to include aggregate net metering.[129] The amended law requires utilities to provide aggregate net metering to more than one meter for certain types of customers.[130] Eligible customers include "agricultural, municipal (including county governments), and non-profit entities (e.g., churches and schools)."[131] The practice of aggregate net metering combines meter readings from more than one utility service point.[132] Physical aggregation would occur where the meters and accounts to be aggregated are in close enough physical proximity to create a physical connection between meters.[133] Virtual aggregation would be used when the accounts are at multiple sites owned by the same customer.[134]

In 2015, the Maryland General Assembly passed a virtual net metering bill that authorizes the Maryland Public Service Commission (PSC) to establish a three-year pilot program for community solar projects

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[125] *Id.* at 2.

[126] *Database of st. incentives for renewables & efficiency*, https://perma.cc/4M3X-ALXY (last updated July 12, 2016).

[127] *Id.*

[128] *Id. See*, e.g., University Park Solar, https://perma.cc/EA54-G73B (last visited Nov. 11, 2018) (demonstrating a power purchase agreement between a third-party LLC and the host church).

[129] Md Pub. Serv. Comm'n, *REPORT OF THE NET METERING WORKING GROUP*, 2 (Aug. 2, 2010), https://perma.cc/4K2X-28QU.

[130] Md Pub. Comm'n, *supra* note 124, at 5.

[131] *Id.*

[132] *Id.*

[133] *Id.*

[134] *Id. See*, e.g., Town of University Park, http://peer1.datareadings.com/client/moduleSystem/Kiosk/site/bin/kiosk.cfm?k=elkWdi6e (last visited Nov. 11, 2018) (demonstrating the Town of University Park's net aggregate metering project that uses solar panels set-up on top of an elementary school to offset the Town's electricity bill).

in the State.[135] Virtual net metering is an innovative bill crediting system for community solar.[136] Here, solar is not used on site, but set-up externally and shared among subscribers.[137] This process allows subscribers to receive credits on their electricity bills for the energy produced by their share of the solar site.[138]

E. Maryland's Solar Energy Market

Under Maryland's net metering law, once the solar panels are installed they are interconnected to the grid which is managed by PEPCO.[139] As the panels generate electricity, it offsets the payments made to the supply company, such as PEPCO.[140] Any excess solar generation is credited to the customer's bill at the wholesale rate.[141] Customers can also receive federal tax benefits or MD state grants for using renewable energy such as solar.[142] And for the same production of energy, a customer can receive SRECs (Solar Renewable Energy Credits).[143]

Maryland created the Renewable Portfolio Standard to mandate the transition to renewable sources of energy.[144] It works on a two-tier system "with carve-outs for solar energy and offshore wind energy and corresponding renewable energy credits (RECs) for each tier."[145] Utilities "must submit RECs equal to a percentage specified in statute each year or else pay an alternative compliance payment (ACP) equivalent to their shortfall."[146] Over the past few years, electric companies have met their RPS requirements primarily through RECs, thus avoiding ACPs.[147] Also,

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135 *Id.*

136 *Virtual Net Metering: What is it? How does it work?,* ENERGYSAGE.COM, https://perma.cc/7G3B-LNCM (last visited Nov. 11, 2018).

137 *Id.*

138 *Id.*

139 Gekas, *supra* note 39.

140 *Id.*

141 *Id.*

142 *Id.*

143 *Id.*

144 Stephen M. Ross, *MD HB 1106 Fiscal and Policy Note (Revised – Enrolled Bill)*, MD GEN. ASSEMB. DEP'T OF LEGIS. SERV. 11 (Apr. 29, 2016), https://perma.cc/D8UP-H5A6.

145 *Id.*

146 *Id.*

147 *Id.*

under the RPS law, any ACPs received by the Maryland Energy Administration must be used to support renewable energy sources.[148]

Pursuant to the Renewable Portfolio Standard, RECs are created. A REC (or SREC), generally, "is a tradeable commodity equal to one megawatt-hour of electricity generated or obtained from a renewable energy generation source."[149] The purpose of the REC is to "represent the 'generation attributes' of renewable energy – the lack of carbon emissions, its renewable nature" and so on.[150] RECs have value and over a three-year life, they may be transferred, sold, or redeemed.[151] For compliance purposes, depending on the energy source, RECs are classified as Tier 1 or Tier 2.[152] Under the Maryland RPS, solar and offshore wind are classified as Tier 1.[153] Similar to financial securities like stocks and bonds, RECs are tradeable. Trading can be performed via "a Public Service Commission-approved system known as Generation Attributes Tracking System (GATS), a trading platform designed and operated by PJM, which tracks the ownership and trading of RECs."[154]

The Clean Energy Jobs Act increased the mandatory percentage requirements from 20% by 2022 to 25% by 2020 for Tier 1 sources.[155] Requirements for Tier 2 sources will end after 2018.[156] In 2018, the requirements are 15.8% for Tier 1 renewable sources, including at least 1.50% from solar energy, and 2.5% from Tier 2 renewable sources.[157]

F. Maryland's SREC Market

In 2007, Maryland established a solar carve-out, which currently mandates that by 2020 2.5% of retail electricity must be generated by solar resources.[158] The SREC market was "relatively stable between its inception in 2008 and early 2015" because of "a proactive state legislature and aggressive SREC requirements."[159] This changed beginning in 2015

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148 *Id.*
149 *Id.*
150 *Id.*
151 *Id.*
152 *Id.*
153 *Id.*
154 *Id.*
155 *Id.*
156 *Id.*
157 *Id.*
158 Database of st. incentives for renewables & efficiency, *supra* note 120.
159 SRECTRADE, https://perma.cc/KTV3-6ADR (last visited Nov. 11, 2018).

when the Maryland SREC market "started to become oversupplied due to a substantial amount of solar capacity being installed in the state."[160] SREC investors are hoping that the recent revision of Maryland's RPS under the Clean Energy Jobs Act, which passed into law in February 2017, will support the solar industry and SREC prices.[161]

Pricing for SREC and RECs is difficult, "as the markets for them are influenced by multiple factors, including technology costs, labor costs, permitting costs, electricity costs, capacity market prices, potential future environmental regulations, and federal and state tax policies."[162] As of November 2018, the Maryland SREC spot market price was only $6.50.[163]

G. The impact of the Clean Energy Jobs Act on the REC and SREC market

In 2016, Maryland lawmakers decided to enact a bill with the goal of creating clean energy jobs and altering the renewable energy portfolio standard.[164] However, under an analysis provided by the State, "the incremental costs associated with the bill is absorbed by all electric customers in the State."[165] Here, "the incremental cost of the bill is 1) the cost of additional RECs and SRECs required to meet the enhanced requirements plus 2) the cost of any ACPs paid by electricity suppliers if the enhanced percentage requirements are physically not able to be met."[166] Because price forecasting on SREC and RECs are difficult, there is uncertainty and assumptions within the cost factor.[167]

In light of these uncertainties, the additional cost of RPS compliance pursuant to the bill for years 2017 through 2025 is shown in Exhibit 3 of the analysis.[168] Here, RPS compliance ranges from:

$5.0 million to $19.8 million in 2017 and from $2.2 million to $8.7 million in 2018. In 2019, the range of potential costs increases significantly to between $21.5 million and $86.1 million. Potential costs

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160 *Id.*
161 *Id.*
162 Ross, *supra* note 44.
163 SRECTRADE, *supra* note 159.
164 H.B. 1106, 436th Gen. Assemb., Reg. Sess. (Md. 2016).
165 Ross, *supra* note 44.
166 *Id.*
167 *Id.*
168 *Id.*

peak in 2020 due to relatively high solar ACPs combined with reaching the maximum Tier 1 percentage requirement of 25%.[169]

Thus, the values of the RECs and SRECs will increase for investors in renewable energy, but have a negative impact on Maryland electricity consumers.

Governor Hogan cited this analysis when he vetoed the Bill in May 2016.[170] He viewed the legislation as a tax increase that "will be levied upon every single electricity ratepayer in Maryland."[171] The Governor cited the cost of RPS compliance estimated by the analysis in 2020 of between $49 million to $196 million and viewed it as an unnecessary burden.[172] He remarked that under existing law, Maryland was already a leader in achieving RPS goals.[173]

The veto sparked a fierce partisan debate that lasted until the Legislature voted to override the veto in February 2017.[174] Democrats, representing clean-air advocates and environmentalists, "argued that the requirement will boost the renewable energy industry, create high-paying jobs, and reduce air pollution and combat climate change at a small cost to consumers."[175] The Governor and GOP lawmakers "objected to the cost to consumers."[176] Politically, a classic debate between an anti-tax stance and long-term environmental policy arose.[177] Republicans tried delaying the override attempt and targeted Democratic senators in conservative-leaning districts, but to no avail.[178] The heavily Democratic-legislature pushed the controversial bill through.[179] Thereafter, Hogan warned that the new RPS requirements will "place yet another burden on ratepayers and taxpayers," after posting a list of senators who voted for the override on his Facebook page.[180] He added, "'it will be an additional charge on your energy bill each month to pay for overly expensive solar

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169 *Id.*

170 Letter from Lawrence J. Hogan, Jr., Governor, Md., to Hon. Michael E. Busch, Speaker of the H. (May 27, 2016), https://perma.cc/8VQZ-TYJE.

171 *Id.*

172 *Id.*

173 *Id.*

174 Database of st. incentives for renewables & efficiency, *supra* note 120.

175 Pamela Wood, *After veto override, renewable energy sourcing accelerates in Maryland,* BALTIMORE SUN (Feb. 2, 2017), https://perma.cc/Z63L-YHFY.

176 *Id.*

177 Scott Dance, *Hogan steps back from clean-energy efforts, citing cost to consumers,* BALTIMORE SUN (June 7, 2016), https://perma.cc/EE8G-TKSH.

178 Wood, *supra* note 175.

179 *Id.*

180 *Id*.

and wind energy credits, the majority of which are created by companies outside of Maryland.'"[181]

The debate over the Clean Energy Jobs Act reflects not just a debate about renewable energy policy and the value of the SREC and REC markets, but also a broader debate about environmental policy in Maryland. Indeed, a primary reason "governments and individuals pursue solar power [and other renewables] is because they view it as an environmentally friendly electricity source."[182] Thus, Maryland's Clean Energy Jobs Act derives not just from Maryland's energy policy, but its environmental policy as well.

IV. MARYLAND'S ENVIRONMENTAL POLICY

A. Background

According to Maryland's environmental policy report, "the Earth is warming and this is largely the result of human-caused emissions."[183] This conclusion comes from the National Climate Assessment (NCA), which "found that U.S. average temperature has increased by about 1.5°F since 1895 with 80 percent of this increase occurring since 1980."[184] Likewise, "the Intergovernmental Panel on Climate Change Fifth Assessment Working Group 1 report (IPCC AR5 WG1), Climate Change: The Physical Science Basis came to many of the same conclusions as the NCA, but with a global focus."[185] The increase in warming "that will occur by the end of the century depends on our choices now."[186] Unless we make progress in curbing emissions, "temperatures for the planet could rise between 4.7°F to 8.6°F by the end of this century, compared to the average temperature around the end of the 20th century (1986-2005)."[187] In the United States, "warming is expected to be higher than the global average."[188] Here, "warming averaged across the country could

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181 *Id.*

182 Jordan Lofthouse et al., *Reliability of Renewable Energy: Solar,* UTAH ST. U. 21 (Dec. 3, 2015), https://perma.cc/5HYT-8F9U.

183 MD. DEP'T OF THE ENV'T, GREENHOUSE GAS EMISSIONS REDUCTION ACT PLAN UPDATE 18 (2015), https://perma.cc/65DK-RYGQ.

184 *Id.*

185 *Id.*

186 *Id.*

187 *Id.*

188 *Id.*

be between 5°F to 10°F, assuming emissions rates continue."[189] In addition, "average summer temperatures in Maryland could increase around 9°F by the end of the century if little is done to reduce emissions."[190] The impact of climate change includes sea level rise; shrinking Arctic Polar ice; more heavy downpours; more heatwaves; threats to ecosystems; increased agricultural pests; and ocean acidification.[191] Thus, "science has demonstrated with a high degree of certainty that Earth's climate is being changed by human activities, particularly the emission of heat-trapping gases, generally called greenhouse gases, including carbon dioxide, methane, and nitrous oxide."[192]

B. The Debate Over Climate Science

The science behind climate change has become politicized. Critics of climate change argue, "new questions are arising almost daily about data quality and manipulation, the degree to which carbon dioxide (the primary greenhouse gas) affects global temperatures, the complex interplay of solar, cosmic ray, oceanic and other natural forces, and the inability of computer models to predict temperatures, sea-level rise or hurricanes."[193]

A primary issue is whether it is settled science that human-based carbon emissions have accelerated global warming or climate change?[194]

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189 *Id.*

190 *Id.*

191 *Id.* at 18-19.

192 *Id.* at 13.

193 Paul Driessen & Roger Bezdek, *The phony 'social cost of carbon',* WASH. TIMES (Feb. 28, 2017), https://perma.cc/NL8U-DCL4; *see* Christopher Booker, *Climate Change: this is the worst scientific scandal of our lifetime,* THE TELEGRAPH (Nov. 28, 2009), https://perma.cc/G7D4-YPZ4 (explaining the scandal dubbed "Climategate" arose after the leak of thousands of emails from climate scientists that suggested they had manipulated and hidden data); *see also* Nicholas D. Loris et al., *The U.S. Should Withdraw from the United Nations Framework Convention on Climate Change* 6 (June 9, 2016), https://perma.cc/2WV9-F96Z (stating "the fact of the matter is that observed climate data, failed climate projections, and inaccurate climate models provide enough reason to question calls for immediate domestic or international action on global warming").

194 *See* Scott Pruitt & Luther Strange, *The Climate-Change Gang,* NAT'L REV. (May 17, 2016), https://perma.cc/XQ82-35KC (suggesting from former EPA Chief Scott Pruitt that the debate over global warming "is far from settled").

Can the science be questioned, or must we accept that climate change is happening, and human beings are the cause?[195]

According to Britain's Meteorological office, as 2015-16 El Nino dissipated, "average global temperatures have fallen back to their 1998-2014 level."[196] This means "that there has been no measurable planetary warming for eighteen years."[197] In addition, whistleblowers have come forward revealing evidence that the organization - that is the world's leading source of climate data - rushed to publish a landmark paper that exaggerated global warming and was timed to influence the historic Paris Agreement on climate change.[198] Here, a high-level whistleblower has come forward and shown irrefutable evidence that a report by the U.S.'s National Oceanic and Atmospheric Administration (NOAA) breached its own rules on scientific integrity by publishing a sensational but flawed report, aimed at making the maximum possible impact on world leaders including Barack Obama and David Cameron at the U.N. climate conference in Paris in 2015.[199]

An ancillary issue is if climate change is happening, what can be done? One solution is a carbon tax.[200] Instead of a "mishmash of EPA regulations, renewable energy standards and subsidies for wind and solar power," a carbon tax would be a much "more efficient way to cap carbon-dioxide emissions."[201] However, this is considered a production tax at the expense of U.S. producers.[202] Meanwhile, producers in other nations, such as China and India, would benefit.[203]

A tertiary issue is whether the effects of carbon are truly negative?[204] The Obama administration used "social cost of carbon" metrics to

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[195] *Id.* (remarking from former EPA Chief Scott Pruitt that "scientists continue to disagree about the degree and extent of global warming and its connection to the actions of mankind").

[196] Driessen & Bezdek, *supra* note 193.

[197] *Id.*

[198] Press Release, *Former NOAA Scientist Confirms Colleagues Manipulated Climate Records,* COMM. ON SCI., SPACE, AND TECH. (Feb. 5, 2017), https://perma.cc/NWT9-LPJZ.

[199] *Id.*

[200] Stephen Moore, *The carbon tax scam,* WASH. TIMES (Feb. 12, 2017), https://perma.cc/AU25-NV5M.

[201] *Id.*

[202] *Id.*

[203] *Id.*

[204] Robert Zurbin, *Carbon Emissions Are Good,* NAT'L REV. (Apr. 3, 2012), https://perma.cc/AYD2-SJS8.

"calculate the 'hidden costs' of carbon-dioxide emissions associated with fossil fuel use, assigning [a] dollar value to each ton of carbon dioxide emitted by power plants, factories, homes vehicles, and other sources."[205] But this fails to mention tremendous and obvious carbon benefits.[206] It has also led to a villainization of fossil fuel.[207] Fossil fuels have supplied "over 80% of the energy that powers the United States and other modern civilizations, and will continue doing so for decades to come."[208] These fuels – oil, natural gas, and coal – "generate up to $70 trillion in annual global gross domestic product."[209] Further, "the U.S. Energy Information Administration forecasts that fossil fuels will provide 75-80% of worldwide energy through 2040 – when the total amount of energy consumed will be at least 25% greater than today."[210] In addition to the benefits of fossil fuel, there are also the benefits of carbon-dioxide emissions itself.[211] Studies have verified, "rising levels of this miracle molecule are 'greening' the Earth – reducing deserts and improving forests, grasslands, drought resistance, crop yields, and human nutrition."[212]

Skeptics argue that policymakers "claim they can accurately forecast damage to the world's climate, economies, populations and ecosystems from U.S. carbon-dioxide emission over the next two to three centuries."[213] Moreover, policymakers "say we must base today's energy policies, laws and regulations on those forecasts."[214] But there remains unanswered questions. The Trump administration has begun to rollback many of the imposed regulations in a complete reversal of the Obama administration – further strengthening the conclusion that the science is up for debate.

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[205] Driessen & Bezdek, *supra* note 193; *see* Ben Wolfgang, *White House declares 'the war on coal is over' as Trump begins unraveling Obama's climate agenda,* WASH. TIMES (Mar. 28, 2017), https://perma.cc/Z54U-C8VP (stating that President Trump has nixed the use of the "social cost of carbon" calculation through executive order, "ending an Obama-era experiment that put an official price tag on greenhouse gas emissions").

[206] *Id.*

[207] Robert Zurbin, *Fossil Fuels and Morality,* Natl'l Rev. (Nov. 12, 2014), https://perma.cc/8BQB-42BT.

[208] Driessen & Bezdek, *supra* note 193.

[209] *Id.*

[210] *Id.*

[211] *Id.*

[212] *Id.*

[213] *Id.*

[214] *Id.*

C. Maryland's 2009 Greenhouse Gas Emissions Reduction Act (GGRA)

As a result of Maryland's vulnerability to climate change, the State legislature passed the Greenhouse Gas Reduction Act of 2009 (GGRA) with the intent of requiring the state to develop a plan to "reduce greenhouse gas (GHG) emissions by 25% from 2006 levels by 2020."[215] In response, Maryland has crafted a comprehensive plan with the help of more than a dozen State agencies and nongovernmental organizations to achieve the target GHG emission reduction goals.[216] The GGRA directed that the Maryland Department of the Environment (MDE) present an updated report in 2015 to the Governor and General Assembly.[217] This report is intended to update the contents of the 2012 GGRA Plan.[218] According to the 2015 MDE report, Maryland is on target to not only meet, but exceed, the 25% required emissions reductions.[219] Moreover, the report projects the GGRA plan will increase economic output and create thousands of new jobs by 2020.[220] A suite of programs, including "EmPower Maryland, the RPS, and the State's Regional Greenhouse Gas Initiative are projected to provide some of the greatest reductions in GHG."[221]

Notwithstanding the progress, MDE also reports in its 2015 report that the scientific consensus is worldwide GHG emissions reductions as high as 72% by 2050 will be necessary to minimize the impacts of climate change.[222] Thus, even though Maryland has a head start in GHG reductions, more reductions are needed.[223]

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215 S.B. 323, 2016 MD. GEN. ASSEMB., 2016 Sess. (Md. 2016).

216 *Id.*

217 MD. DEP'T OF THE ENV'T, GREENHOUSE GAS EMISSIONS REDUCTION ACT PLAN UPDATE 12 (2015), https://perma.cc/TX9N-FVAH.

218 *Id.*

219 *Id.*

220 S.B. 323, 2016 MD. GEN. ASSEMB., 2016 Sess. (Md. 2016).

221 *Id.*

222 *Id.*

223 *Id.*

D. Maryland's 2009 Greenhouse Gas Emissions Reduction Act (GGRA) – Reauthorization

In April 2016, Governor Hogan signed the Greenhouse Gas Emissions Reduction Act – Reauthorization (SB 323).[224] The GGRA-Reauthorization "repeals the termination date of the prior requirement to reduce GHG emissions by 25% from 2006 levels by 2020 and requires the State to develop plans, adopt regulations, and implement programs to reduce GHG emissions by 40 percent from 2006 levels by 2030."[225] Unless reauthorized, this requirement will terminate December 31, 2023.[226]

E. Maryland's Clean Energy Jobs Act

As a corollary to the GGRA – Reauthorization, the Legislature passed the "Cleans Energy Jobs Act" in 2016.[227] The MDE's 2015 report credits the RPS with carbon emissions reductions.[228] A veto by the Governor of the Act, which increases the RPS, left environmental advocates wondering "how the State will meet the goals to cut carbon emissions by 40% by 2030."[229] Subsequently, environmentalists and climate change activists hailed the Legislative override based on the perceived environmental benefits of renewables - in this case solar.[230]

However, perception is not always reality. Thus, it is important to understand the environmental implications of renewables – in this case solar.

F. Environmental Cost/Benefit of Solar Energy

Under the two primary categories of solar technology, photovoltaic (PV) solar or concentrating solar thermal plants (CSP), "the potential

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224 *Governor Larry Hogan Signs Three Bills Into Law,* OFF. OF GOVERNOR LARRY HOGAN, https://perma.cc/3P7H-TE7Z (last visited Nov. 11, 2018).

225 S.B. 323

226 *Id.*

227 Dori Pastor, *Md. 2016 Legis. Rev.,* SIERRA CLUB (Apr. 15, 2016), https://perma.cc/WTL7-TES7.

228 MD. DEP'T OF THE ENV'T, GREENHOUSE GAS EMISSIONS REDUCTION ACT PLAN UPDATE 79 (2015), https://perma.cc/377C-WBLJ.

229 Scott Dance, *Hogan steps back from clean-energy efforts, citing cost to consumers,* BALTIMORE SUN (June 7, 2016), https://perma.cc/CNK2-N4D2.

230 Pamela Wood, *After veto override, renewable energy sourcing accelerates in Maryland,* BALTIMORE SUN (Feb. 2, 2017), https://perma.cc/DS7J-PYTJ.

environmental impacts – land use and habitat loss; water use; and the use of hazardous materials in manufacturing – can vary greatly depending on the technology."[231]

i. Land Use

The location of a solar facility may raise issues about land degradation and habitat loss.[232] Land area requirements for solar "depends on the technology, the topography of the site, and the intensity of the solar resource."[233] In contrast with wind facilities, there is less of a chance of sharing land with other land uses.[234] Land use issues can be abated by selecting lower quality locations (e.g., brownfield land).[235] In addition, utilizing roof space on homes or commercial buildings can also have minimal land use impact depending on the scale of the solar PV array.[236]

ii. Water Use

During the electricity generating process, there is no water use for solar PV panels.[237] Water is used during the manufacturing process of PV components.[238] In addition, CSP technology requires water for cooling.[239] Here, water use depends on the plant design, plant location, and the type of cooling system.[240] However, regions where CSP

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[231] *Environmental Impacts of Solar Power*, UCSUSA (last revised Mar. 5, 2013) https://perma.cc/FM5D-98TV; *see Concentrating Solar Power*, SEIA, https://perma.cc/KJ5N-DBXZ (last visited Nov. 11, 2018) (explaining that "CSP uses mirrors to concentrate the energy from the sun to drive traditional steam turbines or engines that create electricity" – this is not to be confused with PV panels that directly converts electricity via the photovoltaic effect).

[232] *Environmental Impacts of Solar Power*, UCSUSA (last revised Mar. 5, 2013) https://perma.cc/FM5D-98TV.

[233] *Id.*

[234] *Id.*

[235] *Id.*

[236] *Id.*

[237] *Id.*

[238] *Id.*

[239] *Id.*

[240] *Id.*

technology has the highest potential tend to be the driest climates and water use needs to be carefully considered.[241]

iii. Hazardous Materials

The process of manufacturing PV cells requires hazardous materials which are mostly used to clean the semiconductor's surface.[242] Here, the volume and type of chemicals used varies based on the size of the silicon wafer, the type of cell, and the amount of cleaning needed.[243] In addition to the environmental risk, workers may face health risks if they inhale silicon dust.[244] Further. newer PV materials have more toxic materials than traditional silicon PV cells.[245] If not handled or disposed of properly then these synthetic materials may pose environmental and public health issues.[246] Normally however, these rare and highly valuable materials are recycled and not simply thrown away.[247]

iv. GHG Emissions

There are no GHG emissions associated with electricity generation, but there are emissions associated with other parts of the solar life-cycle.[248] According to a report by the U.N.'s Intergovernmental Panel on Climate Change (IPCC), for PV technology, most of the GHG emissions are between 30 and 80 g CO2 eq/kWh.[249] In comparison, this is far less than lifecycle GHG emissions for natural gas (270 to 800 g CO2 eq/kWh) and coal (630 to 1630 g CO2 eq/kWh).[250] Thus, there are environmental benefits to solar, but also hidden environmental costs as well.

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241 *Id.*
242 *Id.*
243 *Id.*
244 *Id.*
245 *Id.*
246 *Id.*
247 *Id.*
248 *Id.*
249 *Id.*; IPCC, SRREN REPORT 370 (2012), https://perma.cc/V6SD-JUUF.
250 *Id.*; IPCC, SRREN REPORT 19 (2012), https://perma.cc/V6SD-JUUF.

V. PREDICTION ABOUT THE FUTURE OF MARYLAND'S ENERGY POLICY

A. An Alternative to renewables: Natural Gas

The debate over Maryland's energy policy is part and parcel of the broader debate over Maryland's environmental policy and the push for renewable energy as a way to fight climate change. Both sides agree that we need a cleaner source of energy. However, there is particular disagreement over the cost of using less efficient sources of energy such as solar.

One source of energy that is growing in popularity is natural gas.[251] The recent introduction of hydraulic fracturing "fracking" drilling operations has fundamentally changed the fossil fuel markets in the United States.[252] Natural gas has become the fuel of choice because of the resulting reduction in natural gas prices due to fracking.[253] Further, "since the 2006 baseline year, GHG emissions in Maryland have decreased because electricity generation and industrial sources are using more natural gas instead of coal (natural gas emits half the amount of GHG as coal when used to make electricity)."[254]

President Trump has embraced the fracking revolution.[255] The new administration is expected to open up more federal lands to take advantage of the trillions in untapped shale, oil, and gas reserves and export it abroad, giving the U.S. economic and strategic political benefits.[256] Unexpectedly, Maryland's Governor has signed legislation to ban fracking in the state, making Maryland one of the first to do so by

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[251] *Natural gas expected to surpass coal in mix of fuel used for U.S. power generation in 2016,* EIA (Mar. 16, 2016), https://perma.cc/DE6E-NUCF.

[252] MD. DEP'T OF THE ENV'T, *supra* note 228.

[253] *Id.*; *see* James Conca, *Using LCOE to find the cheapest energy mix for America,* FORBES (July 9, 2015), https://perma.cc/B8LB-5GTZ (explaining that when constructing *new* power plants, natural gas and nuclear are found to be the cheapest source of electricity for the near-future); *see also Natural Gas $ Calculator,* PJM, https://perma.cc/2Q4M-7B2Y (last visited Nov. 11, 2018) (stating 'natural gas has surpassed coal to become the primary fuel source in PJM's generation mix"—so "when there is a high natural gas price, you can expect to see a high electricity price").

[254] MD. DEP'T OF THE ENV'T, *supra* note 228.

[255] Andrew Follett, *Who will help Trump make the energy department great again?,* DAILY CALLER (Nov. 10, 2016), https://perma.cc/9KUG-A4EF.

[256] *President Donald J. Trump Unleashes America's Energy Potential,* WHITEHOUSE.GOV (June 27, 2017), https://perma.cc/GR5Y-W3ER.

law.[257] Hogan had previously supported lifting a moratorium on fracking, which would open the Marcellus shale formation located beneath Western Maryland, if it could be done safely.[258] Now, he has changed his position citing environmental concerns.[259]

Despite the ban on fracking, natural gas will most likely remain an important part of Maryland's energy future.[260] Its use is increasing, it is abundant, and it will continue to lower emissions of carbon dioxide from power generation in Maryland.[261] Additionally, facilities like Cove Point will be used to export natural gas, benefiting Maryland economically.[262] As a result, Maryland residents will continue to see the benefits of natural gas even with a ban on in-state production.

VI. CONCLUSION

Maryland's solar market is created by government mandates and subsidies driven by questionable climate science. Thus, issues arise. The first issue for a Maryland solar investor is the lack of space to set-up an efficient solar array. The amount of electricity that is generated through the PV effect is not enough to offset a significant portion of an investor's

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[257] Brian Witte, *Maryland Governor Signs Fracking Ban Into Law,* AP NEWS (Apr. 4, 2017), https://perma.cc/E4Y9-8WC5.

[258] Katelyn Newman, *Maryland Close to Passing Statewide Fracking Ban,* U.S. NEWS (Mar. 22, 2017), https://perma.cc/CQY7-KGJ6.

[259] *Id.*; *But see* Dan Ervin, *Hogan's fracking ban would cost Maryland jobs, benefits,* DELMARVANOW (Mar. 24, 2017) https://perma.cc/J8M5-6KJA (arguing that "fracking is safe, suitable for long-term development and has a positive economic impact in the areas lying above the shale formation").

[260] Mark Green, *Poll: Maryland Plurality Supports Fracking,* ENERGY TOMORROW (Mar. 1, 2017), https://perma.cc/A7DG-U5QL.

[261] Mark Green, *Maryland and Energy Opportunity,* ENERGY TOMORROW (Dec. 17, 2016), https://perma.cc/NQ9C-PCTM.

[262] *Dominion Cove Point,* DOMINION ENERGY, https://perma.cc/9SW2-Z4VB (last visited Nov. 11, 2018) (explaining that Cove Point provides bi-directional service of import and export of natural gas with benefits that significantly support the community and the economy); *see Diagram: The Process of Exporting Liquefied Natural Gas,* DOMINION ENERGY, https://perma.cc/62YR-KRCC (last visited Nov. 11, 2018) (showing the process of how natural gas is liquefied at Cove Point, then shipped to areas around the world, before being re-gassed then finally used by customers); *see also* Steven M. Ross, *MD HB 1106 Fiscal and Policy Note (Revised – Enrolled Bill)*, MD GEN. ASSEMB. DEP'T OF LEGIS. SERV. 3 (Apr. 29, 2016), https://perma.cc/3EW4-UPB7 (stating that as part of the Clean Energy Jobs Act, money received from approval of Cove Point will fund access to capital for small, minority, and women-owned businesses in the "clean energy industry").

electrical bill. More land use is required. On the east coast of the U.S., land use is limited. In the west, there is enough land to set-up an efficient solar array which is typically done in an open arid climate. However, there are environmental issues that arise because of land degradation and habitat loss. As a result of the lack of efficiency, solar power becomes a niche investment for good intentioned purposes.

To overcome this limitation, a solution that the Legislature has agreed to is a virtual net metering program. The program allows investors to subscribe to a community solar system without requiring property ownership. In theory, subscribers can then offset a significant portion of their electrical bill. Maryland's program is currently in the middle of a three-year pilot period.[263]

Otherwise, to earn a return on the investment, a Maryland solar investor is forced to turn to government subsidies, such as federal income tax credits. The second place to look are the SREC markets, but there is a lack of value of SRECs in the Maryland market. At this time, due to an oversupply of SRECs in the market, the value is relatively low at $6.50. In contrast, the DC SREC market is $295. However, in order to sell a DC SREC, an investor needs to be connected to the DC grid. Fortunately for a Maryland SREC investor, the Maryland Legislature has recently raised the mandate making the MD SREC more valuable as utilities seek to purchase them to meet their RPS requirements and avoid penalties. However, this does come at a cost, which the governor objected to, for taxpayers and ratepayers.

Another benefit for an environmentally-conscious Maryland solar investor is the relatively low amount of carbon emissions from the PV effect. Unfortunately, there are hidden environmental costs as well, such as the land use requirement, which will in all probability limit the greater use of PV solar. Moreover, there are also hazardous materials in the manufacture of solar panels – making solar panels not as clean and simple as most investors most likely assume.

An alternative to government mandated renewable sources of energy, like solar, are market-driven sources of energy. The resource that is growing in popularity is natural gas. This is a result of a new drilling technique called hydraulic fracturing, or "fracking". Thus, the prices for natural gas have decreased making it a cost-effective and cheap source of energy. In addition, natural gas is relatively clean, emitting half the

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[263] *Community Solar Pilot Program,* MD PUB. SERV. COMM'N, https://perma.cc/78F7-RNWT (last visited Nov. 11, 2018).

amount of GHG as coal when used to make electricity. Further, it is exportable due to an abundant U.S. supply.

In Maryland, residents will continue to see the benefits of natural gas, despite a ban on fracking. An example is the Dominion Cove Point LNG (liquid natural gas) facility in Southern Maryland. This facility receives interstate natural gas for export. In return, the state is able to subsidize renewables and fund other green energy programs.[264]

Nationally, because of fracking, the Trump Administration seeks to compete with other energy exporters such as Russia and the Middle East as part of a strategic plan to gain independence from foreign sources of energy; repay national debt; rebuild American infrastructure; bring back jobs; and start a new American renaissance.

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[264] H.B. 1106, 2016 MD. GEN. ASSEMB., 2016 Sess. (Md. 2016) (explaining that the construction of a natural gas electric generator would be conditionally approved based on contributions to the Maryland Energy Assistance Program and the Strategic Energy Investment Fund (SEIF) which in turn would subsidize state green energy projects like GHG mitigation programs and renewable resources).