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It's not Always Sunny in Philadelphia: The Problem with the Pennsylvania Solar Initiatives

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INTRODUCTION

Over the last decade, solar energy has gained in popularity in the United States. Solar energy proponents point out that solar energy is the cleanest source of electricity: it does not require vast spaces of land or the damming of natural rivers, and it does not emit carbon dioxide.[1] The Obama Administration has also publicly supported solar energy. In 2010, the Obama Administration announced its plan to install solar panels on the White House roof.[2] Six years later, President Barack Obama acknowledged the significant progress of solar energy in his final State of the Union Address.[3]

The numbers tend to show the popularity of solar technologies. According to the U.S. Department of Energy, solar installations have grown seventeen-fold since 2008.[4] Moreover, the current cumulative solar electric capacity in the U.S. has exceeded 22,700 Megawatts (MW).[5] No one denies the progress of solar technologies. However, the question remains whether these technologies indeed are "saving Americans tens of millions of dollars a year on their energy bills," as President Obama claimed in his State of the Union Address.[6] Several publications recently questioned the efficiency of current alternative energy programs.[7] They have focused on the free riding problem, where the cost of solar panels is shifted from those who reap the benefits to third persons, including low-income population.[8]

The above problem is not uncommon in Pennsylvania: economically disadvantaged groups end up absorbing the costs of someone else's solar panels.[9]

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[1] K.K. DuVivier, *Solar Skyspace B*, 15 MINN. J.L. SCI. & TECH. 389, 389–90 (2014).

[2] Genevieve Coyle, Comment, *The Not-So-Green Renewable Energy: Preventing Waste Disposal of Solar Photovoltaic (PV) Panels*, 4 GOLDEN GATE U. ENVTL. L.J. 329, 329 (2011).

[3] President Barack Obama, State of the Union Address (Jan. 12, 2016), https://www.whitehouse/.gov/the-press-office/2016/01/12/remarks-president-barack-obama-%E2%80%93-prepared-delivery-state-union-address [hereinafter State of the Union Address].

[4] OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, SOLAR ENERGY IN THE UNITED STATES, http://energy.gov/eere/solarpoweringamerica/solar-energy-united-states (last visited Feb. 17, 2016).

[5] *Solar Industry Data*, SOLAR ENERGY INDUSTRIES ASS'N, http://www.seia.org/research-resources/solar-industry-data (last visited Feb. 17, 2016).

[6] State of the Union Address, *supra* note 3.

[7] *See* discussion *infra* Part III.A.3.

[8] *See* discussion *infra* Part III.A.3.

[9] *See infra* Part II.B.

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Specifically, the Pennsylvania legislature imposes certain minimum quantities of solar energy that state electric distribution companies are obligated to buy and supply to their customers.[10] Electric companies incur additional costs in complying with this requirement, which they pass along to their customers.[11] Despite some recent evidence that solar energy is inefficient in Pennsylvania,[12] Pennsylvania authorities continue to enforce this requirement. This paper argues that mandatory quotas for solar technologies in Pennsylvania are not an effective solution to developing renewable energy resources in Pennsylvania. In combination with net metering, solar quotas are resulting in subsidizing the owners of solar panels at the expense of low-income people.[13] Part I will provide a historic development of the national energy regulation to put the solar regulation in the context. Part II will describe the current energy regulatory regime in Pennsylvania. It will address the statute that introduced retail competition in Pennsylvania, Act 129 on energy-efficiency, and Alternative Energy Portfolio Standard Act that specifically imposes solar quotas. Part III will discuss the negative implications of solar programs nationwide, and analyze Pennsylvania solar initiatives to come to the conclusion that the current regulatory regime should be modified to address cross-subsidizing and free-riding.

I. Development of the National Energy Industry: From Monopolism to Deregulation

The energy market of the United States was built on the principles of monopolism for many years.[14] This was mainly attributed to the high dependence of the energy industry on the infrastructure—once one electric company established its distribution system, the second company on the market had to create its own distribution system, which entailed high costs.[15] As a result, vertically integrated utility companies controlled all stages of energy production: generation, transmission, and distribution.[16] Moreover, they were granted geographic monopoly to serve all customers within a specific location.[17] The U.S. government, in exchange, subjected electric companies to extensive regulation, turning electric

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[10] *See infra* Part II.C.

[11] *See infra* Part III.B.2.

[12] *See infra* Part III.B.1.

[13] *See infra* Part III.B.2.

[14] Trevor D. Stiles, *Regulatory Barriers to Clean Energy*, 41 U. Tol. L. Rev. 923, 926 (2010).

[15] *Id.* at 926–27.

[16] *Id.* at 927.

[17] *Id.*

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companies into highly regulated public utility companies.[18] Specifically, electric companies were obligated to provide service to every customer within the company's service area on a non-discriminatory basis.[19] In addition, federal government had authority to approve the rates electric companies charged.[20]

Vertically integrated electric public utility companies lasted until the 1970s energy crisis, when the biggest oil exporters introduced an embargo on all oil supplies to Western nations, resulting in a tremendous increase in oil and gas prices.[21] In an attempt to reduce U.S. dependence on foreign oil and develop alternative energy resources, President Jimmy Carter introduced the National Energy Act of 1978.[22] Its key element, the Public Utility Regulatory Policies Act (PURPA), required electric companies to procure a portion of the electricity from "qualified facilities"—small generation sources of alternative energy.[23]

The Federal Energy Regulatory Commission (FERC) was put in charge of the PURPA implementation.[24] Specifically, the FERC promulgated regulations setting a minimum price for the energy procurement from such generation sources.[25] Under these regulations, electric companies were to buy energy from the qualified facilities at the price charged to the companies' own customers.[26] Because small generation sources of alternative energy could not get such high prices before the PURPA, the new regime was a significant step to encourage renewable sources of energy throughout the United States.[27]

In the 1990s, the energy market went through a period of "deregulation."[28] Deregulation meant the "unbundling" of electric utility rates, i.e., separating

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[18] *See* Joseph P. Tomain, *Electricity Restructuring: A Case Study in Government Regulation*, 33 TULSA L.J. 827, 831 (1998).

[19] *Id.* at 841.

[20] *Id.* at 831.

[21] *Id.* at 834.

[22] *Id.*

[23] Public Utility Regulatory Policies Act of 1978, Pub. L. No. 95-617, 92 Stat. 3117 (1978).

[24] Tomain, *supra* note 18, at 835.

[25] *Id.*

[26] *Id.*

[27] *Id.*

[28] Inara Scott, *"Dancing Backward in High Heels": Examining and Addressing the Disparate Regulatory Treatment of Energy Efficiency and Renewable Resources*, 43 ENVTL. L. 255, 263 (2013).

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customer charges for generation, transmission and distribution.[29] Specifically, these changes stemmed from the Energy Policy Act of 1992 (EPA)[30] and FERC Order No. 888.[31] Order No. 888 required two important mandates from electric companies: (1) to unbundle the wholesale transmission from generation, and (2) to "provide open access to their transmission lines."[32] This meant that all generation facilities could compete on the open market to sell their energy to utility transmission and distribution companies.[33] However, these sales still did not reach ordinary customers because FERC did not have jurisdiction to regulate retail competition.[34] In addition, state utility commissions that had the authority to regulate retail hesitated, for various reasons, to introduce retail competition on the energy generation market.[35] Consequently, the federal government took a few steps to encourage the use of alternative energy sources by requiring the electric companies to buy renewable energy from the qualified sources and by letting generation facilities that produced energy from renewable sources to compete on the open market.[36]

In the mid-1990s, several states followed the federal trend of deregulating the energy market and authorized retail competition.[37] Under this new regime, residential and industrial electricity consumers were able to choose the type of generation source as their energy supplier.[38] States, however, went farther and introduced renewable portfolio standards.[39] Many of these standards required investor-owned electric utility companies to purchase certain amounts of energy

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[29] *Id.*; Stiles, *supra* note 14.

[30] Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. 2776 (1992).

[31] Scott, *supra* note 28; Stiles, *supra* note 14, at 928.

[32] Atlantic City Elec. Co. v. Fed. Energy Regulatory Comm'n, 295 F.3d 1, 4 (D.C. Cir. 2002) (referring to Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services By Public Utilities, 18 C.F.R. § 35 (1996)).

[33] David Schraub, *Renewing Electricity Competition*, 42 FLA. ST. U. L. REV. 937, 957 (2015) ("[T]he pricing and usage of the transmission lines had to be 'unbundled' from other non-retail utility services, preventing self-dealing and other anti-competitive practices meant to favor the incumbent owners.").

[34] *Id.*

[35] *Id.* at 958–59.

[36] Michael Coyn Mateer, Note, *When the Lights Go Out: The Impact of House Bill 6 on Regional Transmission Organizations and the Reliability of the Power Grid*, 12 GEO. MASON L. REV. 775, 787 (2003–04).

[37] Schraub, *supra* note 33, at 960.

[38] *Id.*

[39] *Report of the Renewable Energy Committee*, 29 ENERGY L.J. 269, 270 (2008).

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from alternative sources.[40] Consequently, the last decade of the 20th century was marked with significant transformations of the energy market. Energy generation business was de-monopolized and renewable energy received strong incentives from both federal and state government.[41]

II. PENNSYLVANIA ENERGY REGULATION

Pennsylvania followed the national trend to deregulate energy market and promote energy efficiency and renewable energy. In particular, the Pennsylvania legislature enacted the Electricity Generation Choice and Competition Act, including Act 129,[42] and the Alternative Energy Portfolio Standard Act.[43]

A. Pennsylvania Unbundling

Following FERC Order 888, Pennsylvania enacted its own legislation that required the unbundling of utility rates—the Electricity Generation Customer Choice and Competition Act.[44] While the statute did not prohibit regulated electric utility companies from owning and operating generation facilities,[45] it prevented them from including expenses relating to generation facilities in their rate base.[46] Since regulated electric utility companies received their revenues from the sales of electricity to their customers charged at a pre-approved rate by the Pennsylvania Public Utility Commission (PA PUC),[47] the companies had no incentive to keep any generation sources in their system.[48] Electric utility companies could still recover the costs relating to generation facilities through selling generated energy on the open wholesale market.[49] The companies could, thus, maintain the generation side of the

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[40] *Id.*

[41] Scott, *supra* note 28, at 272–73.

[42] 66 PA. CONS. STAT. § 2801 (2008).

[43] 73 PA. CONS. STAT. § 1648.1 (2008).

[44] 66 PA. CONS. STAT. § 2801 (1996).

[45] *Id.* § 2804(5) ("The commission may permit, but shall not require, an electric utility to divest itself of facilities or to reorganize its corporate structure.").

[46] *Id.* § 2807.

[47] Sandra Levine & Katie Kendall, *Energy Efficiency and Conservation: Opportunities, Obstacles, and Experiences*, 8 VT. J. ENVTL. L. 101, 104 (2007).

[48] For a discussion of how such a regime affected the alternative energy market in Pennsylvania, see *infra* Part III.B.

[49] 66 PA. CONS. STAT. § 2807(e)(5)(ii) (1996).

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energy business unburdened by PA PUC regulation, but they no longer had guaranteed revenues.[50]

Hence, the Electricity Generation Customer Choice and Competition Act created the first impulse to reshape the Pennsylvania energy market.[51] The new regulatory regime prompted changes in electric utility business policies and practices, e.g., changes in billing practices and metering, and "stranded benefits," such as assistance to the low-income population, conservation programs, and consumer education.[52]

B. Act 129

Twelve years after enacting the Electricity Generation Customer Choice and Competition Act, the Pennsylvania legislature adopted Act 129 that created the Energy Efficiency and Conservation (EE&C) Program.[53] The EE&C Program required electric public utilities with at least 100,000 customers to adopt the EE&C Plan, which was aimed at reducing energy consumption by at least 1 percent.[54]

In addition to reducing energy consumption, the EE&C Plan had to be cost-effective.[55] To measure cost-effectiveness, Act 129 introduced the Total Resource Cost (TRC) test—a cost-benefit analysis determined by PA PUC.[56] The test compared the net present value of financial resources spent over a 15-year period on supplying electricity with the net present value of the monetary cost of EE&C measures over the same 15-year life span.[57] In simpler terms, the test compared whether it was cheaper to continue supplying electricity for the next 15 years or to install the EE&C measures that would save electricity.

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[50] *Id.*

[51] John Hanger, *Pennsylvania's Electric Restructuring: How the View Changed*, PUB. UTIL. FORT., May 1997, at 22, 22 (calling the Electricity Generation Customer Choice and Competition Act "a historic statute that [would] introduce competition in the retail market among suppliers of electric generation").

[52] *Id.*

[53] *Energy Efficiency and Conservation (EE&C) Program*, PA. PUB. UTIL. COMMISSION, http://www.puc.pa.gov/filing_resources/issues_laws_regulations/act_129_information/energy_efficiency_and_conservation_ee_c_program.aspx (last visited Mar. 20, 2016).

[54] *Id.*

[55] 66 PA. CONS. STAT. § 2806.1 (2008).

[56] *Id.* § 2806.1(c)(3).

[57] *Id.* § 2806.1(m).

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In order to meet the TRC test, the EE&C measures should provide greater net present value than the value of the avoided cost for supplying electricity.[58] Consequently, the TRC test has been the main evaluator of the EE&C measures implemented by electric public utility companies.[59] In addition, it has been widely used to estimate the cost-efficiency of any energy-related measure, including programs under the Alternative Energy Portfolio Standards Act.[60]

C. Alternative Energy Portfolio Standards Act and Alternative Energy Credits

In 2004, the Pennsylvania legislature enacted the Alternative Energy Portfolio Standards Act (AEPSA) "designed to promote conservation and environmental stewardship by reducing reliance on traditional sources of electric generation."[61] The purpose of the AEPSA was to diversify energy sources, by requiring that a certain amount of power that electric distribution and generation companies sell to their retail customers come from sources of renewable energy.[62] Moreover, the AEPSA required that electric distribution companies (EDC) and electric generation sources (EGS) purchase a certain amount of solar photovoltaic power coming from solar alternative energy sources.[63] For example, by 2020, EDC and EGS will be required to sell to their customers at least 0.5 percent of the energy that comes from solar photovoltaic technologies.[64]

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[58] *Id.*

[59] *See Total Resource Cost Test*, PA. PUB. UTIL. COMMISSION, http://www.puc.state.pa.us/filing_resources/issues_laws_regulations/act_129_information/total_resource_cost_test.aspx (last visited Mar. 20, 2016).

[60] PA. PUB. UTIL. COMM'N, IMPLEMENTATION OF THE ALTERNATIVE ENERGY PORTFOLIO STANDARDS ACT OF 2004: STANDARDS FOR THE PARTICIPATION OF DEMAND SIDE MGMT. RES.—TECH. REFERENCE MANUAL 2013 UPDATE 2 (2012).

[61] Pa. Pub. Util. Comm'n, *Pennsylvania Sets Standards for New Program*, 3740 PUR UTIL. REG. NEWS, Oct. 2005, at 5, 5.

[62] Zachary Brecheisen, Comment, *Green Acres: How Bringing Pennsylvania Rural Electric Cooperatives Under the Full Provisions of the Alternative Energy Portfolio Standard Can Boost Renewable Energy Growth in Pennsylvania*, 19 PENN ST. ENVTL. L. REV. 333, 339–44 (2011).

[63] 73 PA. CONS. STAT. § 1648.3(b)(2) (2008); PA. PUB. UTIL. COMM'N, POLICY STATEMENT IN SUPPORT OF PENNSYLVANIA SOLAR PROJECTS 5 (2010) [hereinafter POLICY STATEMENT SUPPORTING SOLAR PROJECTS].

[64] 73 PA. CONS. STAT. § 1648.3(b)(2).

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The AEPSA is enforced through a system of Alternative Energy Credits (AEC) earned by EDC and EGS.[65] PA PUC, entrusted with the enforcement of the AEPSA,[66] has promulgated regulations that further develop the AEC system.[67] A specially assigned AEC program administrator (Administrator) monitors EDCs and EGSs on the issue of their compliance with the AEC requirements.[68] There are several ways in which EDCs and EGSs can earn these credits.[69] The first and most obvious way is through producing or buying energy from solar photovoltaic technologies, where one credit is equal to one megawatt of electricity generated or purchased from an approved alternative energy source.[70] Alternatively, EDC and EGS can buy AECs as a tradable instrument.[71] This means that AECs can be traded without actually being tied to power purchase by EDC, similarly, for example, to trading in stock or bonds.[72] Consequently, the AEC system creates an entire system of tradable instruments that can be bought or sold depending on whether an EDC (or EGS) underperformed or over-performed the Alternative Energy Standards.[73] For example, if an EDC sold 0.6 percent of solar energy to its retail customers in 2020, it could sell the remaining 0.1 percent to a company that only sold 0.4 percent.

The AEPSA originally gave the utility companies a two-year grace period from compliance with alternative energy portfolio standards, including solar energy requirements.[74] In addition, the companies were exempt from compliance with the AEPSA during the "Cost-Recovery Period."[75] The Cost-Recovery Period essentially meant the period of time during which EDCs continued to incur costs relating to generation facilities, without yet having recovered such costs for various reasons.[76]

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[65] *Id.* § 1648.3(e)(1).

[66] Brecheisen, *supra* note 62, at 341.

[67] *See* 52 PA. CODE §§ 75.61–75.70 (2008).

[68] *Id.* § 75.64; 73 PA. CONS. STAT. § 1648.3(e)(2) (2008).

[69] 52 PA. CODE §§ 75.61(a), 75.65 (2008) (allowing alternative compliance payments).

[70] POLICY STATEMENT SUPPORTING SOLAR PROJECTS, *supra* note 63; Brecheisen, *supra* note 62, at 341.

[71] 52 PA. CODE § 75.61(a).

[72] Brecheisen, *supra* note 62, at 342.

[73] 52 PA. CODE § 75.61(a).

[74] Brecheisen, *supra* note 62, at 343.

[75] 73 PA. CONS. STAT. § 1648.3(d).

[76] *Id.* § 1648.2; *see also* 66 PA. CONS. STAT. §§ 2808, 2812 (2008).

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Hence, Pennsylvania authorities gave EDCs an opportunity to recoup the costs spent on generation facilities.

In addition to alternative energy portfolio standards, the AEPSA introduced net metering.[77] Net metering enables connecting customer generators[78] to the EDC grid and rotating the energy from the generator back to the grid.[79] Customers can then sell the energy in excess of their needs back to the EDC.[80] Under the AEPSA and subsequent regulation promulgated thereunder, EDCs were required to provide a net metering option to all their customers who wanted to connect their generators to the grid.[81] Furthermore, EDCs were required to credit a customer-generator at the full retail rate.[82]

Alternative energy and net metering came with a price, and Pennsylvania legislators were well aware of this.[83] With regard to EDC's expenses on generation or purchase of solar energy, the AEPSA allowed EDCs to recover "all reasonable costs"[84] incurred in the process of purchasing or generating solar energy and then reselling the energy to its customers as a default service provider.[85] Concerning the costs for small-scale solar projects incurred by residential customers and small businesses, the Pennsylvania legislature enacted the Alternative Energy Investment Act that provided funding to small businesses and residential customers willing to install solar panels through the Department of Environmental Protection.[86] Finally,

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[77] Steven Ferrey, *Power Future*, 15 DUKE ENVTL. L. & POL'Y F. 261, 286 (2005).

[78] For more discussion on the distributed generation, see *infra* Part III.

[79] Ferrey, *supra* note 77.

[80] *Id.*

[81] 73 PA. CONS. STAT. § 1648.5 (2007); 52 PA. CODE § 75.13 (2016).

[82] 52 PA. CODE § 75.13.

[83] POLICY STATEMENT SUPPORTING SOLAR PROJECTS, *supra* note 63 (discussing economic barriers to solar technologies).

[84] Reasonable costs usually mean the costs that are related to the service of EDCs' customers, and that are prudent and just. POLICY STATEMENT SUPPORTING SOLAR PROJECTS, *supra* note 63, at 16.

[85] 73 PA. CONS. STAT. § 1648.3(a)(3)(ii) (2007) (*referring to* 66 PA. CONS. STAT. § 2807(e)(3.9) (2008)) ("[A] default service provider shall have the right to recover on a full and current basis, pursuant to a reconcilable automatic adjustment clause under section 1307 (relating to sliding scale of rates; adjustments), all reasonable costs incurred under this section and a commission-approved competitive procurement plan."). Because EDCs are natural monopolies with an obligation to serve customers of their service territory, they are default service providers and are legally obligated to procure energy sufficient to meet the demands of all their customers.

[86] *Id.*

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for large-scale solar projects, Pennsylvania created funding through the Department of Community and Economic Development.[87]

Unfortunately, the good intentions behind the AEPSA have failed to bring positive changes, especially when it comes to solar energy.[88] First and foremost, the solar provisions of the AEPSA face strong obstacles due to their high cost.[89] Moreover, economic analysis of solar technologies yields uncertain results, which further chills the interests of investors in solar programs.[90] And those programs that do exist in Pennsylvania create the effect of subsidizing the few owners of solar panels that can afford such technologies at the expense of those who cannot—low-income citizens.[91]

III. Cost of Solar for Pennsylvania

This Part will address the economic and social implications of solar energy. It will start by comparing the instances of successful implementation of solar in California, North Carolina, Arizona, and Nevada with the practices of other states. Then, it will focus on Pennsylvania solar policies and address the negative social implications of solar technologies in Pennsylvania.

A. Solar Projects Nationwide

Solar technologies have proved successful in a number of states. This success can be largely attributed to the relatively lower cost of solar energy or the relatively higher cost of fossil fuels.[92] In such states, solar technologies, specifically utility-scale solar generation facilities, can become the energy of the future.[93] In other states, however, solar projects are mostly limited to distributed generation, which creates a series of negative externalities.[94]

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[87] *Id.*

[88] *See infra* Part III.B.

[89] Policy Statement Supporting Solar Projects, *supra* note 63.

[90] *Id.*

[91] *See infra* Part III.B.

[92] *See* Karen Henry, *NREL Seeks to Determine Equation for Solar Market Success*, Energy Manager Today (Dec. 15, 2014), http://www.energymanagertoday.com/nrel-seeks-determine-equation-solar-market-success-0107472/ (listing the amount of sunlight available for potential solar generation and the cost of competing grid electricity as key non-policy factors of determining the success of solar technologies).

[93] *See* the experience of California, North Carolina, and Arizona discussed in Part III.A.2 *infra*.

[94] *See infra* Part III.A.3.

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1) Types of Solar Technologies

The economic and social analysis of solar technologies is impossible without understanding the difference between utility-scale solar energy and rooftop distributed generation. Utility-scale solar energy is energy generated at power plants in the amount large enough to meet the needs of many customers.[95] Distributed generation is small-scale solar energy generation, ordinarily installed by customers themselves to satisfy their personal energy needs.[96] In many instances, however, the energy generated through distributed generation exceeds the needs of its owner, which gives such owner an opportunity to sell the energy through net metering.[97] The effectiveness of solar energy strategy often depends on the type of solar energy technologies used in each particular case.[98]

2) Success of Solar Technologies in Certain States

One of the U.S. leaders in solar technologies is, not surprisingly, California.[99] Specifically, California is breaking national records in the area of behind-the-meter rooftop solar technologies[100] and utility-scale projects of 20 megawatts and above.[101] California lawmakers are also trying to create a comfortable environment for

[95] *Utility-Scale and Distributed Solar Energy Generation*, OFF. OF INDIAN ENERGY & ECON. DEV., http://teeic.indianaffairs.gov/er/solar/restech/tech/index.htm (last visited Mar. 20, 2016).

[96] *Id.*; *Distributed Solar*, SOLAR ENERGY INDUSTRIES ASS'N, http://www.seia.org/policy/distributed-solar (last visited Mar. 20, 2016).

[97] *See supra* Part II.C (explaining the notion of net metering).

[98] *See* James Conca, *Which Is Cheaper—Rooftop Solar Or Utility-Scale Solar?*, FORBES (July 30, 2015, 6:26 AM), http://www.forbes.com/sites/jamesconca/2015/07/30/which-is-cheaper-rooftop-solar-or-utility-scale-solar/#2fb032a94f6d.

[99] Tam Hunt, *California Is Getting Serious About Distributed Generation*, GREENTECH MEDIA (June 17, 2015), http://www.greentechmedia.com/articles/read/california-is-getting-serious-about-distributed-generation.

[100] Behind-the-meter rooftop solar technologies are solar panels that are not connected to utility grid and are not subject to net metering. *Id.*

[101] Hunt, *supra* note 99.

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developing wholesale distributed generation,[102] which is less popular than behind-the-meter rooftop and utility-scale solar technologies.[103]

North Carolina-based Duke Energy, which is the largest U.S. electric utility company, also heavily invests in solar panels.[104] Similar to electric utility companies in California, Duke Energy prefers investing in utility-scale solar technologies that are more efficient than distributed generation due to the economy of scale.[105] Several electric utility companies in Arizona have followed the example of California and North Carolina—Arizona Public Service and Tucson Electric Power are implementing utility-owned rooftop solar pilot programs.[106] Utility-scale photovoltaic generation facilities also operate in Nevada.[107]

3) Negative Effects of Solar in Other States

Before trying to replicate the energy model of California or Arizona in other states, we must remember that these are states with two of the highest amounts of sunshine per year in the country.[108] In other states, for example Wisconsin, Connecticut, Illinois, Idaho, or Maryland, states that receive less sun, electric utility companies are not willing to follow the California or Arizona path and invest in utility-scale solar generation facilities.[109] Instead, they limit their programs to distributed generation, where their customers invest in solar technologies, while the utility companies only provide connection to the grid.[110]

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[102] Wholesale distributed generation is a kind of distributed generation systems that produces significantly larger amounts of electricity than rooftop distributed generation and sells this electricity on the wholesale market. *See Wholesale Distributed Generation*, SOLAR ENERGY INDUSTRIES ASS'N, http://www.seia.org/policy/renewable-energy-deployment/wholesale-distributed-generation (last visited Mar. 20, 2016).

[103] Hunt, *supra* note 99.

[104] *Duke Energy Proposes Innovative Solar Programs for South Carolina*, DUKE ENERGY (Feb. 10, 2015), https://www.duke-energy.com/news/releases/2015021001.asp.

[105] Gavin Bade, *Inside Duke Energy's Renewables Strategy*, UTIL. DIVE (June 22, 2015), http://www.utilitydive.com/news/inside-duke-energys-renewables-strategy/401084/.

[106] *Id.*

[107] *Profile Analysis—Nevada*, https://www.eia.gov/state/analysis.cfm?sid=NV (last visited Sept. 25, 2016).

[108] *Average Annual Sunshine by State*, CURRENT RESULTS, https://www.currentresults.com/Weather/US/average-annual-state-sunshine.php (last visited Jan. 13, 2016).

[109] Herman K. Trabish, *The Fight Over Solar Moves From Net Metering to Rate Design*, UTIL. DIVE (Nov. 3, 2014), http://www.utilitydive.com/news/the-fight-over-solar-moves-from-net-metering-to-rate-design/327742/.

[110] *Id.*

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Unfortunately, notwithstanding its potential benefits, distributed generation may negatively impact electric utility companies and their customers.[111] The key to understanding this phenomenon lies in the nature of the utility industry.[112] Specifically, electric utility companies receive their revenues from selling electricity within their service territory at a rate pre-approved by a state public utility commission.[113] The rates are established during a ratemaking case, in the course of which a state public utility commission considers the capital costs that an electric utility company invested and projected operating costs the company will have to spend to serve all customers within the company's service territory.[114] Because electric utility companies cannot increase their rate outside the ratemaking process, they are sale-driven—the more electricity they sell, the more revenues they get.[115]

When customers satisfy their own demands for electricity with distributed generation, this reduces the market share of electric utility companies, and consequently reduces their revenues.[116] Even when distributed generation satisfies a portion of general demand, electric utilities companies' costs cannot simply be reduced per capita of their customer market—the companies still have to invest the same funds in energy resources, because they are legally obligated to provide a reliable service within their service territory if the distributed generation fails.[117] When the electric utility companies' revenues fall, they turn back to state public utility commissions to have their rates increased.[118] State public utility commissions have to balance two evils—on one hand, they do not want electric utility rates to

[111] Peter Kind, *Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business*, EDISON ELECTRIC INST. (Jan. 2013), http://www.eei.org/ourissues/finance/documents/disruptivechallenges.pdf.

[112] *Id.*

[113] Scott, *supra* note 28, at 264–65; *see also* Levine & Kendall, *supra* note 47.

[114] Scott, *supra* note 28, at 264–65.

[115] *Id.*

[116] Kind, *supra* note 111, at 1.

[117] Ashley Brown & Jillian Bunyan, *Valuation of Distributed Solar: A Qualitative View*, 27 ELECTRICITY J. 27 (2014); David Schmitt, *Net Metering: Getting Beyond the Controversy*, http://www.americanbar.org/content/dam/aba/migrated/2011_build/public_utility/netmetering_getting_beyond__the__controversy.authcheckdam.pdf (last visited Jan. 14, 2016).

[118] Levine & Kendall, *supra* note 47.

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skyrocket, while on the other hand, they need to make sure that the utility companies stay in business to serve their customers.[119]

While electric utility companies can potentially increase the fee for providing connection to distributed generation, such an increase will affect the cost-efficiency of such alternative energy programs, and therefore reduce the company's TRC ratio.[120] Consequently, utility companies prefer recouping the loss in revenues through an increase in rates to all its customers.[121] As a result, the customers that do not own a distributed generation facility absorb the cost for the customers that do.[122]

B. Adverse Social Implications of Pennsylvania Solar Program

Pennsylvania, which receives significantly less sun than California or Arizona, is a good example to test the hypothesis described in Part III.A.3. Currently, all seven Pennsylvania investor-owned EDCs have finished their cost recovery periods[123] and have become subject to new alternative energy portfolio requirements.[124] In particular, pursuant to the AEPSA requirements,[125] Pennsylvania EDCs provide opportunities for distributed generation using solar energy resources. PPL Electric Utilities (PPL), PECO, Citizen Electric of Lewisburg, and UGI allow their customers to connect customer distributed generation technologies to utility distribution systems subject to fees.[126] For example, PPL allows its customers to connect their solar hot water and solar (photovoltaic) generation systems to PPL distribution systems with an option to sell the produced electricity back to PPL through net

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[119] Alexander D. White, *Compromise in Colorado: Solar Net Metering and the Case for "Renewable Avoided Cost,"* 86 U. COLO. L. REV. 1095, 1107 (2015) ("Commission must . . . set rates which protect both: (1) the right of a public utility company and its investors to earn a rate of return reasonably sufficient to maintain the utility's financial integrity; and (2) the right of consumers to pay a rate which accurately reflects the cost of service rendered.").

[120] Under Act 129, the costs of compliance with the AEPSA that are known and knowable to EDC must be included in the TRC Test calculation. Consequently, the increase in fees for distributed generation under the AEPSA increases the total costs of EE&C Measures under the TRC test and diminishes the utility chance of compliance with Act 129. PA. PUB. UTIL. COMM'N, 2016 TOTAL RES. COST (TRC) TEST, 17 (2015).

[121] Kind, *supra* note 111, at 1.

[122] *Id.*; *see also* Trabish, *supra* note 109; Brown & Bunyan, *supra* note 117.

[123] For the definition of the term "cost recovery period" see *supra* Part II.C; *see also* 52 PA. CODE §§ 75.61–75.70 (2008); *see also* § 75.64.; 73 PA. CONS. STAT. § 1648.3(e)(2).

[124] Brecheisen, *supra* note 62, at 343.

[125] 73 PA. CONS. STAT. § 1648.5.

[126] Herman K. Trabish, *PPL, Peco Join List of Utilities Seeking Big Fixed Fee Hikes*, UTIL. DIVE (Apr. 7, 2015), http://www.utilitydive.com/news/ppl-peco-join-list-of-utilities-seeking-big-fixed-fee-hikes/383667/.

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metering.[127] UGI provides similar services to its customers:[128] limiting net metering for residential services to 50 kilowatt (kW) and all other service locations to 3,000kW. Similarly, Citizen Electric of Lewisburg allows connecting small solar photovoltaic projects to its distribution system subject to fees.[129]

Pursuant to the AEPSA and PA PUC regulations, EDCs are allowed to recover the costs attributable to complying with the solar AEPSA requirements by using the non-bypassable Solar Photovoltaic Requirements Charge Rider (SPVRC Rider) as approved by the PA PUC.[130] Since solar energy remains more expensive in Pennsylvania than fuel energy, it does not require a complicated mathematical analysis to establish that when EDCs include their costs for solar AECs into their rates, the rates go up.[131] The analysis below will address the economic and social consequences of the Pennsylvania solar policy.

1) Addressing Economic Evidence

Solar technologies in Pennsylvania are predominantly limited to residential distributed generation.[132] In particular, while customer distributed generation is getting more widespread in Pennsylvania, utility scale solar systems remain significantly less popular.[133] And this is not surprising—a recent study conducted specifically for PA PUC established that utility-scale solar technologies are not

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[127] PPL Electric Utilities, *Renewable Generation—Making the Connection*, https://www.pplelectric.com/~/media/pplelectric/at%20your%20service/docs/customer-owned-generation/renewableenergyoptions.pdf (last visited Sept. 25, 2016).

[128] UGI Utilities, Inc., *Distributed Customer Generation Information* (Mar. 25, 2009), https://www.ugi.com/wp-content/uploads/2015/10/2015Small-Generator-Interconnection-Process.pdf.

[129] *Customer-Owned Small Generator Interconnection Requirements*, CITIZENS' ELECTRIC, https://www.citizenselectric.com/CustomerOwnedSmallGenerator.asp (last visited Jan. 14, 2016).

[130] Edison Co., Pennsylvania Elec. Co., Pennsylvania Power Co. & W. Penn Power Co., *Joint Petition of Metro. for Approval of Their Default Serv. Programs*, 314 P.U.R.4th 365 (July 24, 2014); PPL Elec. Utilities Corp., *Petition for Approval of A Default Serv. Program & Procurement Plan for the Period June 1, 2015 Through May 31, 2017*, P-2014-2417907, 2015 WL 302144, at 5 (Jan. 15, 2015).

[131] *Cf.* Dan Haugen, *Are Renewable Standards Driving Up Utility Rates?*, MIDWEST ENERGY NEWS (May 17, 2011), http://midwestenergynews.com/2011/05/17/are-renewable-standards-driving-up-utility-rates/.

[132] Anya Litvak, *Pa. Companies Shying Away From Solar Power*, PITTSBURGH POST-GAZETTE, Oct. 18, 2013, http://www.post-gazette.com/business/businessnews/2013/10/18/Pa-companies-shying-away-from-solar-power/stories/201310180173.

[133] *See Conergy, Epuron Complete 3 MW Solar PV Project in Pennsylvania*, SOLAR INDUSTRY (Nov. 20, 2008), http://solarindustrymag.com/conergy-epuron-complete-3-mw-solar-pv-project-in-pennsylvania (explaining that extensive research has yielded only one completed utility-scale solar project).

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"cost-effective within the study horizon" to even further explore their nature and economics.[134] However, the study determined that solar distributed generation is not equally cost-efficient when applied to residential, commercial and industrial sector.[135] This conclusion is based on factors such as high solar distributed generation equipment costs and moderate to low avoided costs in Pennsylvania (resulting in minimum benefits for distributed generation technologies).[136] The study concludes that, over time, costs for solar distributed generation *may* decline, but *currently* such technologies are not sufficiently cost-efficient to warrant any significant attention.[137]

While other studies are more optimistic on the future of solar energy, none clearly addresses the ultimate issue—the cost-efficiency of solar technologies.[138] For example, in 2009, the American Council for an Energy-Efficient Economy issued a 255-page report on EE&C measures and renewable energy in Pennsylvania.[139] The report failed to address the cost-efficiency of solar technologies, or even a projection of when and under what conditions such technologies will be cost-efficient.[140] Another study expressly admits that "solar energy projects are feasible only through the income generated through incentives," meaning that solar can only work when subsidized.[141] Finally, one study justifies the economic value of solar technologies to the number of jobs it creates;[142] however, this number fades in comparison with $1.1 billion in state and local tax revenues generated and 140,000 jobs created by Marcellus Gas Development in Pennsylvania.[143]

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[134] PA. PUB. UTIL. COMM'N, DISTRIBUTED GENERATION POTENTIAL STUDY FOR PENNSYLVANIA 16 (2015), http://www.puc.pa.gov/pcdocs/1355000.pdf.

[135] *Id.*

[136] *Id.* at 41.

[137] *Id.*

[138] *See, e.g.*, Richard Perez et al., *The Value of Distributed Solar Electric Generation to New Jersey and Pennsylvania*, CLEAN POWER RES. (Nov. 2012), http://mseia.net/site/wp-content/uploads/2012/05/MSEIA-Final-Benefits-of-Solar-Report-2012-11-01.pdf; Maggie Eldridge et al., *Potential for Energy Efficiency, Demand Response, and Onsite Solar Energy in Pennsylvania*, AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON. (Apr. 1, 2009), http://aceee.org/research-report/e093 [hereinafter ACEEE REPORT]; Steffen Lubbe & Joy A. Fritschle, *The Potential of Utility-Scale Solar and Wind Energy in Chester County, Pennsylvania*, 47 MIDDLE STATES GEOGRAPHER 79 (2014).

[139] ACEEE REPORT, *supra* note 138.

[140] *Id.*

[141] Lubbe & Fritschle, *supra* note 138, at 86.

[142] Perez et al., *supra* note 138, at 44–45.

[143] Timothy J. Considine et al., *The Pennsylvania Marcellus Natural Gas Industry: Status, Economic Impacts and Future Potential*, MARCELLUS SHALE COALITION iv (July 20, 2011), http://marcelluscoalition.org/wp-content/uploads/2011/07/Final-2011-PA-Marcellus-Economic-Impacts.pdf.

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Therefore, one should treat numbers with great caution. Studies that propagate solar energy often sacrifice sound economic analysis and instead engage in demagogy. The studies advocating for solar energy encourage us to strive for solar energy despite its economic cost.[144] The studies expressly call for subsidizing of solar technologies, but did not address potential negative effects of subsidies.[145] Hence, one should not base its argument in support of solar on the theoretical benefits of solar energy without considering realistic shortcomings. The emphasis should be made on mechanisms that can work in practice considering social realities. The current Pennsylvania regulatory regime seems to have embarked upon some very unsafe grounds going against prudent scientific and economic evidence.

2) Delineating Cross-Subsidizing

Pennsylvania regulators continue to push for the development of solar technologies, despite their own scientific and economic conclusions.[146] Pennsylvania EDCs have responded by petitioning for recovering costs spent on compliance with the AEPSA.[147] For example, Pennsylvania EDC PECO successfully petitioned the PA PUC to recover costs associated with the procurement of AECs to comply with the AEPSA requirements (including the solar requirement).[148] The costs recovered were then passed on to the PECO customers.[149] PA PUC accepted PECO's argument, stating that the cost recovery would be "in the public interest."[150] As a result of such process, customers that do not own solar technologies end up subsidizing those that installed the distributed generation.

Recently, the PA PUC attempted to limit cross subsidizing of the solar technologies at the expense of non-solar customers and to prevent market distortions arising out of such cross subsidizing.[151] Specifically, in its order, the PA PUC introduced a limit on net metering of customer distributed generation capacity to not

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[144] *See, e.g.*, Lubbe & Fritschle, *supra* note 138, at 86.

[145] ACEEE REPORT, *supra* note 138.

[146] *See, e.g.*, PA. PUB. UTIL. COMM'N, IMPLEMENTATION OF THE ALTERNATIVE ENERGY PORTFOLIO STANDARDS ACT OF 2004, at 5 (2014).

[147] *Petition of PECO Energy Co. for Approval to Procure Tier II Alternative Energy Credits Through Indep. Brokers*, ID178149, 2014 WL 1744784, at 7 (Pa. P.U.C. 2014).

[148] *Id.*

[149] *Id.*

[150] *Id.*

[151] PA. PUB. UTIL. COMM'N, L-2014-2404361, Final Rulemaking Order (2016), http://www.puc.pa.gov/pcdocs/1414766.doc [hereinafter NET METERING ORDER].

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more than 200% of the customer's need.[152] This means that the customer generating its own energy can now only sell up to 200% of its needs back to the utility through net metering.[153] While the PA PUC acknowledged that the absence of any limits with regards to net metering "results in unjust and unreasonable rates paid by all other default service customers," it still introduced a generous upper limit despite the recommendations of Pennsylvania EDCs.[154] In particular, Pennsylvania EDCs pointed out that the 200% limitation would create additional costs for EDCs, "which in turn, would increase costs to electric customers" and result in "a higher level of cross subsidization whereby default service customers, who currently pay net metering cost as part of default service charges, would be required to pay an increased amount."[155]

The notion of negative externalities is one of the main concepts in any law and economics theory.[156] Regrettably, the Pennsylvania legislature seems to have neglected to analyze the negative externalities of solar energy in Pennsylvania before it introduced its renewable energy policy. Although Pennsylvania regulators have finally introduced a limit on net metering, the 200% limit still means that the owners of distributed generation get 100% profit without paying anything for using the grid. Pennsylvania EDCs recognize this problem, but, being investor-owned companies, have little incentive to take remedial measures. Even they, however, have noted in their petitions to PA PUC that a high limit on net metering creates significant adverse effects on customers who do not own distributed generation.[157]

3) Outlining the Burden Placed on Low-Income People

In addition to the general issue of "free-riding," distributed generation disproportionately affects low-income populations since, due to high cost of solar

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[152] *Id.* at 50.

[153] *Id.*

[154] *Id.* at 40–41, 51; Andrew Maykuth, *PUC Votes to Set 'Net-metering' Limits on Customers Generating Electricity*, PHILLY.COM (Feb. 13, 2016), http://www.philly.com/philly/business/energy/20160212_PUC_votes_to_set__net-metering__limits_on_customers_generating_electricity.html.

[155] NET METERING ORDER, *supra* note 151, at 41–42; *see also* PPL, Comments to Advance Notice of Final Rulemaking, No. L-2014-2404361, at 12–14; FirstEnergy, Comments to Advance Notice of Final Rulemaking, No. L-2014-2404361, at 2–3.

[156] Gideon Parchomovsky & Peter Siegelman, *Cities, Property, and Positive Externalities*, 54 WM. & MARY L. REV. 211, 220–21 (2012) (referring to R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 1–16 (1960)).

[157] *PPL Comments to Advance Notice of Final Rulemaking*, *supra* note 155; *FirstEnergy Comments to Advance Notice of Final Rulemaking*, *supra* note 155.

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panels,[158] they cannot afford installation, but end up paying for the installations of others with the increase of utility charges.[159] While the Alternative Energy Investment Act created the Emergency Energy Assistance Fund aimed at helping low-income population in case of unexpected weather conditions or high energy prices, even the name of the fund suggests that such assistance will be available in only extreme circumstances and it requires an action from the Governor of Pennsylvania.[160]

Low-income populations are left with general energy program funding initiatives propagated by the Alternative Energy Investment Act, such as loans, grants, reimbursements, and rebates available for home owners and small businesses.[161] In particular, the Act creates consumer and small business solar energy projects and authorizes Pennsylvania Department of Environmental Protection (PA DEP) to provide further details for such projects.[162] PA DEP acted on such authorization and promulgated Pennsylvania Sunshine Guidelines for the Residential and Small Business Solar Program,[163] which describes the procedure and eligibility for consumers and small businesses to receive rebates for installing solar technologies.[164]

As revised, the Guidelines provide rebates for consumers and small businesses to offset the cost of their solar installations upon the PA DEP approval.[165] However, there are several reservations. First, applicants can receive rebates only when the funding is available; consequently, the approval of the project does not lead to automatic rebates.[166] Second, residential applicants and small businesses must pay

[158] *The Future of the Electric Grid*, MIT ENERGY INITIATIVE 112 (2011), http://energy.mit.edu/wp-content/uploads/2011/12/MITEI-The-Future-of-the-Electric-Grid.pdf.

[159] *See* Kind, *supra* note 111, at 1.

[160] 73 PA. CONS. STAT. § 1649.305.

[161] *Id.* §§ 1649.501–09.

[162] *Id.* § 1649.306.

[163] Department of Envtl. Prot. v. Cole, 52 A.3d 541, 543 (Pa. Commw. Ct. 2012).

[164] PA. DEP'T ENVTL. PROT., PENNSYLVANIA SUNSHINE GUIDELINES FOR THE RESIDENTIAL AND SMALL BUSINESS SOLAR PROGRAM (2013), http://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/GrantsLoansTaxCredits/Solar/Pa%20Sunshine%20Guidelines.pdf.

[165] *Id.* at 1.

[166] *Id.*

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$100 and $150 non-refundable fee.[167] As a result, even small businesses hesitate to install solar.[168] Needless to say, a $100 fee, plus upfront installation costs, is an unbearable burden for the low-income population. Consequently, solar technologies are practically inaccessible to low-income people. Yet, lower income groups are sponsoring solar technologies for others. The adverse effects of solar initiatives on low-income people can create further negative consequences. For example, an increase in utility rates will result in a lack of ability of low-income people to pay for their bills, which in turn may result in increased burden on state social welfare system.

4) Possible Solutions

Although Pennsylvania solar policies have a series of negative social implications, this does not mean that Pennsylvania should totally abandon solar initiatives. Simply, Pennsylvania should not strive to be the front-runner.[169] For example, PA PUC should consider the propositions of Pennsylvania EDCs to lower the upper limit of solar energy from distributed generation entitled to net metering.[170] Another solution to minimize cross subsidizing is to ensure the reliability of solar technologies.[171] This can be achieved through developing quality assurance and inspection programs to "maximize system performance thru [*sic*] proper design, siting, and installation."[172] Reliability of solar technologies will allow electric utility companies to reduce their supply by the amount of the solar energy that is produced constantly and without interruption by customer distributed generation.[173] In such a way, the companies' costs will decrease, which will be reflected on all customers' bills.[174]

Another important technological aspect of solar technologies is energy storage and integrating energy storage programs into solar energy generation and

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[167] *Id.* at 2.

[168] Litvak, *supra* note 132.

[169] Pennsylvania has one of the largest solar mandates in the nation, requiring the installation of 860 MW solar capacity over the next 15 years. Lubbe & Fritschle, *supra* note 138, at 79.

[170] *See supra* Part III.B.2 for a discussion on limiting net metering.

[171] *See, e.g.*, ACEEE REPORT, *supra* note 138, at 62.

[172] *Id.*

[173] See *supra* Part III.A.3 for the explanation of the problem that distributed generation decreases the revenues of electric utility companies, but does not reduce the costs the companies have to spend on their energy supply.

[174] For the explanation of the correlation of electric utility companies' costs and customer utility rates, see *supra* Part III.A.3.

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distribution.[175] For example, there is currently "no successful utility-scale practical implementation of coordinated solar/storage and microgrid systems on a real-life distribution system in the U.S."[176] Energy storage and microgrids[177] are also ignored by the Pennsylvania legislature.[178] Since energy storage and the ability to operate solar energy generation in the microgrid environment directly affects the reliability of solar technologies, Pennsylvania rule-makers should dedicate more attention to this issue.

Finally, measures should be taken to involve the low-income population in solar energy initiatives. The most obvious example is to offer cash flow upfront financing for solar installations and provide technical assistance during such installations.[179] Consequently, it is not the end results that are flawed in Pennsylvania solar regime, but rather the means.

CONCLUSIONS

For the past several years, the Obama administration has become increasingly vocal with regards to the need to prevent global warming and abandon fossil fuels in favor of clean energy.[180] And solar energy seems like the obvious first choice in furtherance of those goals. However, in the race for solar energy, state lawmakers should not sacrifice efficiency and welfare in favor of speedy results. Pennsylvania authorities made a mistake: by adopting one of the most aggressive solar initiatives in the country, they sacrificed hundreds of people who simply cannot afford solar technologies. Specifically, numerous reports and publications have suggested that Pennsylvania Alternative Energy Portfolio Standards, including its solar requirement, create cross subsidizing of the owners of solar panels at the expense of all other energy consumers, distorting the energy market and increasing instances of

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[175] Elisa Wood, *ComEd Microgrid Wins Grid Modernization Funding; DOE Boosts Solar, Energy Storage*, MICROGRID KNOWLEDGE (Jan. 22, 2016), http://microgridknowledge.com/more-grid-modernization-funding/.

[176] *Id.*

[177] Microgrids are "local power networks that use distributed energy resources and manage local energy supply and demand." While typically connected with a national power grid, they have the ability "to pull themselves off the grid and function in island mode when necessary. . . ." Z. Ye et al., *Facility Microgrids*, NAT'L RENEWABLE ENERGY LABORATORY iii (2005), http://www.nrel.gov/docs/fy05osti/38019.pdf.

[178] For example, the term "microgrid" is mentioned only once in the entire energy regulation legislation in Pennsylvania.

[179] ACEEE REPORT, *supra* note 138, at 62.

[180] *See, e.g.*, Coyle, *supra* note 2; State of the Union Address, *supra* note 3.

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free-riding. The groups most affected are low-income populations. Pennsylvania can still, however, successfully pursue its solar initiatives subject to certain changes in its law and policy that address the negative effects of its current regime.

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