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Cleaning Up and Cashing Out: Using Financial Incentives to Increase Missourians Use of Solar Energy and Decrease Missouri's Dependence on Imported Coal

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Douglas Mann[*]

ABSTRACT

Climate change is one of the biggest threats to the human species. Unlike other historical threats to species, this threat is caused by humans themselves. Climate change (a product of a rise in average global temperature due to carbon emissions) is causing extreme weather patterns, droughts, mass migrations, among other catastrophic consequences. The state of Missouri is particularly guilty of carbon emissions. Missouri has one of the dirtiest energy grids in the nations. If Missouri residents were to switch from fossil fuel-generated electricity to residential solar energy systems, there could be a drastic reduction in Missouri's carbon footprint. The Missouri government can incentivize its residents to make the switch by making solar energy systems and installation exempt from sales and use taxes. Providing performance premiums for residents who produce an excess amount of energy with their solar systems could also serve as a strong incentive to switch from fossil fuels to solar energy.

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I. INTRODUCTION

A. Climate Change Overview

Humans are at a defining moment in our history.[1] Climate change is real and so are its effects.[2] Shifting weather patterns, catastrophic flooding, and threatened food supplies are just some of the grave consequences in store for society over the coming decades.[3]

Rising global temperatures are to blame for the extreme weather patterns we are witnessing and will be responsible for further calamities such as rising sea levels and the migration of climate refugees.[4] Additionally, as we see effects on the physical world, economic growth will be slowed, and possibly reversed, by climate change.[5] More extreme effects that may affect Missouri include, but are not limited to extended and more intense heat waves, increased flooding risk, potential drought, and torrential rain.[6]

Scientists have determined that the rise in average global temperature is caused by human activity, such as the emission of greenhouse gasses.[7] These greenhouse gases include carbon dioxide (CO_2), which is emitted in large quantities from burning coal.[8] In order to stave off the worst of the effects, scientists estimate that we will have to reach net zero CO_2 emissions within the next 15 years.[9] This would put us in the best possible position to avoid the most egregious consequences of our fossil fuel usage.[10] Even with these changes, there is still a significant chance that we will see more extreme shifts in weather patterns and climate in the near future.[11]

In order to achieve the goal of reaching zero emissions in the next 15 years, humanity will need to dramatically increase its investment in energy-related technologies.[12] Investments in low-carbon energy technologies and energy efficiency will need to increase to six times their current amount by 2050.[13] The end goal is for the low-carbon and carbon-free energy sector to overtake the fossil fuel industry and eventually render fossil fuels obsolete.[14]

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1. *Climate Change,* UNITED NATIONS, https://www.un.org/en/sections/issues-depth/climate-change/ (last visited Sept. 29, 2019).
2. *Id.*
3. *Id.*
4. *Special Report: Global Warming of 1.5° C*, THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, https://www.ipcc.ch/sr15/ (last visited Sept. 29. 2019).
5. *See* Ove Hoegh-Guldberg et al., *Impacts of 1.5° C Global Warming on Natural and Human Systems*, Chapter 3 of *Special Report*: *Global Warming of 1.5°,* THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, https://www.ipcc.ch/sr15/chapter/chapter-3/ (last visited Sept. 29, 2019).
6. *Id.*
7. Myles R. Allen et al., *Framing and Context*, Chapter 1 of *Special Report: Global Warming of 1.5° C,* THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, https://www.ipcc.ch/sr15/chapter/chapter-1/ (last visited Sept. 29, 2019).
8. *See* Joeri Rogelj et al., *Mitigation Pathways Compatible with 1.5° C in the Context of Sustainable Development*, Chapter 2 of *Special Report*: *Global Warming of 1.5°*, THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 113, https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_Chapter2_Low_Res.pdf (last visited Sept. 29, 2019).
9. *See id*. at 95.
10. *See generally id.* at 118 (revealing some of the benefits to phasing out use of fossil fuels).
11. *See* Allen et al., *supra* note 7, at 53.
12. *See* Rogelj et al., *supra* note 8, at 132.
13. *See id.* at 96.
14. *See generally id*. at 138 (explaining how low-carbon fuels will yield decarbonization).

B. Current State of Missouri Energy Production

At this moment in time, Missouri has one of the dirtiest power grids in the nation.[15] In 2018, 73% of the electricity generated in the state of Missouri came from coal-fired power plants.[16] The only state to produce a larger portion of its electricity from the burning of coal was Texas.[17]

Missouri's dependence on electricity is not only an environmental issue; it is also an economic issue. Missouri imports 82% of the coal it uses in its power plants, making Missouri more dependent on imported coal than any other state in the country.[18] In 2008, Missouri spent approximately $1.13 billion on coal imports for the generation of electricity.[19]

If Missouri were to reduce the electricity it produces in coal-fired power plants by 1%, it could save the state $30 million per year.[20] This could easily be done by residential consumers since 27.3% of Missouri's electricity consumption is residential.[21] One method of reducing dependence on fossil fuel generated electricity would be for Missouri to invest in low-carbon energy production technologies, such as solar energy.[22] Three places where Missouri falls behind more progressive states—and where the government could invest to incentivize the use of solar energy—are tax credits, sales tax exemptions, and performance incentives for solar energy equipment and production.[23]

Part II of this article will discuss what residential solar energy looks like, as well as the current state of consumer attitudes towards transitioning away from fossil-fuels. Part III will discuss the different mechanisms that Missouri may use to financially incentivize the increased use of residential solar energy. Part IV will examine the utilization of financial incentives used by different states to increase the use of residential solar energy, as well as the rates of usage of solar energy in those states. Finally, Part V will offer recommendations on what financial incentives would be most effective to increase the use of residential solar energy in Missouri.

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15. *See generally Missouri: State Profile and Energy Estimates*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/state/?sid=MO (last visited Sept. 29, 2019) [hereinafter *Missouri: State Profile and Energy Estimates*] (revealing that Missouri burns more coal for energy generation than nearly all states).

16. *Id.*

17. *Id.*

18. Jeff Deyette & Barbara Freese, *Burning Coal Burning Cash: Ranking States that Import the Most Coal*, UNION OF CONCERNED SCIENTISTS 35 (May 2010), https://www.ucsusa.org/sites/default/files/2019-09/Burning-Coal-Burning-Cash_full-report.pdf.

19. *Id.*

20. *Id.*

21. *Missouri: State Profile and Energy Estimates*, *supra* note 15.

22. *See generally* Rogelj et al., *supra* note 8, at 135 (explaining how changing to renewable energy sources reduces the climate change impact).

23. *Missouri Solar Policy Information*, SOLAR POWER ROCKS, https://www.solarpowerrocks.com/missouri/ (last visited Sept. 29, 2019).

II. SOLAR ENERGY AS A SOLUTION

A. Residential Solar Panels

Modern residential solar panels utilize the photovoltaic effect to create electrical energy,[24] which can be used immediately, stored in a battery, or put back onto the electric grid.[25] The use of solar power has many advantages over the use of fossil fuels.[26] Sunlight is free of charge and is usually abundant during the day, when the demand for electricity is at its highest.[27] Additionally, solar energy is easier to transfer to the end-user than fossil fuel-generated electricity or wind energy because it is produced at the site of consumption.[28] Solar panels will generally provide energy-cost savings, increase the value of the property on which they are installed, offer an environmentally friendly alternative to fossil fuel-generated electricity, and work virtually anywhere.[29]

Admittedly, one advantage fossil fuel electricity is the upfront cost;[30] typically, the power company provides the infrastructure for the generation and distribution of electricity.[31] With residential solar energy, however, the infrastructure for the generation and distribution of electricity is supplied by the consumer, who bears the upfront cost.[32]

B. Americans Views on Renewable Energy and Cost

The United States is highly dependent on fossil fuels,[33] and the majority of Americans agree that this is a problem.[34] They also believe that solar energy is one of the best solutions to this problem,[35] and are willing to pay more for energy if they know it is environmentally friendly.[36] In fact, despite the rhetoric that green energy will hurt the economy, 71% of Americans believe a strong economy and a clean environment can coexist.[37]

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24. Tom Metcalfe, *How Do Solar Panels Work?*, NBC NEWS, (Jan. 12, 2019, 7:59 AM), https://www.nbcnews.com/mach/science/how-do-solar-panels-work-ncna957231. The photovoltaic effect is light from the sun exciting the electrons in semiconductor material of the solar panel, which in turn creates an electrical charge.

25. *Id.*

26. Jeffrey D. Moss, *Solar Panels, Tax Incentives, and Your House*, 24-1 A.BA. SEC. PROBATE & PROPERTY 17 (2010).

27. *Id.*

28. *See id.*

29. *Benefits of Residential Solar Electricity*, DEP'T OF ENERGY, https://www.energy.gov/energysaver/benefits-residential-solar-electricity (last visited Sept. 29, 2019).

30. *See generally* Moss, *supra* note 26, at 17-18 (explaining some potential disadvantages of solar power).

31. *See generally id*. at 17 (explaining that generally residential solar power necessarily remain on the utility's power grid).

32. *Id.*

33. *See* Roberta F. Mann & Mona L. Hymel, *Getting Into the Act: Enticing the Consumer to be "Green" Through Tax Incentives*, 36 ELR 10419, 10420 (2006).

34. *Id.*

35. *Id.*

36. *Id.*

37. *Id.* at 10419.

Research shows that convincing people to switch to renewable energy is not very difficult.[38] Market demand is a culmination of need, desire, cost, and availability.[39] While Americans agree that climate change is a threat that must be addressed (and that solar energy is a good solution), they do not want to drastically change their lives in order to address climate change.[40] This suggests that, while many Americans understand the merits of (and need for) renewable energy, the desire to implement it is impeded by its cost.[41] To achieve this goal, those individuals need incentives in order to make doing the right thing (solar energy) the easy thing.[42] For the rest of the population, increased awareness of the benefits of solar energy would increase the likelihood of its widespread use.[43] This can be done through government investment and incentives,[44] which would send the message that climate change is real and that consumers can help alleviate its effects by investing in renewable energy.[45]

III. USING FINANCIAL INCENTIVES TO INCREASE SOLAR ENERGY USE

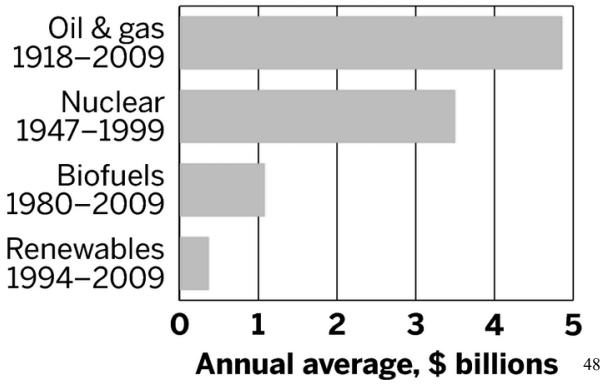
Incentives for energy production are nothing new. This section will look at the history of those incentives. Additionally, it will address several specific incentives which could be used to incentivize the use of solar energy: income tax credits, sales tax exemptions, and performance incentives.

A. History of Tax Incentives in Energy

Historically, the government has provided the majority of energy subsidies to the fossil fuel industry.[46] The amount of government subsidies provided to the fossil fuel industries and renewable energy is illustrated in Figure 1. In 2015, the United States government provided the industry with approximately $649 billion in subsidies, incentivizing its production and consumption.[47]

38. *See id.*
39. *Id.*
40. *Id.* at 10420–21.
41. *Id.* at 10421.
42. *Id.*
43. *See id.*
44. *Id.*
45. *See generally* Sharon C. Nantell, *Federal Tax Policy in the New Millennium: A Cultural Perspective on American Tax Policy*, 2 CHAP. L. REV. 33, 76 (1999) (explaining that taxes have the ability to subtly alter private activity); Alice G. Abreu, *Taxes, Power, and Personal Autonomy*, 33 SAN DIEGO L. REV. 1, 6 (1996) (discussing the role taxes can have on an individual's behavior).
46. Mann & Hymel, *supra* note 33, at 10424.
47. *Id.* at 10422–23.

FIGURE 1



[48]

Currently, many of the tax incentives for residential renewable energy go towards developers, builders, and contractors.[49] This creates an incentive for new builders to utilize renewable energy, but does not offer those with older houses the option to take advantage of the same financial benefits, limiting the use of solar energy on older homes, therefore leaving those properties dependent on fossil fuel for their electrical needs.[50] A new set of incentives must be put in place if homeowners and developers are expected to make a transition to solar energy.

B. Tax Credits

Tax credits can help consumers overcome the high upfront cost of solar energy.[51] As the initial cost becomes less of a hurdle for consumers, an increase in demand for solar energy systems will likely occur.[52] As the demand increases, the production of solar energy systems will become more efficient, which will also mitigate costs in the long run.[53] While the benefits of tax credits are well established, they must be administered properly in order to be effective.[54] The American Council for an Energy Efficient Economy ("ACEEE") has outlined eight principles of effective energy tax incentives.[55] ACEEE noted that tax incentives should (1) stimulate commercialization of technologies, (2) pay for performance, (3) create substantial incentives, (4) choose technologies where cost is a major barrier, (5) be flexible on who can take advantage of the credit, (6) work with other policy initiatives, (7) offer various incentives, and (8) allow adequate time for incentives to work.[56] When

48. Jeff Johnson, *Long History of U.S. Energy Subsidies*, CHEMICAL AND ENGINEERING NEWS (Dec. 19, 2011), https://cen.acs.org/articles/89/i51/Long-History-US-Energy-Subsidies.html.
49. Erik Smith, *The Whole Home Approach: Spurring Home Energy Efficiency Through A Renewable and Transferrable Property Tax Incentive*, 6 ARIZ. J. ENVTL. L. & POL'Y 398, 400 (2015).
50. *Id.*; Mann & Hymel, *supra* note 33, at 10425.
51. *Id.* at 10421.
52. *Id.*
53. *Id.* at 10421–22.
54. *Id.* at 10428.
55. Patrick Quinlan et al., Tax Incentives for Innovative Energy-Efficient Technologies 2 (ACEEE Rep. No. E013) (2001), https://www.aceee.org/sites/default/files/publications/researchreports/e013.pdf.
56. *Id.*

implementing the tax credits, it is especially important that Missouri allows them to remain in effect long enough to reduce the cost of production and installation of solar panels.[57] This is important to allow solar energy to become competitive with its relatively inexpensive fossil fuel-generated counterpart.[58]

To be fair, there are a number of arguments against the use of tax credits to incentivize behavior. The tax code grows more complex every year,[59] and the majority of Americans typically have someone else prepare their tax returns for them.[60] This would suggest that taxpayers are not well-versed in all of the intricacies of the tax code, either federally or at the state level. For this reason, it is unlikely that many are going to be aware of, let alone be persuaded to act upon, these tax credits.[61] Additionally, the advent of "behavioral economics" has suggested that individuals are more persuaded by loss from action than loss from inaction.[62] The field of behavioral economics has also shown that individuals are not the "rational actors" of economic models: when given the choice, people tend to make decisions that benefit them in the short-term rather than in the long-term.[63] This suggests that people may be less persuaded to use a tax credit if they may not feel its effects—however positive—for a significant period of time.

Such income tax credits are one method of incentivizing the use of solar energy in which Missouri lags behind the more progressive states in the country.[64] At the moment, U.S. citizens can take advantage of 26 U.S.C. § 25D (sometimes referred to as the "Federal Solar Energy Tax Credit") in order to receive a federal tax credit of up to 30% of the cost of "qualified solar electric property expenditures made by the taxpayer during such year."[65] As of 2019, twenty states have offered an additional income tax credit for their citizens.[66] Missouri is not counted among them, which represents a missed opportunity for the state to convince residents to utilize solar energy at home.[67]

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57. Mann & Hymel, *supra* note 33, at 10428.
58. *Id.*
59. Eric J. Toder, Co-Director, Urban-Brookings Tax Policy Center, Statement Before the Senate Committee on Finance Responses to Tax Incentives in a Complex and Uncertain Tax Law 14 (Mar. 30, 2011), https://www.urban.org/sites/default/files/publication/27781/901418-Responses-to-Tax-Incentives-in-a-Complex-and-Uncertain-Tax-Law.PDF.
60. Tim Ranzetta, *QoD: What percent of U.S. taxpayers prepared their own tax returns in 2018?*, NEXT GEN PERS. FIN. (April 8, 2019), https://www.ngpf.org/blog/question-of-the-day/qod-what-percent-of-us-taxpayers-prepared-their-own-tax-returns-in-2018/.
61. Toder, *supra* note 59, at 11.
62. *Id.* at 9.
63. *Id.* at 8–9.
64. *Missouri Solar Policy Information*, *supra* note 23.
65. I.R.C. § 25D (2018).
66. *Tax Credits Rankings*, SOLAR POWER ROCKS, https://www.solarpowerrocks.com/state-solar-power-rankings/#taxcredits (last visited Sept. 29, 2019).
67. *Id.*

C. Sales Tax Exemptions

In the United States, sales tax rates vary from approximately 1.5% to nearly 10%.[68] Items such as food and medication are often exempt from sales tax,[69] and some states institute "sales tax holidays" in order to help spur spending on specific products during designated times of the year.[70]

Sales tax exemptions can have a real effect on the spending habits of consumers because they are reflected in the price at the point of purchase.[71] Studies have shown that sales tax holidays cause a statistically significant spike in the purchase of goods that are exempt.[72] For example, in 2007, states which provided tax holidays on computers sold 161% more computers during a given week than states without tax holidays over the same time period.[73]

The positive effects of sales tax exemptions are clear, but there are problems with using the "tax holiday" model for solar energy systems. The main issue is the duration of the tax incentives' availability. "Tax holidays" tend to only last for short periods of time at a specific point in the year. For tax incentives to effectively increase the long-term use of solar energy, those incentives must exist long enough for costs to come down to a point where solar can compete with traditional methods.[74] This will take time,[75] so the exemption would need to last for years rather than days. A sales tax exemption, if implemented correctly, could incentivize increased use of residential energy. Additional measures, such as performance incentives, could help expand the use, and production, of solar energy even further.

D. Performance Incentives

Another tool that can be used to incentivize residential solar use is giving the consumer the ability to profit from the excess electricity they produce. This is mainly done through net metering and performance premiums.[76] Both of these

68. Michael B. Souter, *States with the highest and lowest sales taxes*, USA TODAY (Mar. 27, 2018), https://www.usatoday.com/story/money/taxes/2018/03/27/states-highest-and-lowest-sales-taxes/452512002/.

69. Katherine Loughead, *Sales Taxes on Soda, Candy, and Other Groceries, 2018*, TAX FOUND. (July 11, 2018), https://taxfoundation.org/sales-taxes-on-soda-candy-and-other-groceries-2018/.

70. *Sales Tax Holidays*, SALES TAX INST. (Oct. 9, 2019), https://www.salestaxinstitute.com/resources/sales-tax-holidays.

71. Mann & Hymel, *supra* note 33, at 10428.

72. Aditya Aladangady, Shifrah Aron-Dine, Wendy Dunn, Laura Feiveson, Paul Lengermann, and Claudia Sahm, *The Effect of Sales-Tax Holidays on Consumer Spending,* THE FED. RES. (Mar. 24, 2017), https://www.federalreserve.gov/econres/notes/feds-notes/effect-of-sales-tax-holidays-on-consumer-spending-20170324.htm.

73. Adam J. Cole, Sales Tax Holidays: Timing Behavior and Tax Incidence (2009) (unpublished Ph.D. dissertation, University of Michigan) http://closup.umich.edu/files/sales-tax-holidays.pdf.

74. Mann & Hymel, *supra* note 33, at 10422.

75. An exact timeframe is not possible to calculate, but costs have been plummeting, therefore solar energy should be competitive within the decade. *See* Dominic Dudley, *Renewable Energy Costs Take Another Tumble, Making Fossil Fuels Look More Expensive Than Ever,* FORBES (May 29, 2019), https://www.forbes.com/sites/dominicdudley/2019/05/29/renewable-energy-costs-tumble/#7ac51bfe8cea.

76. *Net Metering,* SOLAR ENERGY INDUSTRIES ASSOCIATION (Oct. 9, 2019), https://www.seia.org/initiatives/net-metering; Ben Zientara, *What are SRECs and solar performance payments?*, SOLAR POWER ROCKS (Oct. 9, 2019), https://www.solarpowerrocks.com/affordable-solar/what-are-solar-performance-payments-srec-pbi/.

processes allow for consumers to be credited by energy companies for the energy they produce in excess of what they use.

i. Net Metering

Net metering is the process by which consumers with a solar energy system in their home receive a credit for the electricity they produce in excess of what they consume.[77] In Missouri, this credit is calculated based on the cost of the fuel that energy companies must purchase to produce the same number of kilowatt-hours,[78] and is carried over from billing statement to billing statement.[79] Because the excess energy is put back into the electrical power grid to be used by anyone,[80] the consumer profits from the surplus energy that they created.[81] For example, if you produce excess energy in month one that saves the state $35 in fuel costs, and in month two you use $35 worth of electricity that you did not generate, your net payment due in month two would be $0. This effectively allows consumers to "use" that excess energy they created, but at a later date. Net metering is one area where Missouri does not find itself lagging behind most other states,[82] as individuals are able to receive a credit for the excess energy that they produce.[83]

The system of net metering has many benefits. First, it provides incentives for people to install solar systems on their properties. The ability to have passive income from your home's energy system can be a great draw.[84] Second, the excess energy put back onto the grid means energy companies can use less coal to produce the electricity for the remainder of the population. For Missouri, this has a double effect as it would contribute to the lowering of the state's carbon footprint as well as reduce the state's dependence on imported coal.[85]

ii. Performance Premiums

Performance premiums are payments for your solar energy above the going rate for net metering.[86] In other words, you are provided a payment for the electricity you put back on the grid, but the rate of your reimbursement is greater than the market rate of electricity. For example, Minnesota has a Solar Rewards Program through the energy company Xcel, which provides consumers with incentives to

77. *Net Metering, supra* note 76.

78. *Net Metering and the Easy Connection Act*, MISSOURI DEPARTMENT OF ECONOMIC DEVELOPMENT DIVISION OF ENERGY (Sept. 2019), https://energy.mo.gov/sites/energy/files/pub2238_0.pdf.

79. *Id.*

80. *Net Metering, supra* note 76.

81. *Id.*

82. *Net Metering and the Easy Connection Act*, *supra* note 78.

83. *Id.*

84. Helen Breewood, *What's the profit motive and how is it supposed to work?*, THE PROGRESSIVE MOTIVE (Nov. 20, 2017), http://www.theprogressmotive.org/whats-the-profit-motive-and-how-is-it-supposed-to-work/.

85. *Missouri's Dependence on Imported Coal*, UNION OF CONCERNED SCIENTISTS, https://www.ucsusa.org/sites/default/files/2019-09/UCS-BCBC-factsheet-Missouri.pdf (last visited Sept. 29, 2019); *Missouri State Profile and Energy Estimates*, U.S. ENERGY INFORMATION ADMINISTRATION (Apr. 18, 2019), https://www.eia.gov/state/?sid=MO.

86. Zientara, *supra* note 76.

produce more solar energy than they need.[87] This program is also tiered based on income level.[88] This is meant to ensure that people are able to take advantage of solar energy, regardless of their income.[89]

The introduction of performance premiums has multiple effects. For those who are incentivized by the prospect of passive income via solar energy, this increases the income potential.[90] For those who are worried about the cost of solar energy, performance premiums can drastically reduce the amount of time it takes to recoup your initial investment.[91] Additionally, for Missouri it would have the benefit of decreasing stress on the grid.[92] Furthermore, the use of solar energy decreases demand during peak hours, while also decreasing the need for transmission and burning of fossil fuels.[93] This means lower maintenance costs for energy companies, which translates to savings for both companies and consumers.[94]

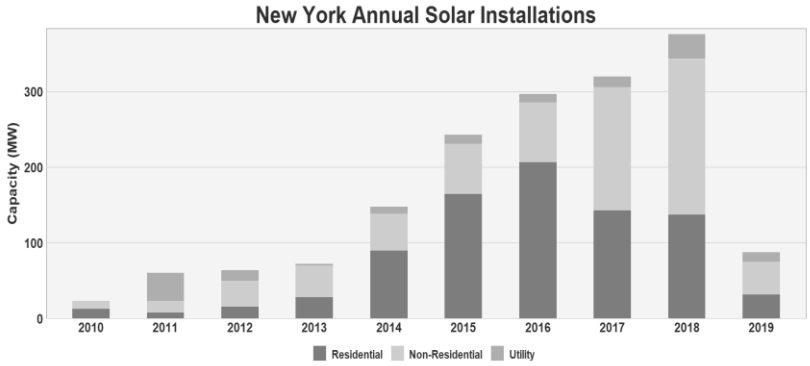
IV. PROGRAMS IN OTHER STATES

A. New York

New York is one state that has seen success in incentivizing residents to switch to solar energy. Between 2011 and 2014, New York saw a 300% increase in the use of solar energy,[95] which is more than twice the increase in solar energy *nationwide* over the same time period.[96] It is fair to say this is due, at least in part, to the implementation of solar energy tax incentives in the mid-2000s. [97]

87. *Xcel Energy launches 2019 Solar*Rewards Program, with new carve out to serve low-income customers,* COM. DEP'T DIVISION OF ENERGY RESOURCES, http://mn.gov/commerce-stat/pdfs/xcel-launches-2019-solar.pdf (last visited Oct. 10, 2019).
88. *Id.*
89. *Id.*
90. Russel Huebsch, *Can I Make Money Selling Electricity to My Power Company?*, POCKET SENSE (July 27, 2017), https://pocketsense.com/can-selling-electricity-power-company-8380208.html.
91. Zientara, *supra* note 76.
92. *Id.*
93. *Id.*
94. *Id.*
95. *Solar Energy in New York*, DEP'T OF ENVTL. CONSERVATION, https://www.dec.ny.gov/energy/43231.html (last visited Sept. 29, 2019).
96. *Id.*
97. N.Y. Tax Law § 606 (2019); N.Y. Tax Law § 1115 (2019).

FIGURE 2



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Under New York state law, citizens have two separate tax incentives designed to make solar energy more affordable on the front end. First, any "arrangement or combination of components installed in a residence that utilizes solar radiation to produce energy designed to provide heating, cooling, hot water and/or electricity" is exempt from state sales tax.[99] In New York, a typical-sized system costs $19,140 on average.[100] With the state sales tax rate at 4%,[101] consumers would pay $765.60[102] in sales tax without the exemption.[103] These savings could be a deciding factor in the choice to switch to solar.

New York is slightly less generous with their income tax credits. Under state law, individuals may be allowed to credit 25% of a qualified solar energy equipment purchase against their income taxes.[104] That credit is capped at $3,750,[105] which is unfortunate: without the cap, New Yorkers could potentially receive a credit of approximately $4,785[106] (assuming they purchased a typical system).[107] While this does leave over $1,000 on the table, it is far more generous than the current laws in Missouri, which do not allow residents to credit any amount of solar equipment expenditures against their taxes.[108] Nevertheless, the effect of these tax credits may be lessened by the complexity of the New York tax code and the fact that tax credits are a future, and not immediate, benefit to the consumer.[109]

98. *New York Solar*, SOLAR ENERGY INDUSTRIES ASS'N, https://www.seia.org/state-solar-policy/new-york-solar (last visited Sept. 29, 2019).
99. N.Y. Tax Law § 1115(ee) (2019).
100. *Is Solar Energy Worth It in New York in 2019?*, ENERGY SAGE, https://news.energysage.com/are-solar-panels-worth-the-investment-in-new-york/ (last visited Sept. 29, 2019).
101. *Sales Tax Rates,* DEP'T OF TAXATION AND FIN., https://www.tax.ny.gov/bus/st/rates.htm (last updated Sept. 24, 2019).
102. The average cost of a typical sized system ($19,140) multiplied by the NYS sales tax rate (4%) equals $765.60.
103. *Sales Tax Rates, supra* note 101; *Is Solar Energy Worth It in New York in 2019?*, *supra* note 100.
104. N.Y. Tax Law § 606(g-1) (2019).
105. *Id.*
106. The average cost of a typical sized system ($19,140) multiplied by the allowable tax credit rate (25%) equals $4,785.
107. N.Y. Tax Law § 606 (2019); *Is Solar Energy Worth It in New York in 2019?*, *supra* note 100.
108. *Missouri Solar Policy Information*, *supra* note 23.
109. Toder, *supra* note 59, at 10–13.

B. Iowa

Iowa is one of the leaders in the Midwest regarding residential solar use. Currently, almost 12,000 homes in Iowa are energy independent because of solar energy.[110] In addition to energy independence and cleaner energy production, Iowa has created almost 1,000 jobs in the state through the promotion of solar energy.[111] Under Iowa law, residents may receive a credit of up to 60% of the cost of solar energy system installation against their income taxes.[112] For reference, a typical 6kW system costs on average of $14,756 in Iowa.[113] This means that a resident installing such a system could credit $8,853.60[114] against their state income taxes.[115] This is an extremely generous credit provided by the state, but it is unclear what effect it has on the rates of the use of solar energy.

Iowans can also take advantage of sales tax exemptions when installing solar energy systems on their homes.[116] In Iowa, the state sales tax is 6%, which means that with that typical 6kW system, Iowans save an additional $885.36[117] when purchasing solar equipment.[118] That does not even include the tax savings from the installation of the equipment, which is also covered under the law.[119] The likely $1,000 savings could be the deciding factor in whether someone can afford the upfront cost of installing a solar energy system.

Iowa was one of the first states in the country to adopt net metering policies.[120] Under this policy, the two major electricity providers in Iowa, MidAmerican Energy and Alliant Energy, track the electricity produced by a solar energy system and the amount used by the residential producer.[121] The providers are then required to reimburse the consumer for the excess electricity they produce and put back onto the grid.[122] This reimbursement may take the form of a credit on a future energy bill, but there must be a "cash out" option at the end of the billing year.[123] The ability to have passive income from the production of solar energy likely has an effect on the size of the system purchased by consumers.

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110. *Iowa Solar*, SOLAR ENERGY INDUSTRIES ASS'N, https://www.seia.org/state-solar-policy/iowa-solar (last visited Sept. 29, 2019).
111. *Id.*
112. IOWA CODE § 422.11L (2019).
113. *How Much Do Solar Panels Cost For the Average House in Iowa in 2019?*, SOLARREVIEWS.COM, https://www.solarreviews.com/solar-panels/solar-panel-cost/cost-of-solar-panels-in-iowa (last visited Sept. 29 2019) (6kW denotes the capacity of production of the system—the larger the kW, the more energy the system can produce).
114. The average cost of a typical sized system ($14,756) multiplied by the Iowa tax credit rate (60%) equals $8,853.60.
115. *How Much Do Solar Panels Cost For the Average House in Iowa in 2019?*, *supra* note 113; IOWA CODE § 422.11L (2019).
116. IOWA CODE § 423.3 (2019).
117. The average cost of a typical sized system ($14,756) multiplied by the Iowa sales tax rate (6%) equals $885.36.
118. *Iowa Sales and Use Tax Guide*, IOWA DEP'T OF REVENUE, https://tax.iowa.gov/iowa-sales-and-use-tax-guide (last visited Sept. 29, 2019); *How Much Do Solar Panels Cost For the Average House in Iowa in 2019?*, *supra* note 113.
119. IOWA CODE § 423.3 (2019).
120. *See Net Metering Program Overview*, NC CLEAN ENERGY TECHNOLOGY CENTER, https://programs.dsireusa.org/system/program/detail/488 (last updated June 7, 2019).
121. *Id.*
122. *Id.*
123. *Id.*

In March of 2019, the Iowa legislature introduced the SOLAR Act.[124] Under the SOLAR Act, Iowans who use residential solar power and take advantage of excess energy credits are required to pay a yearly fee.[125] This fee is meant to keep Iowans from avoiding the costs of the maintenance of the energy grid.[126] Some believe that this bill is a positive move forward as it will ensure "that everyone using the electric grid – the poles and wires that make up the energy delivery system – pays for it as well."[127] Others refer to the bill as a "sunshine tax" and believe it threatens the future of solar energy in Iowa.[128] Only time will tell.

C. Massachusetts

Massachusetts is a major leader in the world of solar power.[129] As of 2019, 433,828 homes in Massachusetts (nearly 20%) have a solar energy system that produces at least as much energy as they consume.[130] More than 12% of the electricity in the state is produced from solar sources, and the industry has created over 10,000 jobs.[131]

Massachusetts provides several different tax incentives for residents to take advantage of when purchasing solar energy systems.[132] On the front end, under Massachusetts law, the sale of "equipment directly relating to any solar, wind-powered; or heat pump system, which is being utilized as a primary or auxiliary power system for the purpose of heating or otherwise supplying the energy needs of an individual's principal residence in the commonwealth" is exempt from sales tax.[133] In Massachusetts, the average cost of a 5kW system is $16,200 and the sales tax and use tax rate is 6.25%, which means that without the sales tax exemption, Massachusetts residents would have to pay an additional $1,012.50[134] in order to install solar systems on their homes.[135]

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124. Stan Wise, *With the SOLAR Act, Iowa is on right path to remain a leader in renewable energy*, DES MOINES REG. (Mar. 20, 2019), https://www.desmoinesregister.com/story/opinion/columnists/2019/03/21/solar-act-iowa-right-path-remain-leader-renewable-energy/3229768002/.

125. H.R. 185, 88th Gen. Assemb., Reg. Sess. (Iowa 2019).

126. *Id.*

127. Adam Wright, *MidAmerican: Solar Act ensures all pay fair share for electrical grid*, DES MOINES REG. (Mar. 1, 2019), https://www.desmoinesregister.com/story/opinion/columnists/2019/03/01/midamerican-solar-act-ensures-all-pay-fair-share-electrical-grid-legislation-tariff-green-energy/3027579002/

128. Whitney Blakemore, *Sunshine Tax: Opponents Say New Bill Threatens the Solar Industry in Iowa*, WHOTV (Mar. 2, 2019), https://whotv.com/2019/03/02/sunshine-tax-opposers-say-new-bill-threatens-the-solar-industry-in-iowa/.

129. *2019 State Solar Power Rankings Report*, SOLAR POWER ROCKS (Oct. 10, 2019), https://www.solarpowerrocks.com/state-solar-power-rankings/.

130. *Massachusetts Solar*, SOLAR ENERGY INDUSTRIES ASS'N (Oct. 10, 2019), https://www.seia.org/state-solar-policy/massachusetts-solar.

131. *Id.*

132. MASS. GEN. LAWS ANN. ch. 64H, § 6 (West 2018) (outlining statutory exemptions); MASS. GEN. LAWS ANN. ch. 62, § 6 (West 2019) (outlining statutory credits).

133. MASS. GEN. LAWS ANN. ch. 64H, § 6.

134. The average cost of a typical sized system ($16,200) multiplied by the Mass. sales tax rate (6.25%) equals $1,012.50.

135. *Solar Panel Cost in Massachusetts*, ENERGYSAGE (June 8, 2019), https://www.energysage.com/solar-panels/solar-panel-cost/ma/; *Guide Sale and Use Tax*, MASS. DEP'T REVENUE (Oct. 10, 2019), https://www.mass.gov/guides/sales-and-use-tax.

Furthermore, residents of Massachusetts can take advantage of a tax credit for "solar energy or any other form of renewable energy which the commissioner specified by regulations, for the purpose of heating or cooling such dwelling or providing hot water for use within such dwelling, or produces electricity for such purposes."[136] Those taking advantage of the tax credit can claim up to 15% of the total expenditure on the solar system or $1,000, whichever is lower.[137] Consequently, for the average system, Massachusetts residents are not able to claim $1,430[138] that they otherwise would if there was not the $1,000 cap.[139]

While New York, Iowa, and Massachusetts are not the exact same as Missouri, they can provide a framework which Missouri can adopt in order to reduce its dependence on fossil fuels. By looking at what works well elsewhere, Missouri lawmakers can make a more informed decision as to what would work best for Missouri and its citizens.

V. CONCLUSION

Missouri has one of the dirtiest energy grids in the United States. With the impending and catastrophic consequences of climate change looming, it is crucial that the state takes steps to clean up its act. One great way that the Missouri government can help its residents decrease their carbon footprint is to incentivize the use of solar power through financial levers.

There are multiple avenues Missouri can take to financially incentivize the use of solar energy. While tax credits can provide a good deal of financial relief to individuals who are wary of the cost of solar energy, those benefits are too far in the future, and the tax code is too complex for tax credits to have a significant effect on the use of solar energy in Missouri. Sales tax exemptions have a much more immediate impact on the cost of the installation of solar power and therefore can have a much greater impact on the purchasing behavior of consumers. While Missouri does have a net metering program, performance premiums can also be very useful; this could greatly increase not only the number of Missourians who use solar energy, but would also increase the amount of energy in Missouri produced by solar energy. Lastly, these incentives should be put in place long enough for the production cost of solar to come down to a point where it is competitive with fossil fuel-generated electricity. If Missouri exempts solar systems from sales tax, increases payments to consumers for produce excess electricity, and allows those provisions to have a long life, we can see Missouri's carbon footprint reduce, and, with a little luck, avoid the worst consequences of global climate change.

136. MASS. GEN. LAWS ANN. ch. 62, § 6.
137. *Id.*
138. The average cost of a typical sized system ($16,200) multiplied by the Mass. tax credit rate (15%) equals $1,430).
139. MASS. GEN. LAWS ANN. ch. 62, § 6.