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**HOTBOXING THE POLAR BEAR:  
THE ENERGY AND CLIMATE IMPACTS OF INDOOR  
MARIJUANA CULTIVATION<sup>†</sup>**

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ABSTRACT

*Indoor marijuana cultivation is currently legal—at least at some level—in all but eight states in the United States. This Article explores the energy and climate harms caused by the budding industry and recommends that state regulators and public utility companies work together to ensure that those harms are mitigated. Indoor marijuana cultivation has an energy demand that rivals data centers. With energy intensities around 2,000 watts per minute, it consumes between 50 and 200 times more than an average office building and 66 times more than an average home. And, given the lucrative nature of the industry and the movement toward legalization, its energy demand is projected to grow exponentially over the next several years. The problem is that this growth is exacerbating an already strained energy delivery system and increasing greenhouse gas emissions due to a fossil-fuel reliant grid. While moving cultivation outdoors would be the most effective way of reducing these harms, outdoor grows are prohibited, or limited, in many states and by the federal government. A small number of states and localities, however, have recognized the energy-related harms and are working to mitigate them through their licensing frameworks. This Article discusses California’s new requirement to limit energy intensity or to require carbon offset purchases, Massachusetts’s and Illinois’s mandates for lighting efficiency, and Boulder, Colorado’s renewable energy requirements and carbon offset funds. While these regulatory requirements can result in significant out-of-pocket costs for indoor growers, this Article recommends all states that legalize indoor cultivation implement policies to address harms caused by overconsumption of fossil-fuel-based energy. Furthermore, public utility companies can play a role in helping offset compliance costs and incentivizing best practices through push and pull policies that can provide incentives for energy-efficient technology, grants for studies to fully understand*

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*the industry's energy demand and for individualized funding of energy-efficient technology, and taxes or fees for overconsumption beyond a set baseline.*

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## INTRODUCTION

This Article discusses the energy intensity of indoor marijuana cultivation and its harms. It looks at some of the lessons learned (or perhaps not learned) over the last five years of marijuana legalization and offers some ideas for moving forward. While more studies are needed, it appears that commercial indoor marijuana cultivation has an energy intensity level that rivals Internet data centers.<sup>1</sup> It requires twenty-four-hour climate control and, even at a residential level, is a significant consumer of electricity due to lighting requirements and temperature and climate control.<sup>2</sup> As more states legalize marijuana cultivation, there is a concern that, if left unbridled, this electricity demand will not only result in grid vulnerabilities and blackouts but also exacerbate climate change and contribute to global warming.

Part I discusses the energy demand of indoor cultivation and the prediction for future growth. Only eight states completely prohibit marijuana within their borders.<sup>3</sup> The remaining states have either fully or partially legalized the once illicit plant.<sup>4</sup> Furthermore, the industry has proven to be quite lucrative, and it is predicted to become fully legal in the entire United States in the future.<sup>5</sup> As more states legalize marijuana cultivation and as states continue to require indoor cultivation and limit outdoor grows, energy demand will continue to rise.

Part II outlines two immediate concerns with the current and projected electricity demand: (1) electric grid vulnerability and (2) greenhouse gas (“GHG”) emissions. The U.S. electric grid is already overloaded and running on an antiquated delivery system established several decades ago.<sup>6</sup> Utilities have disclosed that areas with high indoor marijuana cultivation have experienced blackouts and premature equipment replacement due to the stress on the system.<sup>7</sup>

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<sup>1</sup> KELLY CRANDALL, EQ RSCH., LLC, *A CHRONIC PROBLEM: TAMING ENERGY COSTS AND IMPACTS FROM MARIJUANA CULTIVATION* 5 (2016), <https://eq-research.com/wp-content/uploads/2016/09/A-Chronic-Problem.pdf> [<https://perma.cc/DY5M-EGYS>].

<sup>2</sup> GRID20/20, INC., *IS THE POWER GRID GOING TO POT?* 5-6 (2018), [https://www.grid2020.com/site/download?filename=GRID2020\\_WP\\_Is\\_The\\_Power\\_Grid\\_Going\\_To\\_Pot.pdf](https://www.grid2020.com/site/download?filename=GRID2020_WP_Is_The_Power_Grid_Going_To_Pot.pdf) [<https://perma.cc/R3GW-2XA7>].

<sup>3</sup> Eli McVey, *US Cannabis Industry’s Economic Impact Could Hit \$130 Billion by 2024*, MARIJUANA BUS. DAILY (July 21, 2020), <https://mjbizdaily.com/chart-us-cannabis-industrys-economic-impact-could-hit-130-billion-by-2024/> [<https://perma.cc/464U-9U9N>].

<sup>4</sup> *Map of Marijuana Legality by State*, DISA, <https://disa.com/map-of-marijuana-legality-by-state> [<https://perma.cc/G5ER-V3SG>] (last updated Apr. 2021).

<sup>5</sup> McVey, *supra* note 3.

<sup>6</sup> GRID20/20, INC., *supra* note 2, at 3-4.

<sup>7</sup> Gordon Friedman, *Pot Grows Strain the Electrical Grid*, STATESMAN J. (Salem, Or.), Nov. 5, 2015, at A1; Martha Davis, *Pot Is Not Green*, T&D WORLD (Feb. 13, 2020), <https://www.tdworld.com/utility-business/article/21122891/pot-is-not-green>; *see also* GRID20/20, INC., *supra* note 2, at 8-9 (discussing need to replace transformers, sensors, and other electricity delivery infrastructure to accommodate the unforeseeable energy demands such as marijuana legalization).

In addition to local grid concerns, the marijuana industry also contributes to global GHG emissions due to the United States's reliance on fossil fuels for the majority of its electricity generation.<sup>8</sup> This is especially problematic during a time when the world needs to decarbonize its electricity delivery and reduce overall energy consumption.

Part III looks at some of the lessons from the past five years and discusses state and local licensing schemes that attempt to mitigate some of the energy intensity of the indoor marijuana industry. Massachusetts and Illinois have licensing schemes that focus on energy-efficient lighting and HVAC systems.<sup>9</sup> California's framework seeks to limit overall energy emissions,<sup>10</sup> and both the City of Boulder and Boulder County in Colorado tend to focus on renewable energy mandates and payment of offsets.<sup>11</sup> While moving cultivation outdoors would no doubt be the best option from an energy and climate perspective, until that occurs, Part IV recommends that states continue (or begin) to look at state licensing schemes as a means to control the amount and type of energy consumed by indoor cultivators. In addition, Part IV recommends that state-regulated utilities work with indoor cultivators to help offset increased compliance costs, better understand their energy use, incentivize clean energy and energy-efficient technology, and penalize cultivators who consume above a set baseline.

The Article concludes that it is time for states and state utilities to protect the energy delivery system and to mitigate unfettered GHG emissions. First, states should consider moving cultivation outdoors. While outdoor cultivation has its own set of environmental concerns that would need to be addressed, it would go a long way toward alleviating its energy demands. Second, states that do require or allow indoor cultivation need to enact a stringent framework that requires

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<sup>8</sup> *What Is U.S. Electricity Generation by Energy Source?*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/tools/faqs/faq.php?id=427&t=3> [<https://perma.cc/U44Z-EPWV>] (last updated Mar. 5, 2021).

<sup>9</sup> MASS. CANNABIS CONTROL COMM'N, ENERGY AND ENVIRONMENT COMPILED GUIDANCE 4 (2020), [https://mass-cannabis-control.com/wp-content/uploads/200825\\_Energy\\_and\\_Environment\\_Compiled\\_Guidance.pdf](https://mass-cannabis-control.com/wp-content/uploads/200825_Energy_and_Environment_Compiled_Guidance.pdf) [<https://perma.cc/Y42S-RV59>]; *Illinois Has the Greenest Cannabis Bill in the Country*, ILL. ENV'T COUNCIL (May 31, 2019), <https://ilenviro.org/illinois-just-passed-the-greenest-cannabis-law-in-the-country/> [<https://perma.cc/2BQ9-CB7X>].

<sup>10</sup> See Nate Seltenrich, *Most States Legalizing Marijuana Have Yet to Grapple with Energy Demand*, ENERGY NEWS NETWORK (June 27, 2019), <https://energynews.us/2019/06/27/west-most-states-legalizing-marijuana-have-yet-to-grapple-with-energy-demand/> [<https://perma.cc/2U9T-X38C>].

<sup>11</sup> BOULDER, COLO., MUNICIPAL CODE § 6-14-8(i), -9(g) (2021) (requiring all commercially licensed marijuana cultivators to report their energy usage and to comply with renewable energy targets); *Cannabis Energy Impact Offset Fund*, BOULDER CNTY., <https://www.bouldercounty.org/environment/sustainability/marijuana-offset-fund/> [<https://perma.cc/5SAE-WUVH>] (last visited Apr. 13, 2021) (requiring commercial cultivators to utilize renewable energy or pay surcharge per kilowatt-hour of consumption).

utilization of clean energy or the payment of an offset fee substantial enough to motivate reliance on clean energy. Third, state utilities should educate indoor cultivators about their energy intensity. Electricity bills are some of the most expensive costs for cultivators. Utilities can use push and pull policies to educate and incentivize their customers to convert to more energy-efficient technology and processes.

#### I. ENERGY DEMAND OF INDOOR CULTIVATION

Indoor marijuana cultivation has many benefits, including growers' abilities to carefully control and monitor the growing conditions.<sup>12</sup> However, it has one major drawback: it is extremely energy intensive, requiring twenty-four-hour climate control. Exactly how much electricity does the indoor marijuana cultivation industry require? We know it is significant, but we do not know exactly how much. The reason we do not have this information is twofold: First, given the historical illegality of indoor cultivation, growers have not necessarily been forthcoming with their energy use. Second, as indoor cultivation has been legalized, states have mostly ignored the energy issues that go along with indoor cultivation, and they have failed to mandate or even incentivize studies that would provide a more thorough understanding of the industry's energy intensity.<sup>13</sup>

What we do know with certainty is that it takes a lot of electricity to run the equipment needed to sustain an around-the-clock cultivation cycle.<sup>14</sup> "[I]ndoor grows can have energy intensities of 2,000 [watts per minute]," which is similar to the energy intensity of data centers or somewhere between 50 and 200 times more than the average office building.<sup>15</sup> A 5,000 square-foot facility uses 66 times more energy than a house from the same area.<sup>16</sup> Even growing four plants indoors is equivalent to powering twenty-nine refrigerators.<sup>17</sup>

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<sup>12</sup> Christopher D. Strunk & Mackenzie S. Schoonmaker, *How Green Is the "Green Rush"?* *Recognizing the Environmental Concerns Facing the Cannabis Industry*, 21 VT. J. ENV'T L. 506, 512 (2020) (discussing litigation risks of contaminated cannabis, in part due to patchwork of state and local environmental laws).

<sup>13</sup> CRANDALL, *supra* note 1, at 5.

<sup>14</sup> Kahn R. Wiedis, Comment, *High Time to Go Green: Environmental Impact of Marijuana Legalization*, 31 VILL. ENV'T L.J. 193, 203-04 (2019) (discussing energy intensity of indoor growing and desire of cultivators to "recreate outdoor conditions").

<sup>15</sup> CRANDALL, *supra* note 1, at 5.

<sup>16</sup> Davis, *supra* note 7 ("In 2015, the average electric consumption of a 5,000 sq. ft. facility in Boulder County, Colorado, was 41,808 kWh per month, while the average household in the same area was 630 kWh.").

<sup>17</sup> GRID20/20, INC., *supra* note 2, at 5. Residential growing is increasingly becoming a concern for utilities. Even on a small scale, if everyone in the neighborhood is growing their own plants, it can make a significant impact on the energy delivery system. *Id.* at 5-6.

The three main areas of energy intensity for indoor cultivation include lighting, moisture control, and temperature control.<sup>18</sup> Lighting tends to be the largest source of energy consumption at between 38-86%, depending on the types of lights used.<sup>19</sup> LED lightbulbs, for example, are less energy intensive than incandescent bulbs, and a simple switch from conventional lights to LEDs is an easy way to reduce overall energy consumption.<sup>20</sup> Significant electricity is also required for moisture control and temperature control—for cooling and heating—of the facility.<sup>21</sup>

In 2012, it was estimated that the industry consumed some 20 billion kilowatt-hours of electricity every year and generated some \$6 billion per year in energy costs.<sup>22</sup> We also know that “electricity use increased by 36% annually between 2012 and 2016” in Colorado, and approximately 4% of Denver’s electricity is consumed by indoor growers.<sup>23</sup> Comparatively, by sector, indoor cultivation is one of the most energy-intensive industries in the United States and is on par with data centers.<sup>24</sup> As states have continued to legalize marijuana, there is no doubt that this number has grown—and will continue to grow—exponentially higher with consumption for legal marijuana cultivation projected to increase by 162% between 2017 and 2022.<sup>25</sup>

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<sup>18</sup> Evan Mills & Scott Zeramby, *Energy Use by the Indoor Cannabis Industry: Inconvenient Truths for Producers, Consumers, and Policymakers*, in THE ROUTLEDGE HANDBOOK OF POST-PROHIBITION CANNABIS RESEARCH (Dominic Corva & Joshua Meisel eds., forthcoming 2021) (manuscript at 5 n.2), [https://www.researchgate.net/profile/Evan\\_Mills/publication/342364745\\_Energy\\_Use\\_by\\_the\\_Indoor\\_Cannabis\\_Industry\\_Inconvenient\\_Truths\\_for\\_Producers\\_Consumers\\_and\\_Policymakers/links/5fddd2cc299bf14088237514/Energy-Use-by-the-Indoor-Cannabis-Industry-Inconvenient-Truths-for-Producers-Consumers-and-Policymakers.pdf](https://www.researchgate.net/profile/Evan_Mills/publication/342364745_Energy_Use_by_the_Indoor_Cannabis_Industry_Inconvenient_Truths_for_Producers_Consumers_and_Policymakers/links/5fddd2cc299bf14088237514/Energy-Use-by-the-Indoor-Cannabis-Industry-Inconvenient-Truths-for-Producers-Consumers-and-Policymakers.pdf) [<https://perma.cc/6Q3K-GYTY>].

<sup>19</sup> Jason Reott, *Legal Cannabis Presents Challenges for Utilities, Opportunities for Energy Efficiency*, ALL TO SAVE ENERGY (Sept. 8, 2020), <https://www.ase.org/blog/legal-cannabis-presents-challenges-utilities-opportunities-energy-efficiency> [<https://perma.cc/9GT9-69JY>].

<sup>20</sup> Omar Sacirbey, *Electric Utilities Work with Cannabis Growers to Save on Power Costs*, MARIJUANA BUS. DAILY (July 17, 2018), <https://mjbizdaily.com/electric-utilities-work-with-cannabis-growers-to-save-on-power-costs/> [<https://perma.cc/6K26-MKWC>].

<sup>21</sup> Mills & Zeramby, *supra* note 18 (manuscript at 4-5).

<sup>22</sup> *Id.* (manuscript at 6).

<sup>23</sup> *Id.* (manuscript at 6, 12).

<sup>24</sup> *Id.* (manuscript at 5) (“Operating the equipment needed to create and maintain these artificial environments can require as much energy as a similarly sized data center.” (footnote omitted)).

<sup>25</sup> SCALE MICROGRID SOLUTIONS & RES. INNOVATION INST., THE 2018 CANNABIS ENERGY REPORT 5 (2018). It is important to note that utilities also struggle with energy theft due to illegal marijuana grows for both private use and commercial use. GRID20/20, INC., *supra* note 2, at 6-7 (discussing problems associated with power theft and the cost of installing “smart transformers” to detect them).

## II. GRID VULNERABILITY AND GHG EMISSIONS

Two immediate concerns arise with this level of increased electricity demand: (1) electric grid vulnerability and (2) GHG emissions. The United States grid has long been vulnerable to blackouts caused by climate events and antiquated infrastructure. In recent years, utilities have struggled to keep up with the demand for renewable energy and smart grid technology. This already strained, fossil-fuel-dependent energy delivery system is now being challenged with an increase in demand from data centers, electric vehicles, and the marijuana industry. Further, GHG emissions contribute significantly to climate change and global warming due to fossil fuel electricity generation. The majority of the electricity in the United States still comes from fossil fuels, and until renewable energy is the dominant energy source, the energy delivery system will continue to emit large amounts of GHG.

*Electric grid vulnerability.* Indoor marijuana cultivators require twenty-four-hour firm (continuous) energy demand to ensure their product meets the highest control standards.<sup>26</sup> As a result, several utilities in the Pacific Northwest have reported problems with higher incidents of blackouts and equipment failure and replacement in areas with known indoor marijuana cultivation. For example, Pacific Power in Portland, Oregon, reported seven blackouts attributable to the marijuana industry,<sup>27</sup> and Portland General Electric reported that 10% of its transformers needed replacement due to overheating caused by indoor cultivation.<sup>28</sup> And, risks of power outages are exponentially increasing as “growing weed creates substantial unplanned power demands upon our already aged distribution grid infrastructure.”<sup>29</sup> When the United States power grid was constructed decades ago, no one could predict that it would need to accommodate multiple events such as net metering, data center electricity demand, electric vehicles, and marijuana legalization.<sup>30</sup>

*GHG emissions.* As energy consumption increases, so do harmful GHG emissions. Any time we increase electricity consumption through a mostly fossil-fuel-driven system, GHG emissions increase and climate change concerns become even more perilous.<sup>31</sup> As of 2017, the United States was one of the biggest GHG emitters in the world.<sup>32</sup> Per capita, the United States is only behind

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<sup>26</sup> GRID20/20, INC., *supra* note 2, at 5-6 (reporting that growers need power “for lights, fans, humidity and air conditioning, water pumps, etc.” in order to maintain “controlled indoor conditions”).

<sup>27</sup> Davis, *supra* at 7.

<sup>28</sup> Friedman, *supra* note 7, at A1; *see also* GRID20/20, INC., *supra* note 2, at 8-9 (discussing need to replace transformers, sensors, and other electricity delivery infrastructure to accommodate unforeseeable energy demands such as marijuana legalization).

<sup>29</sup> GRID20/20, INC., *supra* note 2, at 3.

<sup>30</sup> *See id.* at 3-4.

<sup>31</sup> Spencer Gill, *Budding Marijuana Industry Meets Climate & Environmental Crisis: A Call to Legislative Action*, 5 OIL & GAS NAT. RES. & ENERGY J. 661, 674-80 (2020).

<sup>32</sup> Thomas C. Frohlich & Liz Blossom, *These Countries Produce the Most CO2 Emissions*,

Saudi Arabia and Canada.<sup>33</sup> About 31% of United States GHG emissions come from the electricity sector.<sup>34</sup> In 2019, the electricity sector generated some 1,618 million metric tons (“MMmt”) of the United States’s total emissions of 5,146 MMmt.<sup>35</sup> That is because the U.S. electric grid is still over 60% fossil-fuel based.<sup>36</sup>

While the United States has made a lot of progress toward decarbonizing its electric grid, it still has a long way to go. As of 2019, U.S. electricity consumption by energy source was 17.6% renewables, 19.6% nuclear, 38.4% natural gas, 23.4% coal, and 1.2% other fossil fuels—or about 62.6% fossil-fuel based.<sup>37</sup> The United States has increased renewables and clean energy sources over the years and reduced reliance on coal, but it has increased reliance on natural gas.<sup>38</sup> Furthermore, it should be noted that the 62.6% share by fossil fuels is a nationwide statistic. To more accurately predict the amount of GHG emissions coming from indoor cultivation, the key is to look at the electricity portfolio in states where marijuana is legal to determine their dependence on fossil fuels. For example, in 2020, Colorado, one of the largest producers of marijuana in the country, relied on coal-fired power plants for 36% of its electricity generation, and according to 2021 numbers, fossil fuels currently generate 67% of the state’s electricity with renewables making up the remaining 32%.<sup>39</sup>

Compounding the reliance on fossil fuels to supply the United States electric grid is the global need to keep the impacts of global warming to at most 1.5 degrees Celsius above preindustrial levels to avoid the harshest of climate

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USA TODAY: MONEY (July 14, 2019, 1:59 PM), <https://www.usatoday.com/story/money/2019/07/14/china-us-countries-that-produce-the-most-co-2-emissions/39548763/> [<https://perma.cc/7KEG-374G>].

<sup>33</sup> *Id.*

<sup>34</sup> *How Much of U.S. Carbon Dioxide Emissions Are Associated with Electricity Generation?*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/tools/faqs/faq.php?id=77&t=11> [<https://perma.cc/42MJ-K6GM>] (last updated Dec. 1, 2020) (providing breakdown of carbon dioxide (“CO<sub>2</sub>”) generated by U.S. electricity production by source).

<sup>35</sup> *Id.*

<sup>36</sup> *What Is U.S. Electricity Generation by Energy Source?*, *supra* note 8.

<sup>37</sup> *Id.*

<sup>38</sup> Rob Jackson, Robbie Andrew, Pep Canadell, Pierre Friedlingstein & Glen Peters, Opinion, *Natural Gas Use Is Rising: Is that Good News or Bad News for the Climate?*, SCI. AM. (Jan. 9, 2020), <https://blogs.scientificamerican.com/observations/natural-gas-use-is-rising-is-that-good-news-or-bad-news-for-the-climate/> (“In the United States and Europe, natural gas is replacing coal in electricity generation. Coal consumption in both regions dropped at least 10 percent in 2019. . . . Most of the lost U.S. coal capacity was replaced by natural gas, with additional contributions from renewables and energy efficiency.”).

<sup>39</sup> *Colorado State Profile and Energy Estimates*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/state/?sid=CO#tabs-4> [<https://perma.cc/HXF3-A793>] (last visited May 19, 2021).

change predictions.<sup>40</sup> According to the Intergovernmental Panel on Climate Change, pathways to achieving this goal include decreasing energy demand and intensity, “deeply” lowering emissions from energy sources, actively engaging in carbon capture and decarbonization efforts, and increasing renewables to 70-85% of the energy supply by 2050.<sup>41</sup>

These pathways encompass decarbonizing electricity and reducing demand, which is opposite of what is occurring in the United States generally and with the cannabis industry more specifically. According to some projections, this general energy demand will continue to increase over the coming years.<sup>42</sup> The United States’s general electricity demand growth is expected to continue to grow over the next ten years with some analysts predicting that three industries—electric vehicles, data centers, and cannabis cultivation—will significantly increase electricity consumption.<sup>43</sup> Data centers are projected to see

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<sup>40</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, GLOBAL WARMING OF 1.5°C, at 7-8 (Valérie Masson-Delmotte et al. eds., 2019), [https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15\\_Full\\_Report\\_High\\_Res.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf) [<https://perma.cc/XKY3-K87G>] (“Climate models project robust differences in regional climate characteristics between present-day and global warming of 1.5°C, and between 1.5°C and 2°C. These differences include increases in: mean temperature in most land and ocean regions (*high confidence*), hot extremes in most inhabited regions (*high confidence*), heavy precipitation in several regions (*medium confidence*), and the probability of drought and precipitation deficits in some regions (*medium confidence*).” (footnotes omitted)).

<sup>41</sup> Casey Ivanovich & Ilissa Ocko, *Six Takeaways from the New Climate Report*, ENV’T DEF. FUND (Oct. 8, 2018), <http://blogs.edf.org/climate411/2018/10/08/six-takeaways-from-the-new-climate-report/> [<https://perma.cc/TH8N-V3GG>].

<sup>42</sup> U.S. ENERGY INFO. ADMIN., OFF. OF ENERGY ANALYSIS, U.S. DEP’T OF ENERGY, ANNUAL ENERGY OUTLOOK 2020 WITH PROJECTIONS TO 2050, at 64 (2020), <https://www.eia.gov/outlooks/aeo/pdf/AEO2020%20Full%20Report.pdf> [<https://perma.cc/GY29-J97A>] (predicting average 1% growth in electricity demand from 2019 to 2020). The U.S. Energy Information Administration predicts that electricity demand will grow slowly through 2050. *Id.* Morningstar is among analysts predicting an increase in electricity demand through 2030 due in part to marijuana, electric vehicles, and data servers. Andrew Bischof, *Why Electricity Demand Is About to Get a Jolt*, MORNINGSTAR (Dec. 14, 2018), <https://www.morningstar.com/articles/904313/why-electricity-demand-is-about-to-get-a-jolt> (“We think three emerging electricity demand sources—electric vehicle charging, data centers, and cannabis cultivation—will approach 6% of total U.S. electricity demand by 2030, offsetting energy efficiency and supporting our 1.25% annual electricity demand growth forecast through this time period.”); Ben Geman, *The Energy Thirst of Pot, Electric Vehicles, and Servers*, AXIOS (Dec. 4, 2018), <https://www.axios.com/energy-thirst-pot-marijuana-electric-vehicles-power-8a66bd21-46a7-450d-b737-921565833d26.html> [<https://perma.cc/5HMT-ST4L>].

<sup>43</sup> Reott, *supra* note 19 (depicting graphs of total electricity demand growth by sector).

the greatest growth, but not far behind are the electric vehicle<sup>44</sup> and cannabis industries.<sup>45</sup>

Another concern is that the indoor marijuana industry could undo state and local comprehensive climate plans to reduce carbon emissions within their jurisdictions.<sup>46</sup> Multiple states have legislative mandates, goals, and policies in place to reduce statewide GHG emissions.<sup>47</sup> For example, Colorado's target is to reduce emissions by 90% by 2050 (using a 2005 baseline), Massachusetts's goal is 80% by 2050 (using a 1990 baseline), and California's goal is 40% by 2030 (using a 1990 baseline).<sup>48</sup> Without restrictions in place, the marijuana industry could single-handedly negate any previous progress.

Interestingly, Colorado has gotten creative with its attempt to capture GHG emissions and boost marijuana growth at the same time. In 2020, it initiated a

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<sup>44</sup> In December 2020, Elon Musk predicted that all of the world's cars will be electric within twenty years and that the shift will result in doubling our electricity consumption. *Tesla CEO Says Electric Cars Will Double Global Electricity Demand*, REUTERS (Dec. 1, 2020, 11:50 AM), <https://www.reuters.com/article/us-tesla-electric-germany/tesla-ceo-says-electric-cars-will-double-global-electricity-demand-idUSKBN28B5Q8> [<https://perma.cc/25G4-U4EA>] (reporting Musk's projections that 5% of cars would be made electric per year, requiring expansion of solar and wind power and larger battery capacity).

<sup>45</sup> Peter Maloney, *Data Centers, EVs and Cannabis Poised to Boost Demand*, AM. PUB. POWER ASS'N (Dec. 10, 2018), <https://www.publicpower.org/periodical/article/data-centers-evs-and-cannabis-poised-boost-demand> [<https://perma.cc/J7EQ-J72U>] (reporting that analysts expect demand growth from data centers, electric vehicle charging stations, and cannabis cultivation to account for 3.2%, 1.7%, and 1.5%, respectively, of total U.S. electricity demand by 2030); Robert Walton, *Pot, EVs, Data to Lead Electricity Demand Growth: Morningstar*, UTIL. DIVE (Dec. 5, 2018), <https://www.utilitydive.com/news/pot-evs-data-to-lead-electricity-demand-growth-morningstar/543613/> [<https://perma.cc/P2G5-6KDR>]. New Frontier predicts energy use for marijuana cultivation will increase 162% by 2022. Chris Hudock, *162% Increase in U.S. Legal Cannabis Cultivation Electricity Consumption by 2022*, NEW FRONTIER DATA (Oct. 25, 2018), <https://newfrontierdata.com/cannabis-insights/162-increase-in-u-s-legal-cannabis-cultivation-electricity-consumption-by-2022/> [<https://perma.cc/M9M8-N7VN>].

<sup>46</sup> Gina S. Warren, *Regulating Pot to Save the Polar Bear: Energy and Climate Impacts of the Marijuana Industry*, 40 COLUM. J. ENV'T L. 385, 416 (2015) (detailing derailment of a municipal project to reduce electricity consumption in Arcata, California, most likely due to 600 residents that were cultivating marijuana).

<sup>47</sup> Laura Shields, *Greenhouse Gas Emissions Reduction Targets and Market-Based Policies*, NAT'L CONF. OF STATE LEGISLATURES, <https://www.ncsl.org/research/energy/greenhouse-gas-emissions-reduction-targets-and-market-based-policies.aspx> [<https://perma.cc/UXC9-HR XM>] (last updated Mar. 11, 2021) ("At least 16 states and Puerto Rico have enacted legislation establishing GHG emissions reduction requirements, with more requiring state agencies to report or inventory GHG emissions. Other states, such as New Mexico, North Carolina and Pennsylvania, have recently committed to statewide GHG reduction goals through executive action, but do not currently have binding statutory targets." (citations omitted)).

<sup>48</sup> *Id.*

pilot program to capture the carbon dioxide emitted during the fermentation process at local beer brewing facilities and transport it to marijuana facilities, where it is pumped into the air to speed photosynthesis.<sup>49</sup> While this is an innovative idea on a small scale, until states can move to a zero-carbon-emissions grid,<sup>50</sup> the majority of electricity consumption will result in increased GHG emissions in contravention of these comprehensive plans.

### III. LESSONS FROM THE PAST

When I first published on this topic in 2015,<sup>51</sup> the legalized cannabis industry was in its infancy. As states decided how to regulate the industry, I saw an opportunity to integrate sustainable energy practices into state licensing schemes. At the time, only four states had fully legalized marijuana—Alaska, Colorado, Oregon, and Washington.

I envisioned that states could mandate, as part of their licensing schemes, that marijuana growers use 100% clean energy or pay a carbon fee on a sliding scale. One big concern at the time, and still today, however, is that there simply is not enough clean energy available on the grid<sup>52</sup> and not enough space on the rooftops for indoor cultivators to utilize 100% clean energy.<sup>53</sup> In fact, by some estimates, the most rooftop solar energy can supply is “about 5% of a facility’s electricity needs” due to marijuana’s high energy intensity.<sup>54</sup> As a result, I recommended the following:

One option for policymakers faced with this dilemma is to take a two-pronged approach by requiring indoor growers to pay an ever-increasing carbon fee, which would go into a fund for the development of more efficient technology and climate-friendly electricity facilities, *in conjunction with* requiring growers to meet an incrementally increasing requirement to incorporate carbon-free electricity sources. Combining these requirements would ensure growers do not become complacent just

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<sup>49</sup> Jennifer Oldham, *Recycled Carbon Dioxide Feeds Pot*, WASH. POST, Feb. 12, 2020, at A3.

<sup>50</sup> Thirty states plus the District of Columbia have renewable and/or clean energy standards, with many seeking to reach 100% by 2050. See DSIRE & NC CLEAN ENERGY TECH. CTR., RENEWABLE & CLEAN ENERGY STANDARDS (2020), <http://ncsolarcenterprod.s3.amazonaws.com/wp-content/uploads/2020/09/RPS-CES-Sept2020.pdf> [<https://perma.cc/48XS-G5UV>].

<sup>51</sup> Warren, *supra* note 46, at 385 (addressing negative climate and energy impacts of marijuana cultivation).

<sup>52</sup> Gina S. Warren, *1-Click Energy: Managing Corporate Demand for Clean Power*, 78 MD. L. REV. 73, 81 (2018).

<sup>53</sup> Mills & Zeramby, *supra* note 18 (manuscript at 12) (“The feasibility of [going solar] has not been demonstrated at scale, probably because the required solar array would need to be many times larger than the roof of the facility, and of course could not be on the roof at all if a traditional greenhouse design is used.”).

<sup>54</sup> *Id.*

to pay the fee. Instead, it would encourage a shift in behavior to implement more efficient technology to keep the cost down and at the same time encourage indoor growers and policymakers to find a solution to ending fossil-fuel consumption.<sup>55</sup>

After making this recommendation, various state regulatory entities that were interested in the concept contacted me, but none of the original states implemented clean energy standards. At the time, and still today, the City of Boulder and Boulder County in Colorado (collectively, “Boulder”) were the only locality doing something similar.

The City of Boulder requires all commercially licensed marijuana cultivators to report their energy usage<sup>56</sup> and to comply with 100% renewable energy targets.<sup>57</sup> Cultivators can meet this requirement by (1) installing on-site renewable energy, (2) participating in a verified solar program, or (3) purchasing offsets through the city’s Energy Impact Offset Fund.<sup>58</sup>

Likewise, Boulder County requires commercial cultivators to utilize 100% renewable energy or pay a 2.16 cent surcharge per kilowatt-hour of consumption.<sup>59</sup> Fees from this surcharge go into the county’s Energy Impact Offset Fund.<sup>60</sup> Boulder County’s program also has an Energy Impact Offset Fund Credit Program, which allows cultivators to receive a credit against their usage fees for out-of-pocket costs used to install energy-efficient equipment and technology.<sup>61</sup> This is helpful because start-up costs for the marijuana industry are already expensive and many new growers “have limited access to capital due

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<sup>55</sup> Warren, *supra* note 46, at 428.

<sup>56</sup> BOULDER, COLO., MUNICIPAL CODE § 6-14-9(g) (“The records to be maintained by each medical marijuana cultivation facility and submitted to the city shall include, without limitation, records showing on a monthly basis the use and source of energy and any renewable energy generated onsite or through a Community Solar Garden subscription. Such records shall include all statements, reports, or receipts to verify the items included in the report of the business. By application for a medical marijuana business license from the city for a cultivation facility, the medical marijuana cultivation facility grants permission to providers of the energy or other renewable energy acquisition program to disclose the records of the business to the city. Medical marijuana businesses shall maintain records showing compliance with the renewable energy requirements in this chapter.”).

<sup>57</sup> *Id.* § 6-14-8(i) (“A medical marijuana cultivation facility shall directly offset one hundred percent of its electricity consumption through a verified subscription in a Community Solar Garden, or renewable energy generated onsite, or an equivalent that is subject to approval by the city. For medical marijuana businesses licensed by the city on October 22, 2013, this requirement shall apply at the time of renewal of the medical marijuana business license following October 22, 2013.”).

<sup>58</sup> *Boulder Marijuana Cultivation Facilities Energy Requirements*, CITY OF BOULDER COLO., <https://bouldercolorado.gov/planning/boulder-marijuana-facility-energy-requirements> [<https://perma.cc/EU6W-Z92U>] (last visited Apr. 13, 2021).

<sup>59</sup> *Cannabis Energy Impact Offset Fund*, *supra* note 11.

<sup>60</sup> *Id.*

<sup>61</sup> *Id.*

to Federal Deposit Insurance Corporation . . . restrictions and limitations on federal tax deductions.”<sup>62</sup>

In any event, the goal of both the City and the County’s Energy Impact Offset Funds is to educate the industry and create best practices for reducing energy use and increasing reliance on clean-energy and energy-efficient technologies. Interestingly, both funds have a secondary mission to facilitate the supply of affordable renewable energy to low-income families.<sup>63</sup>

Through these programs, Boulder has continued to collect high-quality energy usage data and provide individualized reports to licensed indoor cultivators so that they can understand how best to lower their electricity bills and deliver a “cleaner” product. Unfortunately, Boulder is one of the only jurisdictions in the United States that has undertaken this level of energy efficiency management.

As of January 2021, marijuana is fully legal in fifteen states—Alaska, Arizona, California, Colorado, Illinois, Maine, Massachusetts, Michigan, Montana, Nevada, New Jersey, Oregon, South Dakota, Vermont, Washington—plus the District of Columbia.<sup>64</sup> It is decriminalized in thirty-two states and legal for medicinal purposes in more than two dozen states.<sup>65</sup> At this point, it is probably easier to list the remaining eight states where it is still fully *illegal*—Alabama, Idaho, Kansas, Nebraska, North Carolina, South Carolina, Tennessee, and Wyoming.<sup>66</sup> And, many predict that marijuana will receive federal legal status in the coming years.<sup>67</sup> The industry is a very lucrative one, generating a lot of money and raising a lot of taxes in legalized states. According to one report, “[T]he total economic impact of legal cannabis sales [is projected to] increase[] from \$38 billion-\$46 billion in 2019 to \$106 billion-\$130 billion by 2024 - a 181% increase.”<sup>68</sup>

Given this exponential growth of legal marijuana growing in the United States,<sup>69</sup> it follows that electricity consumption will exponentially grow as well.

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<sup>62</sup> CRANDALL, *supra* note 1, at 9.

<sup>63</sup> *Cannabis Energy Impact Offset Fund*, *supra* note 11 (“This fund in turn, can be used to educate and support best in industry practices with regards to energy usage as well as for funding other carbon pollution reducing projects such as low income renewable energy.”).

<sup>64</sup> *Map of Marijuana Legality by State*, *supra* note 4.

<sup>65</sup> *Id.*

<sup>66</sup> *Id.*

<sup>67</sup> See Marijuana Opportunity Reinvestment and Expungement Act of 2020, H.R. 3884, 116th Cong. (2020) (proposing decriminalization and removal of cannabis from schedule of Controlled Substances Act, 21 U.S.C. § 812).

<sup>68</sup> McVey, *supra* note 3.

<sup>69</sup> One study suggests that marijuana agro-tourism could be an opportunity to “enhance the overall GDP of the country.” Sophia Rolle, *Marijuana Agro-Tourism Habitat*, in TOURISM DEVELOPMENT, GOVERNANCE AND SUSTAINABILITY IN THE BAHAMAS 177, 182 (Sophia Rolle, Jessica Minnis & Ian Bethell-Bennett eds., 2020) (evaluating viability of sustainable marijuana agro-tourism in The Bahamas).

This is further exacerbated by the fact that the majority of states prohibit outdoor growing and require commercial growers to maintain secure indoor growing facilities.<sup>70</sup>

Most states have done little to nothing to limit the negative externalities of indoor cultivation, and they are seeing skyrocketing electricity demands, failed comprehensive climate plans, and increased occurrences of blackouts and grid vulnerability.<sup>71</sup> No jurisdiction has been hit harder than California,<sup>72</sup> the largest producer of cannabis in the nation, which has begun to rethink unbridled marijuana electricity consumption with new limits on energy GHG emissions and requirements to purchase carbon offsets for excess emissions.<sup>73</sup> Two additional states—Massachusetts and Illinois—have utilized their licensing authority to encourage, or in some instances mandate, energy efficiency. While neither mandate use of renewable/clean energy, they do put some additional limitations on lighting.

*California.* California fully legalized marijuana in 2016. Its initial licensing scheme contained no clean energy requirements or electricity monitoring provisions. Due to concerns with unfettered electricity use, however, the framework was amended to incorporate emission intensity mandates. Beginning in 2022, indoor cultivators will be required to report their energy usage.<sup>74</sup> And, beginning in 2023, growers will be required to “ensure that electrical power used for commercial cannabis activity meets the average electricity greenhouse gas emissions intensity required by their local utility provider pursuant to the California Renewables Portfolio Standard Program . . . .”<sup>75</sup> If it exceeds the emissions intensity, the cultivator will be required to purchase carbon offsets to cover the excess.<sup>76</sup> By some estimates, the main avenue for cultivators to comply with this limitation will be to convert existing lighting to LEDs or to pay the

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<sup>70</sup> Mills & Zeramby, *supra* note 18 (manuscript at 16-18).

<sup>71</sup> CRANDALL, *supra* note 1, at 2 (“Utilities and local and state regulators have yet to consider the energy impacts of marijuana cultivation comprehensively.”).

<sup>72</sup> See generally Genevieve Yip, Sustainable Cannabis Policy in California: Addressing the Legal Cannabis Industry’s Carbon Footprint (May 2020) (M.P.A. thesis, San Jose State University) (on file with Boston University Law Review) (discussing energy and climate externalities of marijuana cultivation in California).

<sup>73</sup> See Seltenrich, *supra* note 10 (“[California’s] Bureau of Cannabis Control won’t begin asking cultivators for data on energy use until 2022, and hold them to statewide standards for renewable energy starting in 2023.” (citation omitted)).

<sup>74</sup> *Id.*

<sup>75</sup> CAL. CODE REGS. tit. 3, § 8305 (2021).

<sup>76</sup> *Id.* § 8305(b) (“If a licensee’s average weighted greenhouse gas emissions intensity is greater than the local utility provider’s greenhouse gas emissions intensity for the most recent calendar year, the licensee shall provide evidence of carbon offsets or allowances to cover the excess in carbon emissions . . .”).

offset costs.<sup>77</sup> And, according to the California Department of Energy, as of 2017 only about 4% of indoor cultivators relied on LED lighting.<sup>78</sup>

*Massachusetts.* Massachusetts fully legalized marijuana in 2016. Massachusetts's statutory framework for marijuana cultivators is quite extensive,<sup>79</sup> but it became more so in July 2020, when it required applicants to comply with energy efficiency and reporting standards.<sup>80</sup> All medical and adult-use growers of marijuana must comply with the new provisions.<sup>81</sup> To assist in understanding Massachusetts law, the Cannabis Control Commission issued a fifty-seven-page "Energy and Environment Compiled Guidance" document for growers.<sup>82</sup>

To apply for a license to operate, applicants must show that they have created and maintained "written operating procedures that demonstrate compliance with the energy efficiency standards in the regulations."<sup>83</sup> This operating plan must describe how the cultivator will achieve a reduction of energy and increased efficiency, its efforts to utilize utility efficiency programs, and its efforts to incorporate renewable energy.<sup>84</sup> Annually, the successful candidate must show its energy usage and water consumption as part of the license renewal process.<sup>85</sup>

As noted above, one of the largest areas of energy intensity for indoor cultivation is the lighting system that is required to keep the plants warm and growing twenty-four hours per day. Massachusetts's Department of Energy Resources noted that a failure to address the lighting situation could negate the benefits of all LED bulbs installed in Massachusetts's streetlight replacement

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<sup>77</sup> Bob Gunn, *California Cannabis Energy Mandates Add Undue Cost Burden to Growers*, MARIJUANA BUS. DAILY (July 22, 2020), <https://mjbizdaily.com/california-cannabis-energy-mandates-add-undue-cost-burden-to-growers/> [<https://perma.cc/CM7B-AYWN>].

<sup>78</sup> KELSEY STOBER, KYUNG LEE, MARY YAMADA & MORGAN PATTISON, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, U.S. DEP'T OF ENERGY, ENERGY SAVINGS POTENTIAL OF SSL IN HORTICULTURAL APPLICATIONS, at iii (2017), [https://www.energy.gov/sites/prod/files/2017/12/f46/ssl\\_horticulture\\_dec2017.pdf](https://www.energy.gov/sites/prod/files/2017/12/f46/ssl_horticulture_dec2017.pdf) [<https://perma.cc/ET4M-NCVU>] ("In 2017, . . . LED products [made] up only 2% of lighting supplemented greenhouses and 4% of lighting in non-stacked indoor farms.").

<sup>79</sup> 935 MASS. CODE REGS. 500.120(11) (2021) ("A Marijuana Cultivator shall satisfy minimum energy efficiency and equipment standards established by the Commission and meet all applicable environmental laws, regulations, permits and other applicable approvals including, but not limited to, those related to water quality and quantity, wastewater, solid and hazardous waste management, and air pollution control, including prevention of odor and noise . . . as a condition of obtaining a final license . . . and as a condition of renewal . . .").

<sup>80</sup> MASS. CANNABIS CONTROL COMM'N, *supra* note 9, at 9-10.

<sup>81</sup> *Id.* at 11.

<sup>82</sup> *See generally id.* (assisting licensed Marijuana Establishments with developing best practices for energy efficiency and environmental concerns to comply with state regulations).

<sup>83</sup> *Id.*

<sup>84</sup> *Id.* at 12.

<sup>85</sup> *Id.* at 11.

program—a total of 130,000 bulbs that cost the state \$11 million.<sup>86</sup> In an attempt to address this concern, Massachusetts enacted a technology pushing standard that requires facility light intensity to stay at or below thirty-six to fifty watts per square foot, depending on the total square footage of the facility.<sup>87</sup> To put this in context, a typical office building utilizes two to five watts per square foot and computer system facilities around five to ten watts per square foot.<sup>88</sup> Of note, cultivators who generate their electricity with 80% clean energy are exempt from these lighting density requirements.<sup>89</sup>

*Illinois.* Illinois fully legalized marijuana in 2020 through its Illinois Cannabis Regulation and Tax Act (“Act”),<sup>90</sup> which has been touted as the “Greenest Cannabis Bill in the Country.”<sup>91</sup> The Act limits the number of licenses the state will issue and requires all grows to be indoors.<sup>92</sup> Applicants must provide an environmental plan, which must include a “plan of action to minimize the carbon footprint, environmental impact, and resource needs for the dispensary, which may include, without limitation, recycling cannabis product packaging.”<sup>93</sup> After the plans are filed, they become a binding legal obligation.<sup>94</sup> In addition, like Massachusetts’s statute, the Act limits lighting intensity and provides that it must not exceed thirty-six watts per square foot.<sup>95</sup>

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<sup>86</sup> MASS. DEP’T OF ENERGY RES., CANNABIS AND ENERGY 10 (2018), [https://aeenewengland.starchapter.com/images/Cannabis\\_Energy\\_DOER\\_to\\_AEENE\\_Dec\\_2018\\_Web.pdf](https://aeenewengland.starchapter.com/images/Cannabis_Energy_DOER_to_AEENE_Dec_2018_Web.pdf) [<https://perma.cc/EXF4-C4QU>].

<sup>87</sup> MASS. CANNABIS CONTROL COMM’N, *supra* note 9, at 15.

<sup>88</sup> *Commercial Library*, UNION POWER COOP., <https://c03.apogee.net/mvc/home/hes/land/el?utilityname=union-power&spc=cel&id=960> [<https://perma.cc/9X4N-CA4A>] (last visited Apr. 13, 2021) (“In an office building the lighting and normal ‘floor’ (equipment) electrical loads typically average from two (2) to five (5) watts per square foot. However, architectural or other considerations may make them considerably higher. Buildings with computer systems and other electronic equipment can have electrical loads as high as 5 to 10 watts per square foot.”).

<sup>89</sup> MASS. CANNABIS CONTROL COMM’N, *supra* note 9, at 18.

<sup>90</sup> 410 ILL. COMP. STAT. 705/1-5(a) (2020) (“In the interest of allowing law enforcement to focus on violent and property crimes, generating revenue for education, substance abuse prevention and treatment, freeing public resources to invest in communities and other public purposes, and individual freedom, the General Assembly finds and declares that the use of cannabis should be legal for persons 21 years of age or older and should be taxed in a manner similar to alcohol.”).

<sup>91</sup> *Illinois Has the Greenest Cannabis Bill in the Country*, *supra* note 9 (“This bill is a great example of prioritizing environmental protection and it would put Illinois at the forefront of national cannabis policy.”).

<sup>92</sup> 410 ILL. COMP. STAT. 705/15-25(c), 20-30(c).

<sup>93</sup> *Id.* at 15-30(c)(7).

<sup>94</sup> *Id.* at 30-15(c).

<sup>95</sup> *Id.* at 20-15(a)(23)(B).

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The industry has expressed concern that these restrictions will be too burdensome and have a discriminatory impact on smaller cultivators.<sup>96</sup> No doubt replacing conventional lights with LEDs and incorporating more energy-efficient technologies will be expensive without proper state and utility incentives, discussed in Part IV. According to one estimate, it could cost as much as “\$62,000 for each 1,000 square feet of growing canopy.”<sup>97</sup> Greater restrictions also have the potential to cause some cultivators to go underground,<sup>98</sup> some cultivators to use deceptive reporting practices,<sup>99</sup> or corporate growers to run out the moms-and-pops.<sup>100</sup> While this is not a new argument against greater regulatory restrictions, it is a concern that should be closely monitored as states proceed with clean energy directives.

#### IV. IDEAS FOR THE FUTURE

Two immediate energy needs arise with indoor cultivation. First is the need to reduce grower’s overall energy consumption and alleviate some of the stress on the electric grid. Second is the need to fuel switch from fossil fuels to renewable clean energy and reduce GHG emissions.

Evan Mills and Scott Zeramby, who have been researching this topic for about a decade, argue that the only way to meet these needs is to move marijuana grows outdoors because clean energy and energy-efficient technology will not be enough to actually mitigate the climate damage caused by indoor

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<sup>96</sup> Gunn, *supra* note 77.

<sup>97</sup> *Id.*

<sup>98</sup> *Id.*

<sup>99</sup> See Mills & Zeramby, *supra* note 18 (manuscript at 17) (“[Massachusetts’s] efforts at setting energy standards have been clumsy, e.g., seeking to specify wattage limits on individual light fixtures, which could easily result in operators installing more fixtures than would otherwise be the case.”); Gretchen Schimelpfenig & Leora Radetsky, *Which Cannabis Cultivation Lighting Is Right for You?*, CANNABIS BUS. TIMES (Jan. 14, 2021), <https://www.cannabisbusinesstimes.com/article/the-right-light-cannabis-cultivation-resource-innovation-institute-designlights-consortium/> [https://perma.cc/TNK4-78T9] (noting that Massachusetts and Illinois offer use of horticultural lighting as route for compliance with energy efficiency regulations). While it is commendable that California acknowledges and is attempting to rectify the situation, the problem with a wattage-per-square-foot requirement is that growers could simply install more fixtures to meet the limitations.

<sup>100</sup> Ryan Stoa and others have raised concerns that the regulation of marijuana and some of the controls exerted can result in socioeconomic disparities and create discriminatory practices in marijuana licensing and regulation. See, e.g., Ryan B. Stoa, *Equity in Cannabis Agriculture*, 101 B.U. L. REV. 1135, 108-11 (2021); Michael Polson, *Making Marijuana an Environmental Issue: Prohibition, Pollution, and Policy*, 2 ENE 229, 247 (2018) (“Regulatory attempts are shadowed by prohibition’s legacy and this can affect the socioeconomic differentiation of producers.”).

cultivators.<sup>101</sup> They argue, “[T]here is a degree of naïve optimism and hubris that cultivators need only ‘go solar’ to solve the problem of any remaining energy requirements after efficiencies have been captured.”<sup>102</sup> To them, the only viable solution is to move the cultivation back outdoors, where it belongs.<sup>103</sup>

I do not disagree with this premise.<sup>104</sup> Outdoor cultivation would certainly alleviate the majority of the industry’s energy demand, as indoor cultivation requires over thirteen times more power to grow one gram of marijuana as compared to outdoor cultivation.<sup>105</sup> One main problem is that the federal government and most states prohibit (or at least significantly limit) outdoor marijuana cultivation.

The Agriculture Improvement Act of 2018 (“2018 Farm Bill”) provided a level of hope when it legalized some outdoor cannabis grows, but it also created some confusion along the way.<sup>106</sup> The 2018 Farm Bill reclassifies marijuana with low tetrahydrocannabinol (“THC”) levels as “hemp” and defines hemp as cannabis leaves, buds, and germinating seeds with a THC concentration of 0.3% or less.<sup>107</sup> The 2018 Farm Bill places regulatory authority on the states for

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<sup>101</sup> Mills & Zeramby, *supra* note 18 (manuscript at 11) (noting that grow facilities tend to use high amounts of energy due to “counterproductive design and operational features”).

<sup>102</sup> *Id.* (manuscript at 12).

<sup>103</sup> *Id.* (manuscript at 24).

<sup>104</sup> Outdoor cultivation has its own set of environmental concerns, including but not limited to water waste, land sprawl and use, and pesticide use. Jessica Owley and Ryan Stoa have written about some of the concerns. See Jessica Owley, *Unforeseen Land Uses: The Effect of Marijuana Legalization on Land Conservation Programs*, 51 U.C. DAVIS L. REV. 1673, 1675-76 (2018) (discussing need for environmental and land use regulations for outdoor marijuana growers); Ryan B. Stoa, *Marijuana Agriculture Law: Regulation at the Root of an Industry*, 69 FLA. L. REV. 297, 303-04 (2017) (outlining environmental harms caused by failed or nonexistent regulatory regime); Ryan B. Stoa, *Weed and Water Law: Regulating Legal Marijuana*, 67 HASTINGS L.J. 565, 569-70 (2016) (discussing potential harms to water usage caused by lack of proper regulatory action to accommodate marijuana cultivation); see also Asha Wiegand-Shahani, *Illegal Water Use, Marijuana, and California’s Environment*, 48 ENV’T L. REP. 10,625, 10,629-30 (2018) (discussing environmental damage caused by illegal water use by outdoor growers). *But see* Flavio Scrucca, Carlo Ingraio, Chadi Maalouf, Tala Moussa, Guillaume Polidori, Antonio Messineo, Claudia Arcidiacono & Francesco Asdrubali, *Energy and Carbon Footprint Assessment of Production of Hemp Hurds for Application in Buildings*, ENV’T IMPACT ASSESS. REV., no. 106,417, 2020, at 1, 7 (discussing climate benefits of outdoor hemp cultivated for purposes of processing it into fibers and building materials).

<sup>105</sup> SCALE MICROGRID SOLUTIONS & RES. INNOVATION INST., *supra* note 25, at 41.

<sup>106</sup> *Marijuana or Hemp? Manufacturers Snagged by Farm Bill Confusion*, MARIJUANA BUS. DAILY (Feb. 6, 2019) [hereinafter *Marijuana or Hemp?*], <https://mjbizdaily.com/marijuana-or-hemp-manufacturers-snagged-by-farm-bill-confusion/> [<https://perma.cc/Q4WG-JQKA>] (highlighting law enforcement confusion in distinguishing between hemp and marijuana).

<sup>107</sup> Agriculture Improvement Act of 2018, Pub. L. No. 115-334, §§ 10113, 12619, 132

outdoor cultivation of “hemp” and requires states that choose to regulate it to establish a plan for tracking, testing, inspecting, and disposing of the product.<sup>108</sup> If the state does not establish a plan, the federal government will regulate it through the Department of Agriculture.<sup>109</sup> The 2018 Farm Bill also allows for the transportation in interstate commerce<sup>110</sup> of hemp and lessens penalties for violations of state and federal plans.<sup>111</sup>

The confusion lies with the 2018 Farm Bill’s definition of hemp, “the plant’s complicated biology,” and an inability of law enforcement to determine the difference between hemp and marijuana.<sup>112</sup> Local law enforcement made two high-profile arrests in 2019 when truck drivers attempted to transport what they believed was legally certified hemp across state lines.<sup>113</sup> As noted by one commentator, “The newly enacted legislation does not mean that hemp will immediately become a cash crop or that farmers can grow it as freely as they do corn, soybeans, wheat or tobacco.”<sup>114</sup> While it appears to be a step toward the federal legalization of cannabis and an opportunity to grow at least some types of cannabis outdoors,<sup>115</sup> the 2018 Farm Bill is not consistently applied and gives states the authority to prohibit any hemp harvests within their borders as well as the authority to require cannabis be grown indoors.<sup>116</sup>

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Stat. 4490, 4908, 5018 (removing hemp from definition of marijuana in the Controlled Substances Act, thereby rendering it no longer a controlled substance).

<sup>108</sup> *Id.* § 10113, 132 Stat. at 4909-10 (noting that states must certify that they have the resources and personnel to enforce such plans).

<sup>109</sup> *Id.* § 10113, 132 Stat. at 4912-13 (mandating that the Department of Agriculture establish a plan with tracking, testing, inspecting, and disposing requirements).

<sup>110</sup> *Id.* § 10114, 132 Stat. at 4914 (stating that “[n]othing in this title . . . prohibits the interstate commerce of hemp . . . or hemp products” and that “[n]o State . . . shall prohibit the transportation or shipment of hemp or hemp products produced in accordance with” a state or federal plan through the state).

<sup>111</sup> *Id.* § 10113, 132 Stat. at 4911 (“A hemp producer that negligently violates a State . . . plan . . . shall not as a result of that violation be subject to any criminal enforcement action by the Federal Government or any State government . . .”).

<sup>112</sup> *Marijuana or Hemp?*, *supra* note 106.

<sup>113</sup> *Id.*

<sup>114</sup> Harold B. Hilborn, *2018 Farm Bill Legalizes Hemp, but Obstacles to Sale of CBD Products Remain*, NAT’L L. REV. (Mar. 5, 2019), <https://www.natlawreview.com/article/2018-farm-bill-legalizes-hemp-obstacles-to-sale-cbd-products-remain> [https://perma.cc/9SWD-PLLL].

<sup>115</sup> Jordan Waldrep, *How Cannabis Just Took a Step Towards Legalization in the U.S. Farm Bill*, FORBES (Jan. 3, 2019, 9:04 AM), <https://www.forbes.com/sites/jordanwaldrep/2019/01/03/how-cannabis-just-took-a-step-towards-legalization-in-the-us-farm-bill/> [https://perma.cc/FMB8-2N5J] (characterizing 2018 Farm Bill as “the first real step the federal government has taken towards legalization [in] almost 50 years”).

<sup>116</sup> Agriculture Improvement Act § 10113, 132 Stat. at 4910 (noting that states may include other mandated procedures in their regulatory plan).

This leads us back to the problem at hand—most marijuana is currently cultivated indoors due to federal legal hurdles and state mandates (or due to poor growing climates). Until this indoor cultivation mindset changes, state regulators and public utility companies should work together to mitigate the immediate harms caused by unfettered energy consumption.

*State licensing schemes.* State regulators are in a good position to control the amount and type of electricity consumed through their state licensing schemes. They can mandate growers utilize only clean energy, limit energy intensity, and require energy-efficient technologies as a condition of licensing. As more states create licensing schemes that require indoor cultivation, they should look to Boulder’s clean energy requirements and offset fund management as well as California’s emissions restrictions as baseline models. Massachusetts and Illinois each require environmental plans and limit lighting intensity, but again, neither requires clean energy nor limits the overall energy intensity of the facility. As a result, energy consumption will continue to increase, which will strain the energy delivery system, and GHG emissions will continue to increase, which will contribute to overall global warming.

*Utility incentives.* In addition, state-regulated utilities are well situated to educate indoor cultivators and to incentivize clean and efficient energy consumption through push-and-pull policies including energy audits, rebates and incentives, grants, and surcharges.

When marijuana emerged as a legal state industry, many utilities were very concerned about even supplying electricity to marijuana cultivators, let alone creating incentive programs for them.<sup>117</sup> With marijuana federally illegal, banks, utilities, and other similar service suppliers were concerned that they could be subjected to fines or criminal charges if they assisted those involved in the marijuana industry.<sup>118</sup> Even though banking can still be a gray area, state-regulated utilities are more confident in their ability—and their obligation—to meet the energy needs of their marijuana customers.

That is because, in the United States, electricity is regulated through a cooperative federalism model. Pursuant to the Federal Power Act, the federal government, through the Federal Energy Regulatory Commission (“FERC”), regulates wholesale sales of electricity in interstate commerce, and states, through state public utility commissions, regulate the retail distribution of electricity. In fact, the FERC is prohibited from regulating or interfering with the retail distribution of electricity.<sup>119</sup> State public utility commission regulations mandate that utilities serve their retail customers in a

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<sup>117</sup> Ryan Dadgari, *Powering Mary Jane: Marijuana and Electric Public Utilities*, 10 GOLDEN GATE U. ENV’T L.J. 55, 56 (2018) (discussing role of state utility companies in supplying electricity to federally illegal marijuana growers).

<sup>118</sup> See, e.g., *id.* at 77 (“While unlikely, public utilities could face criminal prosecution for providing service to marijuana grows.”).

<sup>119</sup> 16 U.S.C. § 824(a)-(b).

nondiscriminatory manner.<sup>120</sup> This means that utilities must supply electricity to anyone seeking the service at the same rate and on the same basis as others within the same customer category. It is possible that a utility receiving federal funding or receiving power from a federally owned energy source could still run up against concerns;<sup>121</sup> however, most utilities are fully funded through their intrastate retail consumer base and regulated by their state public utility commission.<sup>122</sup>

Some areas in which utilities can make a big difference in offsetting compliance costs, reducing consumption, and increasing efficiencies include energy audits, incentives, grants, and surcharges.<sup>123</sup>

*Energy audits.* As noted at the beginning of this Article, one of the biggest problems with addressing the energy consumption issue is actually knowing exactly how much energy is being consumed and what aspects of the indoor cultivation process have the highest energy intensity.<sup>124</sup> Lighting is an obvious area of energy intensity, but studies and on-site audits would provide additional information for growers and utilities alike. To incentivize growers to evaluate their electricity usage, some utilities are offering energy audits at discounted prices. For example, National Grid's program in Massachusetts will defray 75% of the cost to study the heating, ventilation, and air conditioning and lighting systems.<sup>125</sup>

*Utility incentives and grants.* Reducing emissions intensity will no doubt increase out-of-pocket costs for growers, but it will also reduce monthly electricity costs, which should offset the costs over time. The indoor cultivator's electricity bill is one of the biggest expenses incurred during the cultivation process with monthly bills ranging between \$3,000 and \$100,000.<sup>126</sup> Utilities can provide incentives by reducing the costs of electricity in exchange for greater

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<sup>120</sup> 18 C.F.R. § 35.27 (2021).

<sup>121</sup> See CRANDALL, *supra* note 1, at 9 (discussing how marijuana customers who receive power from Bonneville Power Administration, which is a federal agency, are not provided any rebates or incentives because marijuana is still federally illegal); see also Sacirbey, *supra* note 20 (explaining that utilities that receive power from particular federal entities "generally balk at providing cannabis businesses [power] because they fear federal interference").

<sup>122</sup> CRANDALL, *supra* note 1, at 2 (describing how public utility commissions regulate costs that investor-owned utilities can recover from customers).

<sup>123</sup> *Id.* at 11-14 (recommending that utilities: (1) educate marijuana growers about how much electricity they are using, (2) tailor incentives for the marijuana industry, (3) design rates to promote efficiency, and (4) create fair policies for new customers).

<sup>124</sup> *Id.* at 8 ("There is an information vacuum both about, and within, the marijuana industry.").

<sup>125</sup> *Energy Companies Incentivize Growers*, ANDEN (July 23, 2020), <https://www.anden.com/energy-companies-incentivize-growers/> [<https://perma.cc/VR4M-8AN2>].

<sup>126</sup> See CRANDALL, *supra* note 1, at 7 (explaining that monthly energy bills for cannabis growers in Denver, Colorado typically range from \$20,000 to \$50,000).

energy efficiency and utilization of more energy-efficient technology. Puget Sound Energy in Washington, for example, offers an incentive of \$0.20 per kilowatt-hour of first-year savings, up to 100% of the incremental cost of more efficient equipment.<sup>127</sup> Likewise, some utilities are offering grants, which are nonrepayable funds given in exchange for energy efficiency, to growers who install energy-efficient technology. For example, Efficiency Maine may pay up to 50% of a project's cost (up to \$1 million) for LED lights and energy-efficient HVAC systems.<sup>128</sup> Interestingly, Efficiency Maine had originally banned offering incentives to marijuana growers due to concerns that the federal government would crack down on the marijuana industry.<sup>129</sup> It was only in October 2020 that it voted to lift the ban.<sup>130</sup> In any event, providing these types of incentives that lower the grower's electricity bill can be appealing to a grower and beneficial for an overloaded utility.<sup>131</sup>

*Surcharges and taxes.* The above types of incentives use the proverbial carrot to encourage growers to become more energy conscious. Another option is using the stick—a surcharge or tax for electricity consumed above a certain baseline. It has always baffled me that some utilities will provide discounts for higher energy usage. It is not uncommon for the first 500 kilowatts of electricity to be \$0.10 per kilowatt, but after that, it goes down to \$0.095 per kilowatt.<sup>132</sup> Given the climate damage caused by energy consumption, this seems extremely counterintuitive and harmful. Some jurisdictions are catching on, however, and reversing course. For example, Arcata, California is leveraging a 45% surcharge or tax on customers who use more than 600% of an energy consumption

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<sup>127</sup> MARK CROWDIS, ENERGY EFFICIENCY REBATES AND THIRD-PARTY FINANCE (2018) (PowerPoint) (on file with Boston University Law Review).

<sup>128</sup> Penelope Overton, *Once Shut Out, Maine Cannabis Industry Now Eligible for Sustainable Energy Grants*, PORTLAND PRESS HERALD (Oct. 7, 2020), <https://www.pressherald.com/2020/10/07/once-shut-out-maine-cannabis-industry-now-eligible-for-sustainable-energy-grants/> [<https://perma.cc/SDG2-N63X>] (noting that Energy Maine trustees' choice to reverse ban reflected confidence that marijuana businesses were "just as likely to last long enough to produce the energy savings needed to justify the grant as any other kind of business").

<sup>129</sup> *Id.*

<sup>130</sup> *Maine Cannabis Companies Now Qualify for Energy-Efficiency Grants*, MARIJUANA BUS. DAILY (Oct. 8, 2020), <https://mjbizdaily.com/maine-cannabis-companies-now-qualify-for-energy-efficiency-grants/> [<https://perma.cc/DM64-L8FG>].

<sup>131</sup> Investor-owned utilities, however, can run into a conflict with helping customers decrease their electricity bills as their sole source of income comes from their customer base. *See* CRANDALL, *supra* note 1, at 2 ("Because the majority of U.S. electric customers are served by investor-owned utilities . . . , the public utility commissions that regulate them may soon be faced with balancing utilities' incentives to increase their sales of electricity versus other societal goals for efficient, affordable, and clean energy." (footnote omitted)).

<sup>132</sup> *Id.* at 11 (discussing rate design measures that can encourage efficiency).

baseline.<sup>133</sup> This type of surcharge could be effective in incentivizing consumers to reduce their overall energy consumption.

#### CONCLUSION

Indoor cultivation of marijuana is not green. With a U.S. grid that is still primarily fossil-fuel based, it is more a smoky brown than green, placing the polar bear<sup>134</sup> in the notorious hotbox.<sup>135</sup> Moving cultivation outdoors would be the best option, but until that happens (1) states that legalize marijuana should establish responsible licensing frameworks that mitigate the industry's energy consumption; and (2) state-regulated utilities should work with cultivators to provide energy audits, offer incentives and grants for clean energy alternatives, and penalize costumers whose energy intensity is over an established baseline.

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<sup>133</sup> *Excessive Electricity Use Tax*, CITY OF ARCATA, CAL., <https://www.cityofarcata.org/733/Excessive-Electricity-Use-Tax> [<https://perma.cc/XSV3-ZE3J>] (last visited Apr. 13, 2021) (noting that Arcata citizens passed the surcharge tax measure by a vote of 68% to 32%).

<sup>134</sup> Of course, I refer to the polar bear as a euphemism for our climate. Warren, *supra* note 46, at 388 n.5 (“Ezra Rosser notes that the majority of the population will never have an occasion to see a polar bear, but polar bears are the representative for the anti-global warming movement.” (citing Ezra Rosser, *Offsetting and the Consumption of Social Responsibility*, 89 WASH. U. L. REV. 27, 70-71 (2011))).

<sup>135</sup> A “hotbox” is a hot, confined space. It is slang for a place where pot smokers get together to smoke marijuana so that the exhaled smoke fills the space and intensifies the experience for everyone. See *Hotbox*, URB. DICTIONARY (Aug. 24, 2004), <https://www.urbandictionary.com/define.php?term=hotbox> [<https://perma.cc/H8V2-XAGF>].