High Usage in High Times: The Potential Energy Demand Implications of the Legalized Cannabis Cultivation Market

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ABSTRACT

With recreational cannabis cultivation now legalized in eight states and Washington D.C., the U.S. has experienced an influx of new cannabis growers eager to operate in legal, regulated markets. To maximize profits, growers utilize indoor and greenhouse growing facilities that reduce their production cycles and provide increased control and security during cultivation. Indoor facilities consume significant amounts of energy—up to five times more per square foot than commercial facilities of other industries—primarily due to energy-intensive fluorescent, metal-halide and high-pressure sodium lamps running between 18 and 24 hours a day.

After the state of California passed legislation to legalize recreational cannabis cultivation in November 2016, several cannabis industry professionals believe California—with a potential multi-billion dollar recreational market—could dramatically reshape the cannabis industry and potentially impact changes to federal regulations that currently prohibit recreational cannabis production and consumption. This paper addresses questions relating to the cannabis industry, its energy use, possible utilty intervention strategies, and the implications for legalization of recreational production and use in California. Specifically, this paper utilizes findings from an extensive literature review of previous cannabis research and in-depth interviews with utilities in states where recreational cannabis was legal at the time of the study and with trade organizations that work within the cannabis industry. It focuses on identifying key energy demand implications that result from different types of cannabis production facilities—such as outdoor, indoor and greenhouse—and the anticipated impacts these implications may have on the California market and utilities.

Introduction

Background

This research, conducted on the eve of legalization of recreational cannabis cultivation in California, looks outside of the state to understand what the new legislation will mean within California, and what impacts can be expected on the grid. By interviewing utility staff and industry stakeholders in states that legalized recreation cannabis cultivation before November of 2016,[1] this research can inform utilities in states that are new to legalization about what can be expected, and informs recommendations for the transition after legalization.

Colorado was the first state to legalize recreational cannabis cultivation in 2012. Since then, recreational cannabis cultivation has become legal in Washington, Oregon, Alaska, Washington D.C., Nevada, Maine, Massachusetts and California, with the last four states legalizing cultivation and use in November of 2016. Following legalization, states such as Colorado, Washington and Oregon began to experience an influx of new cannabis growers, many of which chose to grow in indoor and greenhouse growing facilities to minimize production cycles, provide increased control and security during cultivation, and potentially maximize profits. Indoor facilities consume significant amounts of energy—

[1] Oregon, Washington, Colorado, Alaska and Washington D.C.

up to five times more than normal commercial facilities—primarily due to energy-intensive fluorescent, metal-halide and high-pressure sodium lamps that run between 18 to 24 hours a day. The high-energy usage of these facilities strains both utilities as they attempt to handle the increased energy demand, and growers, which have high operating costs.

The majority of the utility staff that participated in this research (representing seven of nine utilities serving areas with legalized recreational cannabis) said they have already observed an increase in energy usage within their service territories that they attribute to new cannabis growing operations, most notably load growth within the commercial sector due to indoor cannabis production. While one rural Washington utility has implemented a cannabis-specific rate to assist cannabis producers, the majority of utility staff interviewed reported that they currently remain "agnostic"—neither advocating for nor against—towards cannabis producers and offer limited applicable commercial incentives such as LED rebates. This research explores the ways utilities are currently interacting with this industry and their plans to do so in the future, and seeks to understand grower preferences that may be barriers to utility energy efficiency program participation.

This research explores multiple questions regarding energy use in the cannabis industry and the potential for integrating more energy efficient practices. Research questions were categorized based on their focus on impacts of legislative change, industry preferences, and intervention strategies.

Impacts of Legislative Change

- What kinds of impacts have utilities and trade organizations seen/observed/measured in terms of an increase in energy use due to cannabis legalization?
- What kinds of energy end uses are utilized for cannabis growing?
- How long after legalizing cannabis growing have utilities and trade organizations observed the impacts of increased energy usage?

Industry Preferences

- What experience do cannabis trade organizations have operating in California and what expectations are there for the California growing market when cannabis is legalized?
- What are the preferred growing conditions, including time of year, type of equipment and location for cannabis growing? Are there different growing models for different types of growing structures and buildings (e.g. greenhouses, other)?
- What is considered "indoor growing" and is cannabis grown indoors for any particular reason?

Intervention Strategies

- Are there any experimental "cannabis rates" which have been piloted or implemented in other states?
- What have been the primary intervention strategies deployed to address energy usage or other impacts and how successful have the efforts been to date? What intervention strategies have been deployed by those utilities that have been impacted by cannabis industry growth?
- What is the potential for energy efficiency upgrades in the cannabis growing industry and how do cannabis growers choose their equipment?

Methodology

Research for this study, conducted in June of 2016, included an extensive literature review of previous cannabis research – including research focused on cultivation techniques and energy

consumption – and recent publications on the recreational cannabis market. Additionally, the research included in-depth interviews with cannabis trade organizations and both large and small utilities operating in three of the states where cannabis production had been legalized prior to the November 2016 election (Washington, Oregon and Colorado).

In-Depth Interviews: We completed nine in-depth interviews with one or more staff members at electric utilities across Colorado, Washington and Oregon. Given the varying levels of interaction with the cannabis market among utilities in the Northwest, utility interviewees had differing backgrounds and responsibilities, ranging from account managers to engineering consultants. As shown in Table 1, the utility survey respondents covered a wide range of service territories including high-density metropolitan areas and rural Northwest communities.

Table 1. Utility survey respondents overview[2]

State	Utility	Service territory
WA	Mason County Public Utility District (PUD) #3	Northwest Washington; greater Olympia area
WA	Okanogan County PUD	Northern Washington
WA	Clallam County PUD	Northwest Washington
WA	Clark County PUD	Southern Washington; Vancouver
WA	Big Bend Electric Cooperative	Eastern Washington; Columbia Basin area
OR	Northern Wasco County PUD	North Oregon, greater Vancouver, WA area
OR	Eugene Water & Electric Board	Greater Eugene area
OR	Emerald PUD	Greater Eugene area
CO	Xcel Energy	Denver; Colorado

We also completed six in-depth interviews with representatives from trade organizations. As shown in Table 2 below, the trade organization interview respondents had a wide variety of involvement in the cannabis industry, ranging from cannabis-specific advisors to national property developers.

Table 2. Trade Organization interview respondents

State	Trade organization	Description
Colorado; National	iComply	Client services provider designed to specifically help cannabis operations build infrastructure and legitimize operations through compliance training and protocol design
National	Kalyx Development	Privately held leasing company that specializes in cannabis properties
California	LifeStyle Solar Inc.	Solar system provider for residential and commercial customers in California
Oregon	Oregon SunGrown Growers Guild	Largest membership driven non-profit advocacy group for growers in Oregon, including cannabis cultivation consulting
Oregon	Energy Trust of Oregon	Independent nonprofit organization dedicated to providing utility customers with low-cost, clean energy solutions
Oregon	Resource Innovation Institute	Nonprofit organization comprised of utilities, growers and technology experts aiming to provide "certification standards, technology reviews and a platform for best practices on resource conservation in the cannabis industry"

[2] Big Bend Electric Cooperative provided responses via email.

Literature Review: As part of the literature review, we reviewed dozens of articles and reports on the cannabis industry and the energy implications of recreational legalization. Overall, the intent of the literature review was to supplement the first-hand information gained through the utility and trade organization interviews with more general findings from previous research, focusing specifically on areas such as growing techniques and grower preferences that utility and trade organizations were less familiar with. Given the immaturity of the legalized cannabis market, we found a limited amount of in-depth research specific to the energy usage associated with cannabis cultivation, relying heavily on research conducted in the Northwest and California by the Northwest Power and Conservation Council, E Source, and Lawrence Berkeley National Laboratory (LBNL), and various news publications. Key findings from the literature review focused on:

- Growing techniques and preferences;
- Energy usage in growing operations;
- Utility intervention strategies;
- Broad community impacts; and
- Potential energy implications for California.

Findings

Growing Techniques and Preferences

Growers choose to cultivate cannabis in various settings based on different needs including desired production time, energy costs and available space. For this research, we focused primarily on the implications for energy usage associated with indoor, outdoor and greenhouse settings, and aimed to understand the trade-offs growers must consider in choosing their facility type. The regional climate is one of the primary factors in choosing facility type, as the ideal temperature for cannabis production is between 75 and 86 degrees Fahrenheit with 12 to 24 hours of lighting a day depending on the stage of the growth cycle. A colder climate may require indoor growing, while a more temperate climate (such as in parts of California) may make outdoor or greenhouse growing a more realistic option. A 2014 report notes that 90 percent of cannabis production in California occurs outdoors (Jourabchi and Lehet 2014), which is higher than the percentage of cannabis grown outdoors in Oregon. While differences in climate certainly play a role in this discrepancy, it is also largely a result of growers operating in an illegal and unregulated market where traditional indoor space may not be readily available.

Among the various growing options, indoor growing requires the most energy due to lighting, cooling and ventilation needs. Additionally, some facilities require water-management equipment and CO_2 injection equipment to help feed the plants (Podorson 2015). High-intensity lighting in indoor facilities is used to improve the number of production cycles that can be completed annually, but results in high energy costs. For lighting, indoor cultivation facilities generally include a variety of tubular fluorescent lamps, metal halide lamps and high-pressure sodium lamps depending on the stage of the cannabis plant. Given the amount of heat generated by the extensive use of artificial lighting, large indoor cultivation facilities generally use rooftop air conditioners (RTUs), while others rely on either mini-split heat pumps or even window air conditioning units. Additionally, to address the water vapor produced by the cannabis plants, indoor facilities also require dehumidifiers and venting equipment (Podorson 2015).

Greenhouse growers use less energy by supplementing daytime lighting needs with natural light, but still need additional lighting in the mornings and evenings in addition to venting and air conditioning. Some greenhouses have the capability to add shades to alter the pace of the production cycle. Outdoor and greenhouse growing conditions are more variable and produce less predictable yields.

When growers are selecting facility options, indoor growing facilities are considered because they help reduce the production cycle time, standardize ideal conditions with regards to temperature, irrigation and lighting and are viewed as being more secure (Jourabchi and Lehet 2014). Instead of having to adhere to natural production cycles that last between 20 and 26 weeks (consisting of planting seedlings in the spring, with the vegetative stage beginning in early spring and summer and the flowering stage in mid to late summer), indoor cultivation facilities allow for year-round production with production cycles of between 14 and 18 weeks (Jourabchi and Lehet 2014).

Energy Usage in Indoor Facilities

Commercial indoor cultivation facilities currently consume a significant amount of electricity. The largest portions of energy consumption from indoor cannabis production are lighting (38%), ventilation (30%) and air conditioning (21%). These measures, especially the lighting equipment, are generally very usage-intensive (about 360 kWh per 25 square feet) (Walton 2015). In addition to being the largest source of energy consumption individually, the grow lighting also has a significant influence on the ventilation and air conditioning requirements because of the large amount of heat the lights give off during the grow cycle.

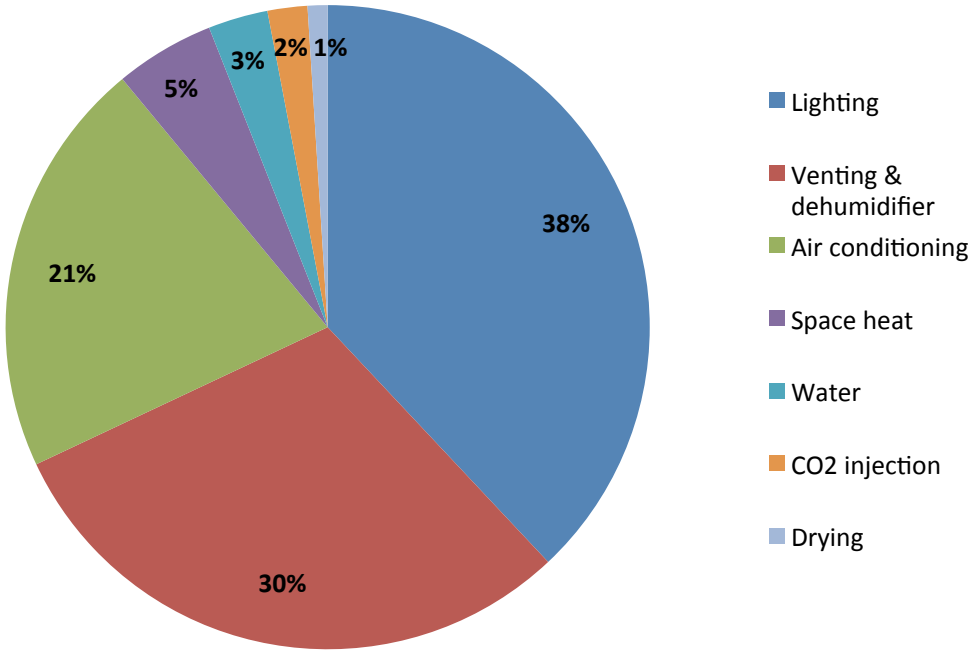

Figure 1. Cannabis growing energy consumption by end use. *Source:* Jourabchi and Lehet 2014.

Overall, electricity usage accounts for between 20 and 50 percent of the total cost of a cannabis cultivation facility depending on the scale of the cannabis production (Sevcenko 2016; Oldham 2015). Energy usage is especially high during the seedling and vegetative stages of the cultivation cycle, when growers commonly have tubular fluorescent lighting on 24 hours a day for the first two to four weeks followed by metal halide lamps of between 400 and 1,000 watts on for 18 hours a day for three to five weeks (Podorson 2015). Furthermore, a survey conducted among Washington cannabis growers found

that growers typically have separate rooms for plants in the seedling and vegetative stages versus the flowering stages. According to the Washington survey results, a 1,000 watt metal halide lamp typically serves two to eight cannabis plants in the early stages of production, while a 1,000 watt high pressure sodium lamp typically serves two to three plants in the flowering stage of growth (NPCC 2014). The intensive lighting installations are specifically made for horticulture, providing the necessary heating and nutrients for the cannabis plants to grow quickly and yield the most amount of product. In addition to the lighting requirements, each typical room also includes separate HVAC equipment with the equivalent of a mini-split heat pump for every 1,000 square feet of space, along with a larger central rooftop air conditioner (Jourabchi and Lehet 2014).

Grid Level Effects of Energy Usage in Growing Operations

Results from the literature review revealed a number of estimates regarding the growth of commercial cannabis-production facilities, and the subsequent increase in demand on the grid. In 2012, the Lawrence Berkeley National Laboratory (LBNL) reported that legal indoor cannabis facilities already accounted for approximately 1 percent of national energy usage (Mills 2012). Participating utilities expressed similar results as seven out of nine utility respondents said they had observed at least some impacts on energy usage in their service territories since the legalization of cannabis.

The majority of the utility interviewees noted they have seen an observable load growth in the commercial sector and attribute this growth to cannabis production facilities, the most impactful of which range from 0.5 to 6 MWs of usage per facility. They also noted that for the majority of cannabis operations, especially indoor growers, the load shape is relatively flat, as some lighting is constantly on throughout the day based on either a 12 hour on/12 hour off or an 18 hour on/6 hour off daily cycle. However, two participating growers said the load shape differed between indoor and greenhouse growers given that indoor operations typically use their lighting 18 to 24 hours a day while greenhouse operations generally need to supplement natural lighting only in the early mornings and late evenings and colder winter months—when daylight is not readily available—with artificial lighting.

In Colorado, the most mature legalized cannabis market, research conducted by Bloomberg estimated that in 2014, more than 1,200 licensed grow facilities accounted for "almost half of new demand for power" in Colorado in 2014, and consumed as much power as 35,000 households (Oldham 2015). The participating Colorado interviewee also added they have observed a total load growth of between 0.5 and 1 percent since 2013, consistent with the estimates reported in the literature review.

Within the Northwest, an additional study conducted in 2014 by the Northwest Power and Conservation Council estimated the energy demand for cannabis production across Washington, Oregon, Montana and Idaho to be approximately 112 average megawatts (MWa) in 2014 and could potentially increase to over 237 average MWa by 2035 (Jourabchi and Lehet 2014). Two Washington utilities said they have seen 40 to 50 percent growth in the energy usage within the cannabis production sector in the last year alone, while forecasts from Seattle City & Light estimated a 3 percent increase in demand on their overall system as a result of legal cannabis operations (Walton 2015). As shown in Figure 2 below, one rural county PUD in Washington saw an even more dramatic increase in demand from cannabis producers, from less than 100 kW in 2014 to nearly 1,000 kW in 2016.

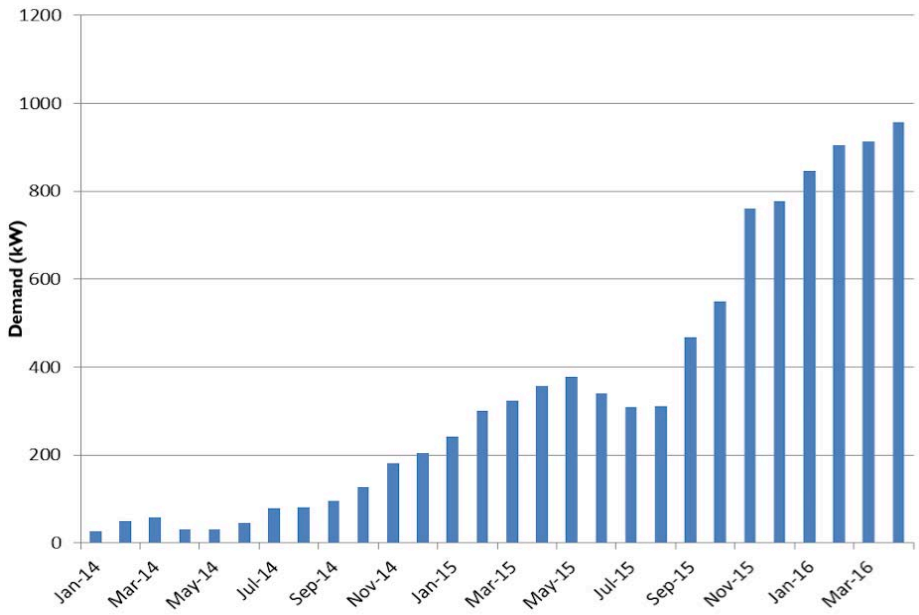

Figure 2. Demand growth from cannabis growers: a rural county in Washington

As a result of the high energy demand of cannabis cultivation facilities, utility companies have observed an increased number of power outages as a result of cannabis production. For example, Pacific Power in Portland, Oregon reported at least seven power outages during the summer of 2015 due to cannabis production, as cultivators overtaxed the local grid and existing transformer capacities (Bade 2015). In addition to increases in demand, three utility interviewees in the Northwest also reported seeing an increase in requests for 1,000 kWh and 1,500 kWh transformers as facilities prepare to increase their production.

Solar Opportunities to Offset High Demand

Trade organizations across Colorado, Oregon and California all discussed the possibilities of solar options in cannabis production facilities. In Boulder County, Colorado, the compliance advisor noted that growers are required by the county to use some percentage of green energy, either through green energy credits or by installing solar. Growers that do not comply are subject to an additional tax of approximately two cents per kWh (Walton 2014).[3] In Oregon, the certification group added that some of the largest Oregon cannabis producers are investing in solar (and LEDs), which helps to offset their total energy demand. One trade organization interviewee suggested that growers could look into micro-grid solutions with no utility usage, relying on solar, wind and storage to power the production facility.

The California solar provider added that the payback period for solar in cannabis production facilities is longer compared with other commercial solar applications, due to the need for grow facilities to use electricity for supplemental lighting. As a result, the solar provider noted that only between 10 and 15 percent of the cannabis producers they discuss solar strategies with end up installing solar options. The participating solar provider added that they see battery storage as an important next step to supporting solar usage in this industry.

[3] In accordance with the Boulder County Energy Impact Offset Fund.

Existing Views from Growers on Energy Efficient Equipment

There is information to indicate that some growers are willing to consider more energy efficient products in their indoor facilities. According to the founder of the regional certification group interviewed by Evergreen, there are some large indoor cannabis producers currently using LED lights, especially as new technologies are introduced in the market that are specifically designed for horticulture and that may minimize the product quality concerns observed with previous generations of LEDs. The Oregon energy efficiency advocate, the California solar provider and the Colorado advisor all said that indoor growers are choosing T5 fluorescents over LEDs and other technologies because they produce the greatest product yield and can be more energy efficient than T8 or other high-intensity lighting equipment. Similar to the utilities, trade organizations are wary of LED adoption in the cannabis market, primarily because current LED options are seen as less productive to growers – given their perceptions that the lighting is less intense, does not contain the ideal lighting spectrum and will slow the production cycle – and are more expensive than other lighting, according to the efficiency advocate.

Utility Intervention Strategies

Currently, seven out of nine utilities said they are taking at least some steps to track the energy impacts directly related to cannabis production, such as continually observing facility energy demand. Two Washington utilities said they utilize a statewide database kept by state officials to identify cannabis growers in their service territories.

Because utilities are still familiarizing themselves with the cannabis market, eight out of nine utilities said they currently have cannabis producers on a general service rate, similar to any other type of non-residential customer. One Washington public utility does currently have a special cannabis rate for customers, which includes a slightly higher usage rate per kWh with a lower demand charge compared to general service customers. The uncertainty about federal restrictions is the main barrier that interviewees expressed to introducing cannabis rates. While two other utilities expressed interest in proposed cannabis rates going forward, several Oregon and Washington utilities expressed concern in "singling out" certain customers, specifically cannabis customers that may be subjected to federal restrictions going forward. As one Oregon utility noted:

> *"[Cannabis rates] haven't really taken shape yet. Research has led us to think that there are opportunities for rate schedules out there in the U.S. for cannabis, and it's come up before but not a lot of traction so far. From our perspective it's tough to single out customers [by] end use and then apply specific rates to them…We actually shy away from it because the thought process is that if federal law does change, we don't want to have direct line to where customers are at."*

Utility interviewees also reported that there are no additional measure incentives (not already offered through commercial and residential programs) given to cannabis growers. However, over half of the interviewed utilities said they have completed LED rebate projects for cannabis producers in their service territory through their general commercial incentive programs. One Washington utility also has started to use metering data from its LED retrofit projects at cannabis growing facilities to examine the potential load shape for the industry moving forward. The Colorado utility interviewee also added that while it does not have any cannabis-specific rebate programs, producers are eligible for programs "if they can find an existing demand-side management program that meets their needs, are approved and demonstrated they've reduced consumption."

One of the primary barriers for utilities operating in the current cannabis landscape is the disconnect between federal regulations and legalization legislation passed at the state level. Specifically among the Oregon and Washington utilities Evergreen interviewed, two thirds (six of nine) mentioned

that they are wary of providing lighting or other incentives to cannabis customers because Bonneville Power Agency (BPA), a main supplier of power in the Northwest, is federally operated and will not fund any cannabis-related programs. As one Oregon utility acknowledged though, it remains somewhat of a grey area for certain utilities given the uncertainty as to how BPA will monitor and enforce the regulations:

> *"The BPA relationship is a barrier for sure. We take power from a federal wholesale provider and they have basically said that no money can go to cannabis activities that can be tied back to them. There's some grey area there in terms of where power is actually flowing to though so we've taken a line where we are agnostic and don't care what's behind the meter, and that's how we have done things historically."*

Over half of the participating utilities, including all those that referenced their relationship with BPA, echoed the sentiment of remaining "agnostic" when it came to cannabis customers, emphasizing that their public responsibility is simply to provide power to customers in their service territory. Additionally, two utilities (one in Washington and one in Oregon) mentioned that some utilities might be hesitant to be proactively involved in the cannabis market if they receive federal power, because the increased demand could move them into higher Tier 2 rates.[4]

Implications for California

In 2006, prior to recreational cannabis being legalized in some states, the federal government conducted a study that estimated that 42 percent of all cannabis produced in the United States as part of the medical marijuana market was produced in California (Jourabchi and Lehet 2014). Even in 2016, as recreational cannabis production has become established in states such as Washington and Colorado, the California medical production market remains the largest cannabis market in the United States, accounting for 9 percent of household electricity usage (Oldham 2015).

With nearly 40 million residents in California, the potential recreational cannabis market would be more than double the size of the market in Colorado, Washington, Oregon and Alaska combined. While Proposition 64 in California resembles the legalization measures passed in other states, some of the specific provisions for the 2016 measure include:

- A 15 percent sales tax;
- A $9.25 per ounce tax on flowers;
- A $2.75 per ounce tax on leaves; and
- Provisions to restrict licenses for corporate or large-scale cannabis cultivation businesses until 2021.

According to research conducted by ArcView Market Research and New Frontier conducted in 2015, the Washington, Colorado, Oregon, Alaska and Washington D.C. markets alone could generate up to $5.5 billion in combined annual sales by 2020 (ArcView and New Frontier 2016). With California having the potential to generate up to twice that amount, potential sales tax revenue alone could be close to $1 billion by 2020 if not sooner.

[4] Beginning in 2012, BPA adopted a tiered rate schedule that offers utilities two price levels when purchasing power supply. Initially, utilities lock in a specific amount of power they wish to purchase from the existing federal system at a cost-based rate (Tier 1). Subsequently, Tier 2 rates are applied for any additional energy a utility obtains from BPA over the course of their contractual agreement. Currently, Tier 2 rates ($/MWh) are approximately 4 percent higher than Tier 1 rates.

Conclusions

Based on the results of the literature review and in-depth interviews with cannabis market actors and utilities, we identified the following key conclusions:

- Lighting is the biggest source of energy use (38% of total energy consumption), followed by venting and dehumidification (30%), air conditioning (21%), heating (5%), water (3%), CO_2 injection (2%) and drying (1%) (Jourabchi and Lehet 2014).
- There are many benefits associated with indoor growing, such as shorter growth cycles, more control over lighting and temperature and predictable output.
- In exchange for better control over product attributes relative to other production methods, indoor growers have the added energy usage and operating expenses of running lighting, venting and dehumidification, air conditioning, heating, water, CO_2 injection and drying. It is well known that lighting in indoor and greenhouse facilities is responsible for a large proportion of total operating costs.
- It is unclear exactly what type of growth facilities (indoor, outdoor or greenhouse) will occur throughout California, but before legalization, California was more likely than other states to have outdoor growing, and we know from past research that greenhouses make up a significant portion of agricultural sales in Southern California (Evergreen Economics 2015).
- Greenhouses offer a middle ground between the greater environmental control of indoor grow operations and the lower energy demand of outdoor operations. They allow growers to utilize natural lighting in the daytime, but require supplemental lighting during the winter and in the early mornings and evenings, resulting in a less predictable load shape.
- Participating cannabis trade organizations suggested that many of the current growers in states where cannabis production is legal came from either non-agricultural industries or had past cannabis growing experience. This may have implications for energy efficiency awareness among growers, as growers that have grown cannabis in the past may be less open to energy efficient technologies due to their current strategies for producing high yields in a shorter time frame compared to those newer to the industry that may be more open to learning about new energy efficient growing practices.
- While some cannabis growers have chosen to install LEDs, there remains a preference for T5s due to the impression among growers that the cannabis yield with LEDs is lower (although this is not a universal belief), that LEDs are bulky and because the upfront cost of LEDs is prohibitory, especially given all the other startup costs associated with building a new indoor grow facility. Some growers in other states have utilized solar to offset their energy intensive growing practices.
- Currently, the primary utility intervention strategy consists of offering existing commercial lighting rebate opportunities to cannabis growers; however, there may be an opportunity for expanded rebates on air conditioning systems, controls and conversion to drip irrigation. Some utilities hesitate to engage with commercial growers because they do not want to encourage growth in an energy-intensive market and have concerns about differences in federal, state and local laws.

Recommendations

Given the industry findings from states that have experienced the growth of the cannabis market after legalization, we offer the following recommendations regarding energy efficiency opportunities for utilities:

- **Focus on infrastructure and accommodation as an initial strategy.** While utilities and trade organizations report that efficiency will play a big role in the California cannabis market, the initial focus should revolve around ensuring that utilities have the general resources to accommodate the rapid growth of cannabis producers. This includes ensuring that utilities have the engineering partners, line crews and other field employees in place to accommodate cannabis growers looking to enter the market very soon after legalization.
- **Engage with cannabis producers and trade allies** as soon as possible **in order to influence purchase decisions for new facilities.** Smaller scale growers are more likely to purchase lighting from box stores, whereas established growers rely on traditional horticultural and cannabis grow shops.
- **Customize program literature to the needs of this specific industry,** as growers will likely come from other industries or from cannabis-specific operations.
- **When advising growers on energy efficient options, take into account local building codes as they relate to indoor cannabis operations.** In Portland, Oregon, for example, growers are finding that city code requires U-values that are too tight for cannabis production (but are generally more efficient overall). To offset insulation efficiency standards, growers are overcompensating with additional air conditioning, increasing their overall energy use. Utilities need to understand the local building codes and offer solutions if they wish to be considered a viable energy efficiency resource for growers.
- **Monitor local initiatives banning commercial growing that may make it more difficult to control load growth; such bans may lead to widespread residential growing.** A trade organization noted that Boulder County, Colorado placed a moratorium on recreational and commercial facilities at one point because of the community's concerns with the potential impacts of commercial growing operations. This caused recreational cannabis growing to increase dramatically, putting an energy strain on Boulder that was more difficult to monitor than the potential energy usage from licensed commercial facilities.
- **Monitor equipment choices as the local cannabis industry develops to gain an understanding of how the local growing conditions influence grower choices and energy usage after legalization.** Growing operations in warmer climates may require additional cooling needs for indoor facilities compared to the Northwest. The high water costs may influence growers to select more efficient watering options (such as drip irrigation). It will be important to balance observation with intervention as new facilities likely will not be ready to invest in more efficient equipment soon after purchasing new equipment for their operations.
- **Work with trade organizations to provide information and tools for growers to compare the energy usage and yield for indoor and greenhouse operations.** Greenhouses are able to utilize natural light during the day and thus minimize energy costs, while indoor facilities offer more control over the environment and are more costly to operate.
- **Consider encouraging integrated solutions that allow facilities to take advantage of wind and solar to help offset increased demand.** Multiple cannabis facilities in Washington and Oregon have started to explore solar options with integrated storage.
- **Create an internal policy for dealing with the differences in federal, state and local cannabis laws**. Some utilities expressed concern about knowing where production occurs in case of federal intervention; however, they acknowledged that it is important to monitor and serve cannabis cultivation customers because of their energy-demand requirements.

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