Cannabis Energy Overview and Recommendations

MA Department of Energy Resources
Energy and Environmental Affairs

2/23/18

The Cannabis Industry and Impact on Massachusetts Emissions

- Following the Global Warming Solutions Act (GWSA) Massachusetts must reduce emissions by 80% (below 1990 levels) by 2050
  - These emissions must account for all generation to cover electricity ***consumed*** by the Commonwealth
  - Therefore ***reducing the amount of energy use*** in the Commonwealth ***reduces our emissions***
- To meet the emissions targets, the Commonwealth must fully implement a suite of emission reduction policies in all energy sectors including electricity, transportation, and the building sector
  - In the most recent Clean Energy and Climate Plan (2020 CECP), All Cost Effective Energy Efficiency was the largest emission reduction strategy.
- The growth of a new industry, such as the cannabis industry, can have a significant impact on unpredicted energy consumption and meeting the GWSA targets.
  - Ensuring energy efficiency in the cannabis industry reduces energy consumption growth and limits new emissions attributed to the Commonwealth

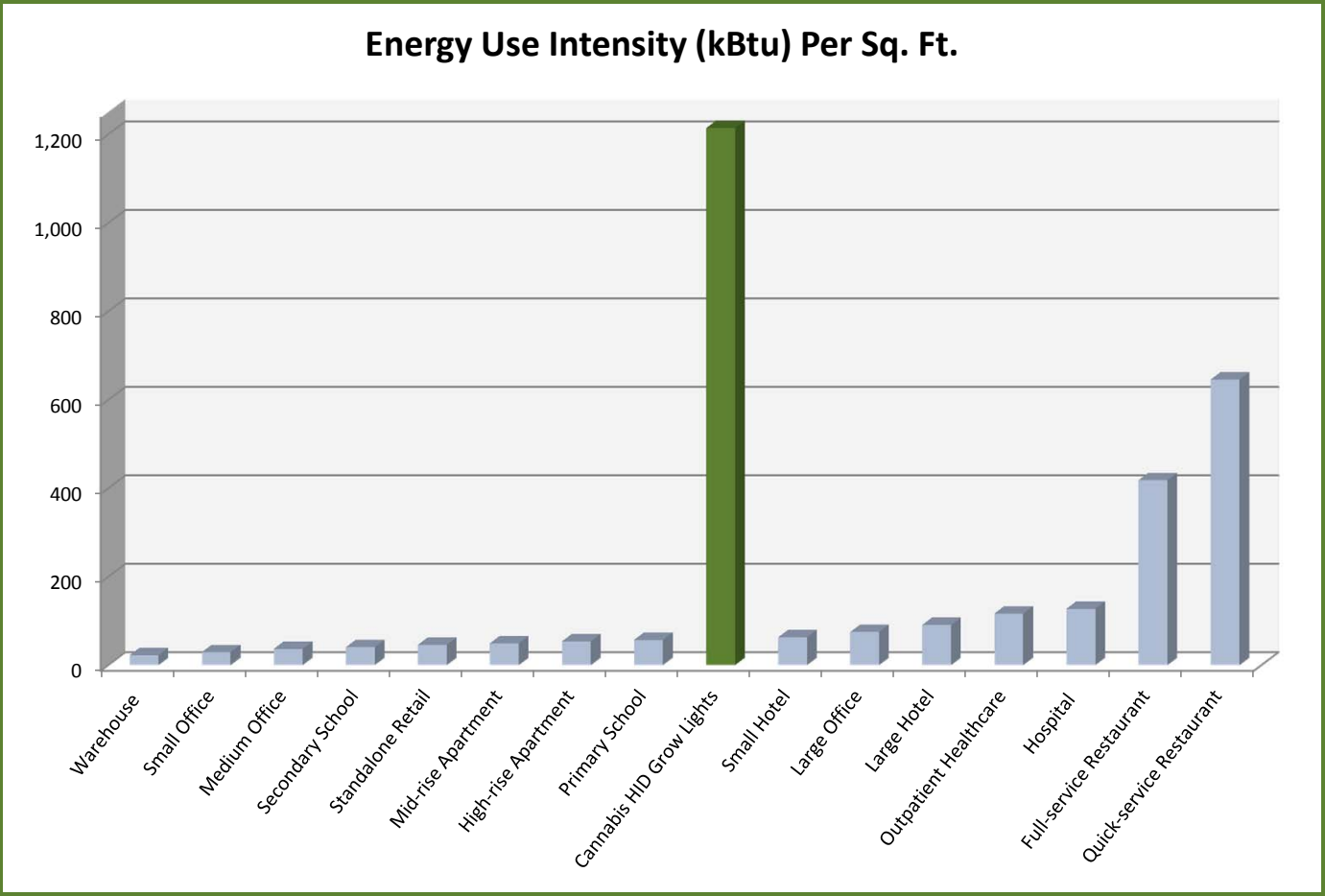
Cannabis Energy Usage in other states

- Other states with emerging recreational cannabis industries experienced increases in their electric usage in their first years of sales:
  - In 2014, Denver saw a 1.2% increase in electricity use; 45% of that came from cannabis[1]. Similar increases were also seen in Washington and Oregon
  - In 2015, Denver's 354 marijuana cultivation facilities used 200 million kWh.
  - Nearly 4% of Denver's electricity usage in now devoted to the marijuana industry.
- Grow operations require about 360 kWh per 25 sq. ft. of space by some estimates. That means a 1 million sq. ft. facility would require about 14.4 million kWh.
  - The wholesale cost of 14.4 million kWh in MA would be approximately $600,000/yr
- In 2018, producers are upgrading to energy-efficient lights, pumps and cooling systems to stay competitive in an environment with rapidly dropping wholesale prices

http://www.denverpost.com/2015/07/01/marijuana-growing-spikes-denver-electric-demand-challenges-clean-power-plan/
http://www.denverpost.com/2017/03/31/buzzkill-for-utilities-high-hopes-of-legal-weed-power-surge/
https://www.utilitydive.com/news/marijuana-grow-houses-boost-denver-power-demand-complicating-efficiency-pl/401751/

How Does the Energy Use of Indoor Cannabis Cultivation Compare to other industries?

- Energy Use Intensity (EUI) is a measure of how much energy a building uses per sq. ft.
- Most industries are well under 100 kBtu / sq. ft.
- The High Intensity grow lights (HIDs) in a marijuana cultivator facility are more intense than any other commercial or industrial use and it grows when all energy uses are considered (HVAC, dehumidification, et. al.)
- Other crops use LED grow lights with great success: carrots, potatoes, tomatoes and lettuce



https://www.prnewswire.com/news-releases/global-led-grow-lights-market-analysis--forecast--2016-to-2021-300539215.html

Energy Use – Indoor Growing

Lighting

Cooling

Dehumidification

Renewables

- Cannabis cultivation facilities should be thought of as industrial/manufacturing – they have high energy use and are very energy intensive

- Much of the high energy use is caused by the type of equipment being used and the lack of energy efficient facilities.

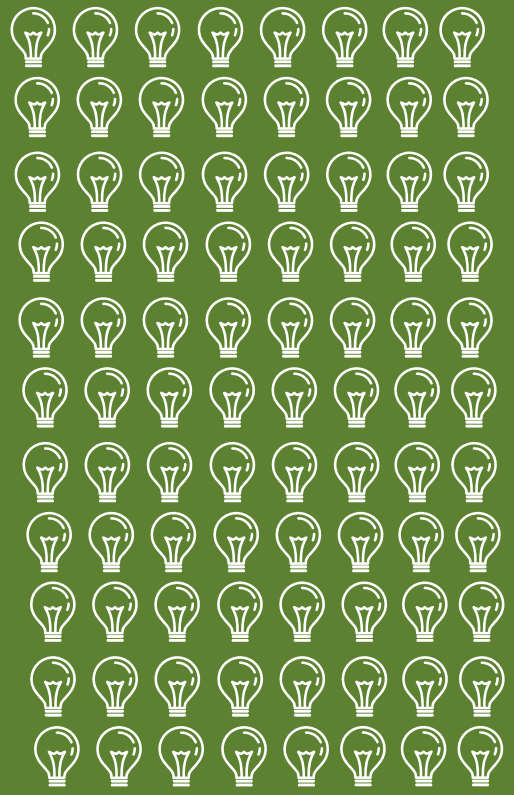
HID Lighting results in significant energy use

- High Intensity Discharge (HID) grow lights use 80x more energy than a 100w LED bulb (1050w vs 13w)
- HID lights are similar to 1970's streetlight technology.
- HID lights produce a significant amount of heat.
  - Cannabis cultivation facilities run AC all year to keep their plants at 65°-75° rather than 100°+.
- The energy consumption from the HID lights plus the consumption from the HVAC to combat the heat produced by the lights are top contributors to the energy concern of these facilities.

The energy used to power HID lights for an approximately 660,000 sq. ft. flowering grow space in MA could negate all LEDs installed in the DOER statewide LED streetlight replacement program. Over $11 million spent to convert over 130,000 streetlights

Intensity of a regular light

Intensity of a grow light



80 x

3 Stages of Cannabis Growth

Propagation

3-5 weeks
18-24 hours of light per day
Lower intensity light

Vegetative

2-8 weeks
18-24 hours of light per day
High intensity light
High cooling needs
Dehumidification needs

Flowering

6-8 weeks
12 hours of light per day
VERY high intensity light
Very high cooling needs
High dehumidification needs

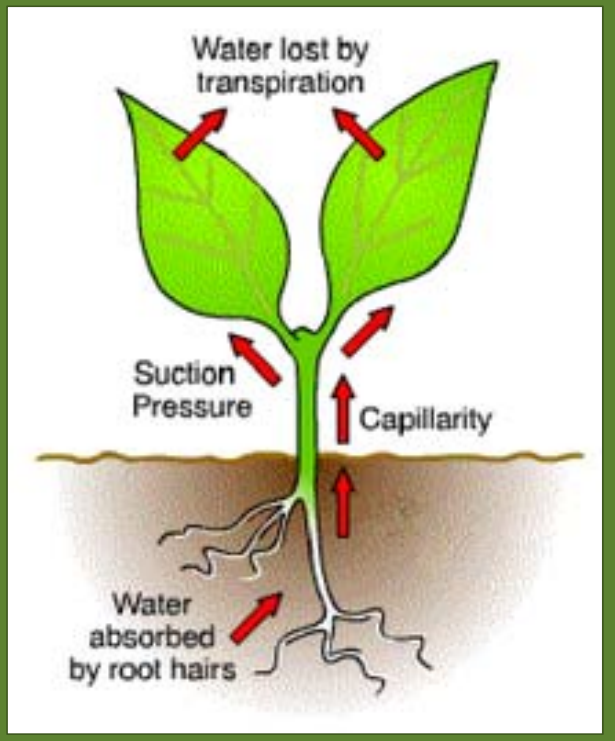
Cultivation of Marijuana Requires Significant Heating, Cooling, & Dehumidification

Heating & Cooling:

- Most growing facilities are re-using old buildings and are not being required to meet new construction building code.
- Most facilities tend to have leaky, under-insulated walls and ceilings which leads to HVAC systems being oversized or overrun.

Dehumidification:

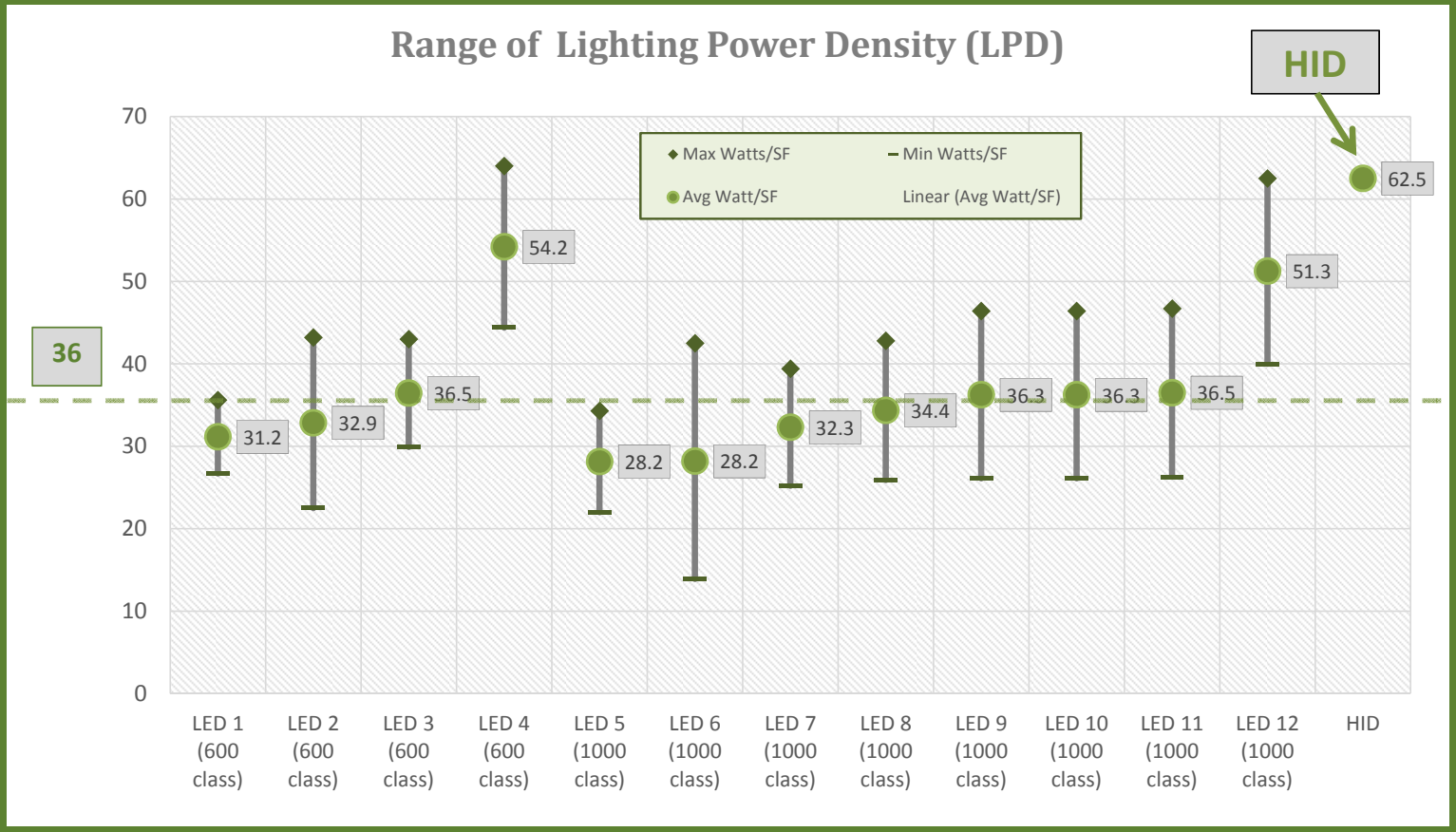
- Unlike Colorado, the MA climate has a high dew point, causing growers to need to use dehumidifiers which require a significant amount of energy.
- The water transpires from the plant and creates a humid indoor environment which can cause mold and other parasites that can ruin the crop.



What can Massachusetts do to limit a significant increase in electrical consumption?

Set Lighting Power Density Standards

LED Fixtures LPD Sold by MA Grow Suppliers

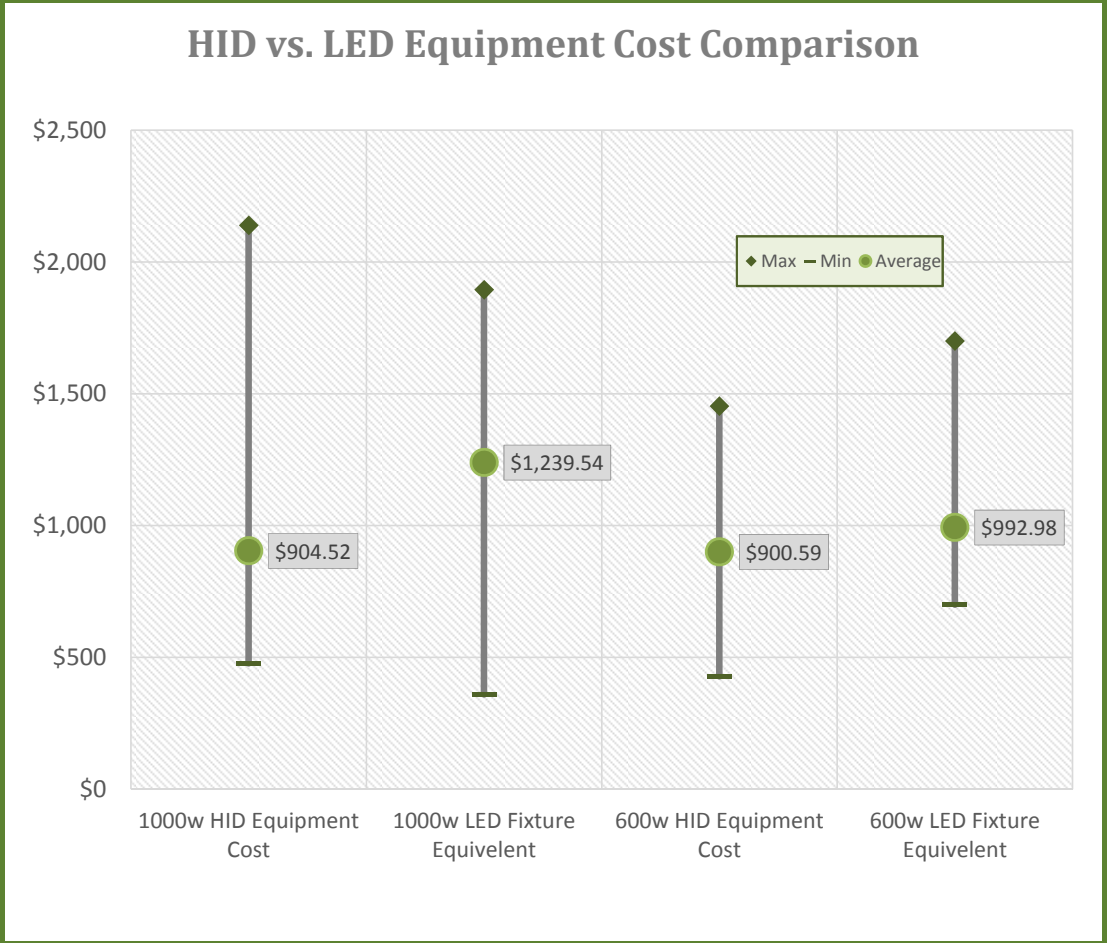


- Lighting Power Density (LPD) – 36 watts per sq. ft. recommended by EEA
- LEDs sold by MA grow supply houses operate at an average LPD of 36.5 w/sq. ft.

LED vs HID – No Significant Equipment Cost Difference

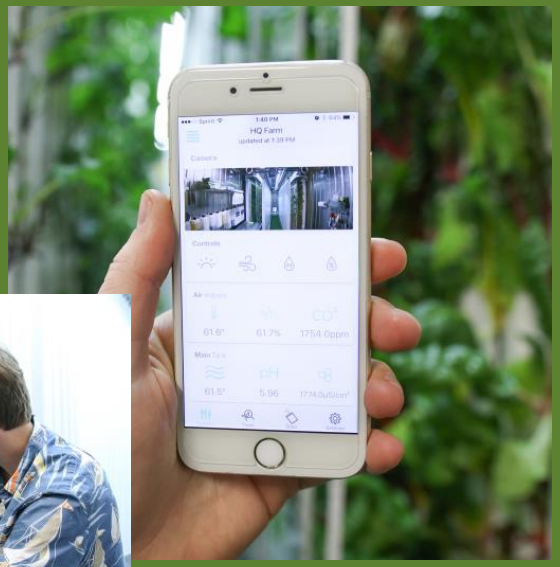
- LEDs are a single unit
- HIDs require ballast, reflector and new bulbs every 18 months.
  - An LED will last about 9 years, so this comparison includes the 6 HID bulbs that would be purchased over 9 years.
- 1000w equipment cost difference = $335.02
  - $3,200 reduction in lifetime energy spend per light by using LEDs+
  - Equipment + Electricity lifetime =
    - HID: $9,800
    - LED: $7,000 ($2,900 less)
- 600w equipment cost difference = $92.39
  - $2,300 reduction in lifetime energy spend per light by using LEDs+
  - Equipment + Electricity lifetime =
    - HID: $6,200
    - LED: $4,100 ($2,200 less)
- Looking at the overall facility, the efficient grow equipment payback ranges from 1-3 years with some large equipment at 5 years.

+Estimate based on 15 hours usage per day, 365 days a year @ $0.18/kWh



Today's Indoor Agriculture is using LEDs

- Freight Farms started in 2010 and is based in Boston. They have modular, LED lit, shipping containers that grow crops in urban settings.
- The technology to grow crops in an energy efficient manner exists currently and is part of an existing thriving industry.



https://www.freightfarms.com/media-kit/

Precedent for New Industries Entering MA

- MGL Ch. 23K Section 18 requires gaming facilities to follow “sustainable development principles” including:
  - LEED Gold Certification
  - Meeting or exceeding the stretch energy code requirements
  - Efforts to mitigate vehicle trips
  - Efforts to conserve water and manage storm water
  - Electrical and HVAC equipment and appliances will be EnergyStar labeled
  - Procuring or generating on-site 10% of annual electricity consumption from renewable sources
  - Developing an ongoing plan to monitor energy consumption and maintain and improve energy efficiency of buildings

Energy Regulations Recommendations for CCC

Energy Efficiency Standard

1. Building envelope must meet insulation (ASHRAE 90.1 2013, Table 5.5-5), air tightness, and air barrier thresholds per building code.

Equipment Standards

2. The Lighting Power Densities (LPD) for cultivation space must not exceed a maximum wattage of 36 watts per square foot of canopy as determined in guidelines issued by the Commission.
3. Heating Ventilation and Air Conditioning (HVAC) and dehumidification systems must be in compliance with Massachusetts Building Code requirements.
4. Safety protocols must be established and documented to protect workers and consumers (e.g., eye protection near operating grow light).
5. Requirements (b) and (c) shall not be required if an indoor marijuana cultivator is generating 100% or more of the onsite load from a renewable resource.
6. The Commission may determine through guidelines, in consultation with the working group established under section 78(b) of chapter 55 of the acts of 2017, reasonable exemptions or modifications of these standards, including but not limited to provisions for greenhouses and agricultural buildings.

Energy and Environmental Leader Recommendation

Energy and Environmental Leader: in the year preceding the date of application for a leader rating:

a) The licensee has met or exceeded its energy and environmental impact goals for its registration period; and

b) The licensee has consistently documented and complied with best management practices for energy use, waste disposal and environmental impact.;

c) The licensee has documented that renewable energy credits representing 100% of the licensee's energy usage have been retired; and

d) The licensee has labeled all their products as being produced using 100% renewable energy.