Electricity,
Carbon Dioxide Emissions,
Water & Pesticides

Electricity

Grow Science Basics

- Indoor & greenhouse cultivation of cannabis requires high intensity grow lights to mimic sunlight.
- A typical (not high efficient) 1,000 watt grow light produces 130,000 lumens.

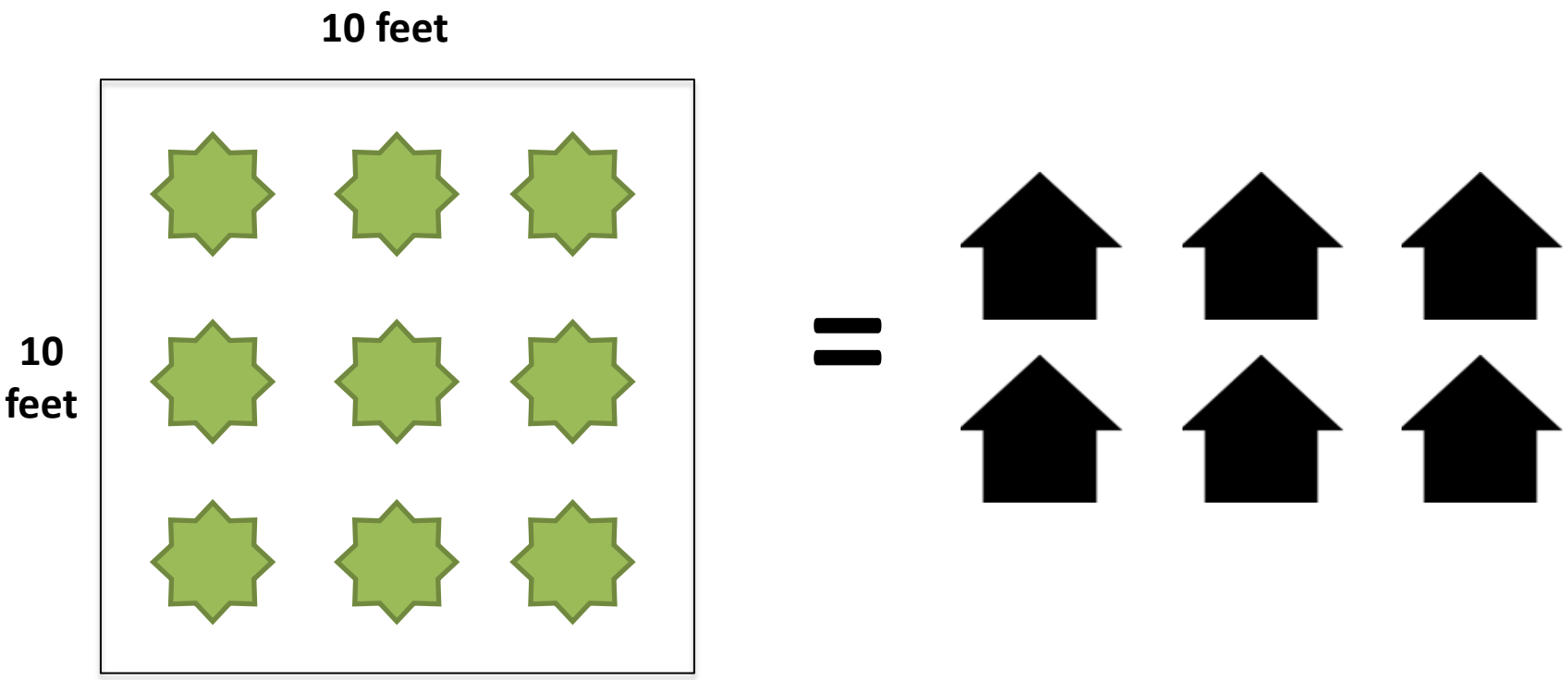
Watts the Issue?

- Most indoor growers use 1,000 W bulbs to achieve best results, e.g., high THC counts.
- Lights run between 12 - 20 hours per day, depending on growth cycle.
- Thus, one 1,000 W grow light uses an average of 16,000 W (16 kW) per day.
- A typical 10,000 sq. ft. grow site will use a minimum of 400 grow lights.

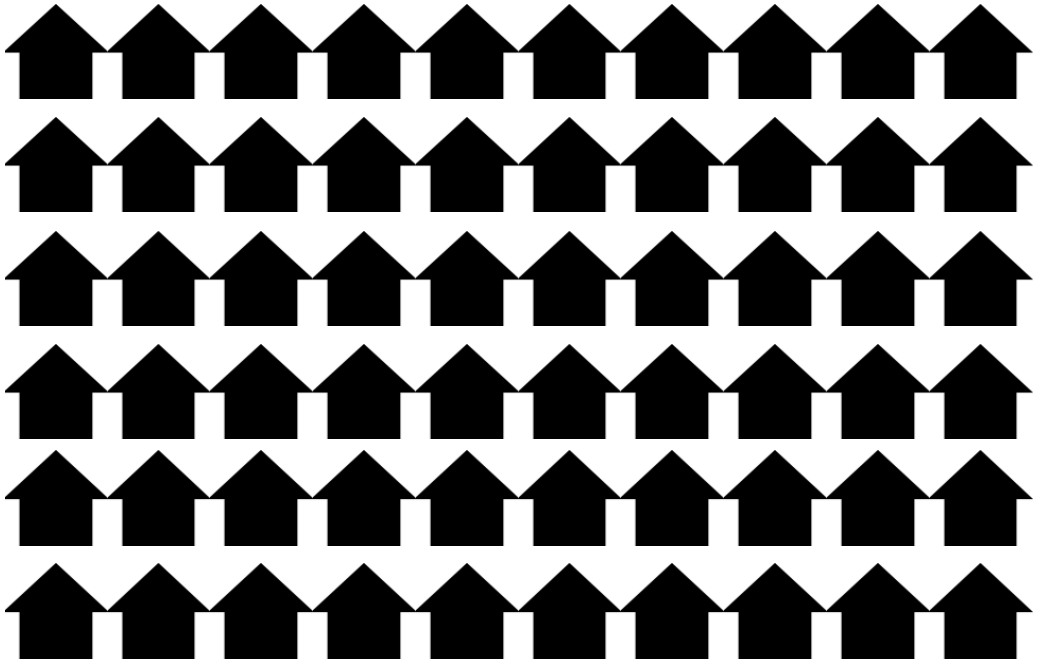
More than just lights

- Only 33 – 40% of total energy use from lighting
- Electricity also used for HVAC, ventilation, humidity control, water pumps, heated flooring, etc.
- Indoor grows require up to 30 hourly air exchanges per day (6 times the rate of high-tech laboratories)

Grow Site Examples

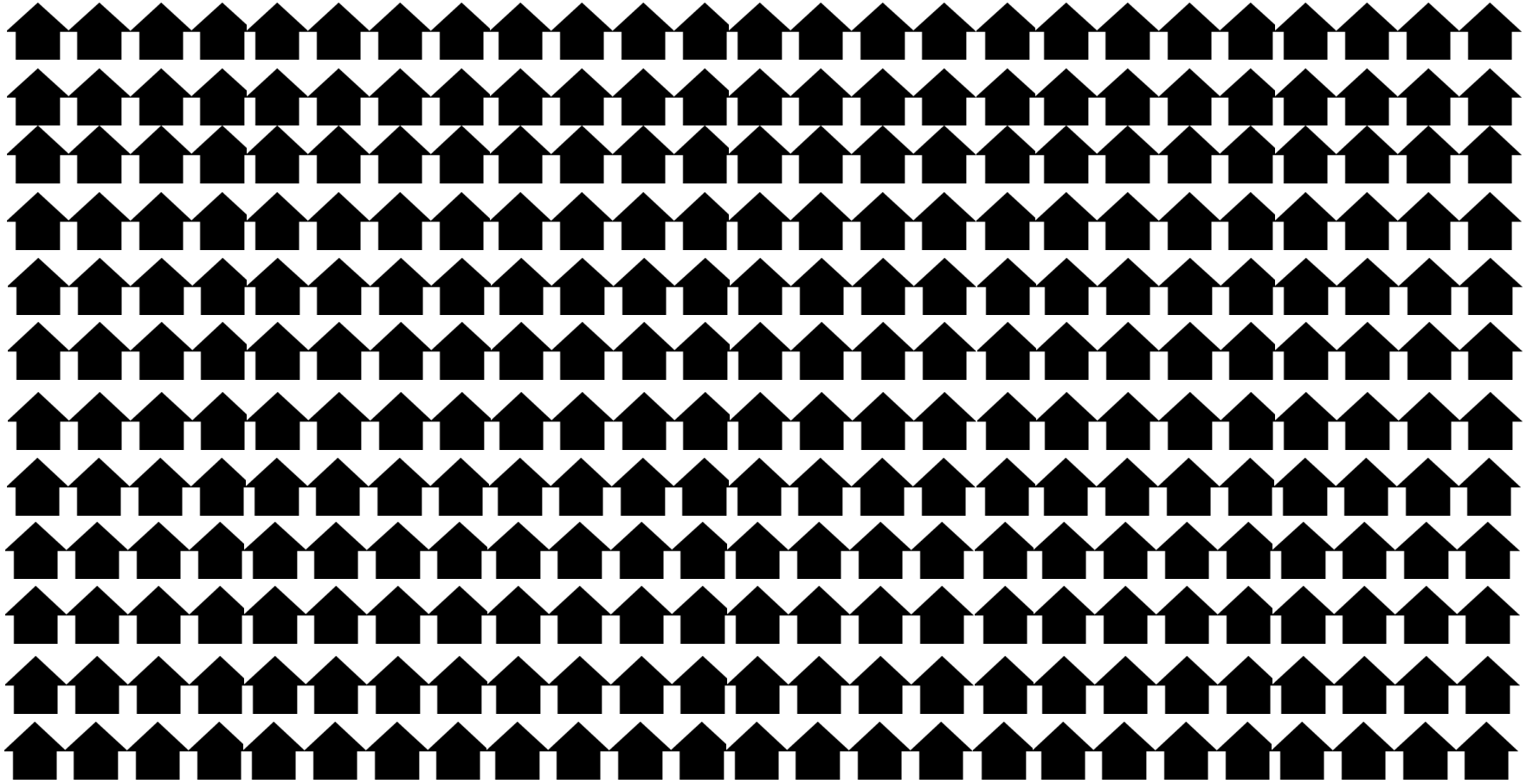


The electricity needed for a 100 sq. ft. indoor grow site would power six houses

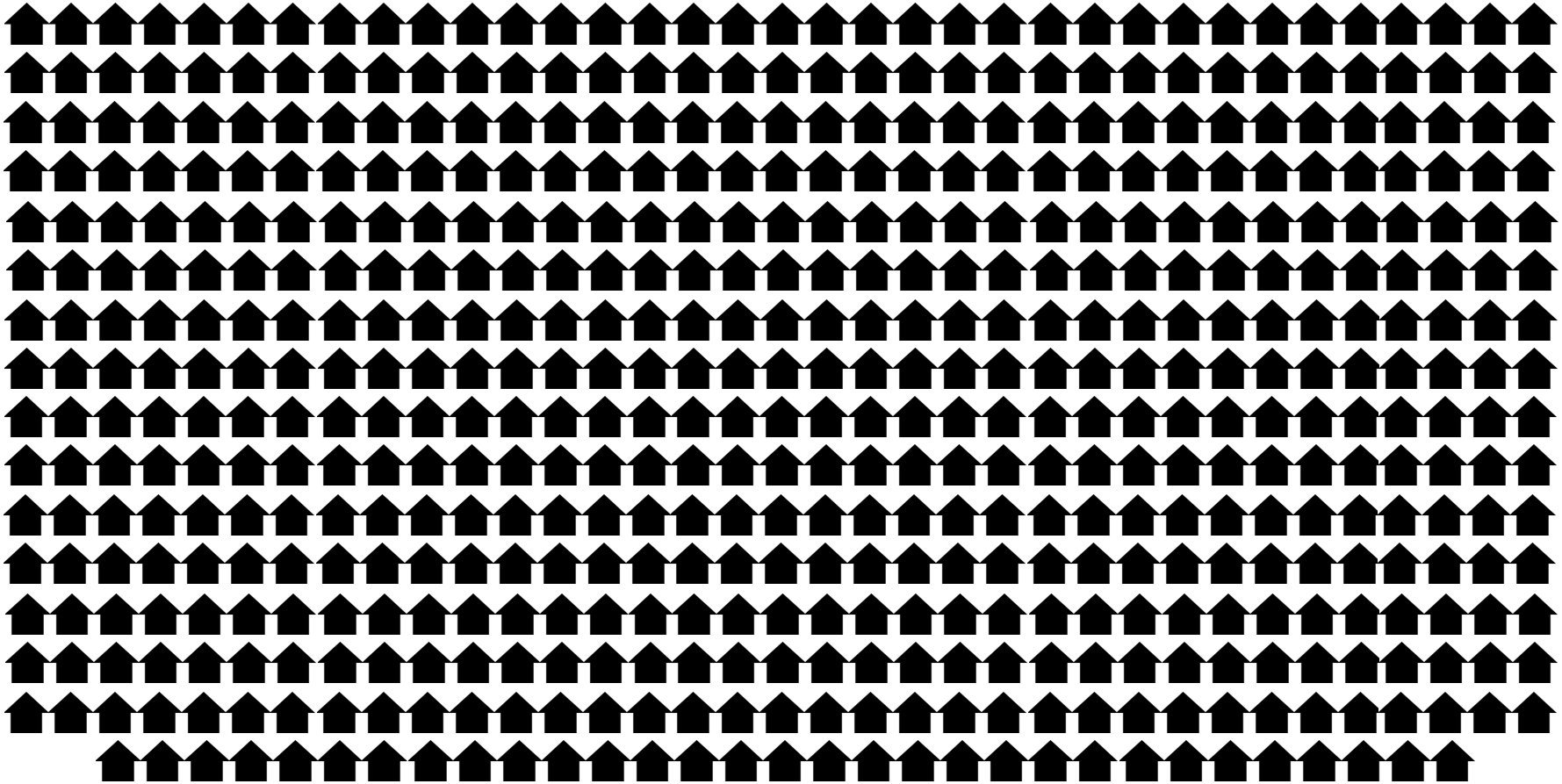


1,000 sq. ft. = 60 houses

(A grow site smaller than the size of this room)



5,000 sq. ft. = 300 houses



10,000 sq. ft. = 600 houses

(6,570,000 kW of electricity per year)

What if?

- There currently are 37,000 medical marijuana growers in Oregon
- If only 100 current medical growers each shift to 10,000 sq. ft. indoor grow operations…
- This scenario requires:
  - 657,000,000 kW of electric capacity added to grid
    - the equivalent of 60,000 new homes
  - A new 150 mW power plant

Carbon Dioxide Emissions

CO2 Emissions

- About 33% of the carbon footprint of indoor-grown marijuana is due to lighting
- About 45% is due to ventilation, dehumidifying equipment, and air conditioning

CO_2 Emissions Stats

- 1 pound of cannabis grown indoors = 3000 pounds of CO_2
- 10,000 sq. ft. grow site can produce 10,000 pounds of cannabis annually
- 10,000 pounds cannabis = 30 million pounds CO_2
  - Annual use of 2,870 cars
  - 2.2 tons of coal

Regulatory Conundrum

- Local governments throughout CO, WA, and CA are reacting to energy demand and carbon emissions with piecemeal regulations.
- Potential for BPA's Tier 2 Energy Rates to kick in causing all ratepayers in a municipality to *pay more*

Taxing Electricity Use

- The City of Arcata, CA to meet the city's greenhouse gas goals – levied a tax rate of 45% on homes that exceeded usage six times that a baseline level of electricity.
- Humboldt Co., CA is also proposing a similar tax.
- Boulder Co., Colorado has passed a 2.16 cent surplus tax on all non-renewable energy use.

Requiring Renewable Energy

- Colorado –Boulder County requires 100% of energy for indoor grow operations to be purchased from renewable sources by 2016.
  - Estimated to increase grow cost by 20-22%
- Fort Bragg and Berkeley, CA have recently passed ordinances requiring renewable energy for indoor cannabis grows.

Rebates

- WA – utilities are offering rebate programs to incentivize higher efficiency lighting
- CO - is offering rebate programs encouraging growers to replace their older lighting equipment
  - "We're trying to get growers to use efficient lighting off the bat so we don't take as much of a hit to our system," Xcel spokesman
- Rebates only available for investor-owned utility customers

Water & Pesticides

Water

- Estimated water use for each marijuana plant is 6-15 gallons/day

Pesticides

- Pesticide use on cannabis is considered “off-label” and is not legal federally
- As much as 70% of pesticide residues can remain in smoked marijuana
  - WA allowing use of specific list of pesticides
  - CO no regulation. Must label product “has not been tested for contaminants.”

Takeaway:

1 cannabis plant grown indoors =
10 kW electricity per day

Conclusion

Two options:

- Conserve energy
- Build new power plants

Works used

Electricity & Environment

Environmental Protection Agency. Clean Energy: Calculations and references. http://www.epa.gov/cleanenergy/energy-resources/refs.html

Mills, Evans, (2011). The carbon footprint of indoor *Cannabis* production. http://evan-mills.com/energy-associates/Indoor.html

O'Hare, M., Sanchez, D., Alstone, P. (2013). Environmental risks and opportunities in Cannabis cultivation. http://lcb.wa.gov/publications/Marijuana/SEPA/BOTEC_Whitepaper_Final.pdf

OMMP Statistical Snapshot, April 1, 2015. https://public.health.oregon.gov/DiseasesConditions/ChronicDisease/MedicalMarijuanaProgram/Documents/ed-materials/ommp-stats-snapshot-4-2015.pdf

Warren, Gina (2015). Regulating pot to save the polar bear: Energy and climate impacts of the marijuana industry. 40 Columbia Journal of Environmental Law _(2015).

Pesticide

Pesticide Use in Marijuana Production: Safety issues and sustainable options http://www.beyondpesticides.org/watchdog/documents/PesticideUseCannabisProduction.pdf

Energy up in Smoke: The Carbon Footprint of Indoor *Cannabis* Production. http://evan-mills.com/energy-associates/Indoor.html

Water use

Your pot habit sucks salmon. http://www.motherjones.com/tom-philpott/2014/04/your-pot-habit-sucks-salmon

Ashland City Administrator article http://www.mailtribune.com/article/20150223/NEWS/150229843