APCO EXHIBIT 12

HEARING BOARD
BAY AREA
AIR QUALITY MANAGEMENT DISTRICT
Case: APCO v. Green Sage, et al. Docket No. 2733
For APPLICANT, RESPONDENT, COMPLAINANT
For Identification C-12
For Evidence

Report on the foreseeability and avoidability of power disruptions and the need for 11 megawatts of diesel generators to power cannabis cultivation at 5601 and 5733 San Leandro Street Oakland, CA

June 27, 2022

Evan Mills, Ph.D.

Prepared for The Bay Area Air Quality Management District (BAAQMD)

Qualifications:

Dr. Mills has had a 40-year career in energy demand analysis and energy management. He has a specialization in energy demand forensics, particularly pertaining to the buildings sector, including more than a decade researching the energy use of cannabis facilities. He is a retired Senior Scientist at the U.S. Department of Energy's Lawrence Berkeley National Laboratory (current Affiliate), Research Affiliate Energy and Resources Group, UC Berkeley, and a participant in work of the United Nations Intergovernmental Panel on Climate Change (IPCC), which shared the 2007 Nobel Peace Prize. I have prepared this report independent of the aforementioned organizations.

Roadmap

- Power outage events
- Precedents
- Cannabis cultivation energy use
- Subject properties
- Timeline of generator deployment
- Benchmarking energy use

Key Sources (see appendices)

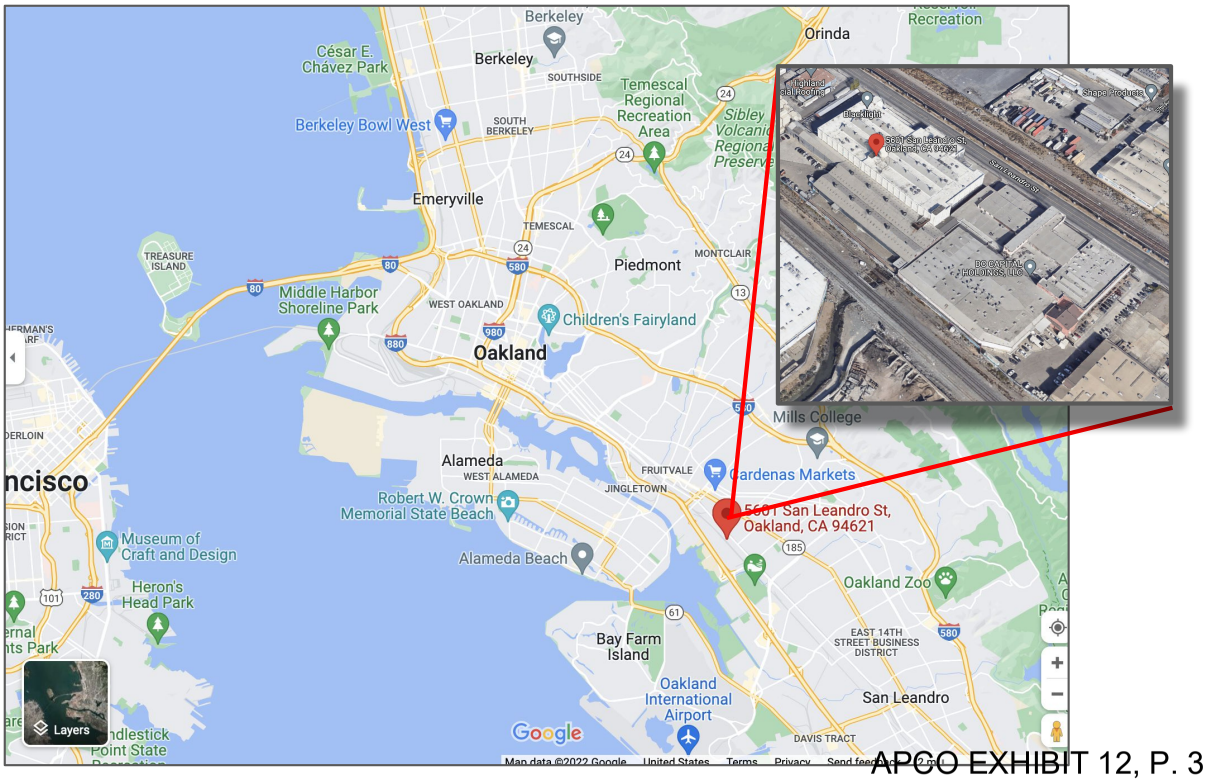
- Building plans
- Leases
- Photographs and videos
- Generator rental invoices
- Detailed Tenant “Case Study”
- PERP forms to CARB
- ICE submittals to BAAQMD
- HR submittals to BAAQMD
- CEQA checklists to OAK
- Information provided by PG&E
- Notices of Violation (OAK Fire, OAK City, and BAAQMD)
- Landlord correspondence to BAAQMD
- Legal filings
- Extensive literature on energy demand profiles for cannabis cultivation

- **Foreseeability**: The high potential for power outages could have been foreseen
- **Avoidability**: The use of generators prior to the July 7, 2021 outage was elective, outage was avoidable, and post-outage generator use could have been markedly reduced
- **Reasonability of potential crop-loss cost estimate:** Inexplicably high

Power outage event: July 7, 2021

Per Green Sage's construction consultant:*

- Demand at Legion of Bloom was ~ 1 MW at time of outage, exceeding the associated transformer's capacity of 0.7 MW
- Cause was tenant "not checking their phase balances", resulting in circuit overload (also affirmed in letter from Green Sage attorney Darrin Gambelin to BAAQMD)
- Connection to transformer melted, causing a fuse on a power pole to "blow up"



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* "There was a failure in the PG&E vault on 7/7/21. The vault where the transformers were located had about 700KW [i.e. 0.7 megawatts, MW] of power. The power was being used by Legion of Bloom (LOB) on the second floor. LOB was using about 1,000 kilowatts (KW) [i.e. 1 MW] of power, and they were not checking their phase balances. One of the phases of the 3-phase power was unbalanced and, therefore, it overloaded and that caused the connection to the PG&E transformer to melt and that caused the large fuse on the power pole to blow up. Once that happened, there was no power to LOB." Source: December 2021 email correspondence between Green Sage construction consultant Martin Espinosa and BAAQMD.

Key data from PG&E

(as of June 13, 2022)

Power outage: July 7, 2021

Cause: customer overload

Transformer(s) blown: 500 kVA

5601's service: 3000 Amps

Brian Case

From: Krausse, Mark <MCKd@pge.com>
Sent: Monday, June 13, 2022 11:07 AM
To: Brian Case; Pamela Leong
Cc: Ali, Fariya
Subject: RE: Green Sage in East Oakland

CAUTION: This email originated from outside of the BAAQMD network. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Brian and Pam—

Below are our responses. We believe the last item is publicly available via building department, so would not be subject to customer confidentiality as much customer data is. If you have additional questions, I can set up a call with our subject-matter experts. Let me know. Thank you.

Can PG&E confirm the date of the July 7, 2021 incident, as described above? That is correct.

- What does PG&E know about the cause? The transformer serving 5601 San Leandro was overloaded by the customer.

- What were the size of the (two?) transformers that were blown out? The transformer serving 5601 San Leandro was a 500KVA/500KVA 480 Bank.

- What was the subject property's service size (kVA) PRIOR to upgrades currently in progress? The existing panel at 5601 San Leandro is 3000 amps @ 480 V 3-wire.

Mark Krausse
Director, State Agency Relations
Pacific Gas and Electric Company
mckd@pge.com
916-995-6827

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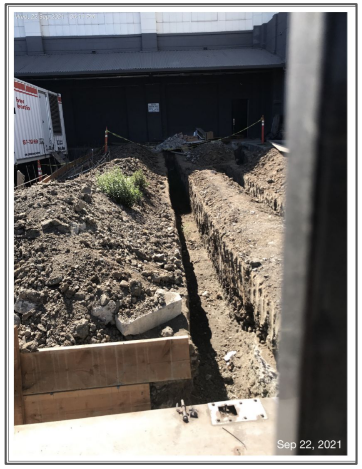
Three other events consistent with excessive power draw

1. July 31, 2020 - outage at 5733 San Leandro Avenue (per PG&E)*

   "The customer added load which resulted in the service wire failing and blowing the fuses at the transformer. PG&E was not consulted before this load was added."

2. October 27, 2021 - outage related to PCB leak from transformer near 5733, and power out for ~18 hrs while repaired**
3. February 14, 2022 (approx) - non-specific outage described by Green Sage attorney***

Electrical panels at 5733 San Leandro (serving RNK)



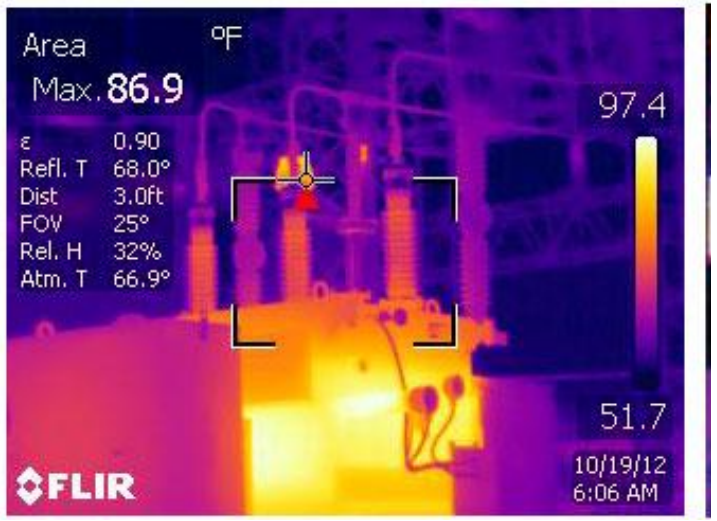
Trenching after 2021 outage at 5601

* Email from Fariya Ali, State Agency Relations, PG&E, June 23, 2022
** Email from Martin Espinoza (Green Sage's construction consultant) to Patricia Barnes, BAAQMD, 16 December 2021
*** February 25, 2022 Letter from Attorney Darrin Gambelin, sent to BAAQMD on behalf of Green Sage

Grid outages caused by cannabis operations are a well-known problem

- **2014** - Florida - 68 plants at a house (*United Press International, UPI*)
- **2014** - Excel Power (CO) - Transformers blowing in converted warehouses (*EnergyWire*)
- **2015** - Los Angeles - 2,100 plants in 13-14 rooms. Transformer blew, leaving many nearby businesses without power (NBC)
- **2015** - Portland General Electric (OR) - Legal cannabis operations responsible for 85% of transformer problems in residential areas (*Daily Astorian*)
- **2015** - Pacific Power (OR) - 7 transformers in 3 months. Just one or two in-house growing operations on a circuit could overload the local grid and cause an outage (*Associated Press*)
- **2015** - Oregon - 33,000 plants. Multiple transformers blown. 7 blackouts in one summer (*News Tribune*)
- **2019** - East Oakland - 6,000-7,000 plants. Blew transformer. Property owner deemed responsible, a dozen adjacent businesses without power (*CBS News/KPIX* - 1.1 miles away from the subject property, and perhaps 1/4 as many plants as Legion of Bloom. Event occurred on May 12.
- **2022** - Portland General Electric (OR) - Utility replacing ~40 transformers a year (10% of all replacements) due to overloading caused by cannabis operations (*Associated Press, AP*)

In some cases, growers impose enough load to require substation upgrades



An overloaded (and overheated) utility transformer

https://testguy.net/content/265-Transformer-Diagnostics-and-Condition-Assesment

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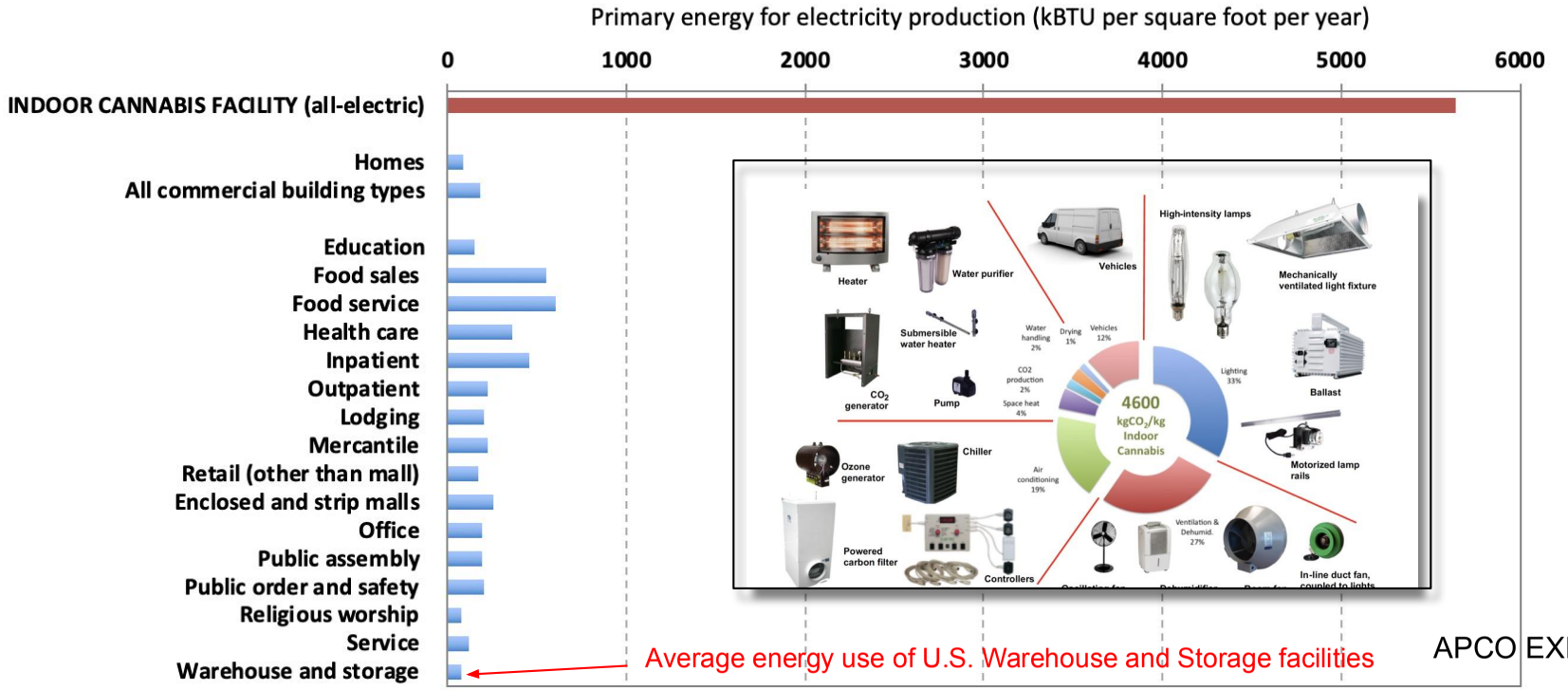
Indoor cannabis cultivation requires prodigious energy use

- Responsible for 1% of national electricity use, 3% CA total, 9% residential (2012)
- Energy intensive
  - Light 100x brighter than in a normal office building (as bright or even brighter than the sun)
  - Long operating hours
  - Intensive needs for heating, cooling, dehumidification
  - Other assorted uses: fans, pumping, water pre-heat, flower drying, refrigeration
- When analyzed in 2012, national cannabis energy use had a carbon footprint equivalent to that of 3 million cars nationally. Likely greater today.
- Energy use, expenditure, and emissions per square foot is 65-times that of an average U.S. home and 30-times that of an average U.S. office building
- One proposed grow in the California desert: 90,000 homes worth of electricity with its own 90 MW power plant, ~8x what we have at San Leandro Street
- In the state with highest per-capita use (CO), 60% of consumers' at-home carbon footprint is attributed to their cannabis use

Cannabis is many-times more energy intensive than ordinary buildings: 71-times more so than warehouses



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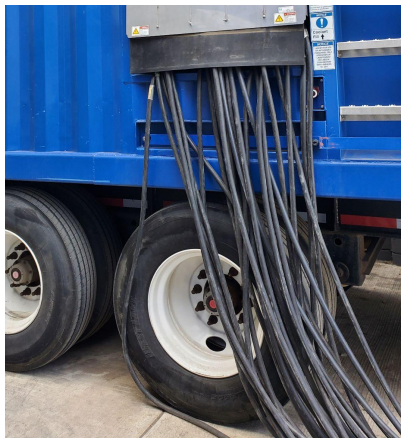
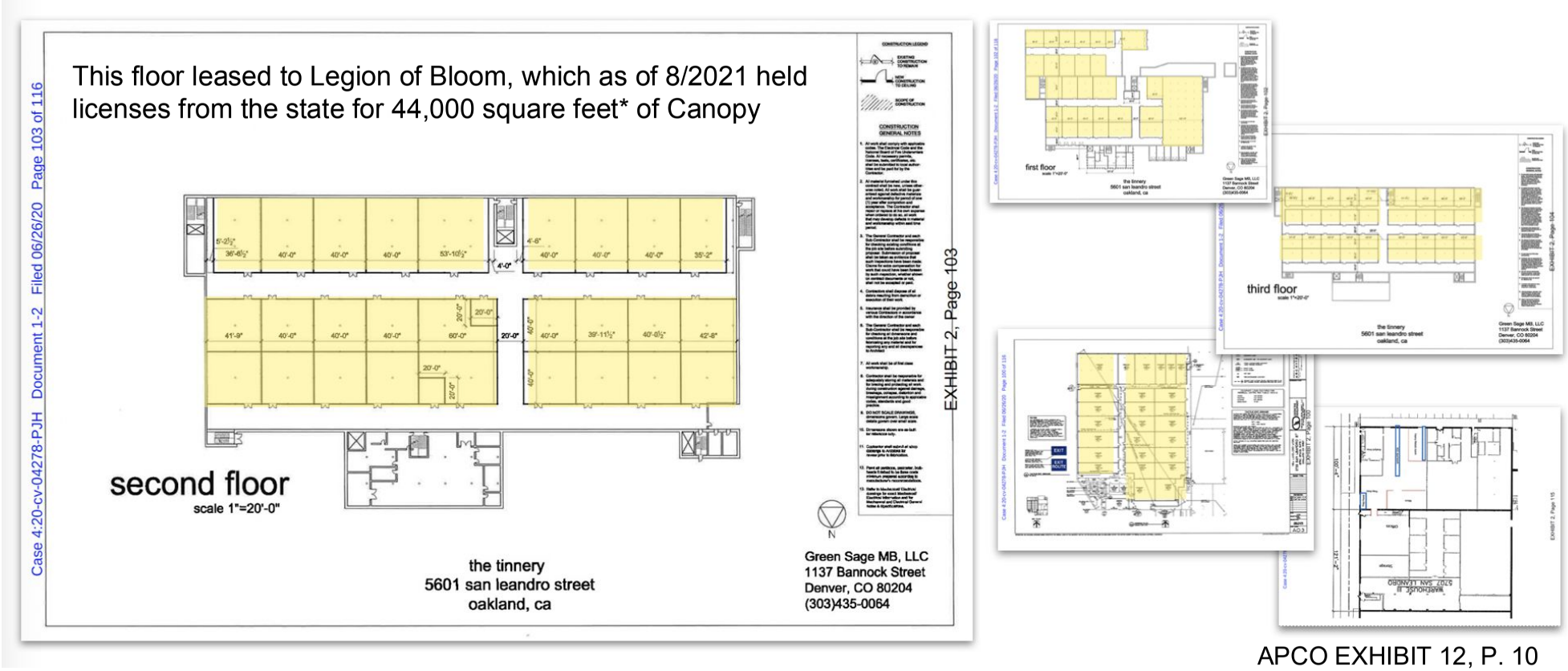
Sources: Typical buildings from U.S. Department of Energy, Energy Information Administration (Residential Energy Consumption and Commercial Buildings Energy Consumption Survey). Mills, E. and S. Zeramby. 2022. "Energy Use by the Indoor Cannabis Industry: Inconvenient Truths for Producers, Policymakers, and Consumers." Chapter in *The Routledge Handbook of Post-Prohibition Cannabis Research*, D. Corva and J. Meisel, *eds.,* 243-265. Cannabis values from Mills, E. 2012. "The Carbon Footprint of Indoor *Cannabis* Production," *Energy Policy* 46:58–67.

Diesel generators power the grow



Source: Photos by BAAQMD inspector Barnes 3/24/2022

Planning took place in 2018 for what appear to be ~120 potential grow rooms (yellow), with a total “net canopy” of ~225,000 square feet



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Architectural drawings 3/2018 per attachment to Complaint filed in Romspen California Mortgage Limited Partnership vs Patrick Koentges, US District Court, Northern District of California, Case No. 3:20-CV-04278 (Romspen vs Koetges.pdf)

* Email from Rene Hussar, California Department of Cannabis, to Brian Case, BAAQMD, May 2, 2022.

Tenancy, facility, and licensing information for cultivators on generators

	Legion of Bloom	XYZ Connections	Magic Bowl	RNK
Address [1]	5601 San Leandro St. (Tinnery)	5601 San Leandro St. (Tinnery)	5601 San Leandro St. (Tinnery)	5733 San Leandro St. (Cannery)
Primary activity	Cultivation	Cultivation	Cultivation	Cultivation
Floor(s) occupied	2nd [1]	1st [1]	1st [4]	?
Total square footage leased	52,134 [3]	?	40,000 [5]	?
Total square footage with current State cultivation license	44,000 [3]	0 [6]	0 [6]	0 [6]
Square footage in cultivation ("canopy")	30,000 [3]	41,500 [7]	24,201 [4]	?
Generator rental dates [2]	04/13/2021 - 03/18/2022	06/29/2021 - 03/18/2022	04/02/2021 - 07/28/2021	10/09/2020 - 03/18/2022
Total number of operating generators over time [2]	10	7	3	11
Maximum megawatts, MW [2]	3.0 MW	2.5 MW	2.0 MW	5.5 MW

NOTE: Eight (8) additional cultivators and six (6) manufacturers and distributors filed CEQA forms with the city of Oakland, some of which are subtenants of the entities in this table.

All eighteen (18) non-residential CEQA-form filers were potentially served by generators electricity for varying periods of time.

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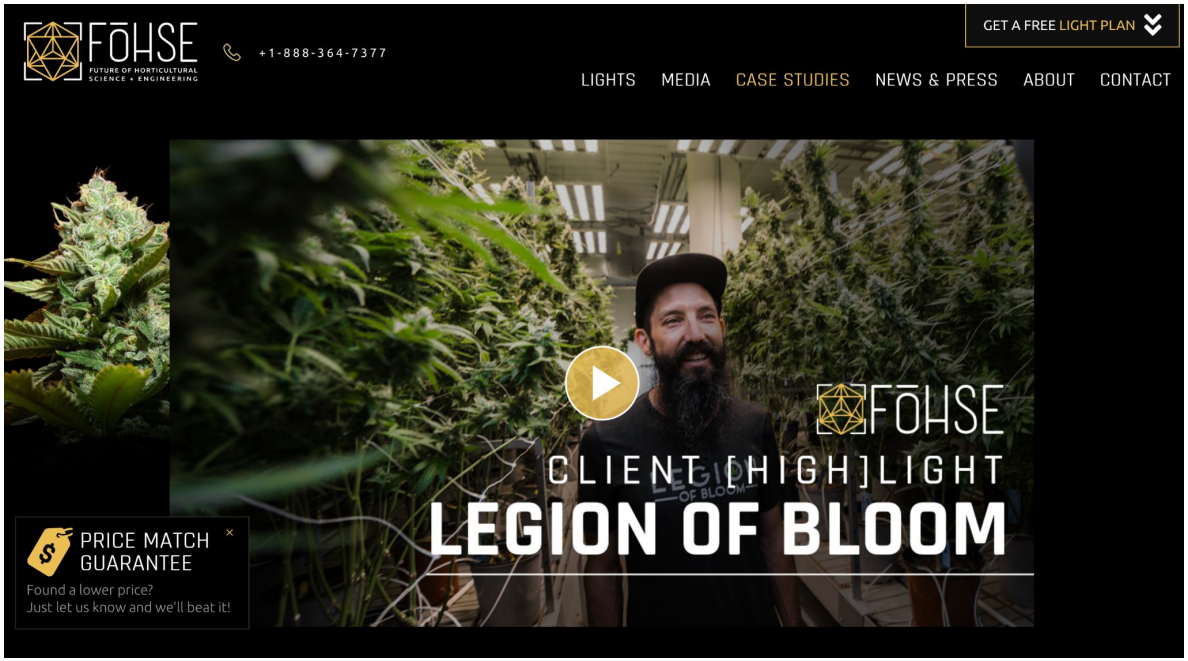
[1] Internal memoranda from BAAQMD (Patricia Barnes) to BAAQMD (Brian Case), April 4 2022. [2] Per generator invoices from United Rentals. [3] Legion of Bloom video from lighting manufacturer: https://www.fohse.com/pages/case-study-legion-of-bloom (see Appendix C). Values as of or before 8/25/2021, i.e., upload date of this video in which the statements are made. Leased area per 5601a and 5601b LLC leases dated June 28, 2017. [4] Per floorplan on lease and net canopy area indicated by Owner's masterplan. Note that City of Oakland, CA - Special Activity Permit, Project APN: 41-3848-14-4, June 19 2020. indicates ~35,000 (OAKrecordsMagicBowl (35k sf).pdf) [5] Lease per "21.08.20.Complaint (2).pdf [6] Only Legion of Bloom is known to have a state license. April 14, 2022 and May 3, 2022 emails from California Department of Cannabis Control (Renee Hussar) to BAAQMD (Paul Grazzini). [7] Sum of subleases to "Dr. Toke", "Hing & Hong", and "Bundle Boiz", per square footage in CEQA forms.

Legion of Bloom video (posted online August 25, 2021)



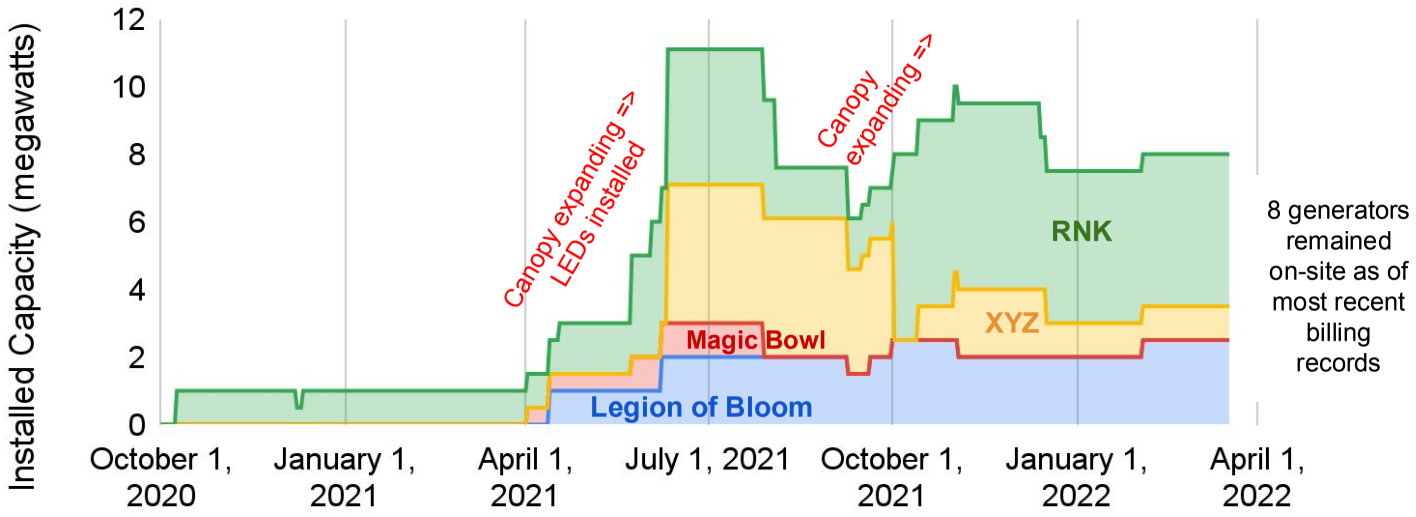
This document provided useful information on:

- Tenant's canopy in use, permitted, and leased
- Original and upgraded lighting technology and its power requirements
- Lighting power per square foot
- Yields per square foot
- Duration of crop cycle

APCO EXHIBIT 12, P. 12

Source: https://www.fohse.com/pages/case-study-legion-of-bloom (posted online August 25, 2021) - See Appendix C

Generator Use Timeline: October 9, 2020 - March 18, 2022



At the peak (11.1 MW, summer 2021) there were enough generators on site to power almost 9,000 California homes.

Existing PG&E service at 5601 at time of outage was about one-third that provided by the generators

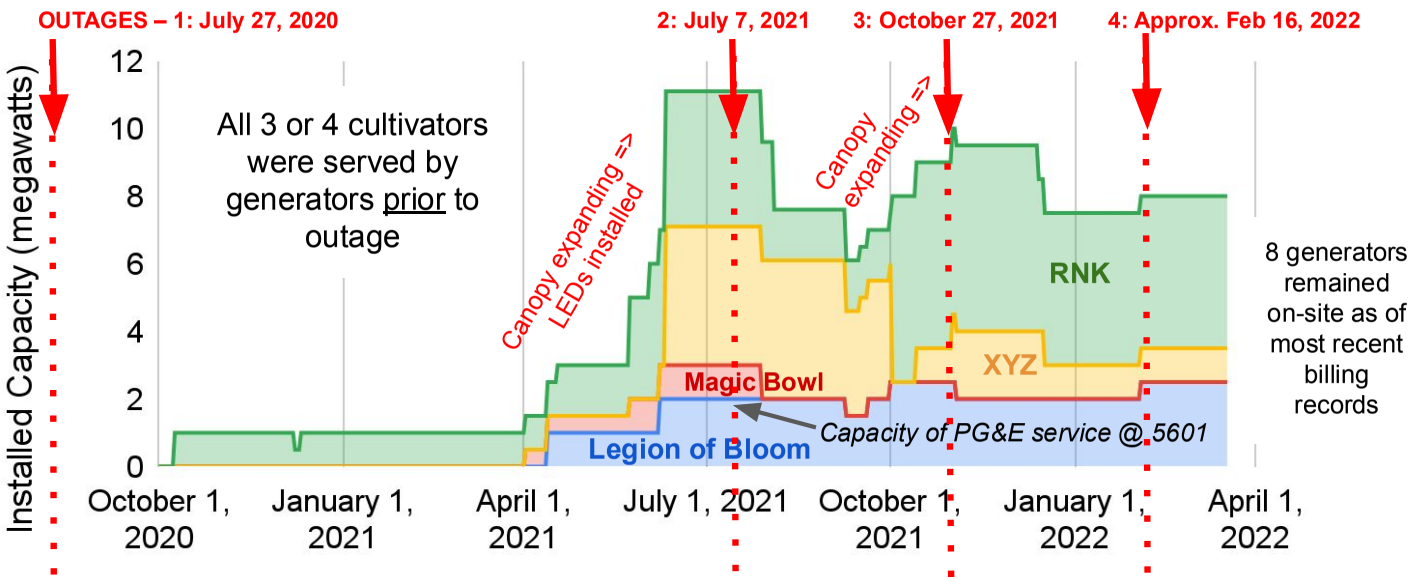
Other observations:

- Days generators onsite: 628
- 3,000 “generator-days”
- Max # generators at one time: 12
- Unique generators over time: 32
- Peak is lower than Green Sage’s stated required power “upgrade” of 16 MW from PG&E
- Strong incentive to push grid power as far as possible b/c generators far more costly to operate
- More gen’s on site than needed

APCO EXHIBIT 12, P. 13

Source: Installed capacity history from United Rentals invoices. Only generators in-use and with return invoices are counted.

Generator Use Timeline: October 9, 2020 - March 18, 2022



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APCO EXHIBIT 12, P. 14

Source: Installed capacity history from United Rentals invoices. Only generators in-use and with return invoices are counted.

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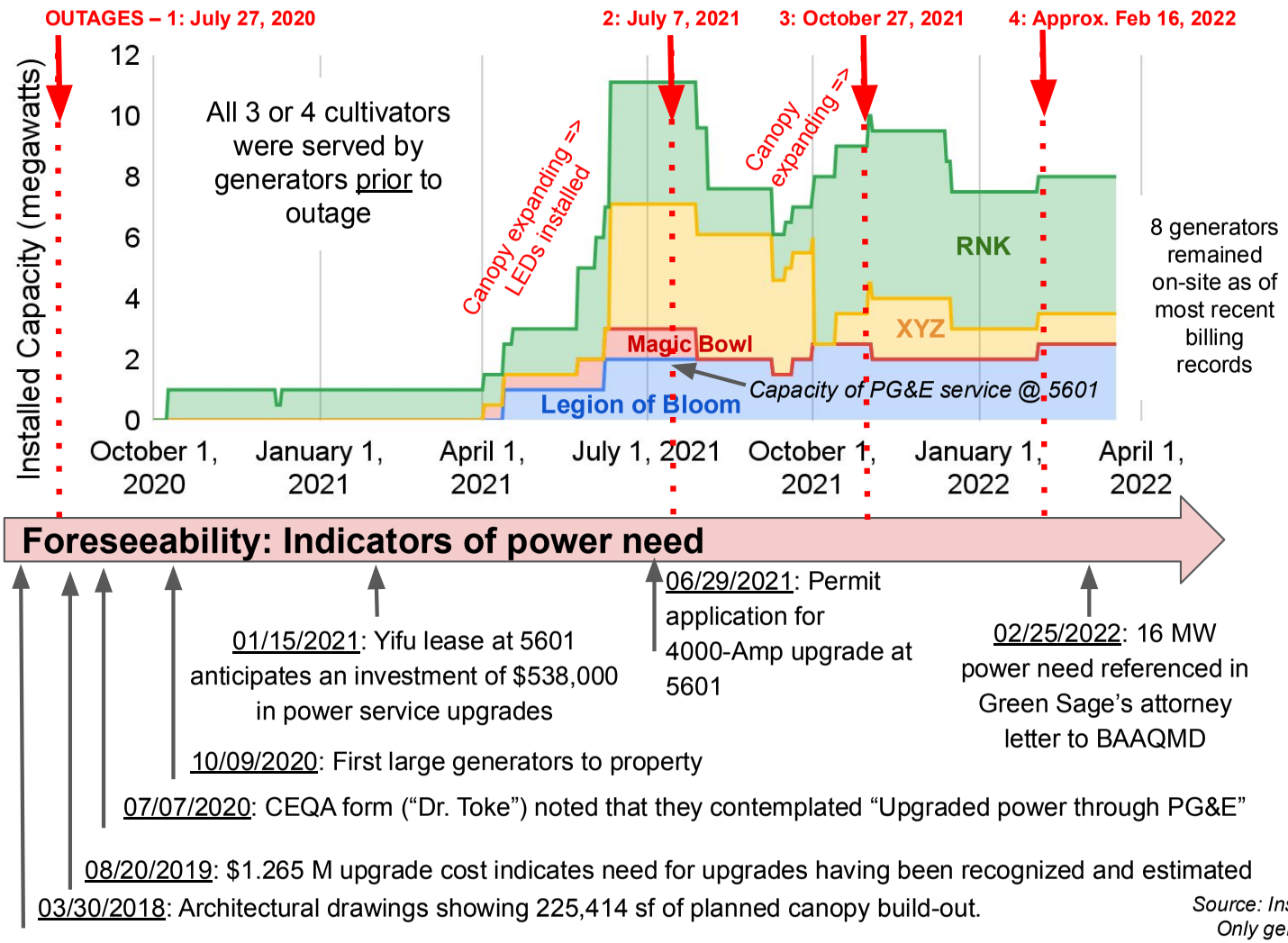

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APCO EXHIBIT 12, P. 15

Source: Installed capacity history from United Rentals invoices. Only generators in-use and with return invoices are counted.

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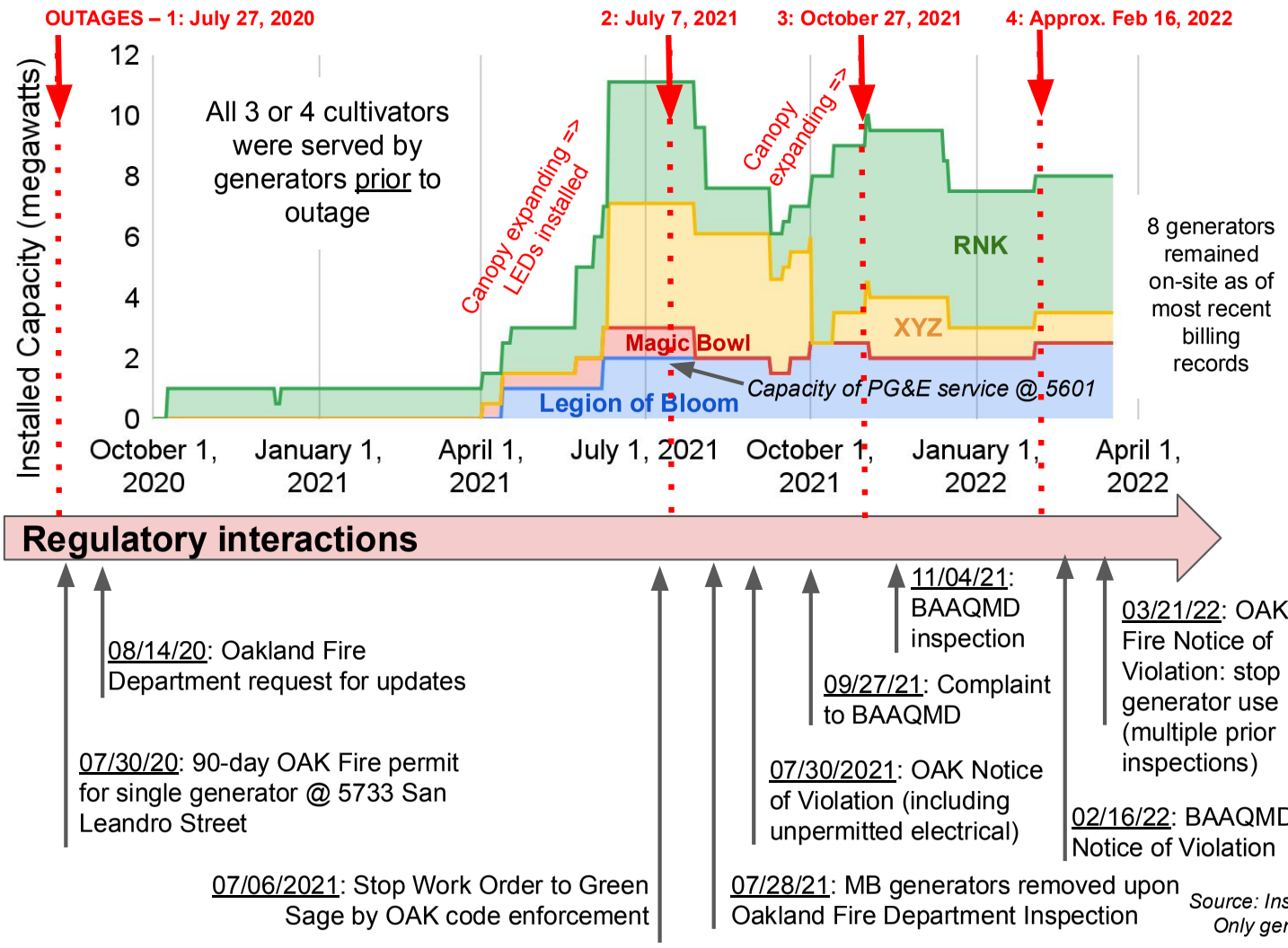

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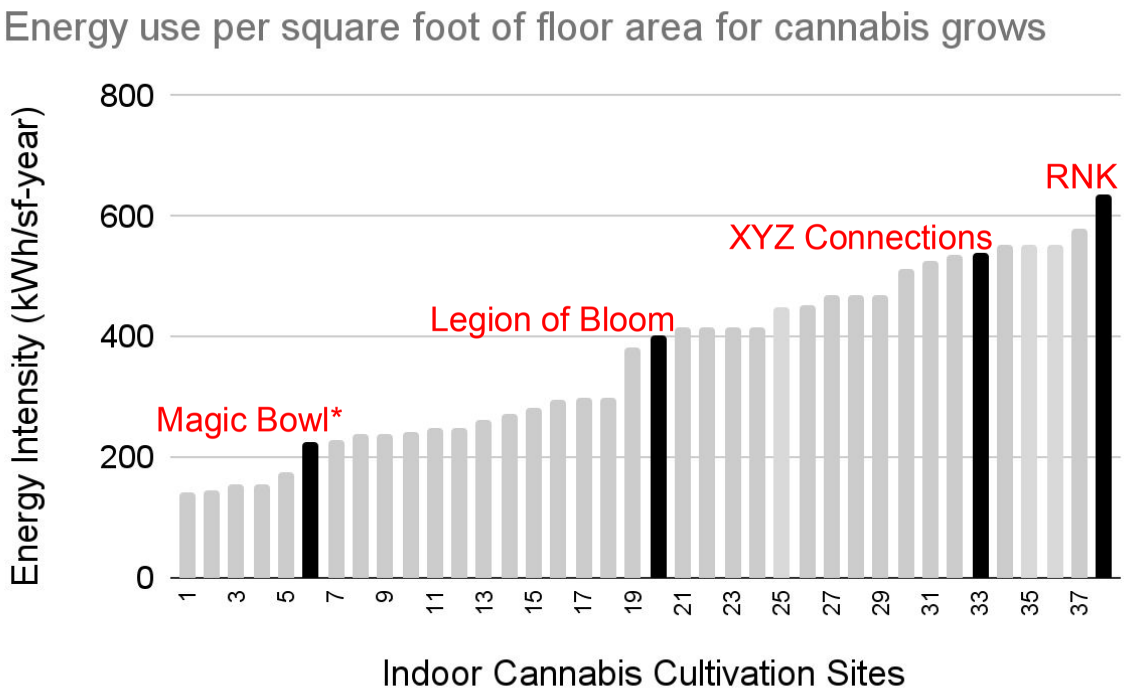
APCO EXHIBIT 12, P. 16

Source: Installed capacity history from United Rentals invoices. Only generators in-use and with return invoices are counted.

Energy use benchmarks: Green Sage tenants in range with peers



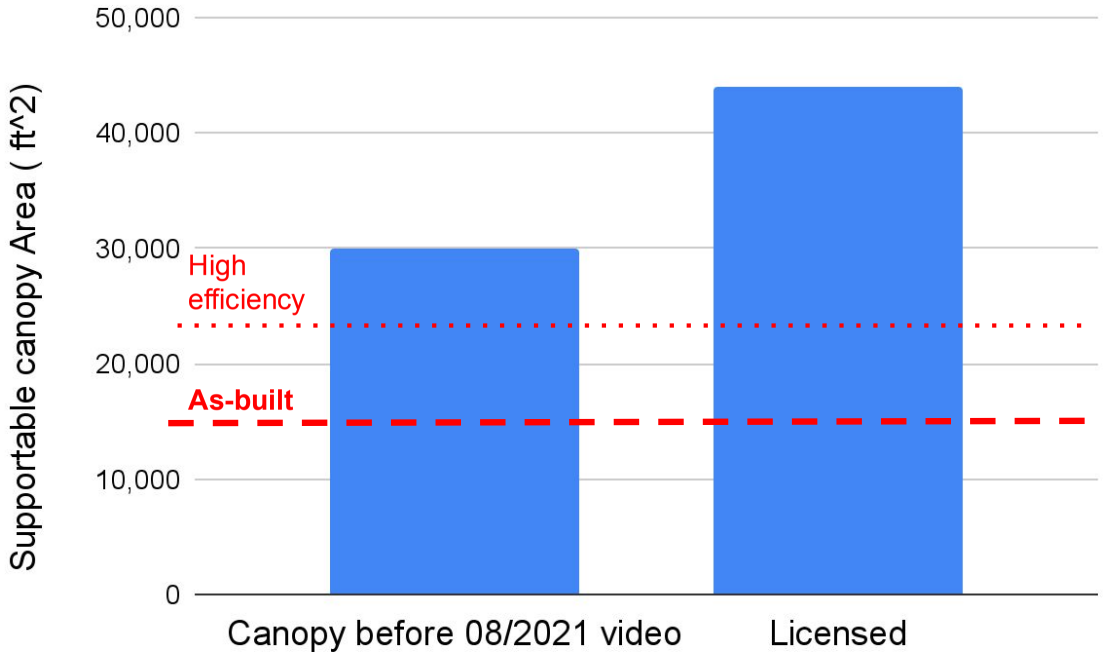
- Green Sage tenants' consumption is in range with other sites around the country
- Tenant values determined using tenant-reported data and post-outage generator rental invoices together with equipment ratings and reported operating hours

APCO EXHIBIT 12, P. 17

* Low value likely due to canopy ot being fully built out, hence less lighting energy need, etc.

Sources: Data collected from open literature by Evan Mills, Ph.D. See also, Mills, E. 2021. "Comment on "Cannabis and the Environment: What Science Tells Us and What We Still Need to Know." *Environmental Science & Technology Letters*, 8:483–485.

Inadequacy of pre-outage PG&E service to Legion of Bloom



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Notes: Canopy supportable with the "as-built" infrastructure is based the energy that could be drawn from the available power of 1 MW(per Green Sage construction consultant) with a safety margin of not exceeding 80% of nominal panel capacity. To obtain square footage, the available annual grid electricity is divided by energy produced per square foot of canopy from generators leased by LoB following the outage. Assumes favorable load factor of 0.85, i.e. that facility is very effectively load-managed such that average load is 85% of peak load. High efficiency is a "stretch" goal of 35% reduced energy requirements, identified as the cost-effective levels identified by techno-economic analyses available in the literature (Leichliter et al., 2018 and ERC 2020).

Foreseeability

The significant potential for power outages could have been foreseen	Landlord Respondents	Cultivator Respondent (5601a LLC, 5061b LLC, aka Legion of Bloom)
Common knowledge within the industry of high power requirements ● Public-domain assessments and trade press reporting from at least 2012 ● Elementary engineering calculations can quickly ballpark needs and limitations	X	X
Significant precedent of publicized power outages caused by smaller facilities (including very nearby in 2019)	X	X
Risks associated with unpermitted, non-compliant, uninspected, or unbalanced electrical infrastructure	X	X
Clear inadequacy of existing electrical service for build-out (irrespective of faulty workmanship), known long before outage (see timeline)		X
Apparent steady expansion of canopy and LED lighting (and thus power requirement) in advance of outage event		X

Simplified Foreseeability Illustration: Lighting only

Prior to the July 2021 outage, Legion of Bloom's electrical panel had 1 MW of PG&E capacity, and the entire building (5601) had about 2 MW

CANOPY	Floor area (square feet)	Power need for lighting only (megawatts, MW)	Equivalent number of 500 kW generators
Partial build-out for Legion of Bloom [1]*	30,000	1.0	2
Licensed canopy for Legion of Bloom [1]	44,000	1.4	3
All planned cultivation areas at 5601 [2]	182,752	6.0	12
All planned cultivation areas in both buildings [2]	**225,414**	**7.4**	**15**

* Per Green Sage's construction consultant, available power at the time of the outage was 700 kW

[1] Legion of Bloom lighting case study video (see Appendix C)

[2] Architectural drawings 3/2018 per attachment to Complaint filed in Romspen California Mortgage Limited Partnership vs Patrick Koentges, US District Court, Northern District of California, Case No. 3:20-CV-04278 (Romspen vs Koetges.pdf)

Locations and sizes of ~120 grow rooms per architectural drawings dated 2018

Lighting need per square foot per Legion of Bloom stated design and case study published on Fohse website.

Assumes no high-power LEDs

Assumes the lighting schedule is concurrent in all buildings.

Total power needs (lighting, heating, cooling, ventilation, dehumidification, drying, storage, water recovery, office spaces, etc.) could be 2- to 3-times greater.

Avoidability

Use of generators prior to the outage was elective, outage was avoidable, and post-outage generator use could have been reduced	Landlord Respondents	Cultivator Respondent (5601a LLC, 5061b LLC, aka Legion of Bloom)
Authorize electrical connections only for legal cultivators (only 1 of many licensed)	X	
Structure leasing to ensure that tenants operate within PG&E power constraints	X	
Disallow generators at time of leasing.* Brickworks FN	X	
Assure proper functioning of electrical infrastructure (keeping phases balance)	X	X
Improve energy efficiency:** LoB uses approximately 3x more energy than best-in-class	X	X
Manage operations to match what could be supported by available grid power: e.g., limit canopy area, fewer grow cycles, strain choice, staggered room operations***		X
Defer upgrade to more power-intensive lighting**** (done in proximity to the outage)	APCO EXHIBIT 12, P. 21	X

* "Defendants [America's Brickworks] were advised at the time they signed the lease that [5601 SLOCA] provides power to all tenant [sic] by renting diesel generators." (Appendix B, Per Kenneth Greer declaration (p. 34) whereas Legion of Bloom's leases referred only to "back-up) generators without mention of generators of primary power (p. 718 and 750), while YiFu's lease stated need for major electrical upgrades (p. 507).
** Both parties installed energy-using equipment. LoB specified lighting and other systems. Per LoB lease (Appendix B, p. 689-752) and Romspen suit, loan agreement, 97/116 (Appendix B, p. 47), there was owner-provided HVAC equipment.
*** For all of 5601: At the high energy requirements of RNK, ~$8 million/year of finished flower could be produced (at avg. Feb 2022 prices), while at the low use at Magic Bowl, $23 million per year.
**** Per case study, "Legion of Bloom couldn't produce the yields necessary to expand their cultivation facility using their labor intensive 315W CMH with Red Halo LEDs." https://www.fohse.com/pages/case-study-legion-of-bloom Lighting power density of 45 Watts per square foot exceed standards (36 W/sf) in MI and IL, and soon California

Calibration of statement that stopping the generators would risk $50 million in crop losses

"Interruption of the power currently supplied by the generators would put $50,000,000+ of cannabis product at risk...." (Letter from Downey Brand, attorney for Green Sage, to BAAQMD, February 25, 2022)

Legion of Bloom

Canopy area (square feet)*	30,000
Annual yield (pounds)*	15,000
Harvests per year*	5.8
Yield per cycle (pounds)	2,589

	California wholesale price ($/lb)**	Gross per-crop revenue ($M)
Low	$300	$0.8
Average	$700	**$1.8**
High	$1,100	$2.8

This calculation is gross potential revenue, excluding expenses (debt service, labor, materials, generator rental, fuel, other NNN expenses…)

Even @ imputed canopy area for all tenants (licensed and non-licensed), average loss would be $8.7M

Revenue had circuit not been overloaded and PG&E power would still have been half of this value at their apparent energy use per pound (and nearly all of it at Magic Bowl's lower energy use)

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A foreseeable and avoidable situation

* Reported by Legion of Bloom (LoB) in video by lighting manufacturer (FOHSE): https://www.fohse.com/pages/case-study-legion-of-bloom (Appendix C)
** California wholesale price range as of February 18, 2022 https://mjbizdaily.com/california-wholesale-cannabis-prices-rebound-from-slump/

SUPPLEMENTARY MATERIAL & SOURCES

Licensing status: LoB had completed the process; others not

How to apply for or renew a license

How to apply for a license

1 Complete local permitting processes

Many cities and counties have rules and permitting for cannabis businesses. Some do not allow cannabis businesses. Make sure you set up your business in an area that allows commercial cannabis activity. Complete any permitting requirements your city or county requires before you apply for a state cannabis license.

2 Learn the state regulations for cannabis businesses

The Department of Cannabis Control (DCC) has requirements for standard operating procedures, training employees and how facilities must be set up. Make sure you understand and can meet these rules.

3 Gather your application information and documents

DCC has resources to help you create the documents you need during the license process. If you have questions about the requirements, email the DCC licensing team.

4 Create a licensing system account

DCC has three licensing systems. Use the one that corresponds to the license type you're applying for. Create an account in the system. Remember your username and password so you can log back in.

5 Complete your application

Fill in the required fields in the licensing system and upload any needed documents. Make sure you disclose all your business's owners and financial interest holders. The DCC licensing systems let you save your progress as you go, so you do not need to complete it all in one sitting. When you finish your application, sign and submit it.

6 Pay your application fee and submit your application

When you finish your license application, the system will tell you how to pay your application fee. DCC cannot process your application until you pay your application fee.

7 Answer any emails from the licensing team

If any parts of your application are not sufficient, the DCC licensing team will email you. They will tell you what you need to correct and give you a deadline to respond. Responding with complete information as quickly as you can helps DCC process your application in a timely manner.

8 Pay your license fee

If your application is approved, you'll receive an email with instructions about how to pay your license fee. You can pay your fee through the licensing system via bank account/check, money order or credit card. You can also pay in cash by setting up an appointment to visit our office in person. For security purposes, no cash payments can be accepted without an appointment. Your license will be issued once we receive your payment.

9 Post your license

DCC licenses are good for one year. Once your license is issued, you can download your license certificate from the licensing system. Post your certificate in a visible place near the entrance of your business so visitors can see it.

APCO EXHIBIT 12, P. 24

Source: California Department of Cannabis Control https://cannabis.ca.gov/applicants/how-to-apply-renew/#how-to-apply-for-a-license

Conflicting Landlord-Tenant incentives

A Landlord's least-cost pathway is to:

- Lease space as rapidly as possible
- Defer repair and upgrade of utility service (for which they must pay) within building
- Defer repair of costly utility infrastructure (for which PG&E would presumably expect to be paid)
- Have tenants pay for generator rental fees *and* the fuel to operate them
- Minimize investment in energy efficiency of HVAC and other energy-using equipment (since tenant's pay for energy)

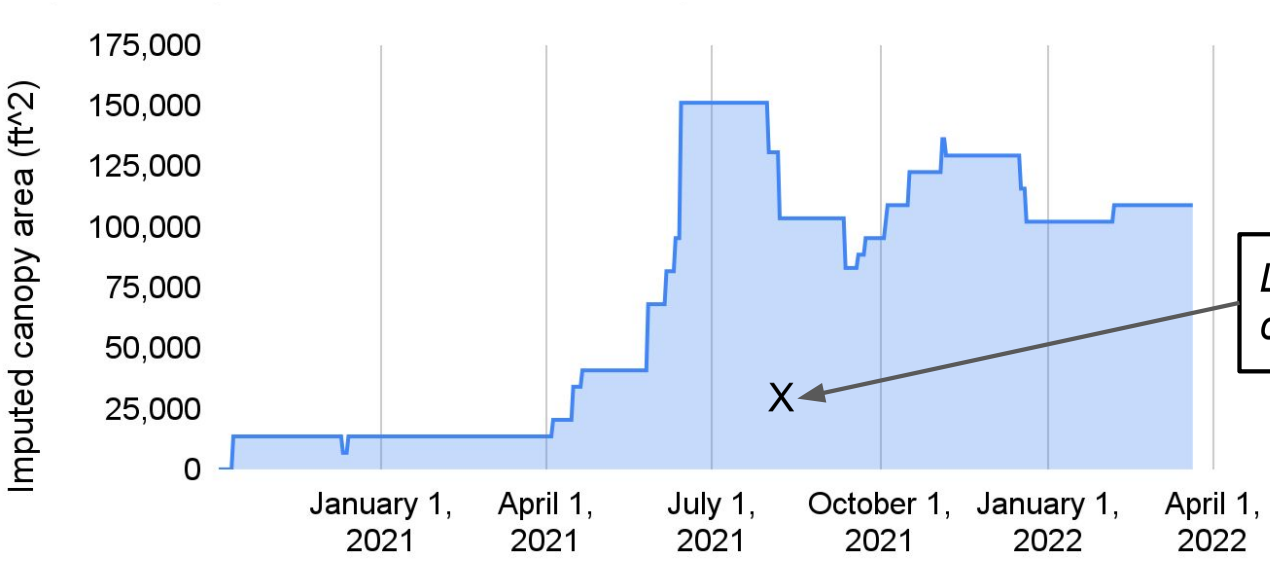
A Tenants' least-cost pathway is to:

- Have access to PG&E power
- Maximize energy efficiency

These factors create an intrinsic "split-incentive" or "dual-agency" issue, which well known and documented in the energy research and policy literature.

Imputed floor area in canopy, based on generator output

(max is 151,000 square feet)



The ratio of generated electricity to the estimated energy used per square foot (LoB) indicates approximate canopy area.

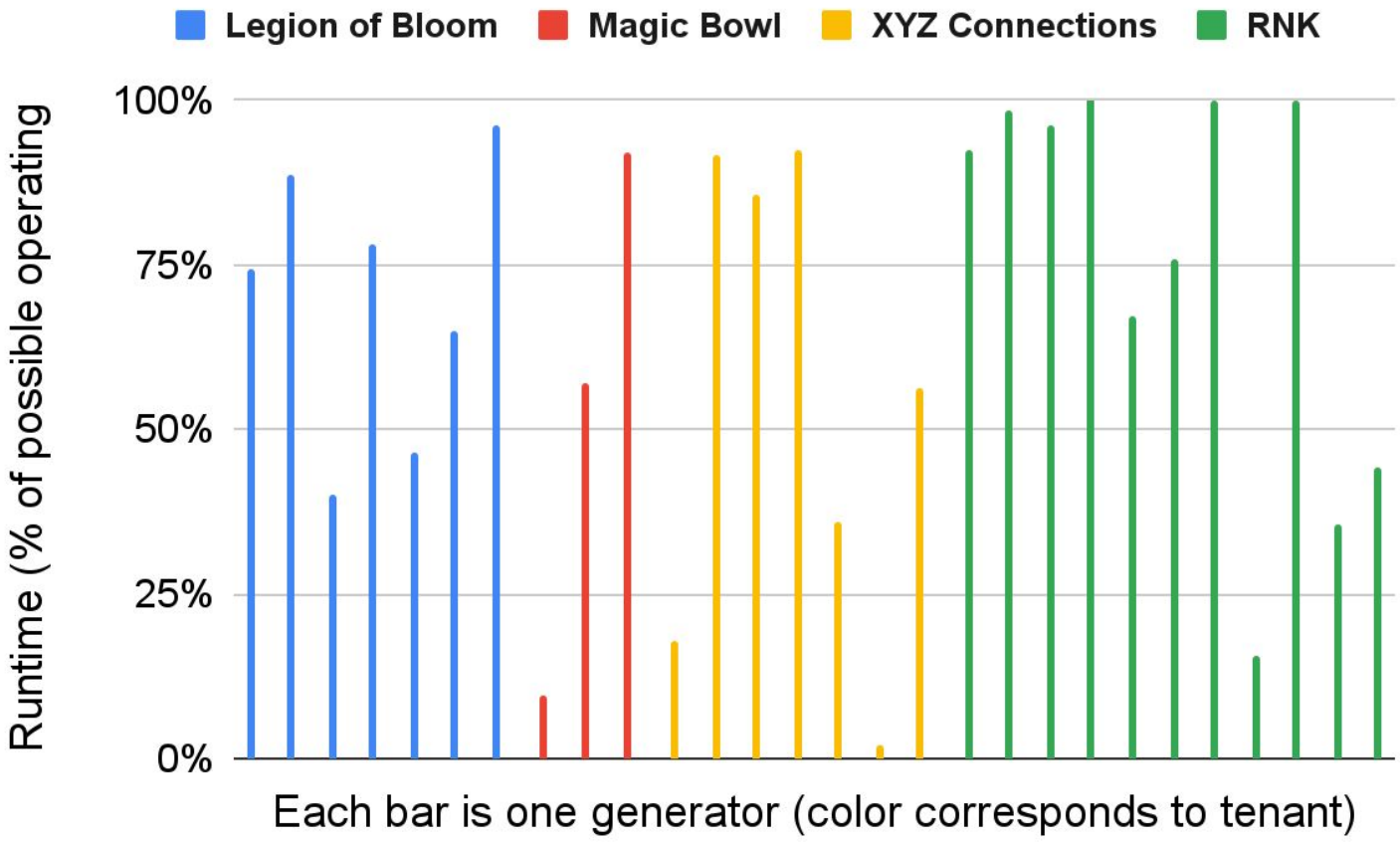
*Legion of Bloom stated cultivation area (30,000 sf)**

Note: Per architectural drawings, the planned ultimate build-out of grow-room area was 225,414 square feet

APCO EXHIBIT 12, P. 26

* Stated canopy area per the following video, uploaded August 25, 2021: https://www.fohse.com/pages/case-study-legion-of-bloom (see Appendix C). Planned canopy per architectural blueprints.

Many generators were under-utilized at 5601 and 5733



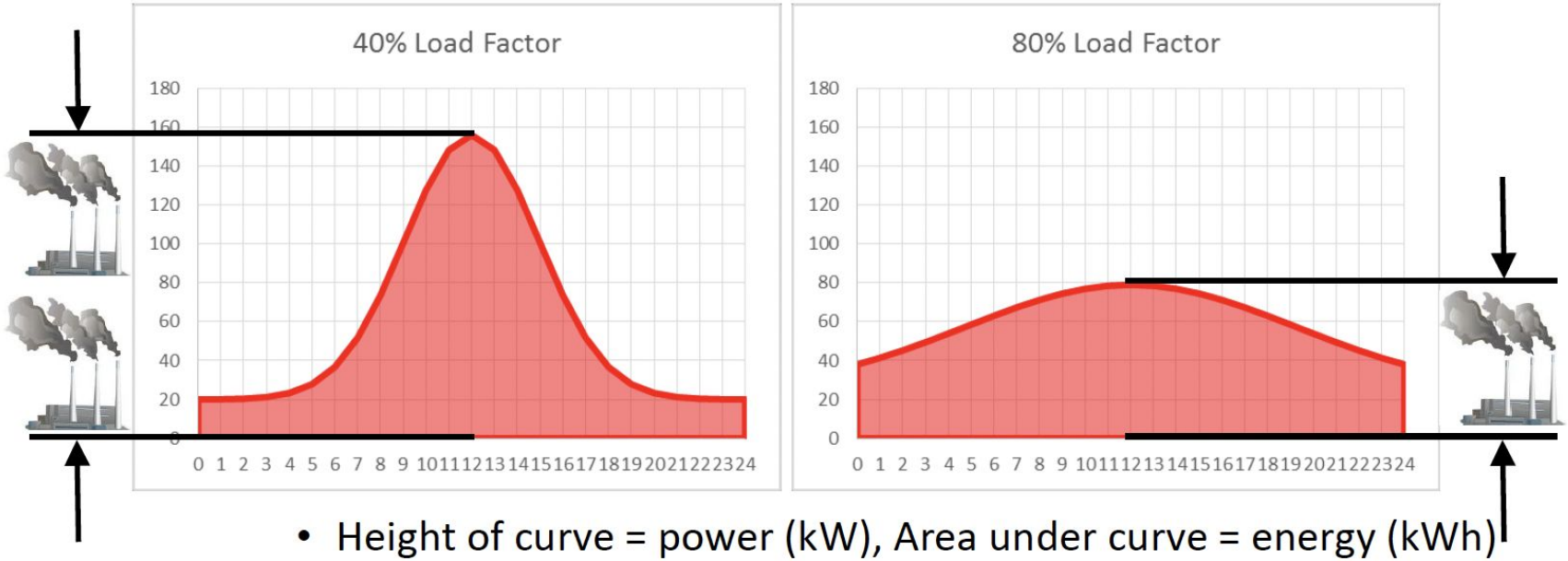
Ramifications

- Lower efficiency
- Higher energy use
- Higher emissions
- More units running at one time, hence more noise

APCO EXHIBIT 12, P. 27

Source: Data from United Rentals invoices, computed as the difference between “meter out” reading when generator is minus the “meter in” and reading when it is returned, divided by total number of hours in the calendar period of the rental

A better “load factor” (flatter demand shape) means same energy but fewer generators



- Height of curve = power (kW), Area under curve = energy (kWh)
- “Load Factor” is the ratio of average power to peak power

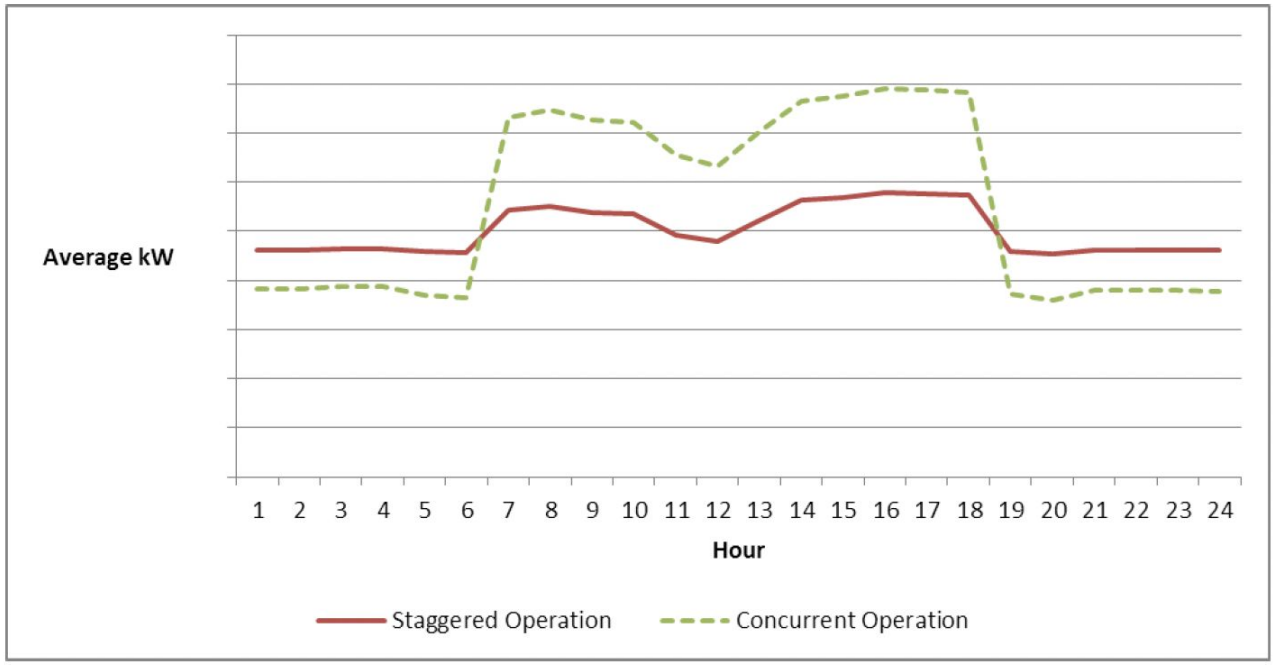
  Load Factor % = Energy kWh / (Demand kW*days*24hr/day)

APCO EXHIBIT 12, P. 28

Source: Queen, Brad. 2016. “Power, Energy, Load Factors, and Costs.” Presented to the Cannabis Sustainability Symposium, Denver, CO, 15pp

Staggering the schedules of different areas flattens load

Figure 4-1. Concurrent vs. Staggered Flower Room Operation



Legion of Bloom reports having 19 individual grow rooms

LoB states that their "load factor" (average/peak load) is 65%, which we adopt.

The highly diversified example to left (red line) is about 90%.

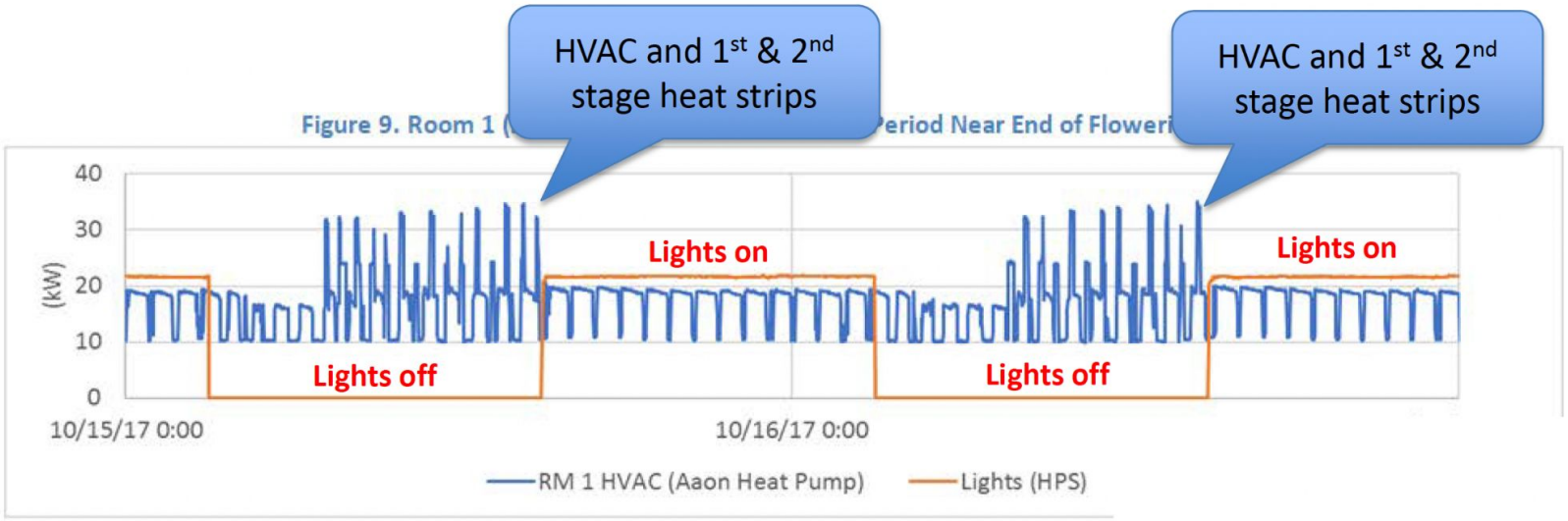
APCO EXHIBIT 12, P. 29

Source: ERS. 2020. "Summary Report of Cannabis Cultivator Energy Efficiency Assessments" Prepared by Energy & Resource Solutions for County of Boulder. April 16. 44pp. See also https://www.greenbiz.com/article/can-we-master-pot-industrys-energy-appetite

The importance of load management practices

- Peak power needs dictate how many generators are required at a given facility
- A “flat” load profile indicates that power requirements are spread evenly across hours, days, and weeks, minimizing peak requirements
- This is highly desirable in order to minimize energy costs, generator rental costs, and inefficiencies associated with “part-load” operation
- A relatively flat load profile can be achieved in a *highly optimized* cannabis facility
- Doing so requires many independently controllable “grow rooms” (Legion of Bloom alone has 19), and/or multiple customers with staggered lighting schedules
- However, “ICE” submittals by tenants indicate a plan that the generator on-time would be only 15 hours per day, only 65% utilization if the generators were at full power when on.
    - MW-weighted days on site (“Meter In” minus “Meter Out”) for invoices indicate a run-time range of 53% to 72% across the 4 master tenants, and far less for given individual generators.

Power needed 24x7, but demand varies with lighting, heating, cooling, etc.: A real-world example (Sacramento)



Lights on mode: 42 kW

Room: 36.5 Watts/ft^2

Canopy: 109.4 Watts/ft^2

Lights off mode: 33.4 kW

Room: 29 Watts/ft^2

Canopy: 87 Watts/ft^2

Source: Sacramento Municipal Utility District, Matt McGreggor field studies on actual grow rooms

Source Material (1 of 5), attached in full as Appendix A

General background

- Mills, Evan. 2012. "The Carbon Footprint of Indoor *Cannabis* Production," *Energy Policy* 46:58–67
- Mills, Evan. 2021. “Comment on *“*Cannabis and the Environment: What Science Tells Us and What We Still Need to Know.” *Environmental Science & Technology Letters*, 8:483–485.
- Mills, Evan and Scott Zeramby. 2022. "Energy Use by the Indoor Cannabis Industry: Inconvenient Truths for Producers, Policymakers, and Consumers." Chapter in *The Routledge Handbook of Post-Prohibition Cannabis Research*, D. Corva and J. Meisel, *eds.,* 243-265.
- Summers, Hailey M., Evan Sproul, and Jason C. Quinn. 2021. “The Greenhouse Gas Emissions of Indoor Cannabis Production in the United States.” *Nature Sustainability*, 4, pp 644–650.
- U.S. Department of Energy, Energy Information Administration, Residential Energy Consumption Survey (RECS) Commercial Buildings Energy Consumption Survey (CBECS).
- California wholesale price range as of February 18, 2022 “California Wholesale Cannabis Prices Rebound from Slump.” *MJBizDaily*.
- ERS. 2020. "Summary Report of Cannabis Cultivator Energy Efficiency Assessments" Prepared by Energy & Resource Solutions for County of Boulder. April 16. 44pp.
- Warren, Gina S. 2020. “Hotboxing the Polar Bear: The Energy and Climate Impacts of Indoor Marijuana Cultivation.” *Boston University Law Review,* Vol. 101:979.
- Queen, Brad. 2016. Power, Energy, Load Factors, and Costs.” *Presented to the Cannabis Sustainability Symposium,* Denver, CO, 15pp
- Southern California Edison. 2021. “Market Characterization of Indoor Cannabis Cultivation.” 61pp.
- Expert consultations with Steve Greenberg (Facilities Energy Management Engineer, Lawrence Berkeley National Laboratory), Norm Bourassa (Energy Performance Engineer, Lawrence Berkeley National Laboratory), and Elizabeth Stoneham (System Planner, Tri-State Generation and Transmission Association)

Source Material (2a of 5), attached in full as Appendix B

Facility data

- Brekke, Dan. 2022. "A Denver-Based Firm Is Using Huge Diesel Generators to Grow Cannabis in East Oakland. Now the City Is Trying to Shut Them Down." *KQED*. March 23 (including embedded documents city-of-oakland-march-21-2022-notice-of-violation-to-green-sage.pdf, city-of-oakland-december-2021-green-sage-violation-notice.pdf, and 5601-sloca-v-americas-brickworks-greer-declaration-220111.pdf). (p. 1-35)
- Brekke, Dan. 2022. "Regulator Moves to Shut Down Diesel Generators at East Oakland Cannabis Facility." *KQED*. April 21. (p. 36-40)
- Architectural drawings and development budget, per as attachment Complaint filed in *Romspen California Mortgage Limited Partnership vs Patrick Koentges, US District Court, Northern District of California, Case No. 3:20-CV-04278* (Romspen vs Koetges.pdf) (at page 59 shows 1-10-18; p. 60 shows 3-30-18; p. 61 shows 3-30-18 with 6-21-18 approval by Coda signature; at page 47 shows $1,265,000 line item for “Utility Connect/Disconnect Fees). (p.41-66)
- December 16, 2021 Email from Green Sage consultant Martin Espinosa to Patricia Barnes regarding description of power failures (p.67-68)
- City of Oakland “Preliminary Checklist for Cannabis Operators Pursuant to the California Environmental Quality Act (CEQA)” checklists, provided by BAAQMD Assistant Counsel Brian Case who collected the forms from either (1) emails from City of Oakland; or (2) City of Oakland Public Records Act Request # 22-2675.(p. 69-157)

Source Material (2b of 5), attached in full as Appendix B

Facility data

- Generator Invoices provided to BAAQMD in response to request for "records/contracts of all diesel engine rentals by Green Sage [at 5601 and 5733 San Leandro Street in Oakland]" (p. 158-324)
- BAAQMD 1-441 Official Request for Information Documentation (Letter and Response Communications) (p.325-331)
- February 25, 2022 Letter from Attorney Darrin Gambelin, sent on behalf of Green Sage, to BAAQMD (p. 332-334)
- Information from Department of Cannabis Control with cover email from BAAQMD assistant counsel Brian Case (p. 335-339)
- 2020 Fire Department Records with cover email form BAAQMD assistant counsel Brian Case (p. 340-355)
- Additional Information explaining invoices from United Records with cover email from BAAQMD Assistant Counsel Brian Case (p. 356-358)
- 3/24/22 BAAQMD inspector Patricia Barnes Site Inspection Photographs (p. 359-452)
- Lease "Exhibit A" showing portion of 1st Floor at 5601 San Leandro occupied by Magic Bowl with cover email from BAAQMD Assistant Counsel Brian Case (p. 453-454)
- September 2021 Oakland Code Enforcement photographs with cover email from BAAQMD Assistant Counsel Brian Case, obtained via email from City of Oakland (p. 455-462)

Source Material (2c of 5), attached in full as Appendix B

Facility data

- July 30, 2021 City of Oakland Code Enforcement Notice of Violation, obtained by BAAQMD Assistant Counsel Brian Case from City of Oakland (p.463-468)
- Loopnet and City of Oakland records pertaining to service levels at 5601 San Leandro, with cover email from BAAQMD Assistant Counsel Brian Case (p. 459-472)
- June 10, 2022 email from BAAQMD Assistant Counsel Brian Case documenting BAAQMD staff assistance with tabulation of “meter-in” and “meter-out” data from generator receipts (p. 473-474)
- June 13, 2022 email from PG&E Director of State Agency Relations Mark Krausse, responding to questions form BAAQMD Assistant Counsel Brian Case (p. 475-477)
- Yifu Investments sublease, showing $538,000 cost being charged to Yifu Investments for “installing new power supply for the entire [5601 San Leandro] building,” obtained by BAAQMD Assistant Counsel Brian Case From City of Oakland Public Records Act Request # 22-2675 (p. 478-515)
- June 16, 2022 email from BAAQMD Assistant Counsel Brian Case with information about the date-of-upload of Legion of Bloom video (p. 516-520)
- Printout of webpage showing Legion of Bloom “case study” at https://www.fohse.com/pages/case-study-legion-of-bloom, downloaded June 20, 2022 (p. 521-523)
- All application files submitted by Green Sage in connection with application to BAAQMD to obtain permit for diesel generators (BAAQMD Application No. 31618) (p. 524 -676)

Source Material (2d of 5), attached in full as Appendix B

Facility data

- Public records (obtained from City of Oakland Public Records Act Request #22-2675) relating to identity of “XYZ Connections” and “Stick-E-Bud” (p. 677-689)
- Public records (obtained by BAAQMD Assistant Counsel Brian Case from City of Oakland Public Records Act Request #22-2675) showing 5601-A Lease Agreement (p. 690 -720)
- Public records (obtained by BAAQMD Assistant Counsel Brian Case from City of Oakland Public Records Act Request #22-2675) showing 5601-B Lease Agreement (p. 721-752)
- Email from BAAQMD Assistant Counsel Brian Case, attaching 5/5/2022 Email from Russell Weisman regarding Air District Accusation (p. 753-760)
- June 23, 2022 Email from Fariya Ali to Brian Case regarding PG&E responses to questions (p. 761-763)
- June 23, 2022 Email from Brian Case, providing additional information on United Rentals Invoicing procedures (p. 764-765)

Source Material (3 of 5), not included in appendices

Energy use in other cannabis facilities: 2012-2020

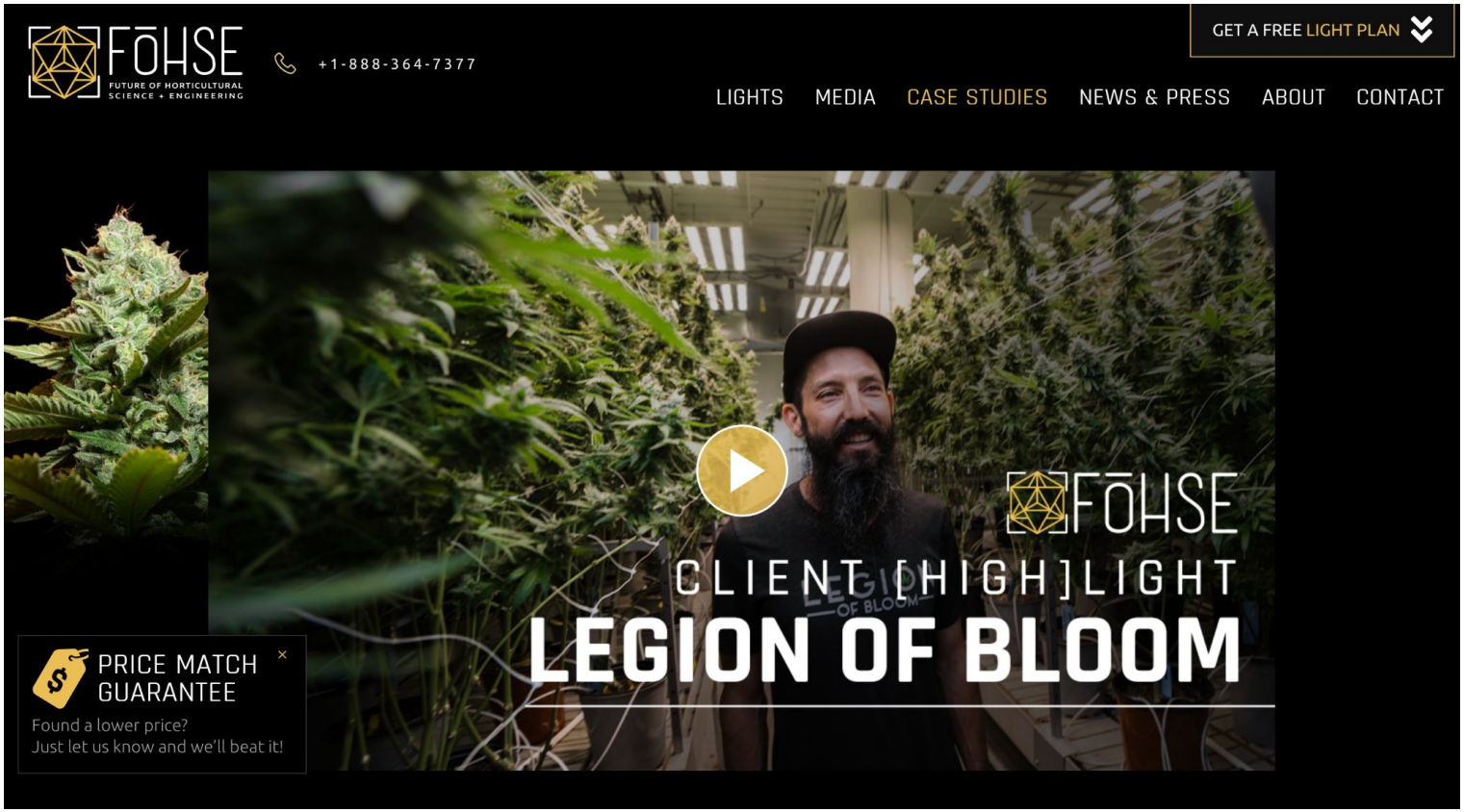
- Mills, Evan 2012. "The Carbon Footprint of Indoor *Cannabis* Production," *Energy Policy* 46:58–67
- Arnold, Jessica. 2013. "Energy Consumption and Environmental Impacts Associated with Cannabis Cultivation." Masters Thesis. Humboldt State University. 120pp.
- NFD. 2018. “The 2018 Cannabis Energy Report.” Washington, D.C.: New Frontier Data. 63pp.
- Queen, Brad. nd (c. 2018) Boulder County Energy Impact Offset Fund (BCEIOF) DSM Study. Phase 1. 43pp.
- Geiling, Natasha. 2016. "Can Marijuana Ever be Environmentally Friendly?" *Think Progress.*
- Hartley, Eric. 2015. "Pot Power: A Pricey Concern for Vegas’ Medical Marijuana Industry.” Las Vegas Review Journal. March 10. CBC. 2019. “Solar Pot: Alberta Cannabis Producer Unveils Rooftop Solar System.” Canadian Broadcasting Corporation, *CBC News*, November.
- Radil. 2016. "Northwest Marijuana Growers Try to Go Green (But it's Hard)." *KUOW*
- Leichliter, K., Bisbee, D., McGregor, M. 2018. “Amplified Farms 2017 Indoor Horticulture Lighting Study.” Sacramento, CA: Sacramento Municipal Utility District, 36pp.
- Northwest Power and Conservation Council forecasting appendix, p E-64, assuming 4 cycles/year
- Mehboob, Nafeesa, Hany E. Z. Farag, and Abdllah M. Sawas. 2020. "Energy Consumption Model for Indoor Cannabis Cultivation Facility." *IEEE Power and Energy,* Vol 7:222-233 .
- ERS. 2020. "Summary Report of Cannabis Cultivator Energy Efficiency Assessments" Prepared by Energy & Resource Solutions for County of Boulder. April 16. 44pp.
- ERC. 2020. “Cannabis Cultivator Energy Efficiency Assessments.” Prepared for Boulder County, Energy & Resource Solutions, Andover, MA 41pp.
- Evergreen Economics. 2016. “SDG&E Cannabis Agriculture Energy Demand Study: Final Report.” Prepared for San Diego Gas and Electric Company, 33pp.

Source material (4 of 5), not included in appendices

Power outages caused by other cannabis facilities: 2014-2022

- UPI. 2014. “Marijuana Grow House Causes Neighborhood Power Outage.” *United Press International*.
- Ferris, David. 2014. “Utilities Struggle to Control Appetites in Energy-hungry Marijuana Industry.” *EnergyWire*.
- *Associated Press and The Oregonian.* 2015. “Marijuana Grows Causing Blackouts, Power Company Says”.
- *Associated Press*. 2015. “Oregon marijuana grows are causing problems for the state’s electrical grid.”
- City of Bandon. 2015. “Utilities Commission Regular Meeting,” Bandon City Hall, November 18.
- Pacific Power. 2015. “Marijuana Growing Legal in Oregon and Washington, but Safety, Electric Capacity Issues Remain.”
- Larkin, Michael and Vikki Vargas. 2015. “Power Outage Leads Police to “Factory-Like” Marijuana Operation.” *NBC News*.
- Fitzgerald, Doub. 2016. “Illegal Marijuana Grow Blows Transformer, Causes Grass Fire.” *Gazette*. April 12.
- *CBS News Bay Area.* 2019. “Illegal Pot Farm Blows Transformer Leaving Oakland Businesses In The Dark For Months.” August 10.
- Warren, Gina S. 2020. “Hotboxing the Polar Bear: The Energy and Climate Impacts of Indoor Marijuana Cultivation.” *Boston University Law Review,* Vol. 101:979.
- Sweeney, Don. 2022. “Exploding Transformers Lead Authorities to Oregon Pot Grow Operation, Feds Say. “ *The News Tribune, Tacoma*, WA.
- BBC. 2022. “Halifax Power Cuts Lead to Cannabis Factory Find.” March 2.

Source material (5 of 5), attached as Appendix C



APCO EXHIBIT 12, P. 39

Source Material: https://www.fohse.com/pages/case-study-legion-of-bloom (posted online August 25, 2021). See Appendix C.