

Welcome to the California Statewide Codes and Standards
Enhancement (CASE) Team's Stakeholder Meeting on
Covered Processes (Controlled Environmental Horticulture)

We'll get started shortly.

In the meantime, please fill out the polls below.



Welcome: Connect Your Audio

Audio – there are **three** options for connecting to the meeting audio:

To view options, click on the  icon on the top ribbon, then select *Connect My Audio*.

- 1 **Dial-out:** receive a call from the meeting. *Please note this feature requires a direct line.*
- 2 **Dial-in:** dial-in to the conference via phone. Conference phone number and room number code provided. *Please then identify your line by entering your unique user ID on your phone.*
- 3 Use the **microphone** from your computer/device.



Join Audio Conference

How would you like to join the meeting's audio conference?

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+1 (USA) Phone Number

Join Listen Only

Above: audio conference settings pop-up box

2022 TITLE 24 CODE CYCLE, PART 6

First Utility-Sponsored Stakeholder Meeting

Covered Processes (Controlled Environmental Horticulture)

Statewide CASE Team
September 19, 2019

Meeting Guidelines

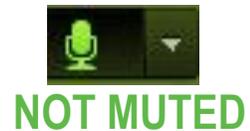
Muting Guidelines

Once you turn on your preferred audio connection, please **MUTE** your microphone.

- Please keep yourself **MUTED**.
- Wait for instructions and/or permission to unmute yourself during designated Q&A periods.

Phone users – please mute your phone line.

Computer/device users – please mute your microphone by clicking on the microphone icon on your top ribbon.



Meeting Guidelines

Participation Guidelines

- **Questions & Comments**

- Click “***Raise Hand***” if you would like to speak. Those with a hand raised will be called on by the speaker.
- All questions and comments are also welcome via the chat window.

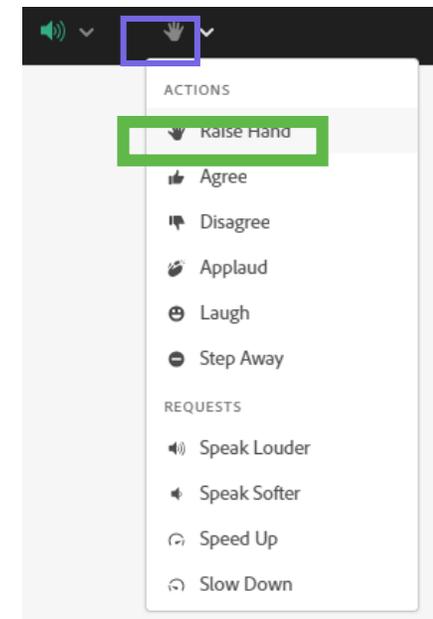
- **Other Meeting Feedback**

- Provide live meeting feedback from the **top toolbar drop-down**.



Above: feedback view for Adobe Connect [app users](#).

Below: feedback view for [HTML users](#).



Meeting Ground Rules

- **We want to hear your thoughts**
 - Supporting and opposing viewpoints are welcome
- **When making comments**
 - Unmute yourself
 - Clearly state your name and affiliation prior to speaking
 - Speak loudly for phone audio
 - Place yourself back on mute
- **Calls are recorded** for note development, recordings will not be publicized
- Notes and presentation material will be posted on [Title24Stakeholders.com](https://www.title24stakeholders.com)

Agenda

1	Meeting Guidelines	<i>8:30 am</i>
2	Opening Remarks from the California Energy Commission	<i>8:35 am</i>
3	Overview & Welcome from the Statewide Utility Team	<i>8:40 am</i>
4	Building Codes Introduction from the Statewide CASE Team	<i>8:45 am</i>
5	Presentation: Controlled Environmental Horticulture	<i>9:00 am</i>
6	Wrap Up and Action Items	<i>11:25 am</i>
7	Closing	<i>11:30 am</i>



Opening Remarks: California Energy Commission

Payam Bozorgchami
Project Manager
California Energy Commission



Policy Drivers: Building Standards

The following policy documents establish the goal for new building standards:

- **2008 CPUC/CEC Energy Action Plan** – ZNE for Residential buildings by 2020 and nonresidential buildings by 2030
- **SB 100** – Clean electricity by 2045
- **B-55-18** – Governor Jerry Brown’s Executive Order to achieve carbon neutrality
- **AB 3232** – Assess the potential for the state to reduce the emissions of greenhouse gases from the state’s residential and commercial building stock by at least 40% below 1990 levels by January 1, 2030

2022 Standards Schedule



Estimated Date	Activity or Milestone
November 2018 - April 2019	Updated Weather Data Files
November 2018 - July 2019	Measures Identified and Approved (Internal at the Energy Commission)
November 2018 - July 2019	Compliance Metrics Development
April 24, 2019	Efficiency Measure Proposal Template for public to submit measures
October 17, 2019	Compliance Metrics and Climate Data workshop
November, 2019	Final Metrics Workshop
November, 2019	Research Version of CBECC Available with new weather data files and updated Metrics
July 2019 - March 2020	Utility-Sponsored Stakeholder Workshops
March, 2020	All Initial CASE/PUBLIC Reports Submitted to Commission
March - August 2020	Commission-Sponsored Workshops
July, 2020	All Final CASE/PUBLIC Reports Submitted to the Commission
July - September 2020	Express Terms Developed
January, 2021	45-Day Language posted and set to list serve, Start of 45-Day review/comment period
January, 2021	Lead Commissioner Hearing
April, 2021	Adoption of 2022 Standards at Business Meeting
May - November 2021	Staff work on Software, Compliance Manuals, Electronic Documents
May - November 2021	Final Statement of Reasons Drafted and Approved
October, 2021	Adoption CALGreen (energy provisions) - Business Meeting
December, 2021	CBSC Approval Hearing
January, 2022	Software, Compliance Manuals, Electronic Documents Available to Industry
January - December 2022	Standards Training (provided by 3rd parties)
June 1, 2022	6 Month Statutory Wait Period Deadline
January 1, 2023	Effective Date

2022 Standards Contact Info

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More information on pre-rulemaking for the 2022 Energy Code at:
<https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency>

Title 24, Part 6 Overview

Kelly Cunningham
Codes and Standards
Pacific Gas & Electric

Statewide Utility Codes and Standards Team

- **Actively supporting the California Energy Commission** in developing proposed changes to the California Energy Code (Title 24, Part 6)
- Achieve significant energy savings through the development of **feasible, enforceable, cost-effective, and non-proprietary** code change proposals for the 2022 code update, and beyond



Requirements for a Successful Code Change Proposal

The utilities support the California Energy Commission by proposing changes to the Energy Code that are:

Feasible | **Cost effective** | **Enforceable** | **Non-proprietary**

Utility-Sponsored Stakeholder Meetings

- All meetings can be attended **remotely**
- Check Title24Stakeholders.com/events for information about meetings and topic updates
- Sign up to receive email notifications



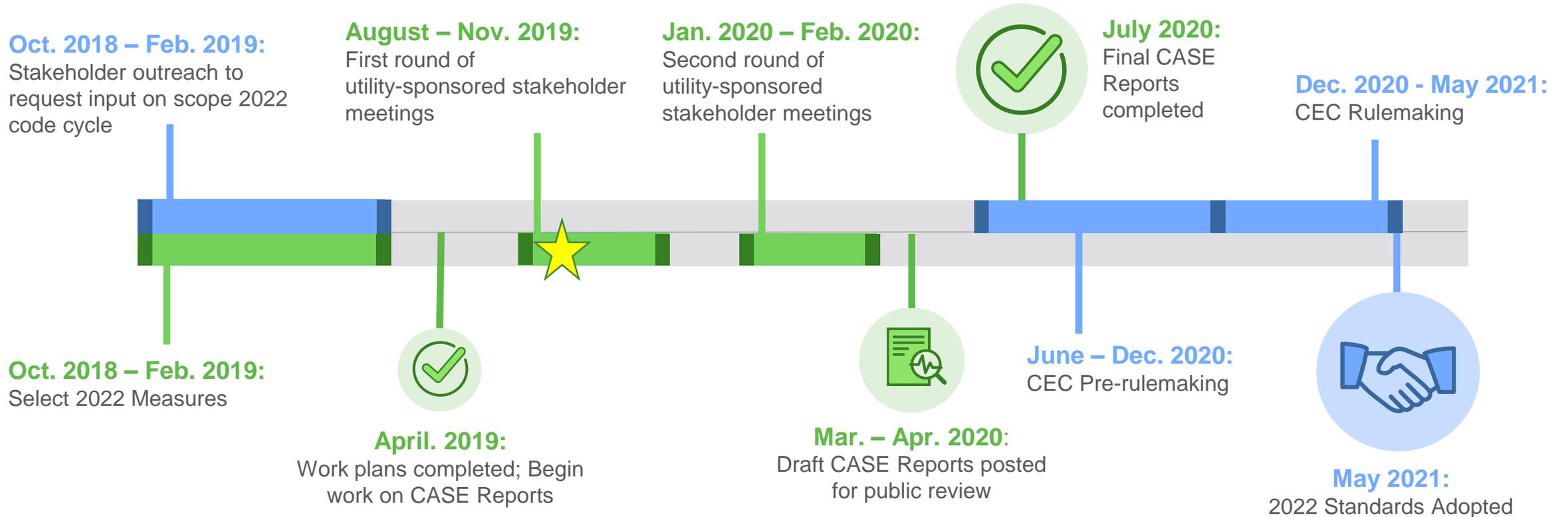
First Round Utility-Sponsored Stakeholder Meetings

Meeting Topic	Building Type	Date
<i>Multifamily HVAC and Envelope</i>	MF, NR	Thursday August 22, 2019
<i>Outdoor Lighting and Daylighting</i>	MF, NR	Thursday September 5, 2019
<i>Indoor Lighting</i>	NR	Thursday September 12, 2019
Covered Processes Part 1: Controlled Environment Horticulture	NR	Thursday, September 19, 2019
Multifamily & Nonresidential Water Heating	MF/NR	Thursday, October 3, 2019
Single Family HVAC	SF	Thursday, October 10, 2019
Nonresidential HVAC Part 1: Data Centers, Boilers, & Controls	NR	Tuesday, October 15, 2019
Nonresidential Envelope Part 1	NR	Thursday, October 24, 2019
Nonresidential HVAC and Envelope Part 2: Air Distribution, & Controls	NR	Tuesday, November 5, 2019
Covered Processes Part 2: Compressed Air, Steam Traps, & Refrigeration	NR	Thursday, November 7, 2019
Single Family Whole Building	SF	Tuesday, November 12, 2019
Nonresidential Software Improvements	NR	Tuesday, November 12, 2019

Sign up for all meetings at title24stakeholders.com/events/

2022 Code Cycle – Key Milestones

- CEC Milestone
- Utility Team Milestone



Comply With Me

Learn how to comply with California's building
and appliance energy efficiency standards

www.EnergyCodeAce.com

offers **No-Cost**

Tools ♠ Training ♠ Resources
to help you decode Title 24, Part 6 and Title 20



This program is funded by California utility customers and administered by Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E®), Southern California Edison Company (SCE), and Southern California Gas Company (SoCalGas®) under the auspices of the California Public Utilities Commission.



Welcome to LocalEnergyCodes.com



The California Codes and Standards (C&S) Reach Codes program provides technical support to local governments considering adopting a local ordinance (reach code) intended to support meeting local and/or statewide energy and greenhouse gas reduction goals. The program facilitates adoption and implementation of the code, by providing resources such as cost-effectiveness studies, model language, sample findings, and other supporting documentation.

Local Government – Local Energy Ordinance Resources and Toolkit

Local energy ordinances require buildings to be more efficient than the existing statewide standards.

The **Codes and Standards Reach Codes Program** provides technical support to local jurisdictions considering adopting a local energy efficiency ordinance.

www.LocalEnergyCodes.com

This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.

Thank You

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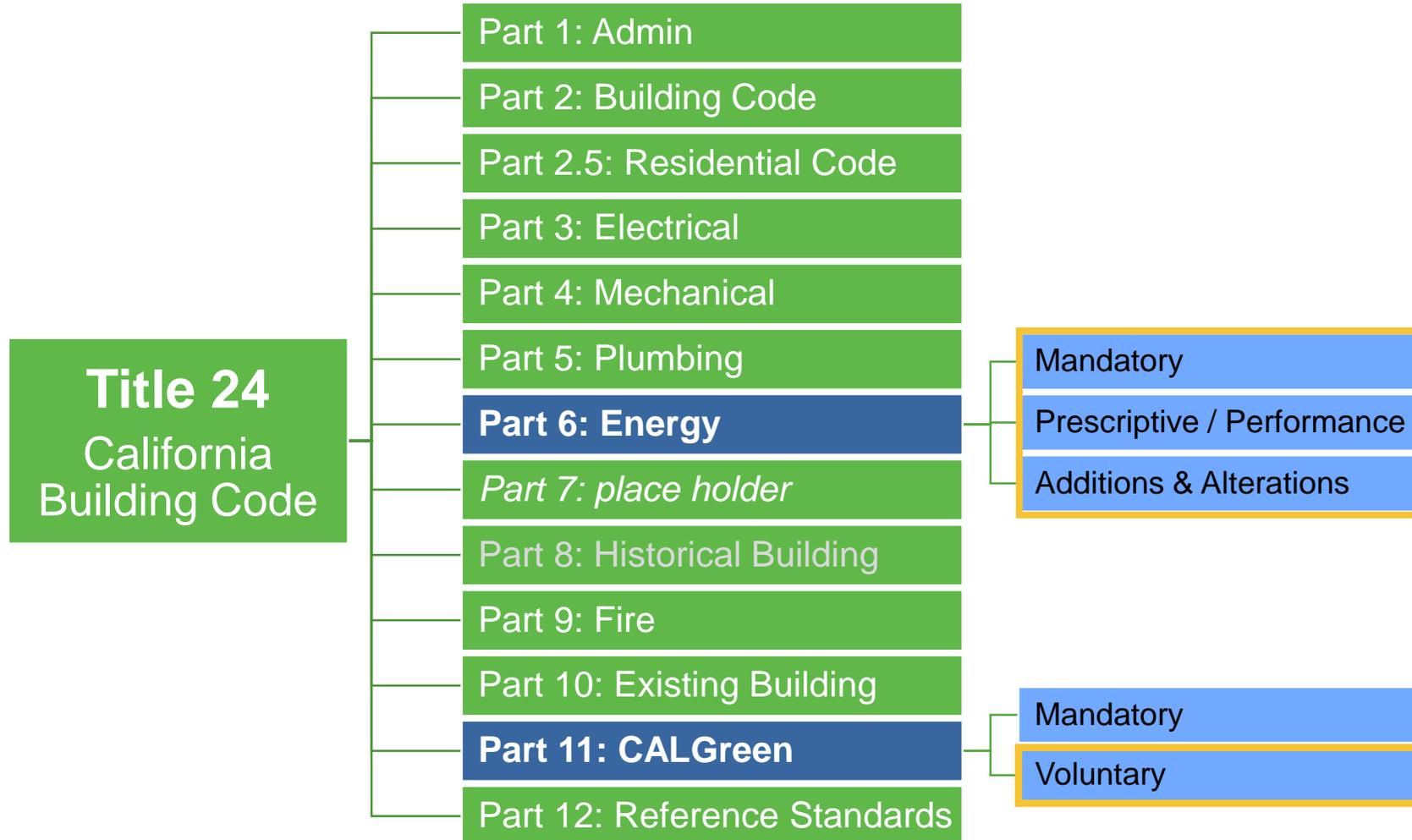
Building Codes Introduction

Heidi Werner

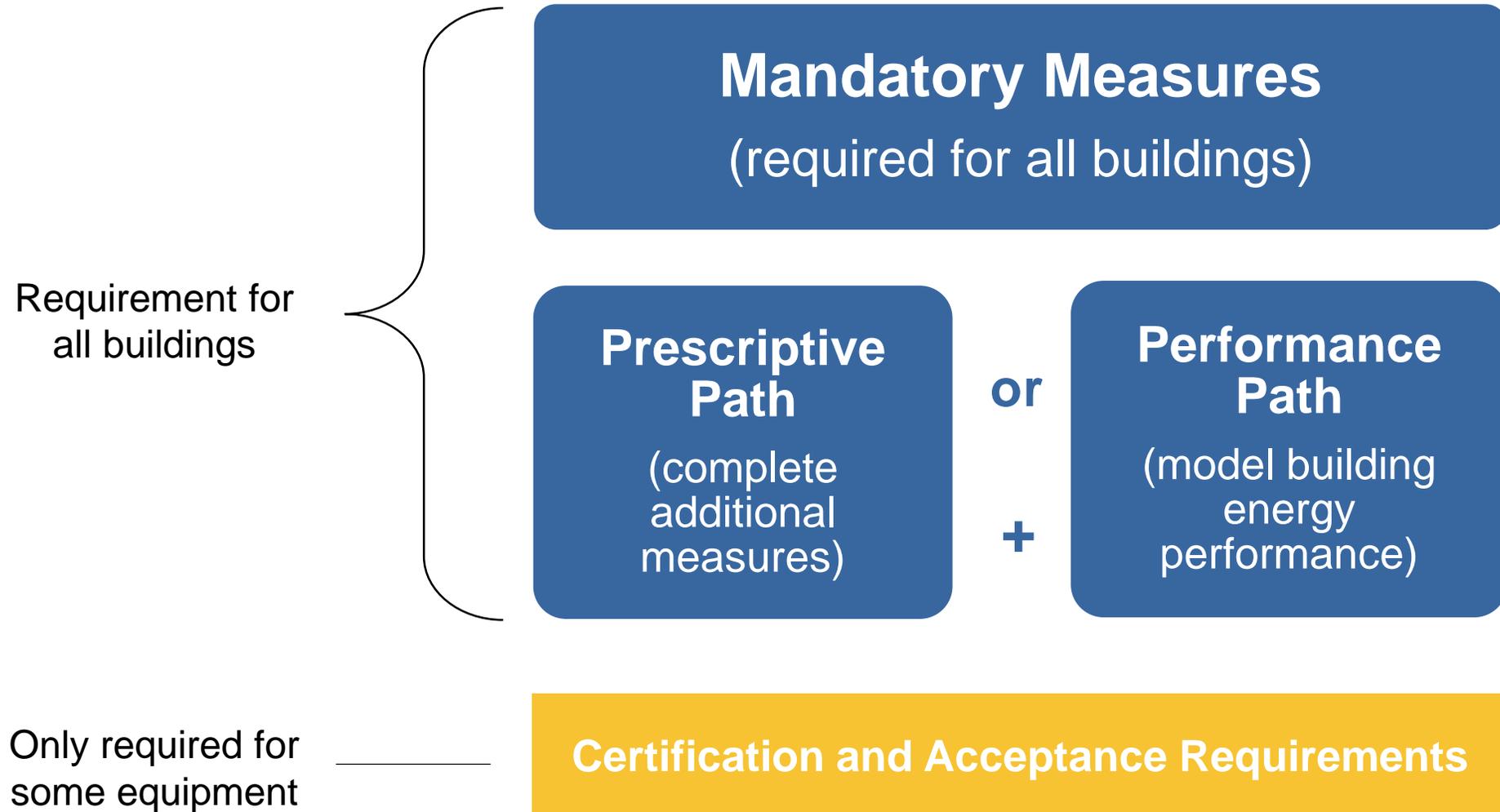
Statewide CASE Team



Primary Focus of Advocacy is Part 6 and Mandatory Energy Efficiency Requirements in Part 11



General Structure of Standards



Which Documents are updated in Title 24, Part 6?

1. Standards
2. Reference Appendices
3. Alternative Calculation Method Approval Manual
4. Compliance Software
5. Alternative Calculation Method Reference Manual
6. Compliance Manual
7. Compliance Forms

Must be ***adopted*** by
the Energy Commission

Statewide CASE Team is a Stakeholder in Code Development Process



CALIFORNIA
ENERGY
COMMISSION

California Energy Commission

- Establish scope of code cycle
- Administer public rulemaking process
- Consider (and approve) code change proposals
- Develop code change proposals
- Maintain compliance software



Public Stakeholders

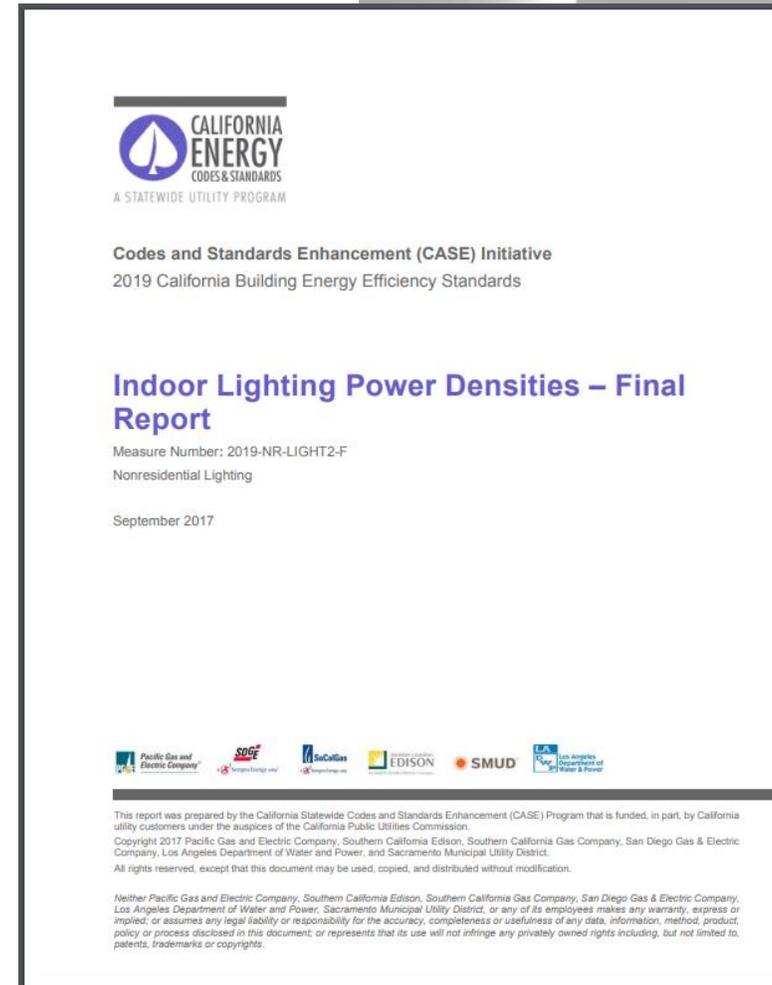
Participate in Energy Commission's rulemaking process:

- Develop code change proposals
- Support Energy Commission throughout rulemaking
- Provide data
- Offer feedback & suggest revisions

Codes and Standards Enhancement (CASE) Initiative

Provide Energy Commission information needed to adopt changes to the Energy Code

- Energy and demand impacts
- Cost effectiveness
- Technical feasibility
- Market impacts
- Suggested code language
- Compliance and enforcement
 - Compliance software recommendations
 - Revisions to Compliance Manuals



The image shows the cover page of a report titled "Indoor Lighting Power Densities – Final Report". At the top left is the logo for "CALIFORNIA ENERGY CODES & STANDARDS A STATEWIDE UTILITY PROGRAM". Below this, the text reads "Codes and Standards Enhancement (CASE) Initiative" and "2019 California Building Energy Efficiency Standards". The main title "Indoor Lighting Power Densities – Final Report" is in a larger, bold font. Below the title, it says "Measure Number: 2019-NR-LIGHT2-F" and "Nonresidential Lighting". The date "September 2017" is listed. At the bottom, there is a row of logos for participating utilities: Pacific Gas and Electric Company, SDGE, San Diego Gas & Electric, EDISON, SMUD, and Los Angeles Department of Water & Power. A small disclaimer at the bottom states that the report was prepared by the California Statewide Codes and Standards Enhancement (CASE) Program, funded in part by California utility customers, and that the report is copyrighted by the participating utilities in 2017. It also includes a statement that the report does not constitute a warranty or assume any legal liability.

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Codes and Standards Enhancement (CASE) Initiative
2019 California Building Energy Efficiency Standards

Indoor Lighting Power Densities – Final Report

Measure Number: 2019-NR-LIGHT2-F
Nonresidential Lighting

September 2017



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2022 CALIFORNIA ENERGY CODE (TITLE 24, PART 6)

Controlled Environment Horticulture

Codes and Standards Enhancement (CASE) Proposal
Nonresidential | Covered Processes

Kyle Booth, Steffi Becking, *Energy Solutions*

Joe Sullivan, *Cultivate Energy Optimization*

September 19, 2019

Agenda

1	Background	<i>5 min</i>
2	Market Overview and Analysis	<i>10 min</i>
3	Technical Feasibility	<i>10 min</i>
4	Cost and Energy Methodology	<i>10 min</i>
5	Compliance and Enforcement	<i>5 min</i>
6	Proposed Code Changes	<i>10 min</i>
7	Discussion and Next Steps	<i>1-3 hr</i>

Background

- Context and History
- 2019 Code Requirements
- Code Change Proposal

Code Change Proposal – Summary

Building Types	System Type	Type of Change	Software Updates Required
Nonresidential	Covered Process	Mandatory	No

Measures for Controlled Environment Horticulture (CEH) facilities:

- Horticultural lighting performance
- Environmental and irrigation controls
- Dehumidification and reuse of transpired water
- Circulation fan performance

- No existing code specific to CEH
- Lighting for plant growth currently exempt from Title 24, Part 6 lighting code

Context and History

- **Why Propose Measures for CEH facilities?**

- California has experienced a recent and sudden increase in energy use due to the changes in state cannabis laws
- Significant opportunity for energy savings (total energy use for licensed California Cannabis market expected to exceed 390 GWh by 2022¹)

- **Type of Facilities under Consideration**

- Non-stacked indoor farms
- Stacked indoor farms

- **Crops under Consideration**

- Cannabis, microgreens, vegetable transplants, basil (representing herbs category), lettuce (representing leafy greens category), tomatoes (representing vine plants category), and roses

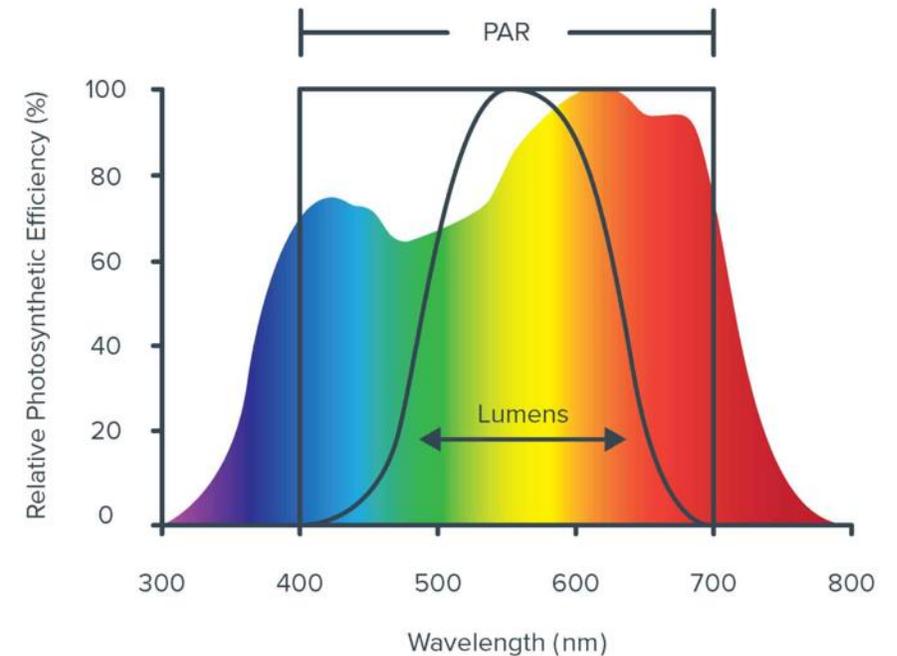
Poll

Should the Statewide CASE Team evaluate proposed measures for greenhouses as well?

- A. Yes
- B. No
- C. Not Sure

Background on Horticultural Lighting

- **Photosynthetic Active Radiation (PAR)** - the portion of light, within the range of 400 to 700 nanometers, that all plants use for photosynthesis
- **Photosynthetic Photon Flux (PPF)** - the rate of flow of photons between 400 to 700 nanometers in wavelength from a radiation source.
- **Photosynthetic Photon Efficacy (PPE)** -
$$\text{PPE} [\text{micromoles/Joule}] = \text{PPF} / \text{Watts}$$



Background on Horticultural Lighting, *cont'd*

Lighting Product Type	Best-in-Class PPE (μ -moles/joule)*
Mogul Base HPS	1.02
Double-Ended HPS (2014)**	1.70
Ceramic Metal Halide	1.46
Fluorescent Induction	0.95
T8 Fluorescent	0.84
LED (2014)**	1.70
Double-ended HPS (2017)**	2.1
LED (2017)**	2.5
Future LED	> 4

Background on Vapor Pressure Deficit

- **Vapor Pressure Deficit (VPD)** is a difference between saturated vapor pressure and actual vapor pressure. The difference describes additional water holding capacity of the air. Water holding capacity of the air doubles with every 20°F increase.
- **Saturated vapor pressure** – maximum water vapor partial pressure
- **Actual vapor pressure** – actual water vapor partial pressure
- $VPD = P_{sat} \times (1 - \text{Relative Humidity})$
- Optimal VPD levels vary throughout plant lifecycle and vary among plant species

VPD	Result
Too high	Plants dry out
Too low	Moist surfaces and mold formation

2019 Title 24 Code Requirements

- Title 24, Part 6 regulates envelope and mechanical HVAC systems of conditioned greenhouses and warehouses that may be used for indoor horticulture
- Exemption for plant growth lighting in Section 140.6.3(G)

“The watts of the following indoor lighting applications may be excluded from Adjusted Indoor Lighting Power:

Lighting for plant growth or maintenance, if it is controlled by a multi-level astronomical time-switch control that complies with the applicable provisions of Section 110.9.”

Existing National Code Examples

Controlled Environment Horticulture Codes in the United States		
Massachusetts		Lighting Power Density requirement ¹
Seattle, Washington		Horticultural lighting PPE requirement ²
Illinois		Lighting Power Density, efficient HVAC units, auto-irrigation and water re-use requirements ³

- CEH energy codes in other states tend to focus on lighting
- Requirements for space conditioning and dehumidification are needed

1. Massachusetts Cannabis Control Commission, 935 CMR 500. March 2018. <https://www.mass.gov/files/documents/2018/03/27/935cmr500.pdf>

2. Washington State Energy Code, Commercial Provisions. 2015. http://www.energy.wsu.edu/Documents/2015WSEC_C_final.pdf

3. Amendment to House Bill 1438. May 2019. <http://www.ilga.gov/legislation/101/HB/PDF/10100HB1438sam002.pdf>

Existing California Local Code Examples

Controlled Environment Horticulture Local Codes in California	
Humboldt County	Electrical power for indoor cultivation shall be provided by grid power from 100 percent renewable source, or onsite renewable energy system with twenty percent net nonrenewable energy use, or grid power supplied by partial or wholly nonrenewable source with purchase of carbon offsets. ¹
Monterey County	Onsite renewable energy generation designed to have a generation potential \geq half of the anticipated energy demand. ²
Sonoma County	100% renewable (grid or onsite generation), or carbon offsets purchased (generators are prohibited) ³

Current local energy codes focus on using renewable energy and do not address energy efficiency

1. Humboldt County Codes. 314-55 Medical Marijuana Land Uses. <https://humboldt.county.codes/Code/314-55>

CalCannabis Cultivation Licensing. *Volume One: Main Body Final Program Environmental Impact Report*. November 2017: 240.

<https://www.cdfa.ca.gov/calcannabis/documents/V1-MainBody.pdf>

2. Monterey County Codes. Chapter 21.67 Commercial Cannabis Activities.

https://library.municode.com/ca/monterey_county/codes/code_of_ordinances?nodeId=TIT21ZO_CH21.67COCAAC_21.67.050RECACU

3. Sonoma County Cannabis. Pre-Operational Requirements. <https://sonomacounty.ca.gov/Cannabis/Permits/Cultivation/>

Existing Horticultural Lighting Standards

Horticultural Lighting Standards	
Design Lights Consortium (DLC) Horticultural Lighting Qualified Products List (QPL)	<p>PPE \geq 1.9 micromole per joule¹</p> <ul style="list-style-type: none"> • 29 luminaire models in DLC QPL products list (PPE range is 1.87 to 3 micromoles per joule)² • 9 manufacturers²
International Energy Conservation Code (IECC)	PPE \geq 1.6 micromole per joule (proposed for 2021 IECC) ³
City of Seattle	PPE \geq 1.2 micromole per joule ⁴
State of Illinois	Either Lighting Power Density (LPD) of 36 W/ft ² of canopy, or PPE \geq 2.2 micromole per joule with products from DLC QPL ⁵
State of Massachusetts	<ul style="list-style-type: none"> • Operations over 5,000 ft² of canopy - LPD of 36 W/ft² of canopy⁶ • Operations under 5,000 ft² of canopy - LPD of 50 W/ft² of canopy⁶

1. Technical Requirements for Horticultural Lighting V1.1. March 2019. <https://www.designlights.org/horticultural-lighting/technical-requirements/>

2. DLC Horticultural Lighting. <https://www.designlights.org/horticultural-lighting/search/>

3. Indoor Horticultural Lighting, IECC C405.4. https://newbuildings.org/wp-content/uploads/2019/02/Indoor_Horticultural_Lighting-NBI-5155.pdf

4. 2015 Seattle Energy Code. <http://www.seattle.gov/documents/Departments/SDCI/Codes/SeattleEnergyCode/2015SECCCommercialChapter4.pdf>

5. Amendment to House Bill 1438. May 2019. <http://www.ilga.gov/legislation/101/HB/PDF/10100HB1438sam002.pdf>

6. MA Reg. #1361. March 2018. <https://www.mass.gov/files/documents/2018/03/27/935cmr500.pdf>

Poll

Should CEH facilities be subject to both LPD and PPE thresholds for lighting?

- A. Yes
- B. No, just LPD
- C. No, Just PPE
- D. Not Sure

Proposed Code Change Overview

Submeasure	Description
Horticulture Lighting Minimum Efficacy	Luminaire PPE requirement
	Lighting power density requirement based on plant canopy area
Environmental and Irrigation Controls	Controls for lighting, temperature, and irrigation
	Humidity controls capable of controlling environment to a specified vapor pressure deficit value
	New acceptance test for controls
Efficient Dehumidification and Reuse of Transpired Water	Dehumidification efficacy requirements
	Reuse of transpired water
Circulation Fan Minimum Performance	Efficiency requirements for circulation fans



Market Overview

- Current Market Conditions
- Market Trends
- Potential Market Barriers and Solutions

Current Market Conditions

- California CEH market valued at \$3B; forecasted to grow to \$8B by 2021^{1,2,3}
- Crops grown in CEH include herbs, vegetables, herbs, microgreens, flowers, and cannabis (70 percent of market)
- 800+ CEH facilities in California^{2,3}
- 10M+ square feet in production for all crops in California

1. Mordor Intelligence, Indoor Farming Market (Hyderabad: Mordor Intelligence, 2019). <https://www.mordorintelligence.com/industry-reports/indoor-farming-market>

2. BDS Analytics. *The 2018 California Cannabis Marketplace in Review*: February 2019. <https://bdsanalytics.com/the-2018-california-cannabis-marketplace-in-review/>

3. USDA-ARS. 2017 Census of Agriculture. *California Stand and County Data. Vol 1. Part 5: 49-50.*

https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/California/cav1.pdf

Current Market Conditions, *cont'd*

- No energy efficiency incentives targeted specifically to CEH
- Limit on number of licenses for medium cannabis facilities (10,001-22,000 square feet) until 2023
- Licenses for large cannabis facilities (>22,001 square feet) will not be issued until 2023

1. CalCannabis Cultivation Licensing 08-07-2019 - <http://calcannabis.cdfa.ca.gov/>

2. New Frontier Data: 2018 Cannabis Energy Report - <https://newfrontierdata.com/product/2018-cannabis-energy-report/>

3. BDS Analytics: California: The Golden Opportunity? https://bdsanalytics.com/wp-content/uploads/2019/01/BDS_2018_California_Golden_Opportunity_Exec_Summ.pdf

4. USDA-ARS. 2017 Census of Agriculture. *California Stand and County Data. Vol 1. Part 5: 49-50.* https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/California/cav1.pdf

5. BDS Analytics. *The 2018 California Cannabis Marketplace in Review*: February 2019. <https://bdsanalytics.com/the-2018-california-cannabis-marketplace-in-review/>

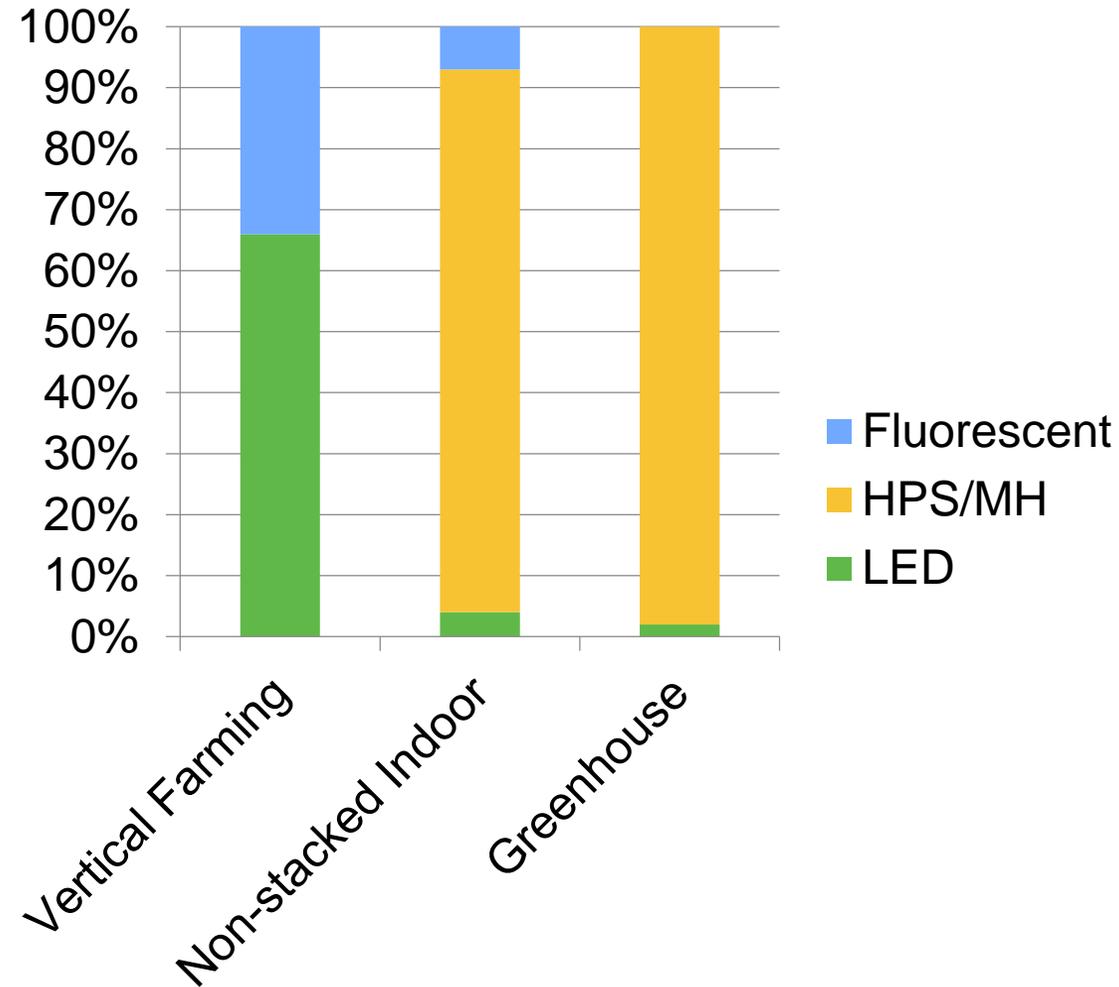
Market Trends

- Indoor cultivation is expanding, particularly in urban areas¹
- Rapid build-out with focus on crop yield and quality, energy efficiency is not a primary concern for growers
- Slow adoption of LED and other efficient technology
- Widely accepted performance metrics for CEH operations not fully developed

Share of Cannabis Production Technology by Region ¹			
Region	Indoor	Outdoor	Mixed Light
Bay Area	61%	26%	13%
North Coast	6%	51%	43%
SE Interior	8%	83%	8%
North San Joaquin	17%	74%	9%
Central Coast	6%	74%	30%
Intermountain	9%	63%	27%
South San Joaquin	3%	43%	54%
South Coast	30%	48%	22%
Sacramento Valley	8%	77%	15%
Total	16%	60%	24%

1. Economic Impact Analysis of Medical Cannabis Cultivation Program Regulations: *Standardized Regulatory Impact Assessment (SRIA)*; January 2017; page 28. http://www.dof.ca.gov/Forecasting/Economics/Major_Regulations/Major_Regulations_Table/documents/20170203FinalIMCCPSRIA.pdf

Market Trends, *cont'd*



Market Barriers and Solutions

Barrier	Solution
Hesitation from growers to change operational practices from legacy technology	Demonstrate success of growers who have adopted energy efficient practices
High start-up costs, permitting fees and local taxes take precedent over efficient technology purchases	Demonstrate financial value of efficient technology
Potential effects of proposed measures to spread pests & disease	Provide guidance and education regarding CEH contamination

Market Barriers and Solutions, *cont'd*

Barrier	Solution
State and county regulations incentivize legal operations to grow indoors with significant energy impacts	Educate authorities on energy and environmental impacts of indoor cultivation. Mitigate impact with EE requirements.
Environmental and energy use requirements differ by crop type	Propose requirements that can be implemented across all crop types
Lack of standard practice baseline information	Conduct survey to gather baseline standard practice information
Concern that regulations render indoor cultivation unprofitable	Indicate that outdoor growing is an effective alternative

5 MINUTE BREAK

Reminder to download and review the *Submeasure Proposal Summary* found in the 'Resources' box

Technical Considerations

- Technical Considerations
- Potential Barriers and Solutions

Technical Considerations

- Different crops have different requirements for lighting, water, air flow, and temperature
- Different growth stages of the same plant have different requirements
- CEH facilities have high humidity, requiring dehumidification
- Interactions between lighting, HVAC, dehumidification, and irrigation systems

Technical Barriers and Potential Solutions

Barrier	Solution
Efficient dehumidification units typically specified for large CEH facilities	Work with manufacturers to identify technologies for small to medium CEH
Recycled water must be treated before it can be given to plants	Provide guidance on efficient procedure to purify run-off and condensate for plant use
Typical circulation fans used in CEH are not tested by a 3 rd party or labeled with performance rating (cubic feet per minute per Watt)	Analyze market data for prevalent CEH circulation fans and advocate labeling circulation fans with performance rating

Energy and Cost Impacts

Methodology and Assumptions

- Energy Impacts Methodology
- Cost Impacts Methodology
 - Incremental costs
 - Energy cost savings

Methodology for Energy Impacts Analysis

Methodology for per unit impacts

- Define metrics specific to plant growth
- Gather range of efficiencies available for each proposed submeasure
- Determine standard baseline practice and operational parameters from survey results
- Calculate savings using average baseline efficiency, proposed code minimum efficiency, average prototype building parameters, and CEH building forecast

Methodology for statewide impacts

- Define prototype buildings for non-stacked and stacked CEH facilities
- Multiply per unit savings by construction forecast

Tools Used for Energy Impacts Analysis

- Survey to gather operational parameters, standard baseline practice, building size, and building characteristics
- Prototype building analysis spreadsheet
- Lighting savings analysis spreadsheet
- Grow Green Horticultural Lighting Calculator
- Dehumidification / HVAC savings analysis spreadsheet
- CEH construction forecast

2023 Construction Forecast

- California Lighting Technology Center (CLTC), UC Davis provided resources and methodology for forecasting the number of CEH facilities¹
- 2017 US Department of Agriculture (USDA) Census of Agriculture²
- Cannabis Industry Organization Data
 - CalCannabis licensing data³
 - Resource Innovation Institute⁴
 - The Cannabis Conservancy⁵

¹ <https://cltc.ucdavis.edu/>

² <https://www.nass.usda.gov/AgCensus/>

³ <https://calcannabis.cdfa.ca.gov/>

⁴ <https://resourceinnovation.org/>

⁵ <https://cannabisconservancy.com/>

Definition of Baseline and Proposed Conditions



Baseline Conditions

- Grower survey to determine standard baseline practice for each measure



Proposed Conditions

- Maximum lighting power density (LPD)
- Minimum photosynthetic photon efficacy (PPE)
- Automated environmental and irrigation controls
- Minimum moisture removal efficiency for dehumidification systems
- Minimum cfm/Watt for circulation fans

Data and Participant Request

- Interested in obtaining data from stakeholders in the following areas:
 - Site energy use
 - Baseline technology data
 - Baseline and high efficiency equipment costs
 - Operational parameters and setpoints
- **Are you interested in participating in further studies?**
 - **Site walk throughs for educational purposes**
 - **Equipment energy use monitoring**

CEH Stakeholder Survey

The Statewide CASE Team will be sending out a survey to **document baseline efficiencies and operational parameters from CEH facilities**. The survey will be sent out to attendees this fall!

If you do not wish to receive the survey, please let us know in the chat box.



Preliminary Energy Savings Estimates¹

Preliminary Energy Savings Estimate		
Submeasure	Annual per Unit Electricity Savings (kWh/Prototype Building-yr)	First Year Statewide Electricity Savings (GWh/yr)
Horticultural Lighting Minimum Efficacy	84,000	64.9
Environmental and Irrigation Controls	49,000	37.9
Efficient Dehumidification and Reuse of Transpired Water	34,000	26.3
Circulation Fan Minimum Performance Specifications	5,600	4.3

¹ Based on 863 indoor sites

Incremental Cost Information

- **How we collected costs for base case technology and proposed technology**
 - Aggregated data from Colorado cannabis energy assessments and implemented energy efficiency projects
 - Interviews with manufacturers and equipment dealers
 - Interviews with CEH owners/operators that have completed efficiency projects

Incremental Per Unit Cost

Technology	Incremental Cost
Lighting	\$800-\$1,300
Environmental & Irrigation Controls	\$30-\$2,000
Efficient Dehumidification	\$3,500-\$30,000
Efficient Circulation Fans	\$50-\$550

Compliance and Enforcement

- Design
- Permit Application
- Construction
- Inspection



Compliance Verification Process



1. Design Phase

- Design team incorporates into project plans equipment that will meet code requirements



2. Permit Application Phase

- Permit applicant completes a certificate of compliance document and ensures building plans are consistent with the information in the certificate of compliance
- Plans examiner at enforcement agency reviews building plans and certificate of compliance and determines compliance with new code requirements

Compliance Verification Process



3. Construction phase

- Construction team installs equipment and verifies proper functioning
- Permit applicant obtains revised certificate of compliance from the enforcement agency for any field changes resulting in noncompliance



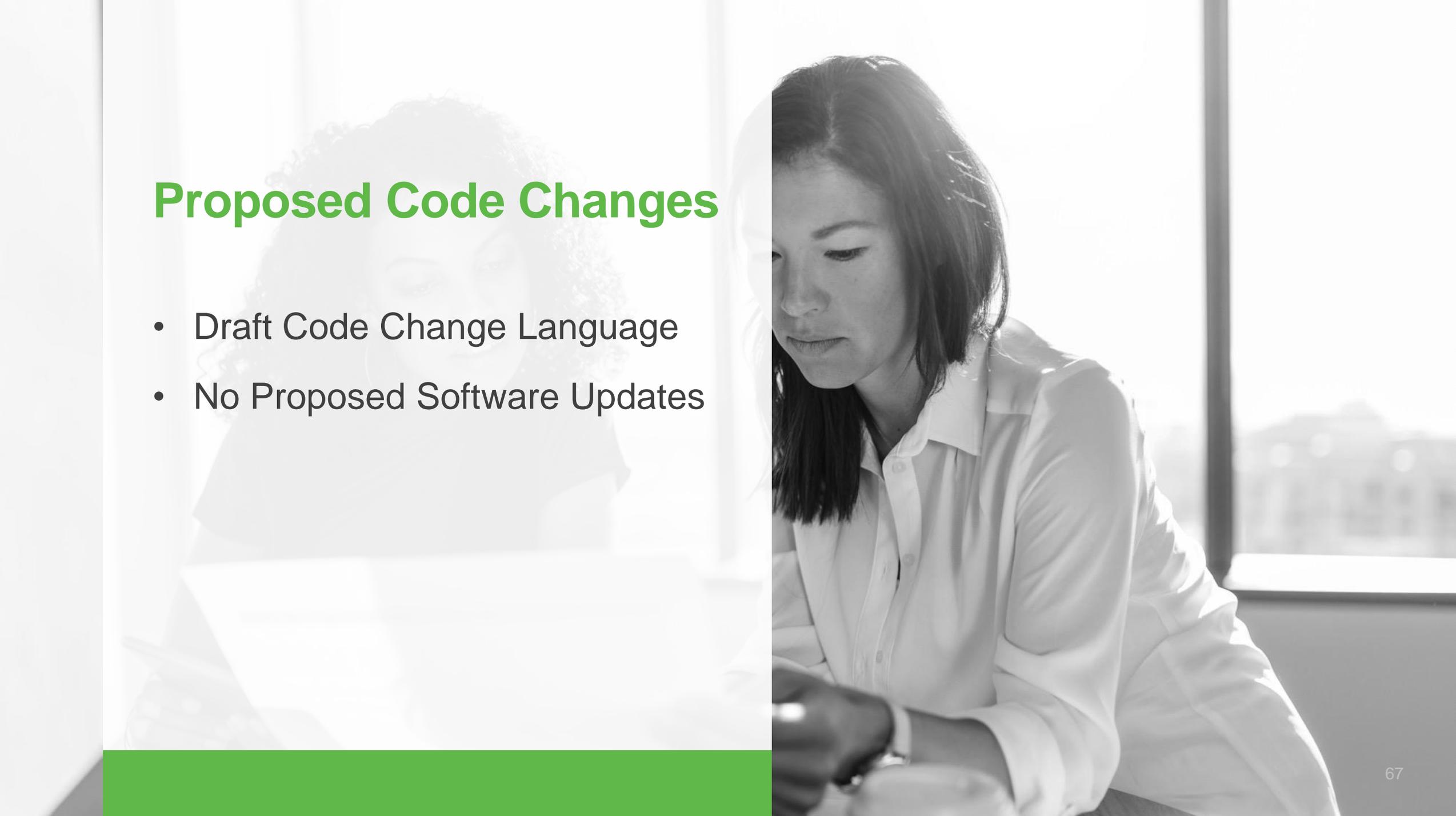
4. Inspection Phase

- Appropriate responsible party for the project completes certificate of installation
- Acceptance testing technician conducts testing to verify proper commissioning of environmental and irrigation controls and completes certificate of acceptance
- Enforcement agency field inspector reviews certificate of installation and certificate of acceptance

Market Actors

- Local California CEH business **owners and operations managers**
- CEH specific **equipment manufacturers** (Fluence Bioengineering, Desert Aire, Thrive Agritech, Surna, BIOS Lighting, Trane, KCC Manufacturing, Argus Controls, Wadsworth Controls, etc.)
- CEH **professional and trade associations** (DLC, California Growers Association, National Cannabis Industry Association, Resource Innovation Institute, etc.)
- CEH **efficiency consultants** (Dr. Nadia Sabeh, Urban-gro, Energy 350, The Cannabis Conservancy, Gro-Tec Systems, etc.)

Please let us know in the chat box if you have recommendations of other key actors!

A woman with dark hair, wearing a white button-down shirt, is seated at a desk in an office. She is looking down at a document or tablet in front of her. The background shows a window with a view of buildings outside. The image is split vertically, with the left side being a faded version of the same scene.

Proposed Code Changes

- Draft Code Change Language
- No Proposed Software Updates

Draft Code Change Language

Please take a minute to review the draft code language available in the resources tab

- **Should there be a minimum size threshold to exempt smaller growers for any measures?**
- **Should CEH-specific HVAC requirements be developed?**
- **When should lighting requirements be triggered for alterations?**

Poll

Should there be exemptions for air-side economizers due to contamination issues with introducing outdoor air?

- A. Yes
- B. No

Discussion and Next Steps



We want to hear from you!

- Provide **any last comments or feedback** on this presentation now verbally or over the chat
- More information on pre-rulemaking for the 2022 Energy Code at <https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency>
- **Comments on this measure** are due by **October 3**, please send to info@title24stakeholders.com and copy CASE Authors (see contact info on following slide).

Thank you for your participation today

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Please complete the closing polls below





Upcoming Meetings

Meeting Topic	Building Type	Date
Multifamily & Nonresidential Water Heating	MF/NR	Thursday, October 3, 2019
Single Family HVAC	SF	Thursday, October 10, 2019
Nonresidential HVAC Part 1: Data Centers, Boilers, & Controls	NR	Tuesday, October 15, 2019
Nonresidential Envelope Part 1	NR	Thursday, October 24, 2019
Nonresidential HVAC and Envelope Part 2: Air Distribution, & Controls	NR	Tuesday, November 5, 2019
Covered Processes Part 2: Compressed Air, Steam Traps, & Refrigeration	NR	Thursday, November 7, 2019
Single Family Whole Building	SF	Tuesday, November 12, 2019
Nonresidential Software Improvements	NR	Tuesday, November 12, 2019