Meeting Notes: December 10, 2025

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These notes summarize the content from the 2028 Title 24, Part 6 Code Cycle Utility-Sponsored Stakeholder Meeting on the **Indoor Controlled Environment Horticulture Prototype.**

If you are interested in providing input on any of the topics covered in this meeting, please email your comments to info@title24stakeholders.com by January 10, 2026. Comments received after then may not be incorporated into the first public draft of the CASE Report.

Quick Links

- ***Key Points from Meeting*** – Read through highlights from each measure and review feedback requested from stakeholders.
- ***In-Meeting Questions / Comments*** – Navigate directly to questions asked during the meeting and responses from CASE Authors
- ***Meeting Materials*** (available on Title24Stakeholders.com) – Review slides, measure summaries, proposed code language and more on our website.

Meeting Information

Meeting Date: December 10, 2025

Meeting Time: 10:00-11:30

Meeting Host: California Statewide Utility Codes and Standards Team

Meeting Agenda

Time	Topic	Presenter
10:00 AM	Introduction	Cosimina Panetti, Energy Solutions Payam Bozorgchami, CEC
10:15 AM	Controlled Environment Horticulture Prototype	Garth Torvestad, 2050 Partners
11:30 AM	Adjourn	

Members of the CASE Team

1.1.1 Statewide Utility Codes and Standards Team – Utility Staff

Name	Email Address	Affiliation
Kelly Cunningham	kelly.cunningham@pge.com	PG&E
Mark Alatorre	mark.alatorre@pge.com	PG&E
Thomas Mertens	T0MA@pge.com	PG&E
Jeremy Reefe	JMReefe@sdge.com	SDG&E
Dom Michaud	dmichaud@sdge.com	SDG&E
Randall Higa	Randall.Higa@sce.com	SCE

1.1.2 Statewide Utility Codes and Standards Team – Codes and Standards Enhancement (CASE) Team Members

Name	Email Address	Affiliation
Cosimina Panetti	cpanetti@energy-solution.com	Energy Solutions
Heidi Werner	hwerner@energy-solution.com	Energy Solutions
Nikki Westfall	nwestfall@energy-solution.com	Energy Solutions
Chris Uraine	curaine@energy-solution.com	Energy Solutions
Remy Hutheesing	rhutheesing@energy-solution.com	Energy Solutions
Jon McHugh	jon@mchughenergy.com	McHugh Energy
Garth Torvestad	garthtorvestad@2050partners.com	2050 Partners
Amy Droitcour	amydroitcour@2050partners.com	2050 Partners
Lydia Miner	lydiaminer@2050partners.com	2050 Partners
Michael Gillespie	gillie@gilliecs.com	Gillie Consulting
Aaron Boronian	aaron.boranian@bigladdersoftware.com	Big Ladder Software

California Energy Commission

Contact for 2028 Code Cycle:

Any questions for the CEC can be sent to: EnergyCodeUpdateInquiries@energy.ca.gov

CEC Docket

Comments on the 2028 Energy Code update can be formally submitted to the docket: **https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=25-BSTD-03**

Key Points from Meeting

The purpose and benefits of the prototype presented at this meeting is noted below. Specific topics we are looking for feedback on are highlighted.

To provide input, email the CASE Authors noted above or send to info@title24stakeholders.com.

TOPIC

- **Purpose**: Solicit feedback on CEH indoor prototype assumptions and user inputs in compliance model.
- **Benefits**:
  - Provides a tool to facility designers and energy consultants to evaluate efficiency measures.
  - Improves model accuracy by integrating variable cooling and dehumidification loads.
  - Provides flexibility when selecting equipment and demonstrating compliance with code requirements.
- **Feedback requested**:
  - Download the prototype excel workbook: https://title24stakeholders.com/wp-content/uploads/2025/12/2028-T24-CEH-Prototype-for-Vetting.xlsx
  - Provide feedback on any and all assumptions in the document.
  - Email amydroitcour@2050partners.com to share feedback via email or to schedule a meeting to discuss your feedback with the team.

In-Meeting Questions / Comments

During the meeting, questions and comments were submitted in the Q&A pane in Zoom as well as asked aloud. Answers are provided below.

Due to time limitations, not all written questions and comments were discussed during the meeting, but all have responses available in these meeting notes.

CEH Prototype, presented by Garth Torvestad

1. **Question asked via Zoom question pane by Jon McHugh:** Is staging of flow areas staged in terms of the age of the plants but also staged in terms of hour of day when lights are on versus off?
   a. **CASE Team Response:** The model currently does not include staggered lights-on times. We have heard that many growers keep one on/off cycle. However, engineers often recommend staggering the lights-on times. We would welcome input on which approach is the industry standard.
   b. **Garth Torvestad (verbally):** As of now, we're staggering the beginning of this cycle, but assuming that those are running on the same 12/12 lighting cycle, so as of now, we are not doing that. We would be interested in feedback on if folks tend to do that in their facilities. The facilities we've seen, they are running all their flower rooms on the same 12-12 cycle, due to labor issues encountered

when they try to stagger them too much. Certainly, if market practice seems to be that one flower room starts at 7 AM and the next at 8 AM and the next at 9, and they are generally in the same schedule, we could incorporate that. As far as the full 12-12 cycle, we've seen reluctance where somebody runs a flower room from, let's say, 8am to 8pm in the other flower room from 8pm to 8am. It is a great practice that allows hydronic systems to be shared between grow rooms, so that the size, and therefore cost, can be reduced. However, the growers we've talked to have been reluctant to implement this approach. So as of now, the model has all rooms on the same 12/12 lighting schedule.

2. **Question asked via Zoom question pane by Jon McHugh:** Are on cycle PPFDs (Photosynthetic Photon Flux Density) different early mid or late plant cycle?
    a. **CASE Team Response:** We have a dimming schedule for the flower room, so the PPFDs vary through the grow cycle.
3. **Question asked verbally by Gretchen Schimpelfenig:** Grower targets for VPD (vapor pressure deficit) can be achieved at a variety of humidity setpoints and temperature settings. I'm curious why a temperature over 80 degrees is being used for the veg setpoint. I think it isn't always that hot, especially if growers are using LED. They might be getting the same VPD at a cooler temperature set point.
    a. **Garth Torvestad:** We would like to get additional data on that. We looked at 8-10 different facilities that went through programs, but they may not have all had LEDs. This needs to be a 100% LED baseline, so we want to reflect practices with LEDs. If typical practices run at a different temperature, we would like to incorporate that. We want to reflect practices with LEDs, so let's see what the data says, specifically for LEDs.
4. **Question asked verbally by Shamim Ahamed:** First question is more for clarification, what is the purpose of the prototype?
    a. **Garth Torvestad:** There are multiple purposes of the prototype. The prototype and model will be used for energy savings analysis for the indoor CEH HVAC/D measure proposed in the 2028 code cycle. We need a good baseline model to start from, which we can use to calculate energy savings, both on an annual and hourly basis, and use that energy savings in the cost effectiveness analysis. Going forward, the prototype could be available in the CBECC compliance software, so that would set the Standard Design energy budget. If the proposed prescriptive code requirements get adopted, and somebody comes in with a project, they have two options. They can follow the prescriptive path, in which case they won't need to run an energy model - they can install the type of system that is specified in the prescriptive requirements. If they choose not to follow the prescriptive path, but to go with an alternative design, they can comply via the performance path. In this case, they would use the prototype as a starting point. The prototype would have most of the assumptions in the Standard Design. Then they would modify the geometry and any other inputs, for their proposed design, and then the software will calculate whether or not that proposed design meets or beats the energy budget set by the standard design, to demonstrate compliance with the energy code using the performance path.
5. **Question asked verbally by Shamim Ahamed:** Do you have any validated evapotranspiration models for the cannabis?
    a. **Garth Torvestad:** Yes, that's on the next slide.
6. **Question asked verbally by Shamim Ahamed:** Will the prototype be only for the indoor, complete indoor facilities, or also for greenhouse?
    a. **Garth Torvestad:** Only indoor - we're not trying to cover greenhouse in this cycle. Greenhouse would be a far more complex model due to interaction with the outdoor environment, solar gains, the nature of the glazing, the strategies

that are used to control those with passive ventilation. The nice thing about indoor cannabis is that there are a set of practices that are fairly consistent within the industry. That's not to say everyone runs them exactly the same, but there are less variables. So, at least for this phase, we are only attempting to take on this specific use case, which is indoor cannabis farms and particularly flower rooms.

7. **Question asked verbally by Shamim Ahamed:** So that means that the evapotranspiration impact is based on data, not any model, right?
    a. **Garth Torvestad:** What I'm showing right now is based on measured data. So this was based on condensate that was measured at facilities to develop an hourly model of how water, or vapor, flows through the facility. This shapes that you're seeing here are each daily load shape, so the first 7 days of the cycle are represented by the far-left bar graph. Then each day in the next week is represented by that load shape, and then the mid-stage, and then the late stage. So it shows the lights-off condition, the lights come on, the humidity, the evapotranspiration increases substantially, it plateaus and then begins to slowly degrade after the lights go off.
    b. **Shamim Ahamed:** This is based on a particular set of conditions, but if the grower wants different conditions, then the evapotranspiration will be different. Can the model adapt to that change.
    c. **Garth Torvestad:** The shape of the load shouldn't very different, but yes, the peak would change, so that's an input. We'll get to that in one of the next slides, but basically that would be calculated from inputs to the model, such as canopy area, lighting intensity (PPFD), and lighting efficiency (PPE). Those values would be used to adjust the peak evapotranspiration rate. The shape would be fixed but scaled to the calculated peak. The individual steps in the shape would be scaled proportionally for the energy model. This will not be perfect and representative of every facility, but it is a vast improvement over other energy models that have virtually no latent load in them right now, and that's basically what we've got - people running a conditioned warehouse and saying close enough, but we've got, you know, 5 gallons a day versus 500 gallons a day from that same space, so this is intended to be a vast improvement upon that, and to reflect the performance of the systems, especially the dehumidification systems that are used in this.
8. **Question asked verbally by Dan Dettmers:** This is Dan Dettmers from Madison Air, which, represents Quest, AgIQ, Argus Technologies, etc.. Is the flower room evaporation schedule data based on a published paper? Can we see a discussion of how it was achieved?
    a. **Garth Torvestad:** Yeah, this monitoring was done through PG&E's Code Readiness Program. There is a paper that's available through ETCC. We can share that out, and it's quite detailed. We have the researchers that conducted that analysis on our team. Let us know if you want to get on a call with Willie Sober from Red Car was very involved with that, as well as Nadia Sabeh from Dr. Greenhouse. We'd be happy to get them on a call to really get into the details of how the monitoring was done and how that was converted into these hourly and daily shapes throughout the growth cycle.
    b. **Report:** https://www.etcc-ca.com/reports/controlled-environment-horticulture-energy-consumption-and-environmental-control-field
9. **Question asked via Zoom question pane by Jon McHugh:** If the prescriptive proposal applies only to spaces > 30 W/sf, but the performance model applies to the entire facility including the vegetative rooms with lighting wattage less than 30 W/sf, what is planned

for the base case default cooling and dehumidification for the vegetative rooms? A particular default or will the proposed measure be the base case?

   a. **CASE Team Response:** The baseline and proposed cases for the cloning, vegetative, and drying spaces will have the same cooling equipment - Constant Air Volume (CAV) RTU with DX (Direct Exchange) Cooling. Their heating equipment will change (DX Heating aka heat pump in proposed, Gas or No heating in baseline). All three spaces will be paired with standalone dehumidifiers (2.41 L/kWh) in both baseline and proposed cases.

10. **Question asked via Zoom question pane by Liping Wang:** My major concern from the fixed assumptions related to the shape and max evapotranspiration, which are largely influenced by environment conditions. The ET measurements from limited number of facilities may not be generalized and widely representing CEH in general.
    a. **CASE Team Response:** The max ET (evapotranspiration) rates will be calculated based on plant canopy area and PPFD, and this is one crop type. Keep in mind that these models are not for sizing and designing systems, but to reflect the respective energy performance of the selected system types. We would welcome additional data on ET measurements and shapes.
11. **Question asked via Zoom question pane by Jon McHugh:** Related to cycle timing, you are not proposing the designer to specify the schedules and the base case and proposed case to use the same schedules but rather to have fixed default schedules?
    a. **CASE Team Response:** For T24 compliance via CBECC, users cannot edit schedules. The schedule assigned to both proposed and baseline is the same, based upon a space type selection. We welcome input on which approach is most common in practice.
12. **Question asked via Zoom question pane by Amine Lazrak:** Modeling evapotranspiration as a schedule should work well for estimating annual energy use, but it may fall short for peak demand analysis or any assessment that depends on hourly equipment power loads.
    a. **CASE Team Response:** Thank you for this input. Please reach out so we can discuss your input and any other potential approaches to latent load modeling.
13. **Question asked via Zoom question pane by Jon McHugh:** For moisture addition, what does the user enter? And how is it converted into a moisture addition schedule?
    a. **CASE Team Response:** The proposal is to have max ET rates calculated based on plant canopy area, lighting density (PPFD) and lighting efficacy (PPE), and then to scale the shape from the schedule to meet this maximum
    b. **Garth Torvestad verbally:** The thinking right now, is that this latent load shape is based on the way that the plants transpire and the timing of that transpiration on a daily basis, and then throughout the grow cycle. So, the thinking is that this is a fairly representative daily shape for that load. Key inputs to scale that would be the lighting intensity. which is PPFD, the lighting efficiency, which is PPE, and then the canopy area. The irrigation rate has been an input that folks use to design systems and to set peak latent load or peak evapotranspiration, but I think that's something that we would try to avoid, because irrigation rate could have runoff, so it's not necessarily a direct correlation to these things. So, while there are other inputs that could be helpful, as of now, we're thinking that just lighting intensity, canopy area, and lighting efficiency would be the key inputs that would essentially define the peak BTUh. Again, we are open for input on how we approach that. We'd also like additional data, certainly, if anyone else has

measured condensate or otherwise characterized the daily evapotranspiration, load shape, that would be something that we'd like to integrate.

14. **Question asked via Zoom question pane by Jon McHugh:** Does the user enter their desired vapor pressure deficit and their desired temperatures at different parts of the growth stages?
    a. **CASE Team Response:** The current proposal has fixed temperature and humidity setpoints, as is typical for compliance models. CBECC fixes thermostat setpoints to be the same between baseline & proposed cases, depending upon selected space type.
15. **Question asked via Zoom question pane by anonymous attendee:** An area of interest you mentioned was to promote demand flexibility. How do you see this prototype considering things like building controls, etc., that are generally known to increase energy savings to promote demand flexibility?
    a. **CASE Team Response:** In compliance software, some controls, PV, battery, and heat pump water heaters can generally be defined. If you would like to reach out, we would be happy to discuss further. Our discussion would be kept anonymous if that is your preference.
16. **Question asked verbally by Krishnan Gowri:** For the prototype, is it the expectation that CBECC will have these assumptions used for the baseline model?
    a. **Garth Torvestad:** Yeah, for new construction, what we shared today will be the assumptions, unless we receive feedback that we should change them. There are a certain number of these that will need to be fixed and locked down in CBECC. In Energy Plus, you can modify any of these things, but for CBECC we need to get some standardized assumptions that are representative of typical industry practice in that we don't want folks to modify, but I think that we need to have continued discussion about which of those should be fixed versus user inputs.
    b. **Krishnan Gowri:** So, the current table where you have fixed and… of variable input. That's just a recommendation at this time, and you're looking for feedback to decide that. Okay.
    c. **Garth Torvestad:** Not all these are necessarily inputs that are currently available in CBECC. I'm not sure something like circulation fan efficiency is available currently in CBECC, so that might be a new input that needs to be opened in the software.
    d. **Krishnan Gowri:** You intend to make changes to ACM to include a new space function that will represent these grow areas and such?
    e. **Garth Torvestad:** Yes, I think all these would need to be defined in the ACM. For folks on the call, that's the Alternative Calculation Manual (ACM). That's where all these details would be included, in the ACM manual that shares what are the fixed assumptions, and then what inputs would be allowed in CBECC.
17. **Question asked verbally by Daniel Dettmers:** So, when you say you're looking for better equipment profiles; are we able to see in the spreadsheet the current equipment profiles you use? I'm just curious if we can see what you're using right now versus what else we can find for you.
    a. **Garth Torvestad:** That's probably a discussion we should get into with Big Ladder. We did actually download some of the curves from Quest and tested those against

the default curves that were in ENERGY+. So, maybe we should have another call offline to make sure that we're doing that correctly.

b. **Daniel Dettmers:** Okay, I was thinking of other pieces of equipment, but sure.

18. **Question asked verbally by Daniel Dettmers:** This spreadsheet is for this prototype only, you're looking for inputs on whether this one is done correctly, so that you can use the same assumptions when you build the ENERGY+ model or finish that, right?
    a. **Garth Torvestad:** Correct.
    b. **Daniel Dettmers:** Sorry for not having more comments, but this is a lot to take in here in one hour and a half.
    c. **Garth Torvestad:** Yeah, I understand. We're happy to have individual calls, but I think it would be good to digest this and what's in the workbook, and then get into more detail offline on a separate discussion.

Wrap-Up

The meeting concluded with a call for participation throughout the code cycle, including input on the prototype assumptions presented. Several future meeting dates were presented. Draft CASE Reports will be posted December 2025 through March 2026 on title24stakeholders.com.

Please reach out to the Garth Torvestad garthtorvestad@2050partners.com or Amy Droitcour amydroitcour@2050partners.com or info@title24stakeholders.com with input on the prototype presented today. Meeting materials, including the excel workbook with prototype details are available here: https://title24stakeholders.com/event/controlled-environment-horticulture-prototype-workshop/ .

The meeting adjourned at 11:30 AM PST.