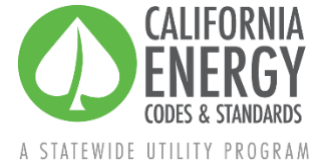


# Meeting Notes: October 29, 2025

Posted November 13, 2024



These notes summarize the content from the 2028 Title 24, Part 6 Code Cycle Utility-Sponsored Stakeholder Meeting on **Process Steam: Flash Steam Reduction and Recovery, Process Steam: Condensate Return, Compressed Air: Air Drying, Modify Existing Chiller/Boiler Requirements to Account for Air-to-Water Heat Pump/ Wastewater Heat Pump (AWHP/WWHP), AWHP Compliance Pathways and Requirements (Glycol Concentration Only), Update AWHP Requirements, Heat Pump Water Heating Ventilation Clean Up.**

If you are interested in providing input on any of the topics covered in this meeting, please email your comments to [info@title24stakeholders.com](mailto:info@title24stakeholders.com) by November 15, 2025. 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
- [Zoom Polls & Responses](#) – Review the Poll Questions asked during the meeting and see the responses from stakeholders.
- [Meeting Materials](#) (available on Title24Stakeholders.com) – Review slides, measure summaries, proposed code language and more on our website.

## Meeting Information

**Meeting Date:** 10/29/2025

**Meeting Time:** 9:00 am – 2:15 pm

**Meeting Host:** California Statewide Utility Codes and Standards Team

## Meeting Agenda

Time	Topic	Presenter
9:00 AM	Welcome and Introduction	Cosimina Pannetti, Energy Solutions Payam Bozorgchami, CEC Kelly Cunningham, PG&E
9:15 AM	Process Steam: Flash Steam Reduction and Recovery	Ryan Swanson, Enesfere
10:00 AM	Process Steam: Condensate Return	Ryan Swanson, Enesfere
10:45 AM	Compressed Air: Air Drying	MM Valmiki, ASK Energy
<b>11:30 AM</b>	<b>BREAK</b>	
12:00 PM	AWHP Alignment with Boiler and Chiller Requirements	Bob Hendron, Frontier Energy
12:45 PM	AWHP Glycol Concentration Limits	Bob Hendron, Frontier Energy
1:30 PM	Solar Pool Heating	Melissa Schellinger Gutiérrez, Energy Solutions
2:15 PM	Adjourn	

## Members of the CASE Team

### 1.1.1 Statewide Utility Codes and Standards Team – Utility Staff

Name	Email Address	Affiliation
Kelly Cunningham	<a href="mailto:kelly.cunningham@pge.com">kelly.cunningham@pge.com</a>	PG&E
Mark Alatorre	<a href="mailto:mark.alatorre@pge.com">mark.alatorre@pge.com</a>	PG&E
Thomas Mertens	<a href="mailto:thomas.mertens@pge.com">thomas.mertens@pge.com</a>	PG&E
Jeremy Reefe	<a href="mailto:JMReefe@sdge.com">JMReefe@sdge.com</a>	SDG&E
Dom Michaud	<a href="mailto:dmichaud@sdge.com">dmichaud@sdge.com</a>	SDG&E
Randall Higa	<a href="mailto:Randall.Higa@sce.com">Randall.Higa@sce.com</a>	SCE

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

<b>Name</b>	<b>Email Address</b>	<b>Affiliation</b>
Cosimina Panetti	<a href="mailto:cpanetti@energy-solution.com">cpanetti@energy-solution.com</a>	Energy Solutions
Heidi Werner	<a href="mailto:hwerner@energy-solution.com">hwerner@energy-solution.com</a>	Energy Solutions
Nikki Westfall	<a href="mailto:nwestfall@energy-solution.com">nwestfall@energy-solution.com</a>	Energy Solutions
Chris Uraine	<a href="mailto:curaine@energy-solution.com">curaine@energy-solution.com</a>	Energy Solutions
Remy Hutheesing	<a href="mailto:rhutheesing@energy-solution.com">rhutheesing@energy-solution.com</a>	Energy Solutions
Jon McHugh	<a href="mailto:jon@mchughenergy.com">jon@mchughenergy.com</a>	McHugh Energy
Bob Hendron	<a href="mailto:bhendron@frontierenergy.com">bhendron@frontierenergy.com</a>	Frontier Energy
James Haile	<a href="mailto:jhaile@frontierenergy.com">jhaile@frontierenergy.com</a>	Frontier Energy
Claudia Pingatore	<a href="mailto:cpingatore@frontierenergy.com">cpingatore@frontierenergy.com</a>	Frontier Energy
Alea German	<a href="mailto:agerman@frontierenergy.com">agerman@frontierenergy.com</a>	Frontier Energy
Ryan Swanson	<a href="mailto:ryan@enesfere.com">ryan@enesfere.com</a>	Enesfere
Lily Baldewicz	<a href="mailto:lily@caiec.co">lily@caiec.co</a>	CAI Energy Consulting
Emma Conroy	<a href="mailto:emmaconroy@2050partners.com">emmaconroy@2050partners.com</a>	2050 Partners
Amy Droitcour	<a href="mailto:amydroitcour@2050partners.com">amydroitcour@2050partners.com</a>	2050 Partners
Ed Spivey	<a href="mailto:edward@enesfere.com">edward@enesfere.com</a>	Enesfere
MM Valmiki	<a href="mailto:Valmiki@askenergyinc.com">Valmiki@askenergyinc.com</a>	ASK Energy
Joe Vukovich	<a href="mailto:joevukovich@2050partners.com">joevukovich@2050partners.com</a>	2050 Partners
Eva Hidalgo	<a href="mailto:evahidalgo@2050partners.com">evahidalgo@2050partners.com</a>	2050 Partners
Melissa Schellinger Gutierrez	<a href="mailto:mgutierrez@energy-solution.com">mgutierrez@energy-solution.com</a>	Energy Solutions
Sean Steffensen	<a href="mailto:ssteffensen@energy-solution.com">ssteffensen@energy-solution.com</a>	Energy Solutions
Eleanore Colton	<a href="mailto:eleanore.colton@salasobrien.com">eleanore.colton@salasobrien.com</a>	Salas O'Brien
John Steinbergs	<a href="mailto:john.steinbergs@salasobrien.com">john.steinbergs@salasobrien.com</a>	Salas O'Brien

## California Energy Commission

### Contact for 2028 Code Cycle:

Any questions for the CEC can be sent to: [EnergyCodeUpdateInquiries@energy.ca.gov](mailto: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 each measure presented at this meeting are 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](mailto:info@title24stakeholders.com).

### Process Steam: Flash Steam Reduction and Recovery

- **Purpose:** Add a mandatory requirement for qualifying process steam loads to reduce energy losses from venting of flash steam to the atmosphere by recovering or reducing flash steam.
- **Benefits:** Significant energy and water savings from process steam loads, with energy savings approximately equivalent to 1-5% of baseline boiler system fuel consumption.
- **Feedback requested:**
  - What is the typical breakdown or distribution between high-pressure and low-pressure loads at large steam systems?
  - What percentage of newly added steam loads in California recover flash steam?
  - At steam loads in California that recover flash steam, what percentage of flash steam is recovered?

### Process Steam: Condensate Return

- **Purpose:** Add a mandatory requirement for qualifying process steam loads to recover condensate.

- **Benefits:** Significant energy and water savings from process steam loads, approximately equivalent to 5-8% of baseline boiler system fuel consumption.
- **Feedback requested:**
  - What percentage of newly added, non-direct injection steam loads in California are installed with condensate return systems?
  - For steam loads that return their condensate, what percentage of condensate typically gets returned?

### **Compressed Air: Air Drying**

- **Purpose:** Encourage the use of efficient compressed air drying by requiring best equipment selection and control practices.
- **Benefits:** Reduced energy consumption of air drying plants, including reduced use of purge air where possible and with air dried to system requirements.
- **Feedback requested:** Information about sizing and dryer selection, including dew point requirements and total number of dryers per plant. Information on incremental costs and market share of different dryer technologies and control features.

### **AWHP Alignment with Boiler and Chiller Requirements**

- **Purpose:** Expand prescriptive equipment isolation requirements for staged chillers and boilers to air-to-water heat pumps (AWHPs) and water-to-water heat pumps (WWHPs)
- **Benefits:** Reduce wasted pump energy and thermal losses, ensure necessary supply water temperature can be met, create more uniform requirements for alternate hydronic space conditioning systems
- **Feedback requested:** Frequency that multi-unit, parallel, staged AWHP and WWHP systems are installed, frequency of improper bypasses or pump deactivation in these systems, potential added cost for compliance and verification

### **AWHP Glycol Concentration Limits**

- **Purpose:** Establish maximum glycol concentrations for AWHPs as a function of climate and system design
- **Benefits:** Higher heat exchanger effectiveness and reduced pump power in situations where excessive glycol concentrations are used

- **Feedback requested:** Typical and maximum glycol concentrations used by designers/installers, entity with primary responsibility for selection of glycol concentration (manufacturer, designer, installer, building owner), likelihood that initial concentration will change over time (intentionally or unintentionally)

## Solar Pool Heating

- **Purpose:** Expand mandatory heating source requirements to existing nonresidential pools when replacing a pool heater.
- **Benefits:** Energy savings
- **Feedback requested:** Technical feasibility and challenges when upgrading an existing gas pool heating to solar thermal, HPPH, or heat recovery system. Additional pool size that should be analyzed for energy savings and cost-effectiveness. Incremental costs associated with the proposal.

## 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.

Attendees were also asked to respond to polls. Navigate directly to the [\*\*Zoom Polls & Responses\*\*](#) by clicking the link.

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

### [Process Steam: Flash Steam Recovery, Ryan Swanson]

1. **Question asked via Zoom question pane by Jon McHugh:** If I am adding a high-pressure load to a steam system with a pressurized deaerator, nothing has to be done?
  - a. Ryan Swanson: If the other code trigger criteria are met - if one or more boilers are 10mbtu or above, and it's above 100 PSI, then it would trigger the requirement.
2. **Question asked via Zoom question pane by Roger Baker:** Does the team have a sense for how much opportunity exists for T24 versus existing systems? I have seen very little opportunity in reviewing the 2012 PG&E Market Characterization studies, the 2015 SCE MASI Reports, and the DOE IAC database of implemented industrial efficiency recommendations.

The concern is yes, there are a lot of existing systems. I don't know how much new load is being put on. Studies from PG&E, SCE, never talked about flash steam as being an opportunity for customers. In the Rutgers University DOE database, there are very few recs in CA compared to the rest of the nation. General condensate measures are also

really low. Could be a problem with what is in T24 vs in other systems not subject to T24. What research has been done to better illuminate the size of the market?

- a. Ryan Swanson: This proposal does not apply to existing steam equipment. There aren't really any good datasets for how many new loads are added and at what pressures. We are doing our best to gather info from stakeholders. This is being done more as interviews. There are some high pressure loads that get added, but the quantification piece is something we are still looking into. I would like to have a conversation with you to continue these discussions.
- b. Lily Baldewicz: One of the challenges with flash steam measures is that it's considered something that has to be addressed on the plans side. The best source we've had right now is talking to people in the field with existing projects. We will need to collect more data.
- c. Ryan Swanson: Thank you, we will follow up so we can continue this discussion at a later time.

### **[Process Steam: Condensate Return, Ryan Swanson]**

3. **Question asked via Zoom question pane by Travis Berry:** Ryan, great presentation. I won't be able to be on the call much longer. I missed your contact information. Please send me an email as I'd like to discuss an option that addresses both flash and condensate return. I work for a steam equipment manufacturer and would like to highlight a technology I have not seen discussed today.
  - a. Emma Conroy: Thank you, Travis – we will record your contact information and reach out to you directly to discuss these potential measures.
4. **Question asked via Zoom question pane by Roger Baker:** Given California's historic water shortage issues, how has this not been incorporated in Title 24 already?
  - a. Emma Conroy: We agree that this would be a valuable addition to Title 24! There has not been an investment in Codes and Standards research to support this Title 24, Part 6 measure before this cycle, but this cycle the Statewide CASE Team is focusing on untapped non-res and industrial opportunities and this one seemed like a strong measure. We would be happy to discuss water savings, estimates of new steam loads, and any other comments you may have. Please reach out to [emmaconroy@2050partners.com](mailto:emmaconroy@2050partners.com) or [ryan@enesfere.com](mailto:ryan@enesfere.com) if you'd like to schedule a call.
5. **Question asked verbally by Amy Droitcour:** Is there a specific percentage of condensate that would have to be returned with the proposal?
  - a. Ryan Swanson: 100% of all uncontaminated condensate must have a return system installed to return it to the boiler plant.
6. **Question asked verbally by Amy Droitcour:** What if some condensates are contaminated but not all of it?
  - a. Ryan Swanson: The contaminated loads do not need to be returned.
7. **Question asked verbally by Amy Droitcour:** For flash steam, how are sites supposed to calculate the amount of flash steam?
  - a. Ryan Swanson: Sites can calculate the mass of flash steam that would be vented in the baseline scenario in pounds per hour. Then you can show you are venting 50% less than that. Alternatively, it could be based on energy embedded into flash steam. Our team is currently ironing out these details. We want to make it

as easy as possible for projects. The CASE Team will put calculation explanation and details in the Non-Residential Reference Appendix.

**[Compressed Air Dryers, M M Valmiki]**

8. **Question asked via Zoom question pane by Justin Aycocock:** Would the desiccant dryer provision apply to the trim air compressor provision? E.g. a dedicated heated desiccant dryer for every trim compressor?
  - a. Joe Vukovich: Yes, the trim air compressor requirement would apply to all dryers.
  - b. Justin Aycocock: Thank you Joe, applying the trim compressor requirement to desiccant dryers may cause problems. A lot of systems use one large desiccant dryer for multiple compressors including the trim unit. Splitting the dryers would take up more space and possibly have higher cost for the user. Also, if the system is smaller, then the trim compressor may not be large enough to warrant a heated desiccant dryer (since it seems heatless will all but be banned). Has anyone considered the market availability of heated dryers for smaller compressors?
  - c. Amy Droitcour: We are aware that there is likely a cost effectiveness sweet spot for heated desiccant dryers. We are likely to provide a minimum ACFM where this requirement may not apply. Regarding using 1 large dryer for a combination of trim compressors and baseloads, all of which are targeting a desiccant level dewpoint (e.g. -100 F), the first question I would have is whether the entire plant would need this -100 F dewpoint, or if this would be served by some air compressors and dryers at either a -40 or +40 cycling refrigerated. If so (that the entire plant) needs to target this -100 to -40 F, we suspect the ACFM range would be well into the cost effectiveness range of a heated blower purge desiccant. We are reviewing our proposal to ensure that a dryer serving a combination of base and trim compressors is allowable, especially in the case of desiccant since capacity is strongly correlated with TCO and ROI.
  - d. M M Valmiki: We have been hearing some feedback regarding the dedicated trim air dryer and how it may or may not make sense under certain conditions. Justin, we'd like to talk with you further about this aspect and what you have seen in the field.
9. **Question asked via Zoom question pane by Justin Aycocock:** The current wording for provision 3 specifies a dew point display and dew point controls, but dew point controls aren't the only way to save energy when using desiccant dryers. Can the wording be amended to more broadly define just "energy savings control" without specifying dew point controls?
  - a. Joe Vukovich: Thank you for this helpful feedback. We can amend the language, and we would like to discuss options for controls that can provide energy savings

and their applications. Please reach out to us at [joevukovich@2050partners.com](mailto:joevukovich@2050partners.com) or [valmiki@askenergyinc.com](mailto:valmiki@askenergyinc.com) if you'd like to set up a meeting to discuss further.

10. **Question asked via Zoom question pane by Justin Aycock:** Has the CEC looked into the cost increases for consumers by forcing the switch to heated dryers and multiple dryers for various size systems?
  - a. Amy Droitcour: The Statewide CASE Team is conducting a cost effectiveness analysis. We would appreciate your input on the incremental costs for these measures.
  - b. M M Valmiki: We recognize that heated desiccant dryers have a large cost premium over heatless models. This is something we'll be accounting for, perhaps in a size threshold for when this requirement would apply, for instance.
11. **Question asked via Zoom question pane by Jeff Wegner:** It may be preferred to limit blowdown to a percentage, rather than dictate a technology that could evolve over time. For example, System Horsepower, Purge Loss (% of rated flow)
  - i. <50 HP, <15%
  - ii. 50-200HP, <10%
  - iii. >200HP, <5%
  - b. Joe Vukovich: Thank you for this suggestion. We would like to discuss your concerns and suggestions further. Please reach out to us at [joevukovich@2050partners.com](mailto:joevukovich@2050partners.com) or [valmiki@askenergyinc.com](mailto:valmiki@askenergyinc.com) if you'd like to set up a meeting to discuss further.
12. **Question asked via Zoom question pane anonymously:** How is that "required pressure dewpoint" determined?
  - a. MM Valmiki: We are going to put that onus on the designer, the end user. We are not going to tell them how to find the necessary dew point. We just want to know what they picked to ensure the correct dryer type. This would ensure that plants would still be able to have the air quality that they need while also selecting the appropriate dryer and control measures.
13. **Question asked via Zoom question pane and verbally by Jon McHugh:** The proposal describes non-cycling versus cycling dryers. I assume VSD dryers might be considered a cycling dryer. Are VSD air dryers more efficient than a standard refrigerated cycling air dryer?
  - a. MM Valmiki: Different versions of cycling dryers, including VSD models, will have slightly different turndown ranges and performance. However, their similarities and benefits are all vastly an improvement over non-cycling when applied in the right setting. So, at this point we consider the main opportunity for this code cycle is to require cycling dryers rather than the specific sub-type. We would like to look to this further, however.
  - b. Joe Vukovich: Yes, we consider VFD cycling (e.g. digital scroll) to be part of cycling refrigerated dryers. We note that in the past, thermal mass is the typical cycling refrigerated option. In recent years, we have heard that miniaturized

HVAC components have reduced the costs significantly, and these VFD units have better turndown performance.

14. **Question asked via Zoom question pane by Justin Aycock:** Has the CEC done an energy analysis on a heated desiccant dryer (not blower) to see how much energy savings there actually are compared to a heatless?
  - a. Amy Droitcour: We have done a preliminary analysis based on kW (heater) vs purge air consumed for (1) heated + purge, (2) heated blower purge, and (3) the baseline heatless.
  - b. M M Valmiki: This gets back to the previous question (#10) and the incremental cost for heated models. We will be accounting for that cost and may identify a size threshold at which it makes sense, for instance.
15. **Question asked via Zoom question pane by Roger Baker:** Have you considered changing from AirMaster+ to MEASUR (the DOE software that replaced most legacy industrial systems analysis software)? AirMaster hasn't been updated since 2012 and may not accurately model newer equipment and system types.
  - a. Amy Droitcour: Thank you for this recommendation; we will look at these sources.
  - b. M M Valmiki: AirMaster+ is still the public option for fully customizable modeling with varying load profiles and equipment. MEASUR does not have as much flexibility that would allow us full control over the modeled conditions. However, we expect to mainly use the AirMaster+ load profiles and compressed air specific energy calculated in previous code cycles and apply that to dryer performance in custom excel calculations.
16. **Question asked via Zoom question pane by Jon McHugh:** Pros and cons of basing the requirements on the CAGI datasheets? See [cagi.org/performance-verification](http://cagi.org/performance-verification)
  - a. Lily Baldewicz: One of the challenges is that the cycling refrigerated CAGI program is voluntary. It should have some good participation, but there may be some holes in that market. It really only applies to cycling and, hot gas bypass.
  - b. Jon M: Right now it just describes cycling versus non-cycling. And basically, making use of the CAGI database, or those sheets, to set a standard. Right now it's voluntary, but potentially what's voluntary becomes mandatory for these trim compressors. I'm wondering about the pros and cons of a technology rather than the performance level.
  - c. Lily B: I agree, would be a good idea to discuss.
17. **Question asked verbally by Justin Aycock:** We're going down the right path with dew point, saying if you need a dew point greater than 35-degrees, you definitely use refrigerated dryers. If you need anything below that, I think then there needs to be scrutiny why. A lot of end users only need desiccant dryers because they're in a colder climate and want to avoid any freezing risk. So, scrutinize anything below a 35-degree dew point.
  - a. MM Valmiki: If you don't mind please do get in touch, we'd love to talk.
  - b. Lily Baldewicz: We are looking at putting in kind of a middle tier, so you have the minus 100, dew point, which can be challenging to heat with heated regen. We're told it's about 10-20% of the desiccant market that will sometimes try to hit these,

you'd call it extremely high performance, low moisture targets. We would love to talk more about that and get your perspective on it.

**[AWHP Alignment with Boiler and Chiller Requirements, Bob Hendron]**

18. **Question asked via Zoom question pane by Alvah Bickham:** Will eliminating unnecessary pump energy prohibit the use of primary/secondary pumping arrangements?
  - a. James Halie: No, this measure limits pump operation when individual units are turned off, and does not alter currently allowed plumbing arrangements.
19. **Question asked via Zoom question pane anonymously:** I'm willing to send a summary of findings associated with the design issues of AWHP during the construction phase. Specifically, for performance and installation issues. Anything in particular you're looking for?
  - a. James Halie: We will take whatever data you're able to give us. Please reach out and we'll set up a meeting.
20. **Question asked via Zoom question pane by John Arent:** Can you please provide a reference to the study that determined that installed performance is lower than expected performance?
  - a. James Halie: Weitze, H., Stober, W., and Gantley, M., Nonresidential Hydronic Heat Pumps: System Operation Field Study and Analysis, PGNE Code Readiness Final Project Report ET21PGE7201-2, October 2024.  
<https://www.etcc-ca.com/reports/code-readiness-final-project-report-nonresidential-hydrionic-heat-pumps-system-operation>
  - b. Bob Hendron: Information beyond the study cited above is based on informal feedback from stakeholders that design or install AWHP systems. Additional non-residential studies that support or counter this statement would be welcome.
21. **Question asked via Zoom question pane by Jeff Wegner:** It's not a great sample size, but I2SL offers their Laboratory Benchmarking Tool where you may filter for "Heat Pump Heating" and there are 12/1446 data points. Unfortunately, it does not explicitly state Air-to-Water, however most would likely be assumed to be the case for the scale and type of facilities described.
  - a. Claudia Pingatore: Thank you for sharing this information. We will take a look and use what we can in the draft CASE report.
22. **Question asked via Zoom question pane by Alvah Bickham:** I missed the poll, but you may consider an exception to the use of heat pumps in high altitude & extreme cold climates. Though California is mostly warm and sunny, there are a few select locations (such as Bodie) where the extreme cold and reduced atmospheric pressure significantly derates heat pumps. So much so where the initial cost will likely be unbearable to most potential business owners. We're seeing this as an issue to development in places like Colorado, who appear to follow California energy standards closely.
  - a. Bob Hendron: We can certainly look at exceptions. If there are thoughts on scenarios where there may need to be an exception, such as a minimal flow because of potential freezing conditions, then please share that. But the questions seems to be about whether AWHPs should be allowed in certain

climates or potentially be derated, which is outside the scope of the proposed measure but is something we can look at for the next code cycle.

23. **Question asked via Zoom question pane by Jon McHugh:** Besides adding controls to bypass air to water heat pumps, is this requiring a VSD on the main circulator pump or is this already required?
- Bob Hendron: Will have to look into this. It's probably not part of the proposed code change, which relates to a parallel pump situation. But if there is a single pump serving several AWHPs, then yes VSD should be used to reduce flow and avoid problems with meeting the desired supply temperature.
24. **Question asked via Zoom question pane anonymously:** Your slides note that the derated performance for AWHP is based on them circulating water even when the system isn't operating. I'm wondering how much this is an issue specific to AWHP or is an issue related to chilled/heated water systems more generally? Can you also speak to how the proposed requirements will address this issue of running when the system isn't operating?
- Bob Hendron: Yes, this is potentially an issue for chillers and boilers. It's already in the code language that it shouldn't happen. This isn't for when the system isn't operating, it's for when one unit isn't operating. We just want to make sure that if it's not operating that it is bypassed or the flow through the nonoperating unit is turned off. There may also be an issue of pumps operating in single-unit systems or when the entire systems is turned off, but that is not currently addressed in 140.4(k) and would therefore go beyond alignment with chillers and boilers. But in future code cycles it may be appropriate to expand the requirement to include single or multiple units, or entire systems.
25. **Question asked via Zoom question pane by John Arent:** I don't see any obvious indication of lower performance of AWHP systems vs. expected performance, from the cited PG&E Code Readiness Brief. I'm not opposed to adding an isolation requirement when there are multiple hydronic heat pumps.
- Bob Hendron: All of the sites in the study had multiple design or installation errors that prevented optimal performance. We agree that some of the tested systems operated with higher efficiency than expected, but sometimes that was because other operating characteristics were not as intended. Further data on installed versus expected performance in non-residential applications would be welcome, because the number of available studies is very small and much of our information is based on informal discussions with stakeholders.

#### **[AWHP Glycol Concentration Limits, Bob Hendron]**

26. **Question asked via Zoom question pane by Roger Baker:** Are the propylene glycol concentrations in slide 6 based on weight, or volume?
- James Halie: Volume.
27. **Question asked via Zoom question pane by Jon McHugh:** Glycol concentration. How is manufacturer warranty addressed? Is the proposal to require a maximum concentration and to have an exception when the manufacturer's recommendation is higher?
- James Halie: We're continuing to review manufacturer documentation related to this issue. They do not generally require specific concentrations, but sometimes include an upper limit. As for warranty, some do not offer a warranty in the event

of freezing regardless of concentration, and some impose limits on leaving water temperature without glycol.

28. **Question asked via Zoom question pane anonymously:** Latest generation AWHPs have built in freeze protection logic that monitor ambient temps, open isolation valves and run water pumps – it's a good way to avoid use of glycol for freeze protection. Glycol is needed for low LWT applications, of course.
- Claudia Pingatore: Thank you for this information; we will include these insights in the CASE report.
29. **Question asked via Zoom question pane by Roger Baker:** Related to Jon's question - don't manufacturer's typically provide glycol concentration requirements as part of installation/commissioning? And one manufacturer (Apollo) notes that not following their concentration guidelines voids the warranty.
- James Halie: We're reviewing manufacturer documentation related to this. From what we've seen so far, they do not require specific concentrations. As for warranty, some do not provide a warranty in the event of freezing regardless of concentration, and some impose limits on leaving water temperature without glycol. We'll check if Apollo is one of the ones we've looked at. Analysis of manufacturer recommendations will be included in the draft CASE report.
30. **Question asked via Zoom question pane by Jon McHugh:** Part of safety factor is when there are small leaks, and make-up reduces glycol concentration. Are there system sizes at which an inline refractive index sensor could be required and a warning system when glycol concentrations fall too low?
- James Halie: Glycol concentration monitoring is generally a good idea, especially for large systems, but I'm not sure that would be an energy code consideration.
  - Bob Hendron: This measure is focused on excessive concentrations, but it's a good point that a safety factor is needed because the glycol can be diluted over time.
31. **Question asked via Zoom question pane by Robert Glass:** The presentation just refers to propylene glycol but not ethylene glycol. Is it that ethylene glycol is not covered by the code?
- Bob Hendron: Ethylene glycol is toxic, so it isn't the best option. But it is not disallowed under Title 24. We will use the more generic "glycol" terminology going forward so both types of glycol are covered.
  - Robert Glass: If it's not banned keep that in mind. You mentioned cooling performance but nothing on the slide related to cooling performance with the glycol concentrations
  - Bob Hendron: You're right, although it was stated in the presentation that it applies to cooling operation, the slide itself should be more clear and it has been modified to state that the pump power and film coefficient impacts are based on cooling operation.
  - Robert Glass: On the poll, the percentage of glycol used depends on what climate zone you're in. There are tools that are readily available that include info on glycol concentration based on the temperature. The info is commonly available, probably more so with boiler manufacturers. This is a place you could find potential sources of information. The proposed level may not be appropriate for high elevations. You may want to have a range. What tolerance is associated with that? If you're going to put a limit you may want to establish tolerances.

Especially in commercial applications. It's going to be very difficult to measure and adhere to a specific level without tolerances.

- e. Bob Hendron: It is effectively a range because we are only establishing an upper limit. We're not ready to establish a lower limit to protect against freezing risk, because there are so many design variables. It is a good point that focusing on specific numbers would not be ideal.
  - f. Robert Glass: The deterioration of performance gets higher with the higher levels of glycol in there. So, people are not going to put a higher amount of glycol in an application.
  - g. Bob Hendron: It is probably appropriate for the code to prevent bad decisions, even though most reputable designers would make sound decisions for glycol concentration based on modeling and analysis of the system and climate. But we welcome information about how often glycol concentration is higher than necessary at the expense of performance, in an effort to be certain freezing and corrosion are avoided.
  - h. Robert Glass: DOE TP's don't take glycol into account. Residential air to water heat pumps will be doing the same thing.
  - i. Bob Hendron: Thank you, that was our understanding as well. The reliability of energy impacts of glycol from available HVAC design tools will be important given the lack of test data.
32. **Question asked via Zoom question pane by Anthony Perrucci:** To what extent would the maximum glycol percentages become part of the baseline performance model when following performance path for compliance. It would seem appropriate to allow glycol percentage to be an available "lever to pull" for a designer following the performance compliance path? If the proposed design achieves freeze protection through some other means such that glycol is reduced/eliminated vs baseline, the proposed design should get credit for the improved performance.
- a. James Halie and Bob Hendron: It's a fair point, but the proposed measure is a mandatory limit, and there are no current plans to consider it in the performance path. The prescriptive path is currently based on performance with 100% water. Expanded AHRI test procedures using glycol might help if this is to be addressed in future code cycles.
33. **Question asked via Zoom question pane by Alvah Bickham:** 33% of Propylene Glycol has a freezing point of ~8°F, there are a few select areas in California with a design point lower than this. I'd recommend looking at this value closer, or perhaps based on a sliding scale.
- a. Bob Hendron: It's a good point, and we will be examining the proposed 33% value to ensure that there is enough of a safety margin to prevent freezing. An

exception may be needed if there will be temperatures below -8F where the water/glycol mixture isn't flowing at all times.

34. **Question asked via Zoom question pane by Jon McHugh:** What is proposed for design temperature? Median of extremes? Something else?
- a. James Halie: The winter median of extremes will be the better reference from a freezing concerns protections question.
  - b. Bob Hendron: It is the extremes that we probably want to focus on to avoid freezing potential.

**[Solar Heating for an Existing Pool and Spa, Melissa Schellinger Gutierrez]**

35. **Question asked via Zoom question pane by Kenneth Gregory:** Since the current Title 24 Rule has not taken effect, why are you changing to change something that has not started?
- a. Sean Steffensen: I would ask that you reach out to me to help us identify your specific concerns.
36. **Question asked via Zoom question pane by Dan Sizelove:** Can you please provide the supporting data from NREL regarding 25-year solar thermal service life?
- a. Sean Steffensen: Will take this offline and get back to you.
  - b. Melissa Schellinger Gutierrez: Please find the link below for the NREL report. Page 43 of the report states that the typical life expectancy of collectors and components is about 25 years. <https://www.nrel.gov/docs/fy16osti/66215.pdf>
37. **Question asked via Zoom question pane by Dan Sizelove:** Many solar thermal pool heating systems are installed on ground racks.
- a. Sean Steffensen: That's a great application, and there's nothing that would prohibit that.
  - b. Dan Sizelove: That is in regards to the SARA. Nobody is considering that many are installed on ground racks. These are installed anywhere there is good solar

radiation for hours a day. In solar thermal dealing with far greater efficiencies. Needs to be modified for glazed and unglazed.

- c. Sean Steffensen: That is a good thing to consider. I am curious of the specifics of it.
38. **Question asked via Zoom question pane by Michael Weinbaum:** Is there a minimum size that a heat pump has to be?
- a. Sean Steffensen: We are not changing the size of the heat pump. There's an equation to calculate the size of the heat pump.
  - b. Michael Weinbaum: What if my pool needed 2 mil btu per hour and I just added an off the rack pool pump and then a 2-mil gas one.
  - c. Sean Steffensen: That doesn't meet the purpose of the regulation, not sure why someone would do that
  - d. Michael Weinbaum: Reason is that it wouldn't take much room. A HP a quarter of that capacity is double the footprint and 3 times the height. A gas one is much cheaper
  - e. Sean Steffensen: Sounds like you have a lot of info that could be useful to us. Would like to schedule something to discuss this in more detail.
39. **Question asked via Zoom question pane by Robert Ilgenfritz:** The pool volumes and sizes listed in this slide are grossly undersized. Schools and municipalities typically have 400,000+ gallons and 12,000+ SF pools.
- a. Melissa Schellinger Gutierrez: Thank you for your comment. We are currently gathering information to update our energy savings and cost-effectiveness analysis. Please provide any additional information on pool sizes you'd like us to consider.
40. **Question asked via Zoom question pane by Michael Weinbaum:** The largest "unitary" heat pump on the market adds 500 kBtu/hr to the pool in ideal conditions. Any load over about 250 kBtu/hr, we start to look at custom assemblies.
- a. Melissa Schellinger Gutierrez: Thank you for providing this information.
41. **Question asked via Zoom question pane by Michael Weinbaum:** Adding switchgear in excess of 200A will usually require the utility to cooperate in upgrades. Inexpensive in some areas, very expensive in others. Simpler to do in new construction, difficult to do in and around existing buildings.
- a. Melissa Schellinger Gutierrez: We acknowledge the concern regarding electrical upgrade challenges and cost variability. Thank you for this information.
42. **Question asked via Zoom question pane by Roger Baker:** Re: solar thermal - I would be concerned about a "lost opportunity" created if a business installs solar thermal, which may foreclose future installation of solar PV.
- a. Melissa Schellinger Gutierrez: Thank you for your comment. That is an important consideration. The code is designed to be flexible and provides alternative compliance pathways besides solar thermal heating technology. A pool owner may choose an alternative such as heat pump pool heating or heat recovery

rather than solar thermal heating if that option fits better with a site's long-term energy goals.

43. **Question asked via Zoom question pane by Robert Ilgenfritz:** 200,000 gallons is not large enough. Pools between 600,000 and 1,000,000 need to be shown.
  - a. Melissa Schellinger Gutierrez: Thank you for this feedback. Our current analysis does include an Olympic-sized pool scenario, which falls within that range. Let us know of information or references you would like us to consider in our analysis.
44. **Question asked via Zoom question pane by Dan Sizelove:** The 70% SARA number should be modified for solar thermal, given the relatively low efficiencies of PV (~20%) compared with solar thermal (+90 percent for unglazed solar thermal collectors). Simply put, solar thermal doesn't need as much roof space as solar electric and the SARA should reflect that.
  - a. Melissa Schellinger Gutierrez: Thank you for your comment. We would like to reach out to further discuss this exception.
45. **Question asked via Zoom question pane by Dan Sizelove:** You won't find a 20,000 gallon nonresidential pool outside of Group R which, as I understand, is exempted from future codes due to AB 306 and trailer bill AB 130.
  - a. Melissa Schellinger Gutierrez: Thank you for your comment. We are looking into analyzing different pool sizes for nonresidential applications in this code cycle. If you have input as to what pool sizes are the most common, please do let us know.
46. **Question asked via Zoom question pane by Dan Sizelove:** Assume a minimum of \$20 per square foot of unglazed solar for commercial pool installations.
  - a. Melissa Schellinger Gutierrez: Thank you for providing this cost information.
47. **Question asked via Zoom question pane by Dan Sizelove:** Booster pumps often required on commercial installations to maintain turnover rate
  - a. Melissa Schellinger Gutierrez: Thank you for providing this information.
48. **Question asked via Zoom question pane by Rich Anderson:** Pumps need to operate within a specific window. Has this been considered when adding new equipment that can exceed the flow rate or lead to not enough flow rate? There can be different turnover rates based on environmental conditions. Was any of this taken into consideration?
  - a. Sean Steffensen: Thank you for raising these issues. We have not heard of this concern before but would love to schedule a meeting with you to dive deeper into this.
  - b. Dan Sizelove: The industry would install a booster pump to maintain that turnover. The industry is very aware of flow velocity and not exceeding the required rate.
49. **Question asked via Zoom question pane by Dan Sizelove:** My understanding is that if a facility does not meet the SARA, it would be exempted from complying with a heat pump, etc. Why?
  - a. Sean Steffensen: The proposed exception would allow a pool that does not have SARA to not be required to meet the requirements of section 110.4(c) pool heater sizing requirements. Exceptions are typically proposed for the primary compliance path. The solar thermal compliance path is the primary path. Once an exception is met then neither the primary compliance path or the secondary

compliance paths need to be met. The heat pump pool heater is the secondary compliance path.

50. **Question asked verbally by Rob Illgen:** Question on the compliance. The amount of heat going in is the same regardless of the type of heater?
- a. Sean Steffensen: The intent is to have flexibility, to have something with that same efficiency.
  - b. Rob Illgen: How would a designer know if they are meeting the code?
  - c. Sean Steffensen: Depends on the specifics, would like to meet later to speak in more detail. But in general you would present it to the CEC to show that there is an equivalence.
51. **Question asked via Zoom question pane by Alvah Bickham:** It was mentioned that solar heater collectors must be sized at 65% of the pool surface area. Would you consider an exception allowing a reduction in this surface area for water-cooled photovoltaic panels?
- a. Melissa Schellinger Gutierrez: Thank you for the suggestion. We would be interested in discussing this technology and its application with you further.

## Wrap-Up

### Questions / Comments Submitted Via Zoom

The meeting concluded with a call for participation throughout the code cycle. Several future meeting dates were presented. Draft CASE Reports will be posted December 2025 through March 2026 on [title24stakeholders.com](http://title24stakeholders.com).

Please reach out to the specific topic lead or [info@title24stakeholders.com](mailto:info@title24stakeholders.com) with input on the measures presented today.

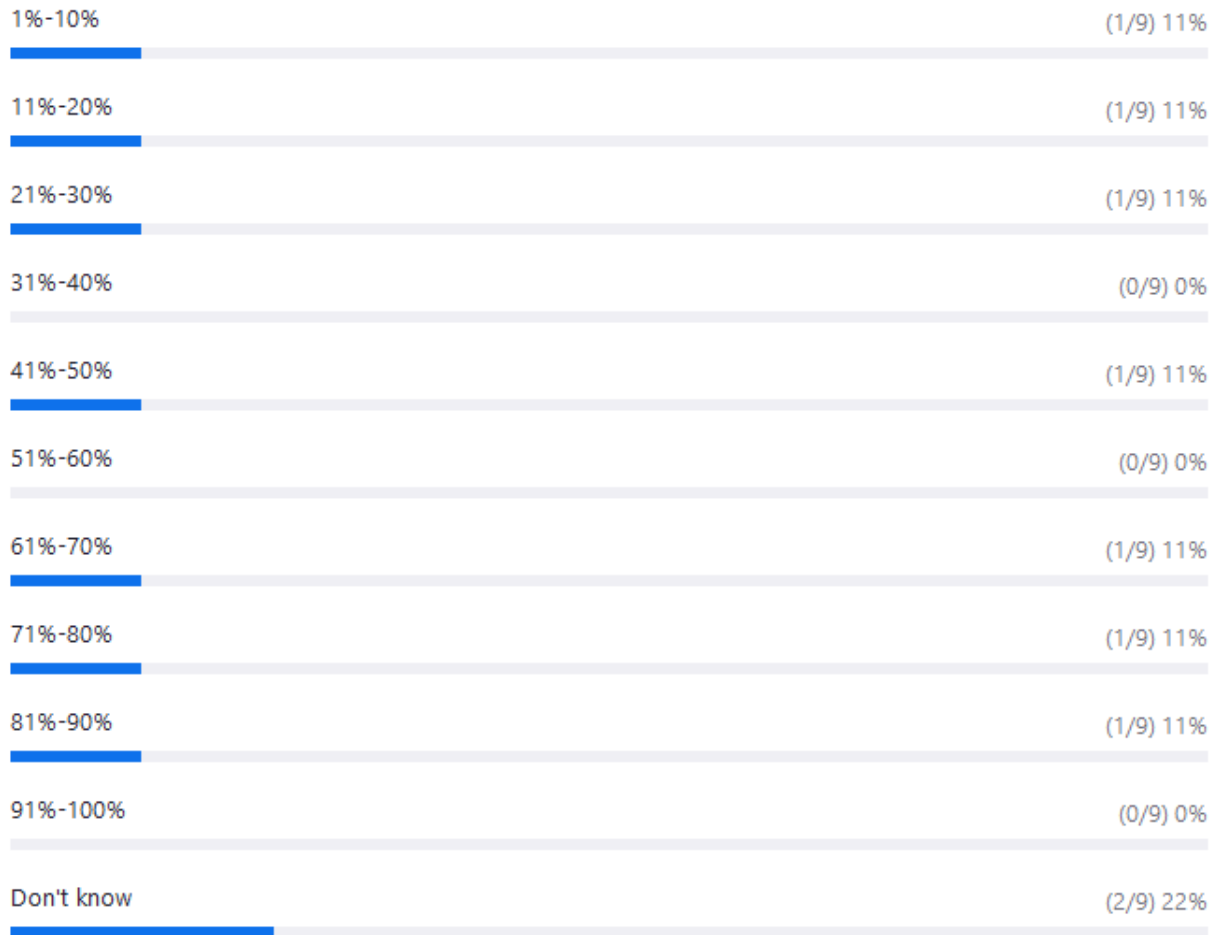
The meeting adjourned at 2:15 PM PST.

### Zoom Polls & Responses

#### Multiple Choice Questions

#### *Process Steam: Flash Steam Reduction and Recovery*

1. For existing sites with flash steam recovery, what percentage of flash steam is recovered? (Single choice)

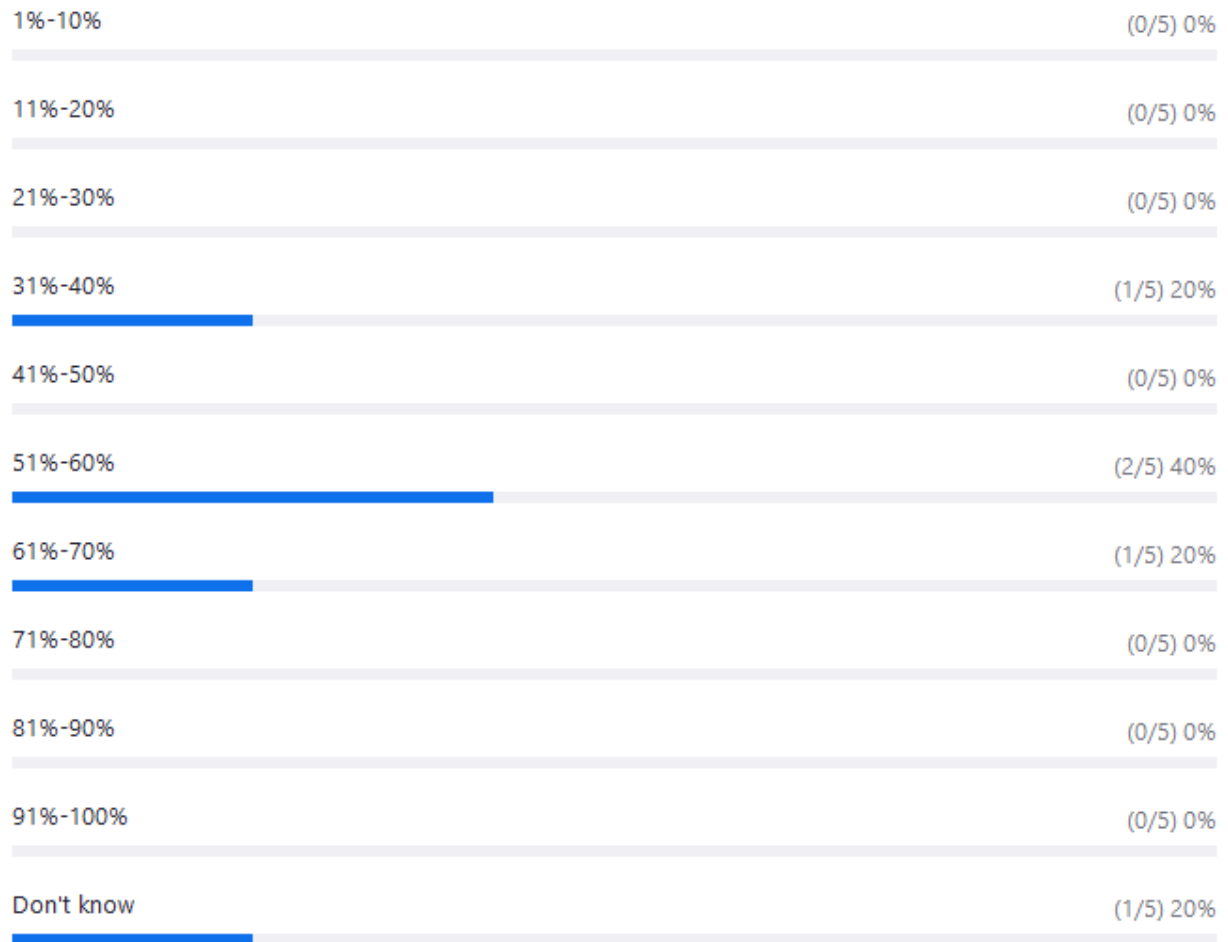


## Process Steam: Condensate Return

1. What percentage of newly added, non-direct injection steam loads in California return any amount of condensate? (Single choice)



1. For existing steam-using sites with condensate return systems, what percentage of condensate typically gets returned? (Single choice)



1. What are typical annual operating hours for existing facilities with condensate return systems? (Single choice)

≤ 2,500 hrs	(0/4) 0%
2,500-3,500 hrs	(0/4) 0%
3,500-4,500 hrs	(0/4) 0%
4,500-5,500 hrs	(1/4) 25%
5,500-6,500 hrs	(2/4) 50%
6,500-7,500 hrs	(0/4) 0%
7,500-8,500 hrs	(0/4) 0%
Greater than 8,500 hrs	(1/4) 25%

### ***Compressed Air: Air Drying***

1. When required dew points are 35°F or above, what percentage of dryers are specified as desiccant dryers? (results will not be shared live) (Single choice)

1% – 10%	(1/5) 20%
11% – 20%	(0/5) 0%
21% – 30%	(0/5) 0%
31% – 40%	(0/5) 0%
41% - 50%	(0/5) 0%
>50+%	(4/5) 80%

## 13 - Compressed Air - Percentage Desiccant Dryer

Webinar poll ended | 1 question | 4 of 47 (8%) participated

1. What percentage of desiccant dryers are specified to include load-following regeneration controls? In other words, what percentage of desiccant dryers include dew point measurement to limit use of purge air during equipment selection?  
(results will not be shared live) (Single choice)

4/4 (100%) answered



## ***AWHP Glycol Concentration Limits***

1. What propylene glycol concentration do you most frequently use for AWHPs in CA? (Single choice)

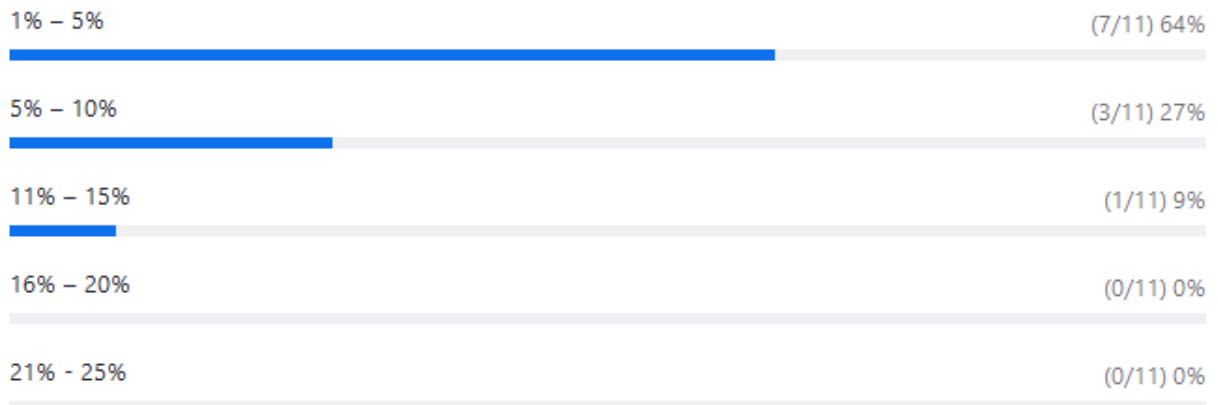


1. How common is pipe freezing for AWHP systems using current practices for addition of glycol? (Single choice)



### **Solar Pool Heating**

1. What is the current market share for alterations? That is, how many existing commercial pools would replace their current systems to solar, a HPPH, or heat recovery in the absence of this proposed requirement? (Single choice)



1. What size pool would stakeholders like to see analyzed for energy savings and cost-effectiveness? (Single choice)



### Long Answer Questions

- 1. How can this proposed requirement consider sites without viable low-pressure loads? What could a possible exception pathway look like?**
  - a. Such a case could only be addressed via pressurized condensate return.
  - b. Exception if it does not have it.
  - c. Steam motive condensate return pumps seem to address this issue.
- 2. Are there additional flash steam recovery methods or applications that should be included?**
  - a. It seems like Pump Traps (Spirax Sarco APT14HC for example) have been omitted in this discussion. These are a great solution to eliminate flash steam release.
- 3. If your steam system has some form of flash steam recovery, what kind is it? If your steam system does not recover flash steam, why not?**
  - a. Flash recovery on wort kettle to maintain temp on an energy storage tank.
  - b. Blowdown flash recovery is the most common due to proximity to DA tank. Flash recovery is typically difficult because process HX are far from the DA.
- 4. When specifying an air dryer, who is the main driver for decision-making?**
  - a. Often times the compressor representative helps the customer with the decision process, e.g., an Ingersoll-Rand rep who sold the air compressors will assist with dryer selection.
  - b. End user. Sometimes with the help of the compressed air "expert" (distributor, factory store, CAGI, CABP, etc.).
- 5. Are there other requirements for chillers and boilers that should also be applied to AWHPs and WWHPs?**

- a. Shut off water pumps (and command ASHP off) when there are no heating calls.

**6. What has been the biggest challenge when upgrading an existing gas pool heater to a solar thermal, HPPH, or heat recovery system?**

- a. For air source heat pumps, It's a tie between the space requirement and the electrical utility requirement. We have no experience with solar thermal actually getting installed.
- b. Space. Gas fired equipment is quite compact comparatively.
- c. Up front cost to the consumer vs how much output they will receive from thermal.
- d. Upfront cost, capex. Cost of heating is typically a line item on a facility's P&L.