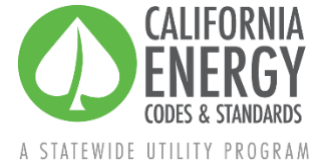


Meeting Notes: March 10, 2026

Posted April 9, 2026



These notes summarize the content from the 2028 Title 24, Part 6 Code Cycle Utility-Sponsored Stakeholder Meeting on Nonresidential Water Heating and HVAC Air-To-Water Heat Pumps (AWHP).

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 May 7, 2026. Comments received after then may not be incorporated into the final version 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: 03/10/2026

Meeting Time: 9:00 am – 1:30 pm

Meeting Host: California Statewide Utility Codes and Standards Team

Meeting Agenda

Time	Topic	Presenter
9:00 AM	Introduction	
9:15 AM	Water Heating – Service Water Prototype & Return to Primary Configuration	David Douglass-Jaimes, Jose Garcia, and Yiyi Chu
10:00 AM	Water Heating – Unitary HP/ER Hybrid Heaters	Bill Healy
10:45 AM	Water Heating – Circulator Pumps	Richard Fatu
11:30 AM	LUNCH	
12:00 PM	Nonresidential AWHP – Modify Existing Chiller/Boiler Requirements to Account for AWHP/WWHP	Bob Hendron
12:45 PM	Nonresidential AWHP – Compliance Pathways and Requirements (Glycol Concentration Only)	Bob Hendron
1:30 PM	Conclusion / Wrap-Up	

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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 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.

Service Hot Water Prototype

- **Purpose:** Currently, hot water usage is defined in prototypes but hot water distribution systems are not. Because recirculation heat loss can be significant, the lack of hot water distribution designs is a key barrier to proposing code change proposals. The Statewide CASE Team developed hot water distribution system designs with input from an experienced plumbing design firm and an experienced plumbing contractor to create detailed designs for the following Prototypes: Small Office, Medium Office, Medium Lab, Small Restaurant, Small School.
- **Benefits:** Developing distribution system designs allows the Statewide CASE Team to calculate recirculation heat loss rates for these prototypes and approximate distribution heat loss for other prototypes based on the results of the detailed designs
- **Feedback requested:**
 - The Statewide CASE Team seeks additional feedback from experienced designers and contractors on appropriate distribution designs.

Return to Primary Configuration

- **Purpose:** Require Return to Primary configuration for split heat pump water heater systems with recirculation in nonresidential buildings
- **Benefits:**
 - Reduce electrical capacity requirement, peak demand, grid impact, and improve grid reliability
 - Reduce installation cost, space requirements, and the complexity of installation and start up
 - Return-to-primary has higher COP than TMHS configuration, achieving operational savings
 - Proposed start up requirements ensure long-term savings for the central HPWH systems
- **Feedback requested:**
 - We propose to update existing JA14 to add the new Qualification Requirements for Hot Water Systems, with exceptions that the

modifications will not impact MF. Do you agree that JA14 should be modified? Or should we create a new JA or NA?

- Are you aware of any installation of central split HPWH in RtP configuration with recirculation outside research projects?

Unitary Heat Pump/Electric Resistance Hybrid Heaters

- **Purpose:** Require installation approaches, ventilation requirements, and sizing specifications to ensure Heat Pump/Electric Resistance Hybrid Water Heaters do not operate primarily in electric resistance mode.
- **Benefits:**
 - Increased energy efficiency of water heaters
 - Increased cost effectiveness
 - Reduced risk of running out of hot water
 - Reduced risk of overcooling space
 - Increased longevity of water heaters
- **Feedback requested:**
 - Should the proposed measure be considered as a prescriptive requirement or a mandatory requirement?
 - What building/facility types are seeing installations of central HPWHs?
 - What percentage of nonresidential buildings (new construction and additions) have Unitary HP/ER Heat pump water heaters?
 - What percentage of nonresidential buildings install Unitary HP/ER heat pump water heaters in alterations?
 - Do the recommended requirements to provide adequate ventilation air to unitary HP/ER water heaters sufficiently account for the range of ambient environments? If not, please explain or offer alternative approaches.
 - What installation and setup requirements are needed to ensure that Unitary HP/ER water heaters achieve expected efficiency levels associated with rated values?
 - What else should we know? Are there market or technical barriers or solutions we should consider?
 - Are you aware of cost data or willing to share cost data for installation of central heat pump water heaters?

Circulator Pump Controls

- **Purpose:** Require controls on service hot water circulator pumps.
- **Benefits:** Reduce pump run time and energy savings associated with distribution losses.
- **Feedback requested:**
 - What else should we know? Are there market or technical barriers or solutions that should be considered?
 - Which controls functionality tends to be the most / least reliable for hot water systems? Are controls bypassed or manually turned off? If so, which ones?
 - We are proposing 125F max return temperature. Are there any specific applications or building types where higher than 125F is needed, if so what building types and what is an appropriate temperature?
 - Are there any other integrated or add-on pump controls that are not listed that you have seen or utilize?

Hydronic Heat Pumps: Alignment with Boiler and Chiller Requirements

- **Purpose:** Require flow shut-off for non-operating hydronic heat pumps, similar to boilers and chillers.
- **Benefits:** Reduce pump energy and ensure that hot water delivery temperature is met.
- **Feedback requested:**
 - Question 1: Is 20-30% market penetration of hydronic heat pumps in 2029 realistic
 - Question 2: Does the assumption seem accurate that 65% of relevant buildings already turn off water flow to non-operating heat pumps

Hydronic Heat Pumps: AWHP Glycol Concentration Limits

- **Purpose:** Establish maximum glycol concentration as a function of climate for AWHPs
- **Benefits:** Avoid wasted pump energy and reduced heat exchanger efficiency for glycol in excess of amount needed to prevent freezing during cold weather.
- **Feedback requested:**

- Question 1: Is it a realistic assumption that 90% of AWHP systems have glycol concentrations that are already minimized by the designer to maintain efficiency while providing freeze protection

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.

Water Heating – Service Water Prototype & Return to Primary Configuration, David Douglass-Jaimes, Jose Garcia, and Yiyi Chu

1. **Question asked via Zoom question pane by Luke Morton:** It's a fine question, but we don't have anything substantive to offer good feedback on the question
 - a. Amin Delagah: Noted, Thanks Luke, Let's see if we can find a spot in the presentation to circle back to your comment
2. **Question asked via Zoom question pane anonymously:** Why was RTP not allowed in the 2025 Energy Code?
 - a. Amin Delagah: Did expand to the MF section previously. There was an alternative pathway to use return to primary as long as it made the list. In the 2025 Energy Code, the multifamily prescriptive code requirements were updated to allow RTP as a alternative prescriptive pathway using the NEEA Tier 2 requirements. in the 2025 non-residential code sections, there is very limited requirements for HPWHs, and there were no requirements based on configuration type
 - b. Amin Delagah: I commented that it was not previously in the non-residential code section and that there was not much code language related to heat pump water heaters outside of broad language that it's required in, like, small schools.

So, this is a big expansion in the non-residential code to require some code language when you're doing heat pump water heaters. To kind of wrap up that question, we also got a question that mentioned that we don't have anything substantive at this point in the presentation to offer good feedback. So one question is, what are some alternatives to Joint Appendix 14? Are there some benefits or drawbacks of putting it here versus putting it into the non-residential Joint Appendix?

This might relate to just kind of what's there and how to best position this language, if you want to take that question on and expand further.

- c. Yiyi Chu: The existing JA14 is the joint appendix. And in this cold cycle, we cannot touch the multifamily part, so we just focus on the

nonresidential part. We are thinking to expand the JA14, since it was already included

There are a lot of qualification requirements for the central heat pump water heater, and then we just expand that to add more requirements for design, installation, and startup requirements.

Since it's the joint appendix, it usually will be referenced by both the NARS and the multifamily. And if we do that, we should have some exceptions say that these modifications will not impact multifamily.

That's why we are thinking whether we should just propose another GA section, and then it will only be referenced by non-res, or we should create a new non-res appendix, so it will only be referenced by the non-residential part.

3. **Question asked via Zoom question pane anonymously:** Please explain 'explicitly advocated' in a manual. Did they reference, or state that this was the 'best' solution?
 - a. Yiyi Chu: They explicitly state their products can work in the return to primary configuration. It's one of the viable options they provided.
4. **Question asked Verbally by John Grose:** Does the study take into account swing pass difficulty? And for requirements to turn off at 85 degrees, is that incorporated in here? There is other technology to eliminate the swing tank
 - a. Yiyi Chu: The data we used was mainly on the CO2 system, it can work at very high temperatures
 - b. John Grose: CO2s perform very poorly above 85 degrees
 - c. Amin Delagah: It is a combination of the return water, coming back to the system. What the system sees depends on day or night
 - d. John Grose: No problem during the day. When not used a lot there are issues, system turns off.
 - e. Amin Delagah: As long as you can control the return temperature there aren't issues.
 - f. John Grose: Do you need to use the swing pass?
 - g. Amin Delagah: No
5. **Question asked Verbally by Dana Fisher:** NEEA criteria, CTA 2045. Have had this technology on products for over a decade but it's being phased out. Suggest using open ADR and wifi to make adjustments to respond to flexible load signals.
 - a. Amin Delagah: Thank you for your feedback. We are working on a memo to expand JA13. We are limited with what we can do with residential systems this cycle. We will follow-up with you as the memo moves forward
 - b. Kelly Cunningham: Memos don't change the stringency or don't warrant a report. Don't require the full labor needed for a CASE Report
6. **Question asked via Zoom question pane by Gabriela Ayala:** Since there are no swing tanks with unitary HWP's, are there any specific requirements with regards to recirculation controls? Maybe this will be addressed in the next chapter
 - a. Amin Delagah: Great question Gabe, The Statewide CASE team has a pump controls measure that we will be discussing next! Pump controls are more complicated with unitary HPWHs due to the control algorithms for each unit. The

CASE team will be publishing lab and field projects funded by the PG&E Code Readiness Program covering pump controls with integrated HPWHs

Water Heating – Unitary HP/ER Hybrid Heaters, Bill Healy

1. **Question asked Verbally by Amin Delagah on behalf of Luke Morton:** For the unitary heat pump electric resistance code, it seems that many of these elements are redundant with the existing code, both in the energy code as well as other codes. Is there a reason to repeat these elements in the energy code?
 - a. Bill Healy: Not aware specifically of where the redundancies are being pointed out. Do see these aspects being important for the energy code. Would appreciate any feedback on areas where you see redundancies.
2. **Question asked via Zoom question pane by John Grose:** Hi Bill, the unitary HPWHer currently have very low BTU capacity, 3,4 and up to 6,000 BTU's. The DHW recirculation system of the building can exceed these capacities. So, the element has to kick in. Are these to be used in Non Recirculation systems?
 - a. Amin Delagah: Hi John, this non-residential measure is focused on commercial integrated HPWHs, the HP capacity is higher at 2.8kW or 42,000 BTU's. Additionally, in many applications, the building may need multiple commercial integrated HPWHs to meet the load and to ensure it is not undersized which would trigger additional ER use and hot water runouts.
3. **Question asked Verbally by Gary Klein:** Unitary HPWH are installed in NR occupancies. It should be either type.
 - a. Bill Healy: We are proposing that these would apply to commercial grade water heaters.
 - b. Gary Klein: Room volume is not relevant. Happy to provide info. It's the energy and the air that matters. 80 F is not relevant. How are we going to adjust the COP. The energy in the air has to be adequate.
 - c. Bill Healy: We believe the air volume requirements would be sufficient. We would appreciate if you have any thoughts on what that would look like in code language. We found that following the manufacturer guidelines made the most sense
 - d. Gary Klein: I don't agree with that but will share more info. Temperature in the space is not adequate. Space volume assumes a certain amount of hot water needed in that day. Once the warmth is gone you have to go back and get new heat. Some NR occupancies have recirculation, but not always.
 - e. Bill Healy: Your point is taken on the air volumes, we will definitely consider it. For recirculation systems, both recirculation and nonrecirculation would apply.
 - f. Gary Klein: The sizing question is more relevant. Energy loss to the loop is relatively large. For New Construction, we need to pay attention to the architecture in terms of space, whether central hot water is needed. We need to get rid of the distribution losses.
 - g. Bill Healy: Scope of this is, if you are installing a unitary water heater, heat pump water heater, in a system, in a building, this is how it should be done. Things like

some of that you mentioned may be a little bit out of the scope of the current measure, but your points are noted, definitely.

4. **Question asked via Zoom question pane by Luke Morton:** It is naive and inappropriate to assume that 100% of the AQMD areas would be captured here. But maybe you have to?
AQMD areas, that 100% of those areas will be captured. Bay area air quality district and south coast AQD are X% of the population
 - a. Bill Healy: It was done by climate zone and population. Looking at what would be all electric.
5. **Question asked via Zoom question pane by John Grose:** 2.8 KW is 8,189 BTU's. So a multitude are needed.
 - a. Amin Delagah: $2.84 \text{ kW input} \times 4.3 \text{ COP} \times 3412 \text{ Btu/kW} = 41,667 \text{ Btu Output}$

Water Heating – Circulator Pump Controls, Richard Fatu

1. **Question asked Verbally by Gary Klein:** Have the recirc pump controls been compared to not having a recirc loop at all? Given the hot water needs in certain occupancies. Several of the occupancies you analyzed, as you showed after I wrote this, I would contend have practically no hot water use, yet we allow research systems in them. And I want to know why we should be matching the loads and the locations of the water heaters much better. If the loads are small, why are we spending energy on the loops at all? It's certainly a new construction.
 - a. Richard Fatu: We did not compare them to removing the recirculation loops
 - b. Amin Delagah: Developed these from our drawings. How we position water heaters in buildings with less use. If you are going to be putting in recirculation we want to make sure pump controls are leading to more savings. Where are centralized systems and when is it appropriate? We will be tackling this questions and would be happy to touch base and see how we account for them in the next code cycle
 - c. Gary Klein: 80=90% of the daily energy use goes to the loops. That can't be happening
 - d. Amin Delagah: One of the key aspects is understanding that these are various NR buildings and their draw profiles differ. Will be helpful to know what should remain centralized and what should not be.
 - e. Gary Klein: We need money to figure this out. Getting data not ahead of the next cycle would be helpful. A pitch for doing some research here. Intermittent controls work best when the pump is only working on one zone, one pipe in the system. Gaps in insulation, did you assume insulation was perfect on the loops? Did you account for the loss on the branches that are not being used. Did the math account for that in the loop loss analysis
 - f. Amin Delagah: We did not model a perfectly insulated loop. There is more heat loss than minimal code. Pipe insulation in NR is much more limited. In terms of

the branch lines, we did not. Supportive of doing more studies in that area in the lab.

- g. Gary Klein: I'm working with some folks on a draft research proposal. Will share that with you. At some point somebody needs to let me know how I can be most useful to this group. I don't usually support code development in CA
 - h. Amin Delagah: Let's definitely connect and keep the dialogue going.
2. **Question asked via Zoom question pane anonymously:** Is this energy analysis compared to not having recirculation, or having basic controls?
 - a. David Douglass-Jaimes: The baseline assumes basic controls.
 3. **Question asked Verbally by John Grose:** For the return to primary measure, is this the place we should eliminate swing tanks to save a lot of energy?
 - a. Amin Delagah: We are not eliminating swing tanks. The alternative would allow you to choose any configuration. Allows you to pick different single tank configurations. There are just two pathways
 - b. John Grose: Savings of a non swing tank system is huge.
 - c. Amin Delagah: Especially in existing buildings we don't want to be using swing tanks. It's a smaller concern in new constructions. But it is a great opportunity. If you have any data we'd love to see that.

Nonresidential AWHP – Modify Existing Chiller/Boiler Requirements to Account for AWHP/WWHP, Bob Hendron

1. **Question asked via Zoom question pane by John Grose:** How about zoning with pumps instead of valves?
 - a. Claudia Pingatore: Thank you for your question John. Yes, pump control is an acceptable approach (Bob addressed this in slide 8).
2. **Question asked via Zoom question pane by John Grose:** Yes, we may need circulation to prevent freezing and for defrost situations.
 - a. Claudia Pingatore: CASE Response re: circulation to prevent freezing: Thank you for bringing this up. This was something we discussed about the measure during development. This requirement is largely bringing AWHP requirements in line with existing chiller and boiler code, which factors in these concerns.
 - b. James Haile: John, let us know if the proposed code language doesn't fully resolve this concern.
3. **Question asked via Zoom question pane by John Grose:** Individual piping per HP to the buffer tank for multi HP's is a zone pumping option.
 - a. Claudia Pingatore: CASE Response re: individual piping: Thank you for your comment.
4. **Question asked Verbally by John Grose:** I was wondering what the point is to not have flow going through the heat pumps when they're not used. Does that, mean we have to use valving to do that, or can we do that, say, with, zone pumping on the heat pump? So each heat pump has its own pump. And, in some cases, pipe it directly to the appropriate buffer tank and back, so there's no, flow from other, heat pumps or other pumps.
 - a. Bob Hendron: We've tried to include flexibility with how the requirements are met. We want to ensure the flow is turned off when it's not needed.

- b. John Grose: Sometimes valves are the weak point of the system, try not to use them and to find other ways.
 - c. Bob Hendron: Depends on a lot of things. How it's done is left to the designer. If you have a chance to look at the draft CASE Report and the actual code language and have thoughts we would appreciate that
 - d. John: Important we have flows where we want and when we want.
 - e. Dana Fischer: Want to concur with John. A directive shouldn't be restrictive on how it is achieved
 - f. Bob Hendron: There is an exception for when flow is needed for particular reasons to protect equipment. Don't require zero flow, but imagine in most cases it would be
5. **Question asked via Zoom question pane by Todd Gottshall:** I would expect that some flow would be required for freeze protection on heat recovery 4P ASHP on the CHW side when the unit is running in heating only below about 45 F OSAT.
- a. Claudia Pingatore: Thank you for your comment. This freezing concern is something that we've considered. This requirement is largely bringing AWHP requirements in line with existing chiller and boiler code, which factors in these concerns. Let us know if the proposed code language doesn't fully resolve this concern.
 - b. Bob Hendron: A freeze protection exception for heat recovery systems has been explicitly added for the Final CASE Report.
6. **Question asked via Zoom question pane by Robert Glass:** Have you accounted for the need for more convectors, radiators, etc. if the supply H2O temps are lower with AWHP than previously with boilers? Seems like costs don't reflect this need to meet same heating requirements of the building.
- a. Bob Hendron: May have to review this more closely to see how it relates to this measure. Will respond in writing.
 - b. Bob Hendron written response: The scope of the proposed measure doesn't address the cost-effectiveness of AWHPs compared to boilers or other HVAC options. The measures are limited to requirements for AWHPs/WWHPs when a designer chooses to use them. But your point is good that if there are requirements to use AWHPs instead of boilers in the future, there may be some less obvious first cost implications.
7. **Question asked via Zoom question pane by Robert Glass:** At what point does the requirement for pump off take effect? Might need a "post-purge" to allow recovery of energy in HEx before shutting off.
- a. Bob Hendron: May be an exception to consider. Can look at in writing.
 - b. Bob Hendron written response: As written, the flow should be shut off immediately when the heat pump is turned off. But you make a good point that an additional exception is probably needed for situations where a short heat recovery period is important, just as we allow for a start-up period. This language has been added for the Final CASE Report.

Nonresidential AWHP – Compliance Pathways and Requirements (Glycol Concentration Only), Bob Hendron

8. **Question asked Verbally by John Grose:** AWHP and Glycol, at 20% there's enough to protect the system, at less than that you need to add an inhibitor to protect the system.

With cooling water concerned about the ambient air. Trying to chill can freeze the heat exchanger. Need enough glycol to protect from damage. Also, I recommend glycol feeder systems. Has the appropriate amount of glycol already going into it. If using a fresh water make out system, you are already diluting even if there is a leak. Needs to be checked annually. Bursting is the concern.

- a. Bob Hendron: Thank you, we'll capture all those thoughts. You shared what could be exceptions. The glycol feeder / glycol management. Do you think it should be required?
 - b. John Grose: For commercial NR I don't see why it can't be part of the code. Ensures longevity.
 - c. Bob Hendron: If the concentration is already optimal, assuming 90% wouldn't be affected by the measure. This would be a cost for everyone, but would there be savings?
 - d. John Grose: There would be savings, backflow preventers are a significant cost
 - e. Bob Hendron: I didn't talk about glycol and how they prevent corrosion. It can serve that purpose but there are other options that don't affect the efficiency. Is glycol the preferred approach?
 - f. John Grose: Sell systems with the inhibitor in there. Need some inhibitor to keep corrosion from happening. Glycol costs more than the inhibitor
9. **Question asked Verbally by Dana Fischer:** I would defer more to the manufacturer for the corrosion protection. If you're in a climate that needs glycol, but I wouldn't have the code require it. If designers see any level of glycol that is the level they will choose. Some of the benefit of not having as much glycol. Instead of using the work maximum, saying the concentration should be below this level. The semantics matter.
- a. Bob Hendron: Saying people who are using less may increase. That's a good point
 - b. John Grose: Perhaps a range of percentages
 - c. Bob Hendron: We were trying to avoid a minimum. Didn't want to recommend a specific amount.
 - d. Bob Hendron written response: Language has been revised to make it more clear that less than the limit is acceptable. Table changed to show \leq the maximum.
10. **Question asked Verbally by Claudia Pingatore:** How has the proposed code change been influenced by stakeholder feedback?
- a. Bob Hendron: Has evolved quite a bit. Switching to freeze protection. Decided at the end to give more flexibility to designers. Exceptions as well, a lot came from stakeholders. Feedback has kept us from being too restrictive.

Wrap-Up

The meeting concluded with a call for participation throughout the code cycle. Several future meeting dates were presented.

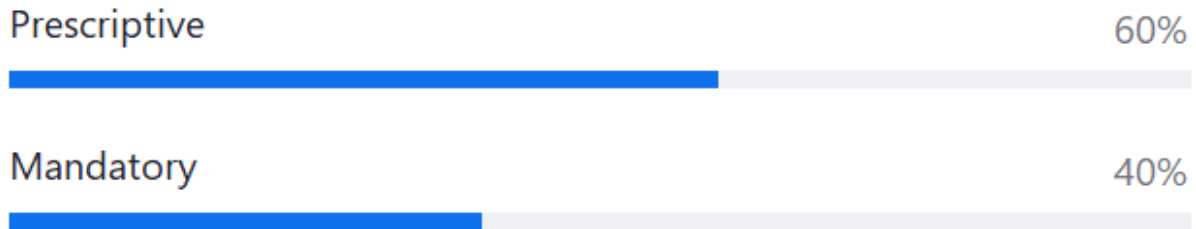
Please reach out to the specific topic lead or info@title24stakeholders.com with input on the measures presented today.

The meeting adjourned at 1:30 PM PST.

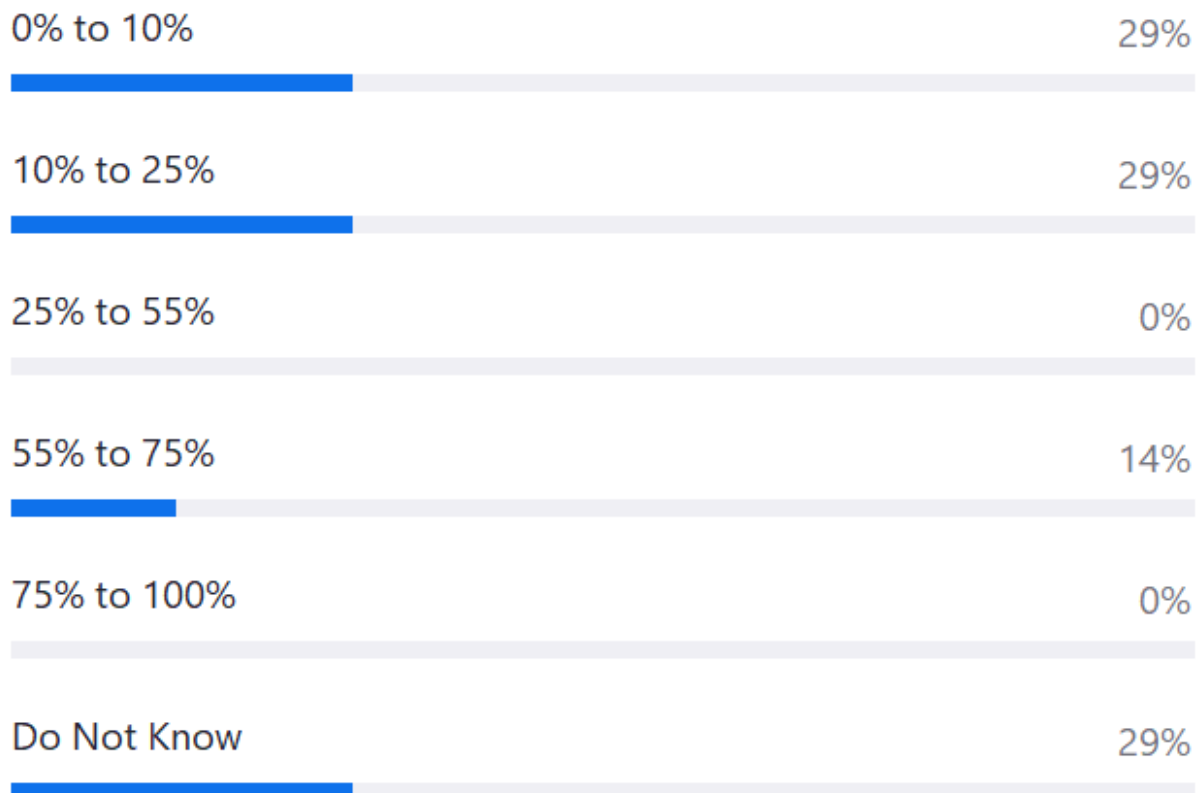
Zoom Polls & Responses

Multiple Choice Questions

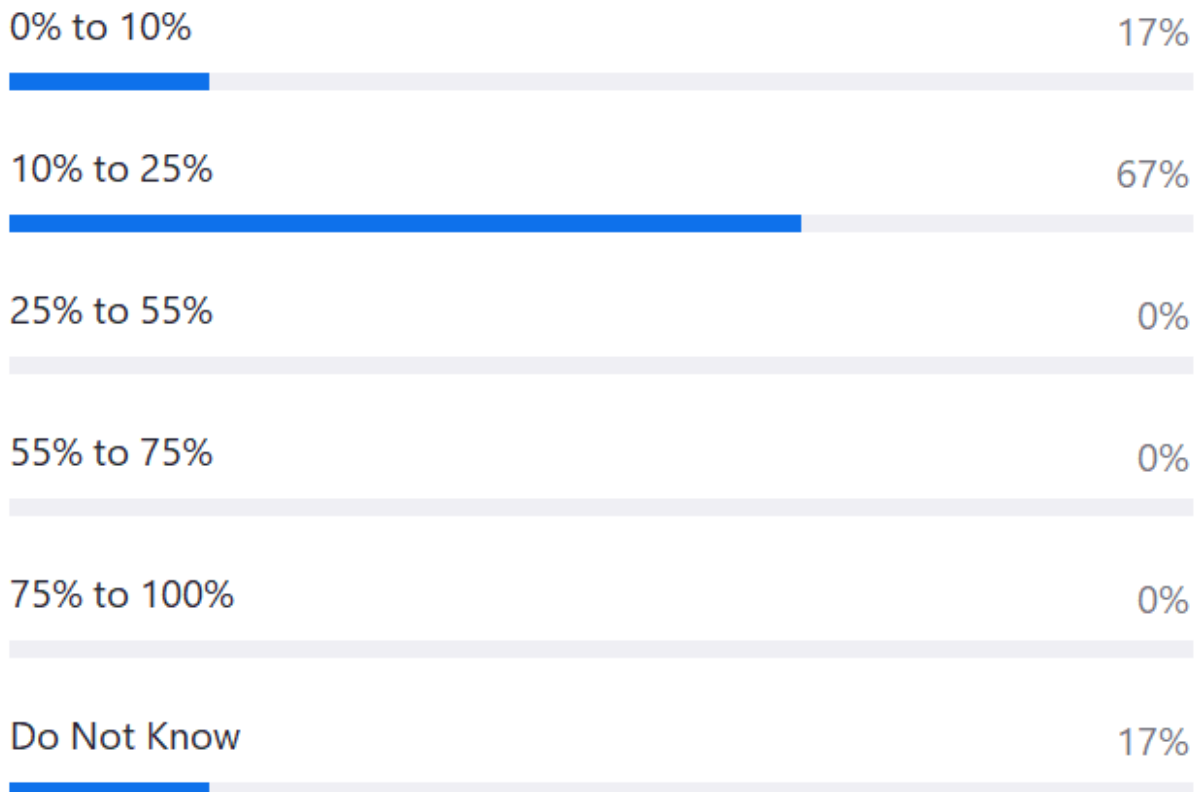
1. Should the proposed measure be considered as a prescriptive requirement or a mandatory requirement? (Single choice)



1. What percentage of nonresidential buildings (new construction and additions) have Unitary HP/ER HPWHs? (Single choice)



1. What percentage of nonresidential buildings install Unitary Hybrid HPWHs in alterations? (Single choice)



Q/A Response:

From Tod Gottshall: Lab/Office buildings

Long Answer Questions

Water Heating – Service Water Prototype & Return to Primary Configuration

1. **We propose to update existing JA14 to add the new Qualification Requirements for Hot Water Systems, with exceptions that the modifications will not impact MF. Do you agree that JA14 should be modified? Or should we create a new JA or NA?**
 - a. Steve Rosenstock: Allow systems with both heat pump and electric resistance storage as some buildings may have space constraints.
 - b. Luke Morton: Modified with what?
 - c. Robert Glass: Modify
 - d. Joe Boros: Modify

2. Are you aware of any installation of central split HPWH in RtP configuration with recirculation outside research projects?

- a. Luke Morton: No, not yet
- b. Gabriel Ayala: Yes
- c. Bryan Ahee: Yes
- d. Dana Fischer: Yes

Water Heating – Unitary HP/ER Hybrid Heaters

1. Do the recommended requirements to provide adequate ventilation air to unitary HP/ER water heaters sufficiently account for the range of ambient environments? If not, please explain or offer alternative approaches.

- a. Gary Klein: No. Am working on a Q&A. Also, See BSI150
- b. Luke Morton: I spend hours a week coordinating ventilation requirements or best practices. Code is neither necessary nor sufficient here.
- c. Roger Baker: To the extent the requirements defer to the manufacturer's installation guidance, yes.
- d. Dana Fischer: Yes
- e. Benjamin Madison: My first instinct here is why CEC is getting into details that are functionally installation and operation requirements that should be defined by manufacturers.
- f. Todd Gottshall: The one I use at my house does. I don't have experience with commercial versions.
- g. John Grose: Ducted or installed in mechanical rooms that give off heat.

2. What installation and setup requirements are needed to ensure that Unitary HP/ER water heaters achieve expected efficiency levels associated with rated values?

- a. Gary Klein: See BSI 150 and Gary Klein's HWF presentation for 2025
- b. Luke Morton: The question is weird-- the expected efficiency values are locally determined and not within the specific purview of the code.
- c. Dana Fische: Located in a space at or in excess of OEM recommendation
- d. John Grose: Adequate cubic feet and largely exhaust the cold air.

3. What else should we know? Are there market or technical barriers or solutions we should consider?

- a. Luke Morton: Barriers are workforce education where codes and standards have little purchase. This is a new technology, and it takes time to learn the best practices.
- b. John Grose: Recirculation DHW is a barrier. Add more storage?

Water Heating – Circulator Pumps

1. **What else should we know? Are there market or technical barriers or solutions that should be considered? Are there any other integrated or add-on pump controls that are not listed that you have seen or utilizes?**
 - a. Travis McDaniel: Controls are non-resilient. They fail. They are reprogrammed. Real world application is unlikely to match intent. There are other areas to save energy in buildings. DHW is life safety.
 - b. Benjamin Madison: Yes, there are dedicated HWR controls that can learn usage. But likely too small for NR applications. (COMFORT HWR)
 - c. John Grose: The Wilo Maxo-Z stainless steel pump has advanced controls.
2. **Which controls functionality tends to be the most / least reliable for hot water systems? Are controls bypassed or manually turned off? If so, which ones?**
 - a. Benjamin Madison: On-demand systems that require direct user interaction. Either disable or change to always on.
 - b. John Grose: Strap on aquastats are the most unreliable.
3. **We are proposing a 125 F max return temperature. Are there any specific applications or building types where higher than 125 F is needed, if so, what building types and what is an appropriate temperature?**
 - a. Gary Klein: Where legionella needs to be managed the minimum temp needs to be 120 F or so
 - b. Benjamin Madison: Isn't this in conflict with PS-115 from IAPMO?
 - c. John Grose: Usually 110 F

Nonresidential AWHP – Modify Existing Chiller/Boiler Requirements to Account for AWHP/WWHP

1. **Do the following assumptions seem realistic?**
20-30% market penetration of hydronic heat pumps in 2029
65% of relevant buildings already turn off water flow to non-operating heat pumps
 - a. Avani Goyal: Seems high
 - b. Robert Glass: Lower penetration. Don't know on 65%.
 - c. Bryan Ahee: 10-12%
 - d. Dana Fischer: Those seem like reasonable assumptions to me. Making the shutoff a testing criteria seems excessive.
 - e. Todd Gottshall: I would expect higher market penetration. We are already including shutoff extending the existing code language.
 - f. John Grose: 20-30% close enough

Nonresidential AWHP – Compliance Pathways and Requirements (Glycol Concentration Only)

1. **Does the following assumption seem realistic?**
90% of AWHP systems have glycol concentrations that are already minimized by the designer to maintain efficiency while providing freeze protection
 - a. Todd Gottshal: In CZ 3 and 4, glycol is rarely used.
 - b. John Grose: c.