

Meeting Notes

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Notes from 2025 Title 24, Part 6 Code Cycle Utility-Sponsored Stakeholder Meeting for:
Nonresidential, Multifamily, and Single Family – Solar Pool Heating

Meeting Information

Meeting Date: 02/01/2023

Meeting Time: 8:30 am – 10:00 am Pacific

Meeting Host: California Statewide Utility Codes and Standards Team

Meeting Agenda

Time	Topic	Presenter
8:30 AM	Introduction	Cosimina Panetti Javier Perez Kelly Cunningham
8:50 AM	Background	Aniruddh Roy and Helen Davis, Energy Solutions
9:05 AM	Market Overview and Analysis	Aniruddh Roy and Helen Davis, Energy Solutions
9:08 AM	Technical Feasibility	Aniruddh Roy and Helen Davis, Energy Solutions
9:28 AM	Cost and Energy Methodology	Aniruddh Roy and Helen Davis, Energy Solutions
9:30 AM	Compliance and Enforcement	Aniruddh Roy and Helen Davis, Energy Solutions
9:35 AM	Proposed Code Changes	Aniruddh Roy and Helen Davis, Energy Solutions
9:45 AM	Discussion & Next Steps	Aniruddh Roy and Helen Davis, Energy Solutions
10:00 AM	Meeting adjourned	

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Meeting Participants available upon request by emailing info@title24stakeholders.com.

Action Items from Meeting

- The Statewide CASE TEAM followed up on all questions or comments that required a response and were not discussed during the meeting.

Key Points from Meeting

This proposal for **Nonresidential, Multifamily, and Single Family – Solar Pool Heating** measures is important because:

- The three options in this proposal; solar thermal, heat pump pool heaters (HPPH), and waste heat recovery, are proven options for pool heating that drastically reduce the use of natural gas and propane.
- Solar thermal pool heating can be used most of the swim season with gas or electric resistance heating used to extend the swim season through the winter.
- This proposed measure would apply to newly constructed pools and existing pools installing a new gas or electric heater. Single family residential pools with an existing pool heater can replace with the same technology.

Meeting Notes

During the meeting, questions and comments were submitted in three distinct formats which are provided in these meeting notes in these [hyperlinked for quick access] sections:

1. **In-Meeting Questions / Comments:** Questions and comments submitted verbally during the meeting via the 'raise hand' function in GoTo Webinar, where participants were unmuted to speak, or in some cases, comments submitted in writing were discussed verbally during the meeting (in which case the person that commented may not be identified in these notes).
2. **Questions / Comments Submitted Via GoTo Webinar:** See this section for questions and comments submitted in written format via the GoTo Webinar question pane.
3. **Public Input Submitted Via Mentimeter:** This section includes public comments and questions, including screen shots of the polls that were conducted during the meeting, and responses to those polls.

Not all written questions and comments were discussed during the meeting, but all have responses available in these meeting notes.

In-Meeting Questions / Comments

Solar Pool and Spa Heating – Mandatory Requirement

1. **Verbal question asked by Ben Davis, CA Solar and Storage Association:** From reading the code language, it sounds like whenever a pool or spa is going to be heated, whether it's a new or old pool, then the requirements kick-in for solar heat pump, solar thermal or energy recovery? Also, is the requirement is only enforced if a permit to heat the pool is pulled?
 - a. Statewide CASE Team response (Aniruddh Roy): Yes, the requirement only kicks in when the pool is being heated. There could be instances when the pool is constructed but the heater is not installed. There may be a couple seasons before the owner of the building realizes heating is needed. The expectation is when a heating system is installed, the requirement would be invoked. The attempt is to connect it to the permitting process for the local authority of that jurisdiction. We have a couple of added suggestions for the compliance forms that are in place today. The intent is to try to be as seamless as possible, not add a new compliance form and further burden the contractor. We are open to any further suggestions.
 - b. Ben Davis follow-up question: If a jurisdiction doesn't require a permit to be pulled to heat the pool, the requirement would not kick-in?
 - c. Statewide CASE Team (Aniruddh Roy): The Title 24, Part 6 provision does requires forms CF1R and CF2R as it pertains to solar OG100 provision for solar water heating. CF2R specifically addresses pool heating. The expectation today is that those forms should be filled out even if the jurisdiction didn't have a permit provision

in place. We are still having conversations on enforcement internally and with the CEC. We can consider how to address the situation in jurisdictions where the permitting is not required, but CF1R and CF2R, as modified to address the proposed code language, will need to be filled out.

- d. Javier Perez, (CEC) added: The energy code is triggered when a permit is pulled or required. Jurisdictions have rules regarding when a permit is required, which is covered In Section 100A of the energy code.
- e. Ben Davis follow-up: If a jurisdiction doesn't require a permit for a pool to be heated, would that jurisdiction be in violation of this requirement?
- f. Javier (CEC): No, the requirement of this standard is triggered when a permit is required to be pulled. If a permit is not required, the code requirement is not in effect.

2. Verbal question asked by Bob Raymet (CA Building Industry Association, the Apartment Association, the Building Owners and Managers, and the Building Properties Association): Over the last 15-20 years, there's been difficulty for local

jurisdictions and the CEC to get HVAC requirements in place, specifically retrofit requirements for heater or air conditions, that you check the ducts. That's been a tremendously difficult issue to crack, and they're still working on it. The result is a ton of HVAC retrofits not getting permitted. I'm concerned that since most new homes are 2-3 stories tall now, there's very limited roof area and may well be very limited lot area. When you have a new home with 4 to 5 kW of solar on the roof, there's not a lot of area left for additional PV or solar thermal. This could be a serious problem moving forward. Very few residential pools are installed at the time of construction when the unit is first being installed; all of this is being installed often well after occupancy. I'll be looking for some exemptions or exceptions, such as the ones you've already produced, to help get this done correctly. Otherwise, people are going to run from getting a permit.

- a. Statewide CASE Team (Aniruddh Roy): Thank you, we encourage you to take a look at the exception language for the situation you just described. We are happy to have a follow-up call if needed.

3. Statewide CASE Team verbal responses to stakeholder comments (submitted in GoTo Webinar Q&A pane) to the question "Please provide feedback and suggestions on the market readiness and technical feasibility of this proposal". (See also: **Public Input Submitted Via Mentimeter section of these meeting notes)**

- **Mentimeter anonymous comment:** 25-year service life for unglazed collectors is unrealistic – that is more in line with PV.
 - a. CASE Team response (Aniruddh Roy): Thank you for your comment. We relied on the National Renewable Energy Laboratory's report linked below on the 25-year life expectancy. 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> That 25 year service life period from the NREL study was unique to solar collectors

for swimming pools but if you have other information please share it with us so we can take it into account.

- **GoTo webinar Q&A, Meg Waltner:** For Scenario 1 (residential), I think that some climate zones in California likely heat their pools year-round. This is obviously user dependent, but the single-family pools that I have experience within Southern California were heated through the winter.
 - a. CASE Team response (Aniruddh Roy): Regarding heating the pool year-round; we will be taking year-round heating into account for the analysis. We will look at different types of buildings and usage patterns.
- **Mentimeter anonymous comment:** Why use a cover on an indoor pool? Keeping air temp at 2 degrees warmer than pool temp serves as heat loss mitigation.
 - a. CASE Team response (Aniruddh Roy): That is being modeled in the analysis but is not a mandate. It accounts for scenarios where an indoor pool may have a cover. The 82 degrees Fahrenheit is tied to an indoor pool dehumidifier standard managed by the Air Conditioning Heating and Refrigeration Institute, so we used this as a best-case assumption based on what is in the rating test procedure.
- **Question/Comment:** How are current solar pool systems' installed costs determined? I see a higher installed cost above the \$5,000 in California.
 - a. CASE Team Response (Aniruddh Roy): Thank you for your comment. We are planning on referencing the project costs associated with the CSI-Thermal program. Please refer to the following hyperlink and let us know if you have any additional data sources for our team to consider:
<https://www.csithermalstats.org/download.html>
- **Mentimeter anonymous comment:** Unglazed collectors have a service life of 12-15 years, which coincides with most manufacturer's warranty coverages.
 - a. CASE Team response (Aniruddh Roy): Thank you for your comment. Regarding unglazed and glazed – we are looking to size the solar collector as a function of the pool surface area. We're trying to be technology neutral as it pertains to solar collectors. The solar industry asked us to take Photovoltaic thermal hybrid solar collector (PVTs) into account as we perform the analysis. We've considered using CSI Solar Thermal Calculator to do a therms per square foot calculation. If you feel we need to take a deeper dive into the efficiency of solar collectors, please let us know. Please provide the CASE team with data correlating manufacturer-specific warranty coverages with estimated product lifetime. We relied on the National Renewable Energy Laboratory's report linked below on the 25-year life expectancy. 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>

- **Mentimeter anonymous comment:** What about customers that don't want heating in their pool?
 - a. CASE Team response (Aniruddh Roy): To be clear, the Section 110.4 mandate only applies to pools that have heating. A survey from 2019 showed that 47% of pools in residential space in CA across 16 climate zones don't use any heating, so this measure would not apply to those pools.
- **Mentimeter anonymous comment:** Recommend modifying residential usage for southern California climate zones to heated year-round.
 - a. CASE Team response (Aniruddh Roy): Thank you for your comment. We are considering this and will be better able to put that usage pattern together to reflect a base case for average use cycle for pool heating today. The CASE team has analyzed RASS 2019, and determined that approximately 11% single-family occupancies heat their pools continuously during a calendar year. We plan on incorporating the pool heating usage patterns summarized in RASS 2019 into our analyses for all 16 California-specific climate zones.

4. **Dan Sizelove (Aquatherm Industries):** What assumptions were used in the swim seasons. There might be some things that don't add up; Sacramento is shown to be opening and using the pools sooner than San Diego.
 - a. CASE Team response (Helen Davis): The average high temperatures each day were reviewed based on the 2022 weather file. We estimated the swim season by review of air temperatures. The swim season start was set for when there was a sustained high temperature of 70°F. The end of the swim season was also set by the earlier of the loss of a sustained 70°F high air temperature, return to standard time or the worsening of the weather. Pools at hotels tend to open later so that swimmers do not disturb guests. Pools at gyms may open earlier to meet schedules for workouts. We're interested if you have a suggestion for a different method or location assumptions (coastal vs. inland for example); we welcome your input.

5. **Stakeholder comments submitted anonymously in Mentimeter to the question “Please provide feedback and suggestions in the code compliance and verification process for this proposal”: Is there any difference in the approach for new construction vs. retrofit?**
 - a. CASE Team response (Aniruddh Roy): Additions and alterations tie into mandatory Section 110.4 with the exception of single-family with existing pool heaters. That sub-Section (150.2) would not invoke Section 110.4; so there would be no provisions invoked for CF1R and CF2R forms relative to what's in place today. You'd still be subject to existing requirements as they are in place today, but not for these proposed changes.

Questions / Comments Submitted Via GoTo Webinar

Question Asked by:	Question Asked Date/Time	Question Asked	CASE Team Response
Ben Davis	9:11:21 AM	Is the proposed requirement that (a) all new pools with heating must come from solar thermal/heat pumps, (b) all new pools must be heated with solar thermal/heat pumps, (c) whenever heating is being added to a pool (whether new or old), the heating must come from solar thermal/heat pumps, or (d) something else?	The proposed requirements under the new subsection 110.4(c) provide multiple pathways with two sets of exceptions. Details can be accessed here for reference: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf
Bob Raymet	9:00:48 AM	I'm sure you will get to this, but what size PV system would be needed for a typical SF home pool?	The proposed draft code language in the following link requires the solar collector area to be equivalent to at least 70% of the pool surface area: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf
Gina Rodda	9:56:33 AM	My concern is that you are only talking of a single-family form, and not the forms used for multifamily and nonresidential projects.	Thank you for this comment. Our understanding of the current code language is that form CF2R-PLB-03-E is applicable to single-family, multifamily, and nonresidential buildings. As an example, Table 100.0-A mandates section 110.4 for all building types, and provisions of that section are appropriately captured in form CF2R-PLB-03-E, so there is an overlap across different building types.
Tim Rosenfeld	9:08:59 AM	VFDs are not common and of those that were installed, many have been abandoned.	Thank you for your feedback, Tim. We will consider this comment along with the feedback provided on our polls during the stakeholder meeting.

Question Asked by:	Question Asked Date/Time	Question Asked	CASE Team Response
Dan Sizelove	9:37:42 AM	Why use a cover for indoor pools?	<p>Thank you for this comment.</p> <p>The original plan was to run scenarios with and without a cover. The presentation at the February 1 stakeholder meeting was limited to the pool cover scenario, but subsequent runs will address uncovered indoor pools.</p> <p>We are aware of at least one case study confirming the energy savings potential of indoor pool covers. It can be accessed here for your reference: https://smartenergy.illinois.edu/wp-content/uploads/2021/11/JALC-Pool-Cover-Case-Study.pdf</p>
Meg Waltner	9:40:14 AM	For Scenario 1 (residential), I think that some climate zones in California are likely heat their pools year round. This is obviously user dependent, but the single family pools that I have experience with in Southern California were heated through the winter.	<p>Regarding heating the pool year-round; we will be taking year-round heating into account for the analysis. We will look at different types of buildings and usage patterns.</p> <p>Occupancies will account for usage patterns summarized in the RASS 2019 data. For example, the data suggests that roughly 47% pools have no heaters, and out of the remaining 53% pools, about 11% are continuously heated.</p>

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Note: all questions and comments submitted via Mentimeter are anonymous. Those that were discussed during the meeting are incorporated into the 'In-Meeting Questions / Comments' section above; others are shown below.

1. Question/Comment: There is a market readiness/feasibility issue regarding the insulation of pool covers. Ideally, if the proposal language can recognize the reality of the situation and work with the industry, it would be best for all parties.

a. CASE Team Response (Aniruddh Roy): Thank you for this comment. The proposed measure for this code cycle is not seeking to address insulation on pool covers. The insulation provision being considered is specific to the side and bottom walls of swimming pools.

2. Question/Comment: Increased costs are always a barrier that will hurt the industry. One economical way to both address heat/energy savings and water conservation is the use of automated pool covers.

a. CASE Team Response (Aniruddh Roy): We agree with this comment. Title 24, Part 6, currently mandates pool cover provisions for outdoor pools or outdoor spas that have a heat pump or gas heater.

3. Question/Comment: I'm supportive of this measure - I agree that it is technically feasible and ready for market.

a. CASE Team Response (Aniruddh Roy): Thank you for your support of this measure. We look forward to your continued participation in the process.

4. Question/Comment: Perhaps you will need to require that all roof areas are pitched for solar access.

a. CASE Team Response (Aniruddh Roy): "As currently proposed, section 110.4(c) in the following hyperlink takes into account circumstances where lack of solar access can still allow for alternative heating solutions:

https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

5. Question/Comment: Not ready unless pool cover is used.

a. CASE Team Response (Aniruddh Roy): We agree with this comment. Title 24, Part 6, currently mandates pool cover provisions for outdoor pools or outdoor spas that have a heat pump or gas heater.

6. Question/Comment: Pool heat pumps are the #1 heating method in Québec, Canada. Heat pumps are slower to heat than gas, but very efficient (set and forget at the beginning

of the season) - we have heat pumps that work down into high 30's. "Thank you for this comment.

a. CASE Team Response (Aniruddh Roy): Please let us know if the proposed language in section 110.4(c)3 in the following hyperlink can be improved in any way based on your field experience: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf We would very much appreciate if you could provide additional data supporting your comment.

7. Question/Comment: Will any of these requirements apply to pools and spas not associated with single-family? Such as multifamily, hotel/motel, health clubs?

a. CASE Team Response (Aniruddh Roy): Yes, the proposed revisions to section 110.4 specified in the following hyperlink will also be applicable to pools and spas in multifamily and nonresidential buildings: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

8. Question/Comment: Both the solar thermal pool heating and swimming pool heat pump industries have over 40 years of market experience and are up to the requirements of the new code.

a. CASE Team Response (Aniruddh Roy): Thank you for this comment. The proposed code language is subject to continuing review by stakeholders. The CASE team would very much appreciate any data you could provide based on your extensive market experience.

9. Question/Comment: Heat pumps are seldom used in CA because they don't deliver a COP of 4. COP of 2.5 is more common. Depends on humidity. No performance curves available for HPPH. Just 3 data points. We've had to extrapolate and look at user experience.

a. CASE Team Response (Aniruddh Roy): The heat pump pool heater provisions proposed in section 110.4(c)3 take into account sizing and COP at low air temperature-mid humidity rating condition. Section 4.2.2.3 of ANSI/PHTA/ICC-15 2021 suggests that installation of heat pump pool heaters with high COPs at low temperatures is the norm. In addition, 110.4(c)1 and 110.4(c)2 are other pathways to compliance in case a heat pump pool heater is not a viable option. Pertinent links are here for your reference: 1. https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf 2. https://issuu.com/thephta/docs/phta-15_standard_res_energy_efficiency_issuu_05172

10. Question/Comment: Roof space for residential pool solar is limited. Homes are not designed with large south facing exposure.

a. CASE Team Response (Aniruddh Roy): Thank you for this comment. The proposed code language also prescribes subsections 110.4(c)2 and 110.4(c)3 as alternative pathways to solar. In addition, the 70% threshold in prescribed in 110.4(c)1 allows for more optimal use of the roof space if a homeowner wants to consider that heating option. Pertinent link to the proposed code language is here for your reference: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

11. Question/Comment: There is already confusion about what is required for single-family pools and spas, very concerned that we are not documenting clearly what is required via compliance documentation.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The intent of the proposed measure is not to add any further burden to the compliance documentation process. The CASE team intends to suggest revisions to existing compliance forms CF2R-PLB-03-E and CF1R-STH-01-E. No new forms will be generated as a result of this measure. In addition, due to the cleanup language being proposed in the code language in the following hyperlink, the CASE team intends to suggest some simplifications to the existing compliance form as a result of those changes: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

12. Question/Comment: The CF1R does not currently include anything about the pool and spa, which causes issues. The CF2R is often forgotten/ignored.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The purpose of invoking CF1R-STH-01-E is to ensure compliance with the proposed solar certification requirements. The plan is to implement the CF1R-STH-01-E and CF2R-PLB-03-E forms as part of the design, permit application, construction and inspection phases.

13. Question/Comment: Pool/spa combos are common and to heat that spa you need gas. It can be done with a water to water heat pump using pool as source but this is brand new idea. Not ready.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. As currently proposed, section 110.4(c) in the following hyperlink allows for gas technologies to be used for spa heating, if applicable for the specific needs of a given project in a specific climate zone: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

14. Question/Comment: Solar requires a cover and is ineffective for 6+ months of year. An exception for automated covers should be considered as it is more effective for energy and water conservation for 12 months of the year. Solar cost would hinder automated cover sales.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Title 24, Part 6, currently mandates pool cover provisions for outdoor pools or outdoor spas that have a heat pump or gas heater. We would very much appreciate additional data confirming how pool owners make purchasing decisions around automated covers to comply with the current code provisions, and also simultaneously tradeoff other pool-related purchasing decisions in lieu of purchasing automated covers. Please also share sources of information on installed costs for such covers.

15. Question/Comment: Will ADA affect the ability of customers to have a heater other than solar or heat pumps for medical reasons?

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The proposed code language in section 110.4(c) of the following hyperlink does not limit pool heating options to only solar and heat pump pool heaters:
https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf However, please share specific details with our CASE team on provisions within the Americans with Disabilities Act that may end up conflicting with the proposed section 110.4(c), and our team will be sure to review it further.

16. Question/Comment: Limited roof space can be overcome by the use of hybrid systems using both solar thermal and HPPHs.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The proposed code language in section 110.4(c) of the following hyperlink provides the level of flexibility summarized in your comment: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

17. Question/Comment: The use of heat pump pool heaters during overnight hours increases COPs to 5 due to higher humidity levels, while using lower, off-peak energy.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The proposed code language in section 110.4(c)3 of the following hyperlink also accounts for heat pump pool heater sizing and COPs during Low Air Temperature-Mid Humidity conditions: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf We look forward to any additional feedback on this matter.

18. Question/Comment: It takes 1 Btu to heat 1 lb of water 1 degree F. A heat pump can raise a 1,000 gallon spa by around 10 degrees per hour at 50F. When temperatures are in the 30s heat pumps need a backup heat source.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The proposed code language in the following hyperlink includes provisions allowing for the use of a backup heat source: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

19. Question/Comment: The product and the installation workforce are market ready. As noted, this is a 50-year old technology with extensive existing installations in California.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Is there anything in the proposed code language within the following hyperlink that would pose a barrier to the extensive product and workforce experience you described in your comment? https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

20. Question/Comment: Clearer distinction between residential and public pools is needed, and of public pools. Also, big difference between residential size motel pool (public) and large community pools. The feasibility of heat pumps/solar is very different for these segments.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. We are relying on RASS 2019 data to specifically differentiate the pool usage patterns residential analyses from pools in nonresidential buildings. We welcome any additional data you may have to help us shape the analyses to be representative of average use cycles in the field.

21. Question/Comment: More data on existing commercial pool heating would be helpful as to load profiles and heating seasons.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. This question was specifically raised during the stakeholder meeting prior to our sharing of five specific scenarios, some of which addressed pools in nonresidential buildings. Please see slides 14, 19, and 25-27 of the following slide deck for additional details: https://title24stakeholders.com/wp-content/uploads/2023/01/2025-T24-Utility-Sponsored-Stakeholder-Meeting-1_Pool-and-Spa-Heating.pdf Please feel free to point our CASE team to any additional data sources.

22. Question/Comment: Enerpool cannot model a heat pump because the performance curve for a heat pump is unknown. Cannot just input a COP.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. We are not limiting Enerpool runs to just heat pump pool heaters. We are also assessing other pool heating options using best guess estimates on current baseline technologies.

The proposed code language in the following hyperlink attempts to address a variety of pool heating options outside of heat pump pool heaters:

https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

23. Question/Comment: Pool volume is not important. Pool top surface area is.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The proposed code language in subsection 110.4(c)1 of the following hyperlink associates the solar collector area with the pool surface area:

https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

24. Question/Comment: Input a different portion of free stream wind on solar and on pool, and results can vary by hundreds of %. You have to know the inputs based on verified monitoring.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. We have revised some of the inputs since the February 1 stakeholder meeting. Please feel free to let the CASE team know if you have any specific recommendations on inputs based on your experience with Enerpool and field installs.

25. Question/Comment: Record pool heating data from winter season use, primarily in the low desert of Southern California. Is solar, gas and a cover used? These pools use natural gas in large quantities. Current prices of gas may force conservation measures.

a. CASE Team Response (Aniruddh Roy): "Thank you for your comment. Title 24, Part 6, currently mandates pool cover provisions for outdoor pools or outdoor spas that have a heat pump or gas heater. We have also observed from RASS 2019 that for nearly 70% single-family buildings with pools, owners choose to never use their pool heating system due to high utility bills, irrespective of gas or electric consumption. Only about 11% of pool owners heat their pools continuously.

26. Question/Comment: There is no way you are getting an average COP of 5.2 on a heat pump pool heater.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Please share with our CASE team some additional data to support this comment on heat pump pool heater performance relative to the COPs reported on California's Modernized Appliance Efficiency Database System .

27. Question/Comment: Heat pump and gas heater costs are for the equipment only, not installation or electrical gas hookup. Price for solar is installed and complete. Numbers are way off.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Please provide the CASE team with data on installation costs, or let us know how far off we

currently are from typical installed costs. Our data sources were Table 8.2.6 of the U.S. Department of Energy's Consumer Pool Heaters 2022 Technical Support Document. We relied on table 8.3.4 for repair and maintenance costs. In addition, we would like to note that the proposed exception 2 to section 110.4(c) in the following hyperlink excludes additions and alterations to single-family buildings with existing pool and spa heating systems: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

28. Question/Comment: Where is the cost associated with supporting solar systems such as structural and electrical?

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Our understanding is that the solar costs presented on slide 30 of the following hyperlink addresses these aspects: https://title24stakeholders.com/wp-content/uploads/2023/01/2025-T24-Utility-Sponsored-Stakeholder-Meeting-1_Pool-and-Spa-Heating.pdf

29. Question/Comment: Gas heaters don't last as long as heat pumps. Also, your costs don't seem to include costs of running gas lines out to the heaters.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Please provide the CASE team with data on equipment lifetime and installation costs, or let us know how far off we currently are from typical installed costs. Our data sources were Table 8.2.6 of the U.S. Department of Energy's (DOE) Consumer Pool Heaters 2022 Technical Support Document. We relied on table 8.3.4 for repair and maintenance costs. We also relied on DOE's documentation on the product lifetime estimates.

30. Question/Comment: Solar PV and heat pumps work very well together.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The CASE team would very much appreciate any data you can provide to help support this comment.

31. Question/Comment: Estimated life of all types of heaters is not realistic; gas is less than ten years, HPPH 10-12 years, and solar pool 15 years.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Please provide the CASE team with data on installation costs, or let us know how far off we currently are from typical installed costs. Our data sources were Table 8.2.6 of the U.S. Department of Energy's Consumer Pool Heaters 2022 Technical Support Document. We relied on table 8.3.4 for repair and maintenance costs. We relied on the National Renewable Energy Laboratory's report linked below on the 25-year life expectancy. 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>

- 32. Question/Comment:** What about pool customers that do not want/need any pool heating, i.e., homes in warm climates where a bubble cover is sufficient?
- a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The proposed revisions to the code language will not address such pool customers as there is no energy consumption related to pool heating.
- 33. Question/Comment:** Agree that you should include cost of running gas line to the heater.
- a. CASE Team Response (Aniruddh Roy): Thank you for your comment. We assuming the baseline heating system to be gas-fired based on available market data.
- 34. Question/Comment:** Inground spas will not be cost effective for solar because effective heating must be glazed solar and most applications require the spa to be at 104 degrees by 8 or 10 a.m., before the sun's energy is available, so the spa is already heated with gas.
- a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The proposed code language in section 110.4(c) of the following hyperlink does not limit pool heating options to only solar: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf Please share additional data with the CASE team to support your comment, and let us know if you have any additional feedback on the proposed code language.
- 35. Question/Comment:** Indoor pool covers do help due to evaporation which equals heat loss.
- a. CASE Team Response (Aniruddh Roy): Thank you for your comment. We are aware of at least one case study confirming the energy savings potential of indoor pool covers. It can be accessed here for your reference: <https://smartenergy.illinois.edu/wp-content/uploads/2021/11/JALC-Pool-Cover-Case-Study.pdf> Please let the CASE team know if you have additional data sources or studies to support your comment.
- 36. Question/Comment:** Use of pool covers seems high. This varies by occupancy. I have not seen hotels use pool covers.
- a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Title 24, Part 6, currently mandates pool cover provisions for outdoor pools or outdoor spas that have a heat pump or gas heater. We look forward to any comments you may have on steps to improve compliance with existing code language.
- 37. Question/Comment:** Covers are the best. Just getting them to be used is not always possible or done. Some insurance liability concerns in commercial applications.
- a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Title 24, Part 6, currently mandates pool cover provisions for outdoor pools or outdoor spas

that have a heat pump or gas heater. We look forward to any comments you may have on steps to improve compliance with existing code language. Please also share additional information with the CASE team on your comment pertaining to insurance liability.

38. Question/Comment: In addition to the cost of the heater, there are costs associated with running gas lines, or electrical service for HPPH (typically 40 amps).

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The CASE team will endeavor to incorporate the total installed cost for such pool heating systems into the analyses. Can you please share additional data with the CASE team, or provide specific feedback on the costs summarized on slide in the following hyperlink? https://title24stakeholders.com/wp-content/uploads/2023/01/2025-T24-Utility-Sponsored-Stakeholder-Meeting-1_Pool-and-Spa-Heating.pdf

39. Question/Comment: Properly installed solar panels typically run \$9,000 and up in LA, especially if permitted.

a. CASE Team Response (Aniruddh Roy): We are planning on referencing the project costs associated with the CSI-Thermal program. Please refer to the following hyperlink and let us know if you have any additional data sources for our team to consider: <https://www.csithermalstats.org/download.html>

40. Question/Comment: Would be helpful to see where assumptions came from, e.g., most lap/competition pools open at 5:30 - 6:00 a.m. for swimmers. Public pools used by children and seniors are often set at 82F or higher.

a. CASE Team Response (Helen Davis): Brief survey of advertised opening times for pools of various types. Pools at hotels tend to open later so that swimmers do not disturb guests. Pools at gyms may open earlier to meet schedules for workouts.

41. Question/Comment: Finding solar pool customers through permits is difficult. Some cities do not require them, and many systems are not permitted. Use visual imagery to local a few pools and ask the owners and their experiences.

a. CASE Team Response (Aniruddh Roy): Per Section 100.0(a)2 set forth in Title 24, Part 6, a building permit is required for several occupancies under subsection 100.0(a)1, so assuming a pool serves any of those occupancies, permit requirements would be invoked via the Energy Code. A pool heater install requires a permit as it essentially involves hard wiring of a gas or electric equipment. Aniruddh Roy

42. Question/Comment: RASS is residential? Where does your commercial pool end use data come from?

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. In addition to RASS 2019, our team relied on the U.S. Department of Energy's technical support

document issued in 2022 on consumer pool heaters to evaluate pool end use data in nonresidential buildings, and the number of pools in such buildings based in California. We are also simultaneously taking into account the California Energy Commission's latest construction forecast and available Pkdata on pools to develop representative estimates.

43. Question/Comment: For justifying pool temperatures, refer to the Red Cross.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. Please share the specific data sources you would like the CASE team to review in support of your comment.

44. Question/Comment: You may want to include some measure of activity level in the pool.

a. CASE Team Response (Aniruddh Roy): Thank you for your comment. The pool use profile form in the simulations being performed by the CASE team incorporates an activity level parameter. Please share any additional data sources with the CASE team, so we can further explore the issue raised in your comment." Aniruddh Roy

45. Question/Comment: Well installed solar pool system that drain nightly do last 25 years of more. Otherwise they will be destroyed by freezing in 10 years in all climate zones.

a. CASE Team Response (Aniruddh Roy): The proposed code language in the hyperlink provided below includes provisions linked to OG-400 and OG-100. Chapter 3 of OG-400 (freeze protection) and OG-100 (freeze tolerance) appear to address the issue raised in your comment. However, the CASE team would very much appreciate any additional data summarizing typical installation practices in California, and how they may or may not impact the estimated equipment lifetime. https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf

46. Question/Comment: Was wind speed considered? Wind has a significant impact on usage season and also the performance of unglazed collectors.

a. CASE Team Response (Aniruddh Roy): The collector parameters in the simulations being performed by the CASE team include a wind dependency factor. Please share any additional data sources with the CASE team, so we can further explore the issue raised in your comment.

47. Question/Comment: In your cost comparison, you should indicate the free cost of operation of solar compared to the costly operation of heat pumps.

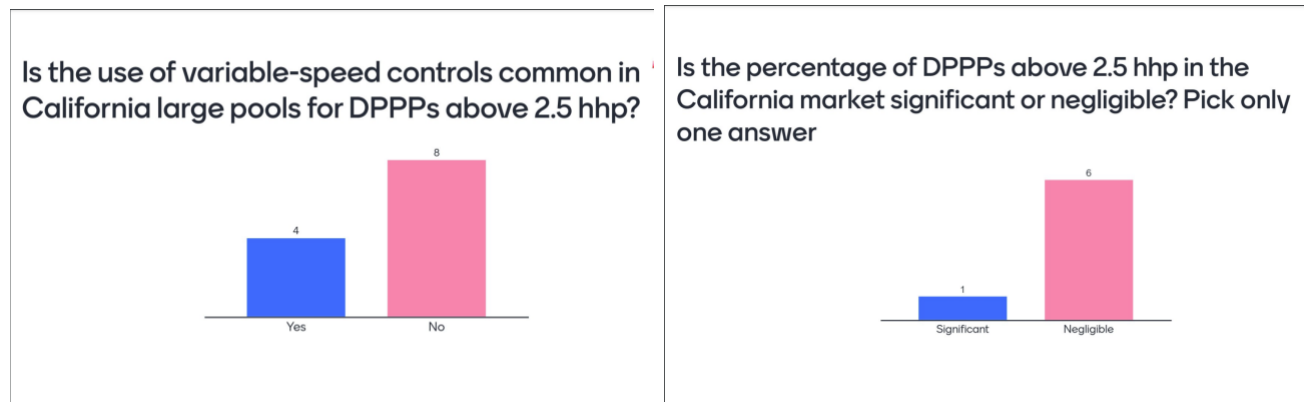
a. CASE Team Response (Aniruddh Roy): The proposed code language in section 110.4(c) of the following hyperlink provides sufficient flexibility on pool and spa heating options: https://title24stakeholders.com/wp-content/uploads/2023/02/2025-T24-Measure-Summary_NR-Swimming-Pool-Spa-Heating.pdf The CASE team's analytical approaches on benefit to cost ratio will take your suggested approach into

account. Please share any additional data sources with the CASE team in support of your comment.

48. Question/Comment: CZ 15 Palm Springs: the season is November to May due to snowbirds flocking to warmer climate.

a. CASE Team Response (Aniruddh Roy): The CASE team will continue to review its analytical assumptions on the swim season. Please share any additional data sources with the CASE team in support of your comment.

Mentimeter Polls & Responses



Please provide feedback and suggestions on the market readiness and technical feasibility of this proposal.



There is a market readiness/feasibility issue regarding the insulation of pool covers. Ideally, if the proposal language can recognize the reality of the situation and work with the industry, it would be best for all parties.

Increase costs is always a barrier that will hurt the industry. One economical way to both address heat/energy savings and water conservation is the use of automated pool covers.

I'm supportive of this measure -- I agree that it is technically feasible and ready for market.

perhaps you will need to require that ALL roof areas are pitched for solar access

Not ready unless pool cover is used.

Pool Heat Pumps are the #1 Heating Method in Quebec Canada. Heat Pumps are slower to heat than gas, but very efficient (Set and Forget at the beginning of the Season) - We have heat pumps that work down into high 30's.

Will any of these requirements apply to pools and spas not associated with single-family? Such as multifamily, hotel/motel, health clubs?

Both the solar thermal pool heating and swimming pool heat pump industries have over 40 years of market experience, and are up to the requirements of the new code.

Heat pumps are seldom used in CA because they don't deliver a COP of 4. COP of 2.5 is more common. Depends on humidity. No performance curves available for HPPH. Just 3 data points. We've had to extrapolate and look at user experience

Roof space for residential pool solar is limited .. Homes are not designed with large south facing exposure .

There is already confusion about what is required for single-family pools and spas, very concerned that we are not documenting clearly what is required via compliance documentation.

the CF1R does not currently include ANYTHING about the pool and spa, which causes issues. the CF2r is often forgotten/ignored.

Pool/spa combos are common and to heat that spa you need gas. It can be done with a water to water heat pump using pool as source but this is brand new idea. Not ready.

Solar requires a cover and is ineffective for 6+months of year. An exception for automated covers should be considered as it is more effective for energy and water conservation 12 months of the year. Solar cost would hinder automated cover sales.

Will ADA effect the ability of customers to have a heater other than solar or heat pumps for medical reasons?

Limited roof space can be overcome by the use of hybrid systems using both solar thermal and HPPHs.

The use of HPPH's during the overnight hours increases COP's to 5 due to higher humidity levels, while using lower, off-peak energy.

it takes 1 BTU to heat 1lb of Water 1 degree F. A heat pump can raise a 1000gallon spa by around 10 degrees per hour at 50F. When temperatures are in the 30s heat pumps need a backup heat source.

Please provide feedback and suggestions on the methodology and assumptions for energy saving estimates of this proposal.

Where is the cost associated with supporting solar systems such as structural and electrical?

25-year service life for unglazed collectors is unrealistic - that is more in line with PV.

gas heaters don't last as long as heat pumps. Also, your costs don't seem to include costs of running gas lines out to the heaters.

Solar PV and Heat Pumps work very well together

Estimated life of all types of heaters is not realistic; gas is less than ten years, HPPH 10 - 12 years, and solar pool 15 years.

Why use a cover on an indoor pool? Keeping indoor air temp at 2 degrees warmer than pool temp serves as heat loss mitigation

What about pool customers that do not want/ need any pool heating? i.e. homes in warm climates where a bubble cover is sufficient.

How are current solar pool systems installed costs determined . I see a higher installed cost above the \$5000.00 in Ca.

Unglazed collectors have a service life of 12-15 years which coincides with most manufacturer's warranty coverages.

The product and the installation workforce are market ready. As noted this is a 50 year-old technology with extensive existing installations in California.

Clearer distinction between res. and public pools needed, and of public pools. Also, big difference between res. size motel pool (public) and large community pools. The feasibility of heat pumps/solar is very different for these segments.

More data on existing commercial pool heating would be helpful as to load profiles and heating seasons .

Enerpool can't model a heat pump because the performance curve for a heat pump is unknown. Can't just input a cop.

Pool volume isn't important. Pool top surface area is.

Input a different portion of free steam wind on solar and on pool and results can vary by hundreds of %. You have to know the inputs based on verified monitoring.

record pool heating data from Winter season use , primarily in the low desert of Southern California . Is solar , gas and or a cover used ...These pools use fratural gas in large quantities . Current prices of gas may force conservation measures .

There's no way you are getting an average cop of 5.2 on a HPPH

Heat pump and gas heater costs here are for the equipment only, not installation or electrical or gas hookup. Price for solar is installed and complete. Numbers are way off.

Agree that you should include cost of running gas line to the heater.

Recommend modifying residential usage for southern California climate zones to heated year round.

In addition to the cost of the heater, there are costs associated with running gas lines, or electrical service for HPPH (typically 40 - amps).

Inground spas will not be cost effective for solar because effective heating must be glazed solar and most applications require the spa be at 104 degrees by 8 or 10am..before the sun's energy is available..so the spa is already heated with gas.

Use of pool covers seems high. This varies by occupancy. I have not seem hotels use pool covers

How did you determine swim seasons by climate zone? Air temperature? San Diego is swimming before Sacramento...

indoor pool covers do help due to evaportaion which equals heat loss ..

Covers are the best ...just getting them to be used is not always possible or done .. Some insurance liability concerns in commercial applications .

Properly installed solar pool panels typically run \$9,000 and up in LA...especially if permitted.

Would be helpful to see where assumptions came from. Ex: Most lap/competition pools open at 5:30 - 6am for swimmers. Public pools used by children and seniors are often set at 82F or higher.

Can you please explain the swim season assumptions

Well installed solar pool system THAT DRAIN NIGHTLTLY do last 25 years or more. Otherwise they will be destroyed by freezing in 10 years in ALL climate zones.

CZ 15 Palm Springs .. the season is Nov _ May due to snowbirds flocking to warmer climate

Finding solar pool customers through permits is difficut ; some cities do not require them , and many systems are not permitted .. Use visual imagery to local a few pools and ask the owners their experiences

For justifying pool temperatures, refer to the Red Cross.

Was windspeed considered? Wind has a significant impact on usage season and also the performance of unglazed collectors

Rass is residential? Where does your commercial pool end use data come from?

You may want to include some measure of activity level in the pool.

In your cost comparison, you should indicate the free cost of operation of solar compared to the costly operation of heat pumps.

Please provide feedback and suggestions in the code compliance and verification process for this proposal.



Please collect what is done compliance documentation wise for nonres and multifamily also, not just single-family.

Is there any difference in the approach for new construction vs. retrofit?

Codes should require that solar pool systems are installed to be freeze-proof, either by installation design (drain-back by gravity or glycol) or with manufacturers 25 year warranty on material flexibility.