DOCKETED	
Docket Number:	25-BSTD-03
Project Title:	2028 Energy Code Pre-Rulemaking.
TN #:	273382
Document Title:	CA Statewide Utility Codes and Standards Enhancement Team Comments - Statewide CASE Team Comments On Swimming Pool And Spa Heating Express Terms Pre-Rulemaking Language
Description:	N/A
Filer:	System
Organization:	CA Statewide Utility Codes and Standards Enhancement Team
Submitter Role:	Public
Submission Date:	11/5/2026 12:18:35 PM
Docketed Date:	11/5/2026

Comment Received From: CA Statewide Utility Codes and Standards Enhancement Team
Submitted On: 11/5/2026
Docket Number: 25-BSTD-03

Statewide CASE Team Comments On Swimming Pool And Spa Heating Express Terms Pre-Rulemaking Language

Additional submitted attachment is included below.

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

COMMENTS ON SWIMMING POOL AND SPA HEATING EXPRESS TERMS PRE-RULEMAKING LANGUAGE

November 5, 2026

California Energy Commission

Docket No. 25-BSTD-03

The California Statewide Codes and Standards Enhancement (CASE) initiative presents recommendations to support the California Energy Commission's (CEC's) efforts to update California's Energy Code (Title 24, Part 6), including revisions to expand the scope to existing pools to improve the energy efficiency of pool heating systems. Three California Investor-Owned Utilities (IOUs) jointly sponsored this effort—Pacific Gas & Electric Company, San Diego Gas & Electric, and Southern California Edison.

In the proposal "Swimming Pool and Spa Heating" submitted in June 2026, the Statewide CASE Team recommends that the CEC expand pool heating efficiency requirements to existing commercial and municipal pools when an existing pool heating system is replaced. Pool heating represents one of the largest energy uses in many recreational facilities. The proposal is cost-effective and technically feasible, would achieve significant statewide energy savings and help reduce operating costs for pool operators.

The proposal was developed through an extensive stakeholder process, including public workshops, written comments, and direct engagement with manufacturers, industry representatives, pool operators, and energy professionals. Stakeholder feedback was incorporated to improve feasibility, lower incremental costs, and expand compliance options.

The Statewide CASE Team recommends that the CEC remove the proposed hardship, technical infeasibility, and hazardous-condition exceptions. These exceptions would be challenging to enforce, and without it, the remaining language provides six flexible, cost-effective compliance options.

This letter first addresses the potential issues with the hardship exception. It then responds to continued stakeholder questions about solar thermal pool heating, summarizing key findings from the Final CASE Report and presenting new information,

including additional examples of California pools using solar thermal heating and new visualizations of the modeling results.

1. Statewide CASE Team's Comments on Proposed Exceptions

1.1 The Statewide CASE Team Recommends Removing the Proposed Hardship, Technical Infeasibility, and Hazardous-Condition Exceptions

1.1.1 Hardship Exception Would Be Difficult to Implement Consistently

The Statewide CASE Team recommends removing the hardship exception because it would be difficult to administer and enforce. The proposed language does not establish how infrastructure costs would be calculated or documented, what evidence an applicant must provide, or how an authority having jurisdiction (AHJ) would determine whether a hardship has been demonstrated. Any hardship exception would also require case-by-case review by AHJs and create enforcement roadblocks.

Furthermore, the proposed language does not define the project's total cost. Without clear criteria, similar projects could receive different determinations across jurisdictions.

Infrastructure costs can also vary substantially depending on contractor pricing, cost categorization, and project boundary definitions. For example, pool heater replacement bids obtained from the City of West Sacramento identified infrastructure costs equal to 2.5%, 14.9%, and 20.3% of total project cost.[1] Under the proposed 20 percent threshold, contractor pricing and cost categorization could determine whether a project qualifies for an exception rather than whether the project presents a genuine hardship. Given the observed range of infrastructure costs, the proposed threshold could result in a substantial number of projects qualifying for a complete exception, limiting the energy savings achieved by the proposed requirements.

The Statewide CASE Team discussed the hardship exception and its potential impact on AHJs with a building official in Sacramento County. This stakeholder recommended establishing specific, clearly defined exceptions rather than a hardship exception. Case-by-case hardship determinations would require substantial judgment and could impose an undue administrative burden on building officials.

If the CEC includes a hardship exception, the Statewide CASE Team recommends aligning it with building code exceptions[2] that employ a "maximum extent feasible" provision. This approach would allow projects to achieve improvements while limiting economic hardship. The enforcement agency would determine the maximum feasible

level of compliance. Proposed modifications to the code language are provided in Section 1.2.

The Statewide CASE Team also recommends the use of "adjusted construction cost" [3] rather than "infrastructure cost" to align with a defined term in the California Building Code. The definition clarifies the costs associated with building the project that should be considered when determining economic hardship and excludes soft costs such as design, management, and inspection fees.

1.1.2 Technical Infeasibility Exception Creates Implementation Uncertainty

The technical infeasibility exception presents implementation challenges because "electrical service constraint" is not defined in the Energy Code and the required verification process is unclear. The CEC's proposed language does not identify what would qualify as an "electrical service constraint." Without clear qualifying criteria and verification requirements, enforcement agencies could interpret the exception broadly and apply it inconsistently.

Given the proposal's multiple compliance pathways, the CEC should remove this exception. If the exception is retained, the CEC should more clearly define technical infeasibility and specify the method for determining it.

1.1.3 Hazardous Condition Exception Is Unnecessary

The Statewide CASE Team recommends removing the hazardous-condition exception. The CEC has not identified a circumstance in which compliance with all applicable pathways would create or maintain a hazardous condition that would justify the proposed language. The proposed exception does not identify qualifying hazards or documentation requirements, creating ambiguity about how it would be applied.

1.2 Statewide CASE Team's Markup of Proposed Code Language

1.2.1 Guide to Markup Language

The Statewide CASE Team's proposed changes to CEC's 2028 Express Terms language are marked with double red underlining (new language) and ~~strikethroughs~~ (deletions).

1.2.2 Standards

Exception 6 to Section 801.~~6~~5.2.1.1: If the *alteration* includes circumstances that make compliance with Section 801.5.2.1.1 a ~~constitute~~ hardship or ~~infeasibility~~ infeasible, the applicant may request approval ~~an exception~~ from the *enforcement agency* to comply to the maximum extent feasible. The applicant shall bear the burden of demonstrating to the *enforcement agency* that hardship or infeasibility exists and no

reasonable alternative is available that complies with ~~the intent of~~ Section 801.~~6.1~~5.2.1.1. The *enforcement agency* shall determine the maximum feasible level of compliance. Circumstances that constitute hardship or infeasibility shall include one or more of the following:

1. The combined cost ~~of infrastructure~~ for the physical site work, building systems and primary utility upgrades to meet Section 801.~~6~~5.2.1.1 exceeds 20 percent of the *adjusted construction* ~~total~~ *cost* of the project. ~~Infrastructure upgrades include but are not limited to an electrical panel upgrade, physical space modification, and venting upgrade, etc. Cost of infrastructure upgrades does not include the cost of equipment~~. When the adjusted construction costs for full compliance with Section 801.5.2.1 would exceed 20 percent, compliance shall be provided to the greatest extent possible without exceeding 20 percent;

2. ~~It~~ Compliance with all alternatives in Section 801.5.2.1.1 is technically infeasible ~~to meet any of the options in Section 801.6.1.1~~ due to physical space limitations or electrical *service* constraints~~.including any alternatives considered but not feasible due to conditions specific to the project~~;

~~3. Compliance with Section 801.6.1 would create or maintain a hazardous condition(s) and present a life safety risk to the occupants.~~

2. The Statewide CASE Team Supports the Solar Pool Heating Proposal for Existing Pools

2.1 Solar Thermal Pool Heating is a Proven Technology

The Statewide CASE Team has received comments questioning the reliability of solar thermal heating technologies. Solar thermal pool heating systems have been successfully deployed in the United States since the 1970s. The Statewide CASE Team has observed multiple pools that have used these systems successfully since the 1980s and continue to use them today.

2.1.1 Examples of Successful Solar Thermal Pool Heating Implementation

The Statewide CASE Team has conducted a broad survey of projects across California that demonstrate the ability of solar thermal pool heating to substantially reduce conventional fuel consumption. Table 1 lists California pools that use solar thermal heating systems. Two projects illustrate the feasibility of these systems: the City of Richmond Municipal Natatorium, which uses glazed solar collectors to heat its Olympic-

sized pool, and the California Aquatics Therapy & Wellness Center, which has used solar thermal heating to supplement its therapy pool heating since 1981.

Table 1: Solar Thermal Heated Pools

Pool Name	City	Year Round	Swim Lessons
Cloverdale Veterans Memorial Building	Cloverdale	No	Yes
River City High School Pool	West Sacramento	Yes	Yes
Life Time	Folsom	Yes	Yes
Park Wilshire Improvement Association	San Jose	No	Yes
Saratoga Star Aquatics	Saratoga	Yes	Yes
The Swim Pro Santa Clara	Santa Clara	Yes	Yes
Santa Clara Swim School	Santa Clara	Yes	Yes
Campolindo Cabana Swim Club	Moraga	Yes	Yes
Rancho San Miguel Swim Club	Walnut Creek	No	Yes
Sherman Swim School	Lafayette	Yes	Yes
Petaluma Swim Center	Petaluma	No	Yes
UC Davis Recreation Pool	Davis	Yes	Yes

2.1.2 Solar Thermal Commonly Used with Supplemental Heating

The proposal allows heaters using any energy source to provide supplemental heat, aligning with widespread industry practice. Solar thermal pool heating systems are generally sized to offset a substantial portion of annual heating demand, with supplemental heating providing the remaining energy needed to maintain water temperatures.[4] The Statewide CASE Team confirmed through stakeholder discussions that gas pool heaters are commonly used for this purpose.

2.1.3 Analysis Predicts Significant Savings

2.1.3.1 Modeling Reflects California's Climate Zones and Pool Operating Conditions

The Statewide CASE Team used Enerpool Pro 3.0 [5] and CEC climate data to investigate energy savings of the proposal. The analysis used this pool-specific energy model to evaluate pool heating performance on an hourly basis throughout the year across California's 16 climate zones. Stakeholder input informed refinements to key modeling assumptions, including pool characteristics, collector sizing, equipment lifetimes, installation costs, and the addition of swim school scenarios to better represent California's diverse commercial pool stock.

2.1.3.2 Solar Thermal Reduces Utility Bills at Both Standard and Elevated Pool Temperatures

The analysis demonstrates that solar thermal systems can provide significant savings across a variety of pool applications, including those requiring elevated water temperatures. Modeled scenarios included a recreational pool maintained at 80°F and a 90°F pool representative of some applications such as swim instruction, therapy, rehabilitation, and adaptive aquatics. Even at elevated temperatures, solar thermal systems paired with supplemental gas heating reduced energy consumption and utility costs, while remaining cost-effective.

For 60,000-gallon indoor[6] pools maintained at 90°F, average monthly utility bill reductions ranged from 4 percent in Climate Zone 3 to 23 percent in Climate Zone 15. For 60,000-gallon indoor pools maintained at 80°F, average monthly utility bill reductions ranged from approximately 16 percent to 63 percent, depending on climate zone.

Figures 1 and 2 present the estimated monthly utility bill savings across all applicable climate zones for the recreational pool (80°F) and the elevated-temperature pool (90°F). In both scenarios, the solar thermal system is sized at 40 percent of the pool surface area. The yellow portion of each bar represents the monthly utility bill savings from the proposed measure, while the remainder represents utility costs after implementation. Together, the stacked bars represent the total utility costs without the measure.

Differences in energy savings (yellow bars) reflect variations in solar availability across California's climate zones. Warmer climates provide longer periods of favorable operating conditions for solar energy collection than colder climates.

Climate Zone 1 is excluded from the proposal because modeled savings were not significant in colder climates such as Arcata, California.

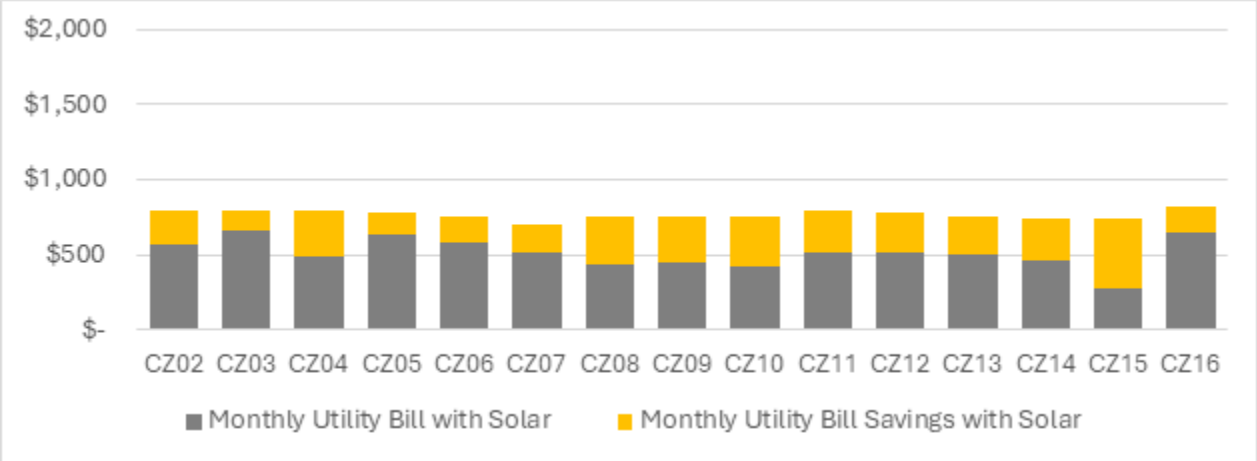


Figure 1. Monthly Utility Bill Savings by Climate Zone (CZ2-CZ16) for a 60,000-gallon Indoor Exercise Pool (80°F) with a Solar Thermal System Sized at 40% of Pool Area

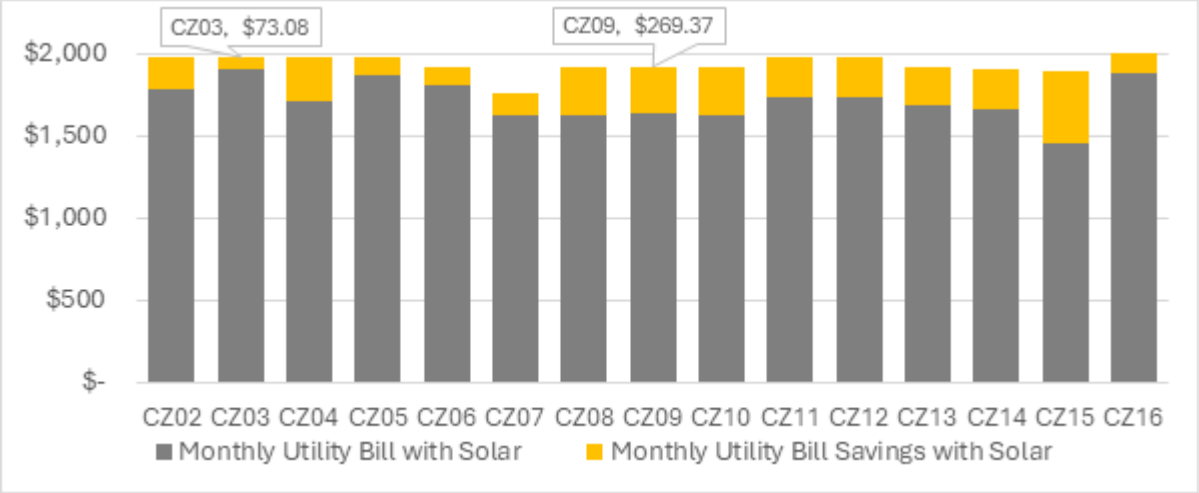


Figure 2. Monthly Utility Bill Savings by Climate Zone (CZ2-CZ16) for a 60,000-gallon Indoor Swim School (90°F) with a Solar Thermal System Sized at 40% of Pool Area

2.1.3.3 Solar Thermal Provides Savings Even with Limited Daily Operating Hours

Even in colder climates and during colder months, where conditions are less favorable for solar heat collection, solar thermal systems can still offset a substantial portion of pool heating demand.

Figure 3 compares a 90°F swim school pool in Pasadena (Climate Zone 9) with the same pool scenario in San Francisco (Climate Zone 3). In Pasadena, warmer conditions allow solar collectors to contribute energy for more hours of the year, offsetting a greater share of pool heating demand.

Figure 3. Daily heating hours available for swim schools in Climate Zone 9 (Pasadena, left graph) as compared to Climate Zone 3 (San Francisco, right graph).

In San Francisco, although solar collector operation does not exceed four hours per day in any month, the modeled swim school still achieves monthly utility bill savings and remains cost-effective. These results demonstrate that solar thermal systems paired with supplemental heating can deliver energy and cost savings while meeting operational requirements.

2.2 The Proposal Delivers Meaningful Statewide Benefits

The proposed measure is projected to achieve:

- **2.46 million therms** of first-year natural gas savings, equivalent to nearly one-tenth (9.5%) of the total statewide natural gas savings projected from the 2025 Energy Code

- **210.32 million kBtu** of first-year source energy savings
- **12,800 metric tons** of avoided CO_2-equivalent emissions annually
- **$196.7 million** in long-term system cost savings over the 30-year period analysis

While no individual measure can achieve California's energy and climate goals on its own, meaningful progress depends on the cumulative impact of cost-effective efficiency measures across the building sector. Commercial pool heating represents a significant energy end use, and improving the efficiency of these systems can provide measurable and persistent benefits over the life of the equipment.

The savings associated with this proposal will accrue over time as compliant equipment is installed and existing systems are replaced. Collectively, these savings contribute to California's long-term efforts to reduce energy consumption and greenhouse gas emissions while improving building performance and maintaining essential community services.

2.3 Solar Thermal Pool Heating Delivers Cost Effective Savings

Solar thermal pool heating systems deliver energy saving that more than offset incremental first costs and maintenances costs over the lifetime of the equipment. The Statewide CASE Team's analysis found that benefits exceeded costs by up to seven times. The analysis incorporated the cost of unglazed solar collectors, retrofit-related costs (including plumbing integration and additional pumping equipment), maintenance, and equipment replacement. The Statewide CASE Team refined the analysis through stakeholder feedback as described in the next section.

Notably, because solar thermal heating did not demonstrate cost effectiveness for all pool prototypes in Climate Zone 1, pool heating alteration requirements in that climate zone are not being considered. See Section 5.5 of the Final CASE Report for detailed analysis.

2.4 Extensive Analysis and Stakeholder Engagement Strengthened the Proposal

Throughout proposal development, the Statewide CASE Team conducted three stakeholder workshops, reached out to over 80 stakeholders, received written feedback, and met with interested parties including five manufacturers, four industry associations, six leaders from safety and community organizations, and other industry experts and refined the proposal based on stakeholder input. The Statewide CASE Team refined the proposal based on this stakeholder input and conducted site visits across multiple climate zones.

Section 1.3 of the Final CASE Report documents the evolution of the proposal, technical analyses performed, stakeholder feedback received, and modifications made throughout the development process.

2.4.1 Cost Assumptions Were Refined Through Stakeholder Input

The Statewide CASE Team incorporated stakeholder comments to refine retrofit cost assumptions, including piping modifications and integration with existing pool equipment. Revised assumptions were presented during subsequent stakeholder meetings for further review and feedback. The final analysis accounts for the cost of the solar collectors themselves, associated retrofits, maintenance, and equipment replacement to better represent real-world installation conditions.

2.4.2 Solar Collector Sizing Requirements Were Refined to Improve Feasibility

Stakeholder feedback prompted revisions to improve the proposal's feasibility for retrofit projects. To address concerns about upfront costs and available roof area, the Statewide CASE Team surveyed 32 pools in Los Angeles County and reduced the minimum solar collector sizing requirement from 65 percent to 40 percent of the pool surface area.

2.4.3 Industry Organizations Validated Modeling Assumptions

The Statewide CASE Team discussed pool energy modeling with the California Solar and Storage Association (CALSSA) and the Solar Rating & Certification Corporation (SRCC). These organizations emphasized the importance of model inputs in aligning results with actual operating conditions, prompting the Statewide CASE Team to confirm inputs with various pool stakeholders.

The Statewide CASE Team met with Natural Resources Canada, the provider of the Enerpool Pro solar pool heating simulation software. A study of a highly instrumented solar-heated pool showed that Enerpool simulations were within 1.7 percent of actual performance when detailed weather data were available. During the 2025 code cycle, the Statewide CASE Team compared Enerpool Pro with TRNSYS and Polysun, two simulation tools commonly used in the solar thermal industry, and found comparable results when reasonable assumptions were applied.

2.4.4 Product Lifetime Assumptions Were Refined Based on Stakeholder Input

Stakeholders raised concerns about the Statewide CASE Team's assumed lifetime for solar thermal pool heating systems. In response, the Statewide CASE Team consulted with solar thermal pool heater manufacturers and reviewed product warranties before reducing the assumed lifetime to 15 years and updating the analysis for the Final CASE Report.

2.5 The Proposal Provides Flexible Compliance Pathways

California's commercial pool stock is diverse and includes facilities with varying site conditions, operational requirements, and physical constraints. Rather than relying on a single technology pathway, the proposal provides multiple compliance options. These include solar thermal systems, heat pump pool heaters, on-site renewable or recovered energy systems, high-efficiency gas pool heaters, solar and heat pump combination systems, and alternative systems approved through CEC review that demonstrate equivalent energy performance. These compliance pathways allow facility owners and operators to select the approach that best aligns with available space, project scope, operational needs, and site-specific constraints.

2.5.1 High Efficiency Gas Pool Heaters

As a direct response to pool industry stakeholders, the Statewide CASE Team added a high-efficiency gas pool heater compliance option. The analysis found that this option is viable when facility space or utility constraints exist and provides a lower-incremental-cost solution while still delivering significant energy and utility bill savings.

2.5.2 Heat Pump Pool Heaters

Heat pump pool heaters were evaluated by the Statewide CASE Team during the 2025 code cycle at the request of the CEC. The resulting analysis, presented in Appendix H of the 2025 Swimming Pool and Spa Heating CASE Report, found these systems to be cost-effective across all California climate zones, with benefit-cost ratios ranging from 2.3 to 11.6 for nonresidential pool applications.

During development of the current proposal, the Statewide CASE Team learned from stakeholders that communities are increasingly adopting solar heating and heat pump pool heaters to meet their climate action goals. Including heat pump pool heaters as a compliance option recognizes the diversity of California's pool stock and provides facilities with an additional pathway for complying with the standards that accommodates site-specific constraints and operational requirements.

2.5.3 Targeted Exceptions Address Specific Site Constraints

The proposal includes an additional exception for permanent spas with inadequate Solar Access Roof Area (SARA). These exceptions help ensure the requirements remain practical and appropriately tailored to real-world conditions.

The existing California Historical Building Code (Section 8-901.5 of Title 24, Part 8) also provides an exception for historic buildings and properties when historical significance or character-defining features would be threatened by compliance with the California Energy Code.

3. Conclusion

The swimming pool and spa heating proposal represents a well-supported update to California's Building Energy Efficiency Standards. It is based on proven technologies, provides multiple compliance pathways, accommodates diverse facility conditions, maintains operational flexibility, and has been demonstrated to be cost-effective through the CASE analysis. Extensive stakeholder engagement also informed refinements that improved the proposal's feasibility, cost assumptions, and compliance flexibility.

The Statewide CASE Team recommends that the CEC adopt the proposed requirements for existing pools while carefully considering the implementation and enforcement concerns associated with the additional hardship, technical infeasibility, and hazardous condition exceptions. If these exceptions are retained, they should include clear qualifying criteria and documentation requirements.

With these considerations addressed, the proposal would provide a practical and balanced means of advancing the state's long-term energy efficiency and climate goals by reducing energy consumption and greenhouse gas emissions.