Codes and Standards Enhancement (CASE) Initiative

2028 California Energy Code

Swimming Pool and Spa Heating

Nonresidential Pool and Spa Heating.

Melissa Schellinger Gutiérrez and Sean Steffensen, Energy Solutions

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Draft CASE Report

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Authors:	Melissa Schellinger Gutierrez, Sean Steffensen (Energy Solutions)
Project Support:	Eleanore Colton, John Steinbergs, David Bradley (Salas O'Brien)
Prime Contractor:	Energy Solutions
Project Management:	California Statewide Utility Codes and Standards Team: Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas & Electric Company

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Acronyms

Table 1 presents a list of acronyms used in this report. Title24stakeholders.com also maintains a glossary of terms.

Table 1: List of Acronyms

Acronym	Definition
ACM	Alternative Calculation Method
ADA	Americans with Disabilities Act
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
ATT	Acceptance Test Technician
BCR	Benefit-to-cost Ratio
Btu	British Thermal Units
CALGreen	California Green Building Standards Code
CALSSA	California Solar and Storage Association
CASE	Codes and Standards Enhancement
CBSC	California Building Standards Commission
CBECC	California Building Energy Code Compliance Software
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CLICC	California Low-Income Consumer Coalition
COP	Coefficient of Performance
CPUC	California Public Utilities Commission
CSI	California Solar Initiative
CZ	Climate Zone
DAC	Disadvantaged Community
ECC	Energy Code Compliance
ESJ	Environmental and Social Justice
GHG	Greenhouse Gas
GWh	Gigawatt-Hour
HPPH	Heat Pump Pool Heater
ICC-SRCC	International Code Council - Solar Rating & Certification Corporation
IECC	International Energy Conservation Code
IOU	Investor-Owned Utility
kWh	Kilowatt-Hour
kWh/year	Kilowatt-Hour Per Year
LSC	Long-term System Cost

MeasureSET	CASE Measure Savings Estimation Template
MG	Million Gallons of Water
PEP	Public Engagement Plan
PHTA	Pool and Hot Tub Alliance
PV	Present Value
SARA	Solar Access Roof Area
W	Watt

1. Introduction

This is a draft addendum. The Statewide Codes and Standards Enhancement (CASE) Team encourages readers to provide comments on the proposed code changes and supporting analyses. The CEC will evaluate proposals that the Statewide CASE Team and other stakeholders submit and may revise or reject proposals. More information about the rulemaking schedule and how to participate in the process can be found on CEC's 2028 code cycle website. Suggested revisions will be considered when refining proposals and analyses. The final addendum will be submitted to the CEC later in 2026.

. For this report, the Statewide CASE Team is requesting input on the following:

1. *California-specific data sources citing costs associated with retrofit solar pool heating installations.*
2. *What retrofit costs and scenarios should the Statewide CASE Team consider? Alteration to buildings for additional equipment? Trenching to connect pool pump pad to solar thermal collector location? Increases for electrical capacity?*
3. *Pool sizes to consider for energy savings and cost-effectiveness analysis.*
4. *Challenges when upgrading an existing gas pool heater to a solar thermal, HPPH, or heat recovery system.*
5. *Examples of solar thermal pool heating retrofit projects in California.*
6. *Description of condensing gas pool heater technology, costs, and examples of its application to pools in California*

Email comments and suggestions to info@title24stakeholders.com *and* mgutierrez@energy-solution.com*.*

Comments will either not be released for public review or will be anonymized if shared.

1.1 Report Context

This proposal describes specific energy efficiency code changes (referred to as "measures") aimed at reducing wasteful, uneconomic, inefficient, or unnecessary consumption of energy in California. These measures are submitted to the California Energy Commission (CEC) for consideration and potential inclusion in California's Energy Code (Title 24, Part 6), which sets statewide energy efficiency requirements for newly constructed buildings and for additions and alterations to existing buildings. Measures may also be considered for inclusion in CALGreen (Title 24, Part 11) as voluntary energy efficiency standards, which would take effect only if adopted by a local jurisdiction seeking to exceed the minimum requirements of the Energy Code. Measures submitted to the CEC will be reviewed, may be modified, and may be incorporated into a broader regulatory package proposed and adopted by the CEC. To

be included in the Energy Code, proposed measures must be both cost-effective and technically feasible.

1.2 Proposal Sponsors

Three California Investor-Owned Utilities (IOUs) — Pacific Gas & Electric Company, San Diego Gas & Electric, and Southern California Edison sponsored this effort as a group. Where the term, “Statewide CASE Team” is used in this report, it refers the authors of the CASE report and the Codes & Standards programs of the supporting California Investor-Owned Utilities.

1.3 Stakeholder Engagement to Inform Proposal

When developing the code change proposal and associated technical information presented in this report, the Statewide CASE Team worked with many industry stakeholders, including the International Code Council - Solar Rating & Certification Corporation (ICC-SRCC), California Solar and Storage Association (CALSSA), Pool and Hot Tub Alliance (PHTA), Rheem/Raypack, HotSun, WaterWorks Swim Schools, U.S. Swim School Association (USSSA), California Coalition for Children’s Safety and Health (CCCSH)(DPF), and Stop Drowning Now. The proposal incorporates feedback received during a public stakeholder workshop that the Statewide CASE Team held on September 30, 2025,.

To support development of the proposed code change, the Statewide CASE Team conducted extensive stakeholder engagement. The Statewide CASE Team conducted email outreach to the Pool and Hot Tub Association (PHTA), California Solar and Storage Association (CALSSA), Aquatherm Industries, Inc., and Hot Sun Industries, Inc. to solicit comment and technical input. This generated significant feedback that informed the Statewide Case Team’s outreach efforts further and the incremental cost assumptions for retrofits. The Statewide CASE team also conducted a meeting with PHTA to better understand the impact of the proposed code change and clarify questions on the trigger and exceptions modified in 110.4(c). During this engagement, the Statewide CASE Team clarified that the proposal sets sizing requirements for a compliant “primary” heater (e.g, solar thermal, heat pump pool heater), to meet a majority of the annual heating load. A gas “supplemental” heater remains permitted to be installed as a backup. The Statewide CASE Team emphasized that the proposal would not ban gas heaters when replacing an existing pool or spa heater in nonresidential pools and spas.

Furthermore, the Statewide CASE Team held two utility-sponsored stakeholder meetings to present the proposal and gather additional feedback on energy modeling and cost-effectiveness assumptions. During these meetings, the Statewide CASE Team received valuable input from many stakeholders, including Martin Aquatic Design and

Engineering, Aquatherm Industries, and Counsilman-Hunsaker, regarding the potential impacts of the proposed code change, market share of alterations, cost assumptions, the share of pools that would qualify for the SARA exception due to lack of roof area, and the selection of pools to model in order to better represent the statewide stock in nonresidential applications. Based on this feedback, the Statewide CASE Team further refined cost assumptions and plans to model additional pools for the final version of the CASE Report addendum. This feedback also prompted the Statewide CASE Team to conduct a survey of 32 indoor and outdoor public pools in LA County to determine the rate at which the SARA exception would be invoked. The research also revealed more information on the market share of heated pools vs. unheated pools and common pool temperatures. The Statewide CASE Team is currently analyzing the results of the survey and determining if changes to the proposed code change are warranted to maximize the benefits to pool owners and the state of California, as well as maximize compliance.

The Statewide CASE Team met with WaterWorks Swim Schools and U.S. Swim School Association (USSSA), as well as pool and children's safety advocate organizations: California Coalition for Children's Safety and Health (CCCSH), Drowning Prevention Foundation (DPF), and Stop Drowning Now to discuss the proposed code change's potential effects on disadvantaged communities as well as technical barriers and proposal costs. The perceived impact of this measure on public schools and ESJ communities has also prompted the Statewide CASE Team to investigate the feasibility of additional energy-efficient technology that would provide similar climate benefits to California, with a lower first incremental cost to pool owners. The Statewide CASE Team is actively soliciting feedback and data from all relevant stakeholders on these and other operational factors to better inform the proposal.

Over the next two months, the Statewide CASE Team plans to incorporate findings of additional research prompted by stakeholder feedback in the Final version of this report. The Statewide CASE Team continues to engage these stakeholders for feedback and invite additional stakeholders to provide data or additional insights to the topics highlighted in Section 1.See Appendix E for additional details on the Statewide CASE Team's stakeholder engagement.

2. Code Change Proposal

2.1 Reintroducing Solar Pool and Spa Heating Proposal for Existing Commercial Buildings (Background Information)

California has one of the largest concentrations of commercial pools in the United States (P.K. Data, Inc. 2023). With so many of these facilities heated year-round, the cumulative energy demand is substantial. This presents a significant opportunity to reduce energy use in the commercial pool market.

Solar thermal pool heating represents a readily available and highly effective strategy for reducing reliance on conventional gas heating. By harnessing an abundant and free source of heat energy (i.e., sunlight)), these systems can significantly reduce fossil fuel consumption, leading to lower energy costs and reduced carbon emissions.

Recognizing this potential, the Statewide CASE Team recommends that the CEC adopt heater sizing requirements for existing pools and spas in nonresidential applications when replacing existing heaters. The Statewide CASE Team made a similar recommendation for the 2025 code cycle; however, the CEC did not adopt the proposal at that time. Therefore, the Statewide CASE Team is submitting this recommendation again for the 2028 code cycle.

For more information on the proposed technology, see Section 3.2 of the 2025 Swimming Pool and Spa Heating Final CASE Report. The Swimming Pool and Spa Heating Final CASE Report from the 2025 code cycle (hereby referred simply as “CASE Report”) is available here.

The full report is also provided as an attachment to this addendum.

This addendum contains pertinent information to recommend the proposal for consideration for the 2028 code cycle. The Statewide CASE Team completed a comprehensive analysis during the 2025 code cycle and provided CEC with the necessary information to consider a code change, including market feasibility, energy, and cost-effectiveness calculations. Much of the information in the Final CASE Report from the 2025 cycle remains relevant without updates. This addendum provides updated pool forecasts, incremental cost assumptions, and statewide impacts.

2.2 Measure Description

Title 24 Part 6 sets requirements for pool heating systems. The current requirements are triggered when a new pool or spa is built with a heating system or when an existing pool or spa adds a heating system for the first time. These requirements cover both

indoor and outdoor pools and spas, whether they are intended for seasonal or year-round heating.

The code requires the use of one of the following compliance options:

- Solar thermal systems for pool and spa heating, excluding portable electric spas as defined in Section 100.1;
- Heat pump pool heaters (HPPH) meeting specified coefficient of performance (COP), sizing, and controls criteria;
- On-site renewable energy or site-recovered energy systems;
- A combination of a solar thermal pool heating system and an electric heat pump pool heater without any additional supplementary heater; or
- A pool heating system determined by the CEC Executive Director to use no more energy than the systems mentioned above.

The primary goal of these requirements is to encourage the adoption of energy-efficient technologies that reduce greenhouse gas emissions and overall energy consumption. Gas heaters remain a permissible supplemental heating source for any of the primary compliance pathways. They may also serve as a primary heat source if the installation qualifies as an exception.

The proposed code change would expand the scope of the swimming pool and spa heating requirements to include existing pools and spas in nonresidential building occupancy buildings that are replacing an existing heating system. This expansion is achieved by making the provisions of Section 110.4(c) mandatory through the application of Section 141.0. Nonresidential pools and spas include those located at municipal facilities, medical centers, water parks, and properties affiliated with schools, sports clubs, and membership-based organizations — most of which are heated year-round. These pools are subject to the proposed requirements when replacing heating systems.

Pools and spas in Group R occupancy buildings, including single family residential pools, multifamily pools, and pools at hotels or motels with an existing pool heater, would remain exempt from these proposed changes. These exempted pools may replace their heating system with a new unit of the same technology type (e.g. gas-for-gas) without triggering these new proposed requirements, provided the new unit meets all applicable federal and state appliance standards.

The proposal would provide an exception to Section 141.0(b) for existing nonresidential pools with inadequate solar access roof area (SARA). SARA is the roof area that is both structurally capable of supporting a solar system and has sufficient annual sunlight. Sufficient sunlight is defined as having 70 percent or more annual solar access after accounting for shading and/or any obstructions. For information on determining whether

a roof has sufficient solar access, the CEC provides several certified tools for calculating solar access (California Energy Commission 2025).

Under Exception 1 of 141.0(b)1F, if a nonresidential pool lacks adequate SARA, the proposed heating system requirements would not apply. Therefore, the pool would not be required to meet the heating source sizing requirements for solar thermal, heat pumps, or other compliance options described in Section 110.4(c). Instead, pools in nonresidential applications may choose among all pool heating system options as long as systems are compliant with Title 20. Existing residential occupancy pools would still be required to comply with the requirements set forth in Section 110.4(c).

The proposal would leave the remaining exceptions unchanged.

The application of how and when the regulations apply with the proposed expanded scope is depicted in Table 2 and Figure 1.

Table 2: Pool/Spa Project Scope – Does Your Pool or Spa Trigger the Energy Code? – Nonresidential Occupancies

Nonresidential Occupancies				
Project Scope	**Project Type**	**Triggers 2025 Code?**	**Triggers 2028 Code?**	**Applicable 2028 Exception**
Installing a heating system for a new pool	New Construction	YES	YES	N/A
Installing a heating system for an existing unheated pool	New Construction	YES	YES	N/A
Replacing a heating system/equipment for a pool with sufficient SARA	Alterations	NO	YES	N/A
Replacing a heating system/equipment for a pool without sufficient SARA	Alterations	NO	NO	Exception 1 to 141.0(b)1F

Table 3: Pool/Spa Project Scope – Does Your Pool or Spa Trigger the Energy Code? – Residential Occupancies

Residential Occupancies				
Project Scope	**Project Type**	**Triggers 2025 Code?**	**Triggers 2028 Code?**	**Applicable 2028 Exception**
Installing a heating system for a new pool	New Construction	YES	YES	N/A
Installing a heating system for an existing unheated pool	New Construction	YES	YES	N/A
Replacing a heating system/equipment for a pool	Alterations	NO	NO	Exception 2 to 110.4(c)

Figure 1: Flow diagram of the proposed code change.

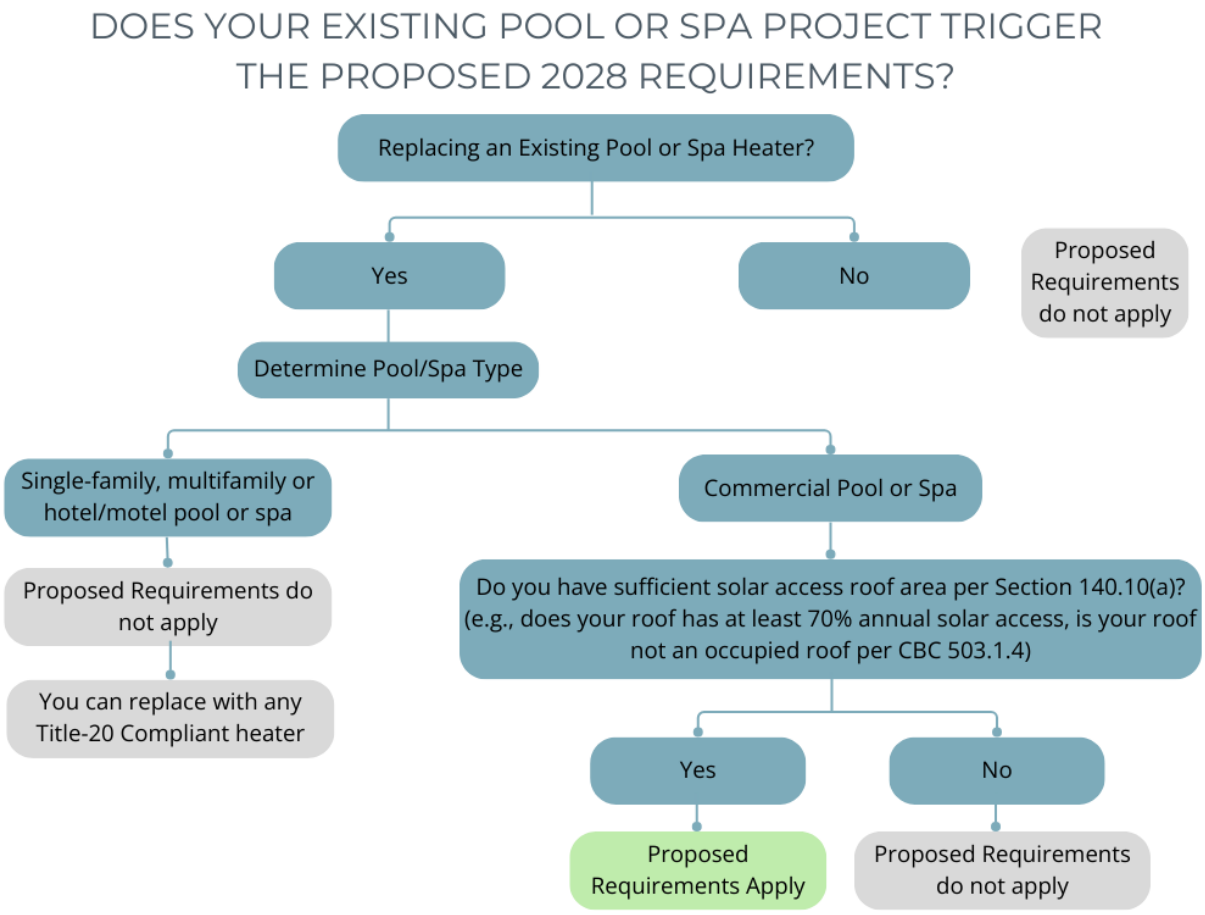

Table 4: Scope of Proposed Code Change

A ☑ indicates the proposed code change is relevant.

Building Type(s)	Construction Type(s)	Type of Change
☐ Single Family	☐ New Constrction	☑ Mandatory
☐ Multifamily	☐ Additions	☐ Prescriptive
☑ Nonresidential (Not Group R uses)	☑ Alterations	☐ Performance

Application Climate Zones	Energy Code Sections	Compliance Forms	Sections of ACM Reference Manuals
Climate Zones 1-16	Title 24, Part 6, Section 110.4(c), 141.0	NRCC-PLB-E	N/A

Third Party Verification)	Updates to Compliance Software
☑ No changes to third party verification	☐ No updates
☐ Update existing verification requirements	☑ Update existing feature
☐ Add new verification requirements	☐ Add new feature

3. Energy Savings and Cost Effectiveness

3.1 Cost Effectiveness Methodology

The Statewide CASE Team collaborated with CEC staff to confirm that the cost-effective methodology aligns with CEC 2028 guidelines, including cost inclusion parameters. The 2028 CASE Methodology Report and Appendix A provide calculation details.

Under California law (Public Resources Code 25000), a measure is considered cost effective if its Benefit-to-Cost Ratio (BCR) is 1.0 or greater when amortized over the economic life of the structure. The Statewide CASE Team calculates BCR by dividing total dollar benefits by total dollar costs over a 30-year analysis period.

Benefits are based on long-term system cost (LSC), which assigns an hourly dollar value to energy use. LSC hourly factors weigh the long-term value of each hour differently, where times of peak demand are valued more than off-peak hours. These factors are not utility rates, forecasts, or bill estimates. The CEC develops and publishes LSC hourly conversion factors for each code cycle.

Costs include first costs and ongoing maintenance costs, assessed over a 30-year period. Refer to Section 6.4 of the 2025 CASE Report for more information on maintenance cost assumptions. Benefits and costs are evaluated incrementally, relative to the most recently adopted Energy Code. Design costs and incremental code compliance verification costs are excluded from the analysis.

The overall energy saving analysis methodology and key assumptions are presented in Appendix A of this addendum report. The Statewide CASE Team maintained the energy savings estimates from the CASE Report for uncovered nonresidential gas pools of average size (20,000 gallons) and Olympic size (660,000 gallons). For details on the prototypical pools analyzed, refer to Table 16. The Statewide CASE Team is seeking stakeholder feedback on which pool sizes should be modeled for energy savings and cost effectiveness, and will update the energy savings results in the Final CASE Report accordingly.

3.2 Energy and Energy Cost Savings Results

Natural gas and energy savings per prototypical nonresidential pools are presented in Table 5 through

Table 10 for alterations. These values are identical to those reported in Section 5.2 of the 2025 CASE Report and have been reproduced here for the reader's convenience and to ensure clarity when aligning them with the renamed building prototypes in this addendum report. The per-unit energy savings figures do not account for naturally

occurring market adoption or compliance rates. Based on the analysis of using a gas-fired pool heater baseline, there are no first-year electricity savings or first-year peak demand reductions.

Table 5: First Year Natural Gas Savings (kBtu) Per Solar Thermal Prototypical Pool – Alterations (Climate Zones 1 - 8)

Prototype	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8
Average-Sized Nonresidential Outdoor Pool	20,000	72,000	37,000	93,000	46,000	50,000	54,000	88,000
Average-Sized Nonresidential Indoor Pool	17,000	69,000	34,000	84,000	42,000	48,000	52,000	88,000
Olympic-Sized Nonresidential Outdoor Pool	1,400,000	3,000,000	2,300,000	3,900,000	2,500,000	2,300,000	2,300,000	3,200,000
Olympic-Sized Nonresidential Indoor Pool	490,000	2,000,000	960,000	2,400,000	1,200,000	1,400,000	1,500,000	2,500,000

Table 6: First Year Natural Gas Savings (kBtu) Per Solar Thermal Prototypical Pool – Alterations (Climate Zones 9 - 16)

Prototype	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Average-Sized Nonresidential Outdoor Pool	88,000	93,000	87,000	79,000	93,000	110,000	120,000	78,000
Average-Sized Nonresidential Indoor Pool	84,000	88,000	78,000	75,000	87,000	78,000	110,000	52,000
Olympic-Sized Nonresidential Outdoor Pool	3,500,000	3,600,000	3,500,000	3,200,000	3,500,000	4,500,000	4,400,000	3,700,000
Olympic-Sized Nonresidential Indoor Pool	2,400,000	2,500,000	2,300,000	2,200,000	2,500,000	2,300,000	3,200,000	1,500,000

Table 7: First Year Source Energy Savings (kBtu) Per Solar Thermal Prototypical Pool – Alterations (Climate Zones 1 - 8)

Prototype	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8
Average-Sized Nonresidential Outdoor Pool	18,000	65,000	34,000	84,000	42,000	45,000	48,000	79,000
Average-Sized Nonresidential Indoor Pool	16,000	62,000	31,000	76,000	38,000	43,000	47,000	79,000
Olympic-Sized Nonresidential Outdoor Pool	1,300,000	2,800,000	2,100,000	3,600,000	2,200,000	2,000,000	2,000,000	2,800,000
Olympic-Sized Nonresidential Indoor Pool	450,000	1,800,000	870,000	2,200,000	1,100,000	1,200,000	1,300,000	2,300,000

Table 8: First Year Source Energy Savings (kBtu) Per Solar Thermal Prototypical Pool – Alterations (Climate Zones 9 - 16)

Prototype	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Average-Sized Nonresidential Outdoor Pool	79,000	83,000	79,000	71,000	84,000	95,000	100,000	71,000
Average-Sized Nonresidential Indoor Pool	76,000	79,000	70,000	68,000	79,000	70,000	96,000	47,000
Olympic-Sized Nonresidential Outdoor Pool	3,100,000	3,200,000	3,100,000	2,900,000	3,200,000	4,000,000	4,000,000	3,300,000
Olympic-Sized Nonresidential Indoor Pool	2,200,000	2,300,000	2,000,000	2,000,000	2,300,000	2,100,000	2,900,000	1,300,000

Table 9: Total 30-Year LSC Savings (2026 PV$) Per Solar Thermal Prototypical Pool – Alterations (Climate Zones 1 - 8)

Prototype	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8
Average-Sized Nonresidential Outdoor Pool	11,000	37,000	20,000	48,000	25,000	27,000	29,000	47,000
Average-Sized Nonresidential Indoor Pool	8,900	35,000	17,000	43,000	22,000	25,000	28,000	46,000
Olympic-Sized Nonresidential Outdoor Pool	780,000	1,600,000	1,300,000	2,100,000	1,400,000	1,300,000	1,300,000	1,700,000
Olympic-Sized Nonresidential Indoor Pool	250,000	1,000,000	500,000	1,200,000	640,000	730,000	790,000	1,300,000

Table 10: Total 30-Year LSC Savings (2026 PV$) Per Solar Thermal Prototypical Pool – Alterations (Climate Zones 9 - 16)

Prototype	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Average-Sized Nonresidential Outdoor Pool	47,000	49,000	44,000	40,000	47,000	55,000	60,000	42,000
Average-Sized Nonresidential Indoor Pool	44,000	45,000	38,000	37,000	44,000	39,000	55,000	26,000
Olympic-Sized Nonresidential Outdoor Pool	1,900,000	1,900,000	1,800,000	1,700,000	1,800,000	2,400,000	2,400,000	2,000,000
Olympic-Sized Nonresidential Indoor Pool	1,300,000	1,300,000	1,100,000	1,100,000	1,300,000	1,200,000	1,600,000	750,000

3.3 Incremental First Cost

Incremental first cost refers to the added expense of integrating a solar thermal system into an existing pool. This analysis outlines the scope of alterations and associated costs for retrofitting two common pool sizes. The Statewide CASE Team gathered cost data from industry sources and the California Solar Initiative (CSI) Commercial Pool Solar Thermal Rebate Program, which includes information on over a thousand commercial pool projects (California Public Utilities Commission 2020).

Retrofitting an existing pool with a solar thermal system requires modifications to the pool's mechanical system and, often, the adjacent building structure (Solar Panels Plus 2012). The primary alterations include:

1. Collector installation: Mounting solar panels either on the roof, an adjacent structure, or on the ground.
2. Plumbing integration: Running new supply and return piping from the existing pool equipment pad to the collectors. This may involve:
    a. Trenching: Excavation to bury pipes between the pool pad and the collectors
    b. Roof penetration: Creating and securing all necessary roof penetrations, which must properly be flashed and sealed in accordance with standard roofing practices to ensure weather integrity.
    c. Insulation: Installing high-temperature, weather-resistant piping insulation on all exposed sections of the solar loop to minimize heat loss.
3. Mechanical additions: Potentially adding a dedicated pump to lift water from the ground-level equipment pad to the elevated collectors.

The Statewide CASE Team assumed that for an average-sized pool with a capacity of 20,000 gallons, the incremental cost was approximately $8,300. For a nonresidential Olympic-size pool (660,000 gallons), the assumed incremental cost was approximately $180,000. For comparison, the incremental costs assumed in the 2025 CASE Report were $5,250 for a 20,000-gallon pool and $139,214 for the Olympic-sized pool.

These current, higher-cost assumptions more comprehensively incorporate installed costs of the solar collectors, plumbing costs, additional piping costs. The solar thermal collector costs were derived from the CSI Thermal Rebate Program and equated to $20 per square foot of panels. The costs for plumbing and pumps are based on industry estimates for trenching and mechanical components, which cover the materials and labor required to integrate the new solar loop with the existing pool mechanical system.

The Statewide CASE Team requests comments to further identify the first incremental costs associated with retrofitting a pool with a solar thermal system.

3.4 Incremental Maintenance and Replacement Costs

The Statewide CASE Team used the same approach outlined in the 2025 CASE Report to calculate Incremental Maintenance and Replacement Costs, assuming an expected useful life of 25 years for the solar thermal system. Incremental maintenance costs were assumed to be one percent of the first cost of the system (Moezzi 2020). The Statewide CASE Team assumed only the replacement costs of the solar thermal collectors and pool pumps. Retrofit costs for associated plumbing were not included, as the expected lifespan for Schedule 40 PVC pipe (the standard material for commercial pool systems) exceed the 30-year CASE period analysis (In The Swim n.d.). For more information, refer to Section 6.4 of the 2025 CASE Report.

3.5 Cost Effectiveness

This measure proposes a mandatory requirement. As such, California Statutes require a cost analysis to identify the costs and benefits of the measure and demonstrate that the measure is cost effective over the 30-year period of analysis.

The CEC establishes the procedures for calculating cost effectiveness. The Statewide CASE Team collaborated with CEC staff to confirm that the methodology presented in this report is consistent with CEC guidelines, specifying which costs are included in the analysis. Assumptions were shared with stakeholders for review and feedback, and Appendix E provides a summary of stakeholder engagement.

The results of the per-unit cost-effectiveness analyses are presented in Table 11 for alterations.

Based on the costs gathered, the proposed measure would provide monetary savings over the 30-year period of analysis relative to the existing conditions. The proposed code change is cost effective in every climate zone for alterations.

Values in Table 11 are shown in 2026 present value dollars (2026 PV$). Benefits include 30-year LSC savings, incremental first-cost savings, incremental maintenance savings, and residual value at the end of the 30-year period of analysis. Costs include the total incremental present-value (PV) cost, incremental equipment costs, incremental replacement costs, and incremental maintenance costs over the analysis period. Future costs and savings are discounted at a real (inflation-adjusted) rate of three percent to represent their present value.

Table 11: 30-Year Cost-Effectiveness Summary Per Solar Thermal Prototypical Pool – Alterations – Average-Sized Nonresidential Indoor and Outdoor Pool

Climate Zone	Outdoor Benefits LSC Savings + Other PV Savings (2026 PV$)	Outdoor Costs Total Incremental PV Costs (2026 PV$)	Outdoor Benefit-to-Cost Ratio	Indoor Benefits LSC Savings + Other PV Savings (2026 PV$)	Indoor Costs Total Incremental PV Costs (2026 PV$)	Indoor Benefit-to-Cost Ratio
1	10,635	12,789	1.0	8,919	12,789	0.9
2	37,004	12,789	3.1	34,947	12,789	2.9
3	19,660	12,789	1.7	17,438	12,789	1.6
4	47,991	12,789	3.9	42,840	12,789	3.5
5	24,638	12,789	2.1	22,275	12,789	1.9
6	26,731	12,789	2.3	25,436	12,789	2.2
7	28,917	12,789	2.5	27,512	12,789	2.3
8	46,556	12,789	3.8	45,643	12,789	3.8
9	46,627	12,789	3.8	43,961	12,789	3.6
10	48,539	12,789	4.0	45,048	12,789	3.7
11	43,552	12,789	3.6	38,203	12,789	3.2
12	39,617	12,789	3.3	37,388	12,789	3.1
13	46,522	12,789	3.9	43,619	12,789	3.6
14	55,358	12,789	4.5	39,402	12,789	3.3
15	60,383	12,789	4.9	55,158	12,789	4.5
16	42,167	12,789	3.5	26,399	12,789	2.3

Table 12: 30-Year Cost-Effectiveness Summary Per Solar Thermal Prototypical Pool – Alterations – Olympic-Sized Nonresidential Indoor and Outdoor Pool

Climate Zone	Outdoor Benefits LSC Savings + Other PV Savings (2026 PV$)	Outdoor Costs Total Incremental PV Costs (2026 PV$)	Outdoor Benefit-to-Cost Ratio	Indoor Benefits LSC Savings + Other PV Savings (2026 PV$)	Indoor Costs Total Incremental PV Costs (2026 PV$)	Indoor Benefit-to-Cost Ratio
1	836,828	298,487	2.8	313,616	298,487	1.1
2	1,702,114	298,487	5.7	1,059,734	298,487	3.6
3	1,325,786	298,487	4.4	556,022	298,487	1.9
4	2,159,982	298,487	7.2	1,295,309	298,487	4.3
5	1,439,873	298,487	4.8	695,549	298,487	2.3
6	1,344,032	298,487	4.5	786,043	298,487	2.6
7	1,349,710	298,487	4.5	845,042	298,487	2.8
8	1,786,690	298,487	6.0	1,372,236	298,487	4.6
9	1,976,360	298,487	6.6	1,323,916	298,487	4.4
10	1,996,237	298,487	6.7	1,359,871	298,487	4.6
11	1,870,157	298,487	6.3	1,170,376	298,487	3.9
12	1,738,678	298,487	5.8	1,138,787	298,487	3.8
13	1,885,208	298,487	6.3	1,334,249	298,487	4.5
14	2,443,461	298,487	8.2	1,215,239	298,487	4.1
15	2,462,470	298,487	8.3	1,696,919	298,487	5.7
16	2,011,896	298,487	6.7	812,313	298,487	2.7

Statewide Impacts

3.6 Statewide Energy and Energy Cost Savings

The Statewide CASE Team estimated the first-year statewide savings from alterations by multiplying the per-pool savings (presented in Section 3.2) by assumptions regarding the percentage of existing pools that would be impacted by the proposed code. Table 17 presents the statewide pool forecast for 2029, along with the Statewide CASE Team's assumptions about the percentage of pools impacted by the proposal, broken down by climate zone.

See the 2028 CASE Methodology Report for details on how statewide savings are calculated. Appendix C presents the assumptions on the percentage of the total construction forecast that the proposed measure would impact.

For more details on the methodology and context for estimating the current market share rate, as well as statewide energy and energy cost savings, refer to the 2028 CASE Methodology Report.

Table 13 below presents the first-year statewide energy and LSC savings for all prototypical pools, categorized by climate zone.

While a statewide analysis is crucial for understanding the broader effects of code change proposals, there is a potential to affect disproportionately impacted populations (DIPs). The Statewide CASE Team is committed to engaging with representatives from as many affected communities as possible. Refer to Section 2 of the 2025 CASE Report for more details addressing energy equity and environmental justice.

Table 13: Statewide Energy and LSC Impacts – All Prototypical Pool Alterations

Climate Zone	Statewide Alterations Impacted by Proposed Change in 2026 (Pools)	First-Year Electricity Savings (GWh)	First-Year Peak Electrical Demand Reduction	First-Year Natural Gas Savings (Million Therms)	First-Year Source Energy Savings (Million kBtu)	30-Year Present Valued LSC Savings (Million 2029 PV$)
1	4	N/A	N/A	0.01	0.57	$0.34
2	22	N/A	N/A	0.10	8.83	$5.15
3	90	N/A	N/A	0.26	23.53	$14.10
4	46	N/A	N/A	0.26	23.33	$13.56
5	9	N/A	N/A	0.03	2.79	$1.69
6	101	N/A	N/A	0.32	29.10	$17.89
7	66	N/A	N/A	0.22	19.57	$12.03
8	146	N/A	N/A	0.73	65.23	$38.88
9	245	N/A	N/A	1.27	114.65	$68.72
10	199	N/A	N/A	1.07	95.91	$56.71
11	22	N/A	N/A	0.11	9.90	$5.57
12	104	N/A	N/A	0.49	44.24	$25.24
13	48	N/A	N/A	0.25	22.81	$12.94
14	42	N/A	N/A	0.26	22.98	$13.39
15	21	N/A	N/A	0.14	12.69	$7.52
16	12	N/A	N/A	0.05	4.90	$2.86
Total	**1,177**	**N/A**	**N/A**	**5.56**	**501.03**	**$296.61**

3.7 Statewide Greenhouse Gas Emissions Reductions

Table 14 presents the estimated reduction in greenhouse gas (GHG) emissions in the first year resulting from the proposed code change. In this initial year, the Statewide CASE Team expects to avoid 30,378 metric tons of carbon dioxide equivalent (CO_2e) emissions. The emission reductions would be realized from the reduction of gas use as pool owners establish solar thermal, or other energy-efficient solutions, as their primary heating source, since solar technology has no GHG emissions associated with it. These savings would be expected even with gas heaters being maintained as supplemental heating sources to meet the individual pool's needs. The GHG emissions reduction represents a significant fraction of code savings and would provide direct and indirect benefits to the California communities. These reductions, along with their associated monetary value, were calculated using hourly GHG emissions factors published alongside the LSC hourly factors and source energy hourly factors in the research versions of the California Building Energy Code Compliance (CBECC) software, as well as data from the CEC's 2028 Metrics Report. See the 2028 CASE Methodology Report for additional information.

Table 14: First-Year Statewide GHG Emissions Impacts

Construction Type	Reduced GHG Emissions from Electricity Savings (Metric Tons CO2e)	Reduced GHG Emissions from Natural Gas Savings (Metric Ton CO2e)	Total Reduced GHG Emissions (Metric Ton CO2e)	Total Monetary Value of Reduced GHG Emissions (Million 2029 PV$)
Total (Alterations)	**N/A**	**30,378**	**30,378**	**3.74**

3.8 Statewide Water Use Impacts

The proposed code change would not result in water use impacts.

3.9 Statewide Material Impacts

The proposed code change requiring solar thermal pool and spa heating systems, HPPH, or waste heat recovery would increase the use and production of copper and plastic in commercial applications.

For more information on the Statewide CASE Team's methodology and assumptions used to calculate embodied GHG emissions, see the 2028 CASE Methodology Report.

Table 15: First-Year Statewide Impacts on Material Use

Material	Impact	Per-Unit Impacts (Pounds per Square Foot)	First-Year Statewide Impacts (Pounds)	Embodied GHG emissions saved (Metric Tons CO2e)
Mercury	No Change	0	0	
Lead	No Change	0	0	
Copper	Increase	10	13,077	-17
Steel	No Change	0	0	
Plastic	Increase	643	840,217	-706
TOTAL	**Increase**	**653**	**853,294**	**-722**

3.10 Environmental Impacts

This information is summarized in Appendix D of the 2025 CASE Report.

3.11 Other Non-Energy Impacts

See Section 7.5 of the 2025 CASE Report for information on non-energy impacts of the proposal.

4. Proposed Language Code

4.1 Guide to Markup Language

The proposed changes to the standards, Reference Appendices, and the Alternative Calculation Method (ACM) Reference Manuals are provided below. Changes to the 2025 documents should be marked with dark blue underlining (new language) and ~~strikethroughs~~ (deletions).

4.2 Administrative Code (Title 24, Part 1)

No changes would be made to Title 24, Part 1.

4.3 Energy Code (Title 24, Part 6)

SECTION 100.1– DEFINITIONS AND RULES OF CONSTRUCTION

Nonresidential Building Occupancy Group Only - As defined by the California Building Code

Group R Occupancy, and Common or Public Use Areas serving that Occupancy – Group R as defined by the California Building Code and spaces ancillary to the occupancy that are not part of the individual dwelling or sleeping units and are intended for shared common or public use including areas that support occupant use or building operations

SECTION 110.4 – MANDATORY REQUIREMENTS FOR POOL AND SPA SYSTEMS AND EQUIPMENT

…

(c) **Heating Source Sizing.** Heating systems or equipment for pool and/or spa shall meet one of the sizing requirements of 1 through 5 below:

1. A solar pool heating system with a solar collector surface area that is equivalent to the following:
   A. For nonresidential and multifamily buildings, 65 percent or greater of the pool and/or spa surface area.
   B. For single family buildings, 60 percent or greater of the pool and/or spa surface area.
2. An electric heat pump pool heater as the primary heating system that meets the sizing requirements of Reference Joint Appendix JA16.3. The supplementary heater can be of any energy source; or

3. A heating system that derives at least 60 percent of the annual heating energy from onsite renewable energy or on-site recovered energy.
4. A combination of a solar pool heating system and heat pump pool heater without any additional supplementary heater; or
5. A pool heating system determined by the Executive Director to use no more energy than the systems specified in Items 1, 2, 3, or 4 above.

Exception 1 to Section 110.4(c): Portable electric spas compliant with 20 CCR § 1605.3(g)(7) of the Appliance Efficiency Regulations.

Exception 2 to Section 110.4(c): Alterations to existing pools and/or spas in group R occupancy buildings and common or public use areas serving that occupancy, with existing heating systems or equipment.

Exception 3 to Section 110.4(c): A pool and/or spa that is heated solely by a solar pool heating system without any backup heater.

Exception 4 to Section 110.4(c): Heating systems which are used exclusively for permanent spa applications in existing buildings with natural gas availability.

Exception 5 to Section 110.4(c): Heating systems which are used exclusively for permanent spa applications where there is inadequate Solar Access Roof Area (SARA) as specified in Section 150.1(c)14 for a solar pool heating system to be installed.

SECTION 141.0 – ADDITIONS, ALTERATIONS, AND REPAIRS TO EXISTING NONRESIDENTIAL, AND HOTEL/MOTEL BUILDINGS, TO EXISTING OUTDOOR LIGHTING, AND TO INTERNALLY AND EXTERNALLY ILLUMINATED SIGNS

(b) Alterations. Alterations to components of existing nonresidential, hotel/motel, or relocatable public school buildings, including alterations made in conjunction with a change in building occupancy to a nonresidential, high-rise residential, or hotel/motel occupancy shall meet item 1, and either Item 2 or 3 below:

1. **Mandatory Requirements.** Altered components in a nonresidential, or hotel/motel building shall meet the minimum requirements in this Section.

    F. **Pool and Spa Systems and Equipment**. Alterations to existing pools and/or spas in Nonresidential Building Occupancy Group Only with existing heating systems shall meet the heating source requirements of Section 110.4

    Exception 1 to Section 141.0(b)1F: Heating systems which are used for pool and spa applications where there is inadequate SARA as specified in

Section 140.10(a) for a solar pool heating system to be installed do not need to comply with section 110.4(c).

4.4 Reference Appendices

There are no proposed changes to the Reference Appendices.

4.5 Compliance Manuals

The Statewide CASE Team will provide the CEC with recommended revisions to compliance manuals after the 45-Day Language is published.

4.6 ACM Reference Manual

There are no proposed changes to the ACM Reference Manual.

4.7 Compliance Forms

The NRCC-PLB-E compliance form would be updated to reflect the proposed change. The Statewide CASE Team can support the CEC in implementing these updates if the proposed change is adopted.

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Appendix A: Assumptions for Cost-effectiveness Analysis

Key Assumptions for Energy Savings Analysis

The Statewide CASE Team analyzed four nonresidential pool applications to determine the energy savings associated with a solar pool heating code change. These represented two pool sizes in both outdoor and indoor configurations:

- A standard nonresidential 20,000-gallon pool (440 square feet surface area) with a gas-fired pool heater capacity of 110 thousand British thermal units per hour (kBtu/h). The solar collector size is assumed to be 286 square feet, meeting the minimum proposed requirement of 65 percent for nonresidential pools.
- An Olympic-sized 660,000-gallon pool (13,450 square feet surface area) with a 2,200 MBtu/h gas-fired heater. The solar collector size was assumed to be 8,746 square feet.

For outdoor pool applications, the sensitivity of using a pool cover was analyzed as part of the 2025 CASE effort. However, as the difference in savings was not significant, pool covers were not evaluated for this analysis. The Statewide CASE Team assumed no pool cover for indoor pools since the controlled indoor environment prevents most evaporation from the pool. All scenarios assume continuous pool heating and the use of unglazed solar collectors, as these are the most common type used in pool heating applications. All scenarios assume an expected useful life (EUL) to be 25 years as specified in PNNL report.

The Statewide CASE Team could not use the 2028 Research Version of the California Building Energy Code Compliance (CBECC) software, as was done for the other Title 24 measures, since CBECC does not model the energy use of pools. Instead, the Statewide CASE Team leveraged the same modeling software used during the 2025 code cycle, Enerpool Pro 3.0 Pool Heater Simulation Software (developed by Natural Resources, Canada). This software was chosen due to its validated ability to model pool temperature fluctuations and its adaptability to California's climate-specific conditions.

The Enerpool Pro 3.0 software simulates the amount of heat that is lost through conduction, convection, radiation, and evaporation of pool water. This software accepts a range of inputs and assumptions, including weather data, pool size, heater and collector size, use of a cover, and activity and usage levels of the pool. For detailed inputs, refer to Section 5.1.1 of the 2025 CASE Report.

For this draft addendum, the Statewide CASE Team utilized the energy savings outputs from the 2025 analysis. The analysis would be redone for the Final Addendum using

updated pool sizes (based on stakeholder input) and the 2028 Title 24 climate files provided by the CEC.

The Statewide CASE Team will not conduct a Heat Pump Pool Heater (HPPH) analysis, as it was already completed during the 2025 code cycle.

Energy Savings Methodology per Prototypical Pool

The 2028 CASE Methodology Report outlines the approach for estimating energy savings per prototypical pool. The CEC instructed the Statewide CASE Team to model energy impacts using specific prototypical pool models representative of various building types. Table 16 presents the prototype pools included in the analysis.

Table 16: Prototypical Pools Used for Energy, Cost, and Environmental Impacts Analysis

Prototype Name	Surface Area (Square Feet)	Pool Volume (Gallons)	Description
Average Commercial Outdoor Pool	440	20,000	Outdoor pool typical of commercial application with no pool cover
Average Commercial Indoor Pool	440	20,000	Indoor pool typical of commercial application with no pool cover
Olympic Outdoor Pool	13,455	660,000	Outdoor Olympic-sized pool with no pool cover
Olympic Indoor Pool	13,455	660,000	Indoor Olympic-sized pool with no pool cover

The Statewide CASE Team analyzed each gas prototype listed in Table 16 for a standard and baseline design for existing pools.

There is an existing Title 24, Part 6 requirement that covers the building system in question and applies to both new construction, additions, and alterations. Therefore, Standard Design is minimally compliant with the 2025 Title 24 requirements.

The Standard Design represents the geometry and usage patterns of the prototypical pool, incorporating features that achieve a long-term system-wide energy budget and source energy budget minimally compliant with the 2025 Title 24, Part 6 code requirements. The Proposed Design represents the same geometry as the Standard Design, but it assumes the sources of energy required by the proposed code change. To develop savings estimates for the proposed code changes, the Statewide CASE Team created a Standard Design and a Proposed Design for each prototypical pool, with the Standard Design representing compliance with the 2025 code and the

Proposed Design representing compliance with the proposed requirements. Comparing the energy impacts of the Standard Design to the Proposed Design reveals the impacts of the proposed code change relative to a pool that is minimally compliant with the 2025 Title 24, Part 6 requirements, which follows industry typical practices.

Statewide CASE Team simulated the energy impacts in every climate zone and applied the per-unit energy impacts, which are presented in savings per prototype pool. The analysis approach differs from the other code change proposals because there is no strong correlation between the building size and the size or energy use of the pool.

Appendix B: Purpose and Necessity of Proposed Code Changes

Introduction

The sections below provide the purpose and necessity of proposed changes to Title 24, Part 1; Title 24, Part 6; and the reference appendices. This section intends to provide the CEC with the information needed for the Initial Statement of Reasons.

See Section 4 of this report for the marked-up code language.

Purpose and Necessity of Changes to Title 24, Part 1

There are no proposed changes to Title 24, Part 1.

Purpose and Necessity of Changes to Title 24, Part 6

Section: Exception 2 to Section 110.4(c)

Purpose: The purpose of this change is to expand mandatory heating source sizing requirements to existing nonresidential pools when replacing a pool or spa heater.

Necessity: The necessity for this change is to reduce energy use in the existing nonresidential pool and spa market.

Section: Section 141.0(b)F

Purpose: The purpose of this change is to expand mandatory heating source sizing requirements to existing nonresidential pools when replacing a pool or spa heater.

Necessity: The necessity for this change is to reduce energy use in the existing nonresidential pool and spa market.

Section: Exception 1 to Section 141.0(b)1F

Purpose: The specific purpose of this change is to specify that inadequate Solar Access Roof Area (SARA) is a qualification for the exception.

Necessity: This change is necessary to remove ambiguity and clearly state the intent of the exception regarding limited available roof space. Specifically, clarifying “roof access” to “solar roof access area (SARA) as is used elsewhere in the Energy Code This proposed change is reasonably necessary to ensure and improve the general clarity and internal consistency of the Energy Code, as directed by California Government Code, Section 11349 and 11349.1, and California Code of Regulations, Title 1, Section 16.

Purpose and Necessity of Changes to the Reference Appendices

There are no proposed changes to reference appendices.

Appendix C: Assumptions for Statewide Savings Estimates

The Statewide CASE Team estimated statewide impacts for the first year by multiplying per-pool savings estimates by statewide pool forecasts, which were developed by the Statewide CASE team. Details of the pool forecast are in Table 17.

The statewide savings and cost estimates take into account the current market share rate. The Statewide CASE Team estimated that the current market share rate for the proposed code change is 3.8 percent for the retrofit market. The current market share rate is estimated based on the Statewide CASE Team's professional judgment and solar pool heating installation data from a 2010 Solar Energy Industries Association (SEIA) report (Solar Energy Industries Association 2010).

The Statewide CASE Team used 2023 PKdata and a listing of Olympic-sized pools from the Swimmer Guide (SwimmersGuide n.d.) to estimate the number of nonresidential pools in California (P.K. Data, Inc. 2023). PKdata indicated that 17 percent of all national pool installations occur in the state. The analysis focused on nonresidential pools located at luxury clubs, health clubs, gyms (e.g., YMCA), medical facilities, water parks, schools, and municipal pools. The PKdata was assumed to have all nonresidential pools, and the Swimmers Guide provided data to estimate the number of Olympic-sized pools within the PKdata.

To project total stock from the 2023 PK Data installation data to 2026, a four percent annual growth rate was applied, based on pre-pandemic trends. A more conservative one percent growth rate was assumed for projections to 2029, consistent with prior analysis (Adler 2015). The Statewide CASE Team assumed that nonresidential pools would be heated by gas or electricity in equal proportions, as was provided by the 2019 RASS data. All nonresidential pools were assumed to be heated continuously based on information provided by the SEIA (Solar Energy Industries Association 2011).

Table 17: Estimated Number of Retrofit Pools Impacted by Proposed Code Change in 2029 by Climate Zone

Climate Zone	City Name	Average-Sized Nonresidential Outdoor Pools	Average-Sized Nonresidential Indoor Pools	Olympic Outdoor Pools	Olympic Indoor Pools
1	Arcata	2	1	0	0
2	Sonoma	12	7	2	1
3	Oakland	47	30	8	5
4	Paso Robles	24	15	4	3
5	Santa Maria	5	3	1	1
6	Los Angeles	53	34	9	6
7	San Diego	34	21	6	4
8	Fullerton	76	49	13	8
9	Hollywood Burbank	128	81	22	14
10	Riverside	104	67	18	11
11	Red Bluff	11	7	2	1
12	Sacramento	54	35	9	6
13	Fresno Yosemite	25	16	4	3
14	Palmdale	22	14	4	2
15	Palm Springs	11	7	2	1
16	Blue Canyon Nyack	6	4	1	1
	TOTAL	**614**	**392**	**104**	**67**

Appendix D: Environmental Analysis

Potential Significant Environmental Effect of Proposal

The CEC serves as the lead agency under the California Environmental Quality Act (CEQA) for the 2028 Energy Code and is responsible for evaluating any potentially significant environmental effects resulting from the proposed standards. A “significant effect on the environment” is “a substantial adverse change in the physical conditions which exist in the area affected by the proposed project (California Environmental Quality Act 2024).”

The Statewide CASE Team has considered the environmental benefits and adverse impacts of its proposal, including—but not limited to—an evaluation of factors contained in the California Code of Regulations, Title 14, section 15064, and has determined that the proposal will not result in a significant effect on the environment determined that the proposal.

Direct Environmental Impacts

Direct Environmental Benefits

The Statewide CASE Team concludes, after careful consideration of the project, that there would be no direct environmental benefits or impacts resulting from the proposed Building Energy Efficiency Standards for solar thermal pool heating. The proposed regulations would not affect the health and welfare of California residents, worker safety, or the state’s environment. The most probable means to achieve the standards would not require the use of materials that are hazardous to the environment.

Direct Adverse Environmental Impacts

There are no direct adverse environmental impacts.

Indirect Environmental Impacts

Indirect Environmental Benefits

The Statewide CASE Team found that this proposal would provide significant indirect environmental benefits through the reduced use and demand for natural gas, which is associated with GHG emissions. Communities near pools would benefit from improved air quality as a result of reduced emissions from the combustion of natural gas to heat pool or spa water.

Indirect Adverse Environmental Impacts

The Statewide CASE Team concludes after careful consideration of the project that there would be no indirect adverse environmental impacts due to the proposed Building Energy Efficiency Standards for solar thermal pool heating.

Mitigation Measures

The Statewide CASE Team has considered opportunities to minimize the environmental impact of the proposal, including an evaluation of “specific economic, environmental, legal, social, and technological factors (California Environmental Quality Act 2024).”

Reasonable Alternatives to Proposal

The Statewide CASE Team has considered alternatives to the proposal and determined that no alternative would achieve its purpose with a lesser environmental impact. The following section presents the alternatives and the Statewide CASE Team’s justification for not proposing them.

The Statewide CASE Team considered proposing a standard similar to the solar thermal pool heating requirements in (ASHRAE Addendum cf to Standard 90.1 2019) and the 2027 International Energy Conservation Code (IECC) CE86-24 standard. The Statewide CASE team did not choose this option since it would have had no environmental impact, while it was less stringent and yielded fewer environmental benefits.

Water Use and Water Quality Impacts Methodology

There are no impacts to water quality or water use.

Appendix E: Summary of Stakeholder Engagement

Introduction to Stakeholder Engagement

Collaborating with stakeholders who may be affected by proposed code changes is a core component of the Statewide CASE Team's process. The Statewide CASE Team engages interested parties to identify and address issues related to the proposals, with the goal of submitting recommendations to the CEC in this Draft CASE Report that reflect broad support. Public stakeholders provide valuable feedback on draft analyses and help identify and address adoption challenges, including cost effectiveness, market and technical barriers, compliance and enforcement, and potential impacts on human health or the environment. Some stakeholders also provide data that the Statewide CASE Team uses to support analyses.

This appendix summarizes the stakeholder engagement conducted by the Statewide CASE Team during the development and refinement of the report's recommendations.

Utility-Sponsored Stakeholder Meetings

Utility-sponsored stakeholder meetings provide an opportunity to learn about the Statewide CASE Team's role in the advocacy effort and to hear about specific code change proposals that the Statewide CASE Team is pursuing for the 2028 code cycle. The goal of these meetings is to solicit input on proposals from stakeholders early enough to ensure the proposals and the supporting analyses are vetted and have as few outstanding issues as possible. To promote transparency in the development of code change proposals, the Statewide CASE Team uses stakeholder meetings to solicit feedback on:

- Proposed code changes
- Draft code language
- Draft assumptions and results of analyses
- Data to support assumptions
- Compliance and enforcement
- Technical and market feasibility

The Statewide CASE Team hosted two stakeholder meetings for the Solar Pool Heating measure via webinar, as described in Table 18. Please see below for dates and links to event pages on Title24Stakeholders.com. Materials from each meeting, such as slide presentations, proposal summaries with code language, and meeting notes, are included in the bibliography section of this report (Statewide CASE Team, (b) 2025) (Statewide CASE Team, (c) 2025) (Statewide CASE Team, (a) 2025) (Statewide CASE Team, (e) 2025).

Table 18: Utility-Sponsored Stakeholder Meetings7

Meeting Name and Link to Materials	Meeting Date	Summary of Items Discussed
First Round of Covered Processes and Envelope Utility-Sponsored Stakeholder Meeting	September 30, 2025	• Solar Pool Heating • Envelope – Fenestration Improvements • Traction Elevators • Data Center Improvements
First Round of Covered Processes, Envelope, AWHP Utility-Sponsored Stakeholder Meeting	October 29, 2025	• Process Steam: Flash Steam Reduction and Recovery • Process Steam: Condensate Return • Compressed Air: Air Drying • Modify existing chiller/boiler requirements to account for AWHP/WWHP • AWHP Compliance Pathways and Requirements (glycol concentration only) • Solar Pool Heating

The first round of utility-sponsored stakeholder meetings began in September 2025 and served as an early forum to promote transparency and gather stakeholder feedback on measures under consideration by the Statewide CASE Team.

The objectives of the first round of stakeholder meetings were to solicit input on the scope of the 2028 code cycle proposals, request data and feedback on specific approaches, assumptions, and methodologies for the energy impacts and cost-effectiveness analyses, and understand potential technical and market barriers. The Statewide CASE Team also presented the initial draft code language for stakeholders to review.

Utility-sponsored stakeholder meetings were open to the public. For each stakeholder meeting, two promotional emails were distributed from info@title24stakeholders.com. One email was sent to the full Title 24 Stakeholders listserv, which includes over 3,000 individuals. A second email targeted specific recipients based on their subscription preferences.

The Title 24 Stakeholders listserv is an opt-in service comprising participants from diverse industries and trades, such as manufacturers, advocacy groups, local governments, and building and energy professionals. Each meeting was announced on the Title 24 Stakeholders LinkedIn page and cross-promoted on the CEC LinkedIn page approximately two weeks in advance to engage individuals, organizations, and broader channels beyond the listserv. The Statewide CASE Team conducted extensive personal outreach to stakeholders identified in initial work plans who had not yet opted in to the listserv. Exported webinar meeting data captured attendance numbers, individual

comments, and results from live attendee polls to help evaluate stakeholder participation and support.

Statewide CASE Team Communications

The Statewide CASE Team held personal communications over email and phone with numerous stakeholders when developing this report, listed in Table 19.

Table 19: Engaged Stakeholders

Organization/Individual Name	Market Role	Mentioned in CASE Report Sections
Pool and Hot Tub Association (PHTA)	Trade Association	Section 1.3
California Pool and Spa Association (CPSA)	Trade Association	Section 1.3
California Solar and Storage Association (CALSSA)	Industry Association	Section 1.3
Aquatherm Industries, Inc.	Manufacturer	Section 1.3
Hot Sun Industries, Inc.	Manufacturer	Section 1.3
Counsilman-Hunsaker	Designer	Section 1.3
Martin Aquatic Design & Engineering.	Designer	Section 1.3
California Coalition for Children's Safety and Health (CCCSH)	Pool Safety Advocate	Section 1.3
Drowning Prevention Foundation (DPF)	Pool Safety Advocate	Section 1.3
U.S. Swim School Association (USSSA)	Swim School	Section 1.3
Stop Drowning Now	Pool Safety Advocate	Section 1.3
Children's Advocacy Institute (CAI)	Children's Safety Advocate	Section 1.3
WaterWorks Swim Schools	Swim School	Section 1.3

Engagement with ESJ communities

The Statewide CASE Team is in the process of conducting outreach to the California Low-Income Consumer Coalition (CLICC) and Diversity in Aquatics to better understand the potential impact of a mandatory solar pool heating measure on low-income consumers in nonresidential settings.