

Proposal Summary



Swimming Pool and Spa Heating

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Prepared by: Melissa Schellinger Gutierrez, Energy Solutions

Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on May 18th, 2023. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback for the Swimming Pool and Spa Heating measure.

To provide comments, please email Melissa Schellinger Gutierrez mgutierrez@energy-solution.com and Helen Davis, hdavis@energy-solution.com directly and cc info@title24stakeholders.com.

Measure Description

The proposal includes measures that save energy on pool heating:

- 1. Require Mandatory Solar Heating, Heat Pump, or On-Site Renewable Energy / Site Recovered Energy for Pools and Spas.** The proposed code change would require solar thermal pool and spa (except portable electric spas) heating systems, heat pump pool heating (HPPH) with a certain COP following sizing requirements or on-site renewable energy/site recovered energy in nonresidential, multifamily, and newly constructed single-family buildings with heated swimming pools and spas. The surface area of the solar collectors installed would be equal to or greater than 60 percent of the surface area of the pool for residential pools and 65 percent of the surface area of the pool for multifamily and non-residential pools. At least 60 percent of the annual heating energy would be required to come from on-site renewable energy or site-recovered energy.
- 2. Clean up and clarify existing requirements.** While we are modifying the requirements for pools and spas, the Statewide CASE Team will also explore opportunities to update language as needed based on advances in technology and standard design practices, and existing federal and state regulations applicable to pool heating products. Clarifying provisions are being added in section 110.4(a) to specify that products and equipment not meeting definitions in Appliance Efficiency Regulations shall not be used as pool heaters, with the

exception of commercial pool heaters. The Statewide CASE team is also proposing a cleanup of section 150.0(p) in an attempt to harmonize Title 24, Part 6, with provisions in the federal/state regulations on dedicated-purpose pool pumps, and replacement dedicated-purpose pool pump motors.

- a. The Statewide CASE Team is recommending revisions to Section 140.0 to include reference to the following sections in accordance with existing provisions set forth in Table 100.0-A: 150.0(p)2, 150.0(p)3, and 150.0(p)4.
- 3. Proposed Appendix JA15.** The Statewide CASE Team is proposing to include new criteria for solar swimming pool or spa heating system, HPPH, and on-site renewable energy or site recovered energy.
- 4. New Definitions.** The Statewide CASE Team is proposing to include new definitions in Section 100.1 to align with the measures being proposed above.

Stakeholder Information Requests (Round 2)

Data may be provided anonymously. To participate or provide information, please email Melissa Schellinger Gutierrez, mgutierrez@energy-solution.com directly and cc info@title24stakeholders.com.

1. Review the draft code language presented below and provide comments.
2. Provide inputs on proposed new definitions (e.g., commercial pool heaters).
 - a. What are the applicable test procedures and efficiency metrics for gas-fired and heat pump commercial pool heaters?
3. What is an appropriate assumption for the compressor lockout temperature for HPPHs? The Statewide CASE Team has observed that product specifications for models sold into California indicate an operating range for the vapor-compression cycle down to 45°F. Some models allow lockout temperatures to be adjusted down to 30°F.
 - a. Are the controls provisions for heat pumps with supplementary electric resistance heaters set forth in section 110.2(b) of the current Title 24, Part 6, also appropriate for HPPHs? If not, what controls provisions are instead applicable to HPPHs such that the use of auxiliary heating is minimized while maximizing the vapor-compression cycle of the HPPH?

Draft Code Language

The proposed changes to the Standards and Reference Appendices will be provided below. Changes to the 2022 documents are marked with underlining in red font (new language) and ~~strikethroughs~~ in red font (deletions).

The draft code language proposes revisions to installation provisions set forth in sections 110.4(b), 140.0, 150.0(p), and 160.7 while also proposing an introduction of a

new joint appendix prescribing eligibility criteria for solar swimming pool or spa heating systems, HPPHs, and on-site renewable energy or site recovered energy. New definitions are being proposed in section 100.1.

As a result of the changes presented below, Table 100.0-A *Application or Standards*, will be updated. Rather than recreate the entire table, the applicable row is included below for reference:

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations
Nonresidential, And Hotels/Motels	Pool and Spa Systems	110.4, 110.5, 160.7 150.0(p)	N. A.	N.A.	141.0

SECTION 100.1 – DEFINITIONS AND RULES OF CONSTRUCTION

DEDICATED-PURPOSE POOL PUMP comprises self-priming pool filter pumps, non-self-priming pool filter pumps, waterfall pumps, pressure cleaner booster pumps, integral sand-filter pool pumps, integral-cartridge filter pool pumps, storable electric spa pumps, and rigid electric spa pumps. See 20 CCR § 1602(g)(4) of the Appliance Efficiency Regulations for additional definitions.

ON-SITE RENEWABLE ENERGY is energy from renewable sources harvested at the building site.

POOL HEATER, CONSUMER is a consumer appliance designed for heating non-potable water contained at atmospheric pressure, including heating water in swimming pools, spas, hot tubs, and similar applications. See 20 CCR § 1602(g)(1) of the Appliance Efficiency Regulations for additional definitions.

POOL HEATER, COMMERCIAL is a pool heater that is not a consumer appliance and is not designed for use with residential pools, is marketed as a commercial equipment containing, contains design modifications related to safety and high volume flow, and is matched with a pump from the point of manufacture to accommodate the needs of public pools.

POOLS, ANSI/APSP/ICC-5 is the American National Standards Institute and National Spa and Pool Institute document titled “American National Standard for Residential Inground Swimming Pools” 2011 (ANSI/APSP/ICC-5 2011 (R2022)) with ~~Addenda A~~.

POOLS, MULTISPEED PUMP is a pump capable of operating at two speeds and variable-speed pumps.

POOL, PUBLIC is a pool other than a residential pool that is intended to be used for swimming or bathing and is operated by an owner, lessee, operator, licensee, or concessionaire, regardless of whether a fee is charged for use. Public pools include pools installed in private settings such as multifamily residential buildings or hotels that are available exclusively for use by tenants or guests.

POOLS, RESIDENTIAL are permanently installed residential in-ground swimming pools intended for use by a single-family home for noncommercial purposes and ~~with dimensions as defined~~ within the scope of ANSI/NSPI-5 ANSI/APSP/ICC-5 2011 (R2022).

PORTABLE ELECTRIC SPA is a factory-built electric spa or hot tub, supplied with equipment for heating and circulating water at the time of sale or sold separately for subsequent attachment. See 20 CCR § 1602(g)(2) of the Appliance Efficiency Regulations for additional definitions.

RENEWABLE ENERGY RESOURCES are energy from solar, wind, biomass or hydro, or extracted from hot fluid or steam heated within the earth.

SITE-RECOVERED ENERGY is waste energy recovered at the building site that is used to offset consumption of purchased fuel or electrical energy supplies.

SOLAR SWIMMING POOL OR SPA HEATING SYSTEM is an assemblage of components designed to heat water for swimming pools or spas by solar thermal means, excluding pool recirculation components.

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

- (a) **Certification by Manufacturers.** Any pool ~~heater and spa heating system or equipment for a pool, spa, or a pool and spa combination may~~ shall be installed only if the manufacturer has certified that the system or equipment has all of the following:
1. **Efficiency.** ~~For e~~Equipment subject to State or federal appliance efficiency standards, ~~listings in the Commission's directory of certified equipment showing compliance with applicable standards,~~ shall comply with the applicable provisions of Sections 110.1; and
 2. **On-off switch.** A readily accessible on-off switch, mounted on the outside of the heater that allows shutting off the heater without adjusting the thermostat setting; and
 3. **Instructions.** A permanent, easily readable, and weatherproof plate or card that gives instruction for the energy efficient operation of the pool~~,~~ spa, or pool and spa combination heater and for the proper care of pool~~,~~ spa, or pool and spa combination water when a cover is used; and
 4. **Electric resistance heating.** No electric resistance heating.

Exception 1 to Section 110.4(a)4: Listed package units with fully insulated enclosures, and with tight- fitting covers that are insulated to at least R-6.

Exception 2 to Section 110.4(a)4: Pools~~,~~ spas, or pool and spa combination deriving at least 60 percent of the annual heating energy from on-site renewable solar energy or site recovered energy.

(b) **Installation.** Any pool, spa, or pool and spa combination systems or equipment shall be installed with all of the following:

1. **Heating Equipment.** Equipment installed to heat water for pools, spas, or pool and spa combinations shall be selected from equipment meeting the standards shown in Table 110.4-A.

Table 110.4-A HEATING EQUIPMENT STANDARD

Heating Energy Source	Standard
Electric Resistance	<u>UL 1261</u>
Gas-fired	<u>ANSI Z21.56/CSA 4.7a</u>
Heat Pump	<u>AHRI 1160 and one of the following: CSA C22.2 No. 236, UL 1995, or UL/CSA 60335-2-40</u>
Solar	<u>ICC/APSP 902/SRCC 400 for solar pool heaters, ICC 901/SRCC 100 for solar collectors</u>

- ~~1.~~ **2. Piping.** At least 36 inches of pipe shall be installed between the filter and the heater or dedicated suction and return lines, or built-in or built-up connections shall be installed to allow for the future addition of solar heating equipment;
- ~~2.~~ **3. Covers.** A cover for outdoor pools, outdoor spas, or outdoor pool and spa combinations that have a heat pump or gas heater; and
- ~~3.~~ **4. Directional inlets and time switches for pools.** If the system or equipment is for a pool:
 - i. The pool shall have directional inlets that adequately mix the pool water; and
 - ii. A time switch or similar control mechanism shall be installed as part of a pool water circulation control system that will allow all pumps to be set or programmed to run only during the off-peak electric demand period and for the minimum time necessary to maintain the water in the condition required by applicable public health standards.

(c) **Heat Source Sizing.** Installed heating systems or equipment for pool, spa, or pool and spa combinations shall meet one of the following:

1. Solar swimming or spa heating system with a solar collector surface area that is equivalent to the following:
 - i. At least 65 percent of the pool surface area for nonresidential and multifamily buildings; and
 - ii. At least 60 percent of the pool surface area for single-family buildings.

2. A heat pump pool heater as the primary heat source shall meet the efficiency requirements in Table 110.4-B. The heat pump pool heater shall meet the sizing requirements of Reference Joint Appendix JA15, Section JA15.3. The heat pump pool heater's control shall meet the criteria set forth in section 110.2(b).

Table 110.4-B HEAT PUMP POOL HEATER MINIMUM EFFICIENCY

<u>Equipment Type</u>	<u>Efficiency</u>	<u>Compliance Date</u>	<u>Test Procedure</u>
<u>HPPH</u>	<u>Coefficient of Performance (COP) of not less than 5.5 at the High Air Temperature-Mid Humidity rating condition.</u>	<u>Manufactured prior to May 31, 2028</u>	<u>10 C.F.R. section 430.23(p) (Appendix P to subpart B of part 430)</u>
<u>HPPH</u>	<u>Integrated Thermal Efficiency, TE_i, not less than the following:</u> $\frac{600(PE)}{PE + 1,619}$ <u>Where PE is the active electrical power, in Btu/h.</u>	<u>Manufactured on or after May 31, 2028</u>	<u>10 C.F.R. section 430.23(p) (Appendix P to subpart B of part 430)</u>

3. Systems that do not use solar collectors or heat pumps as their primary heat source shall derive at least 60 percent of the annual heating energy from on-site renewable energy or site recovered energy.

Exception 1 to Section 110.4(c): Portable electric spas compliant with the Appliance Efficiency Regulations.

Exception 2 to Section 110.4(c): Single-family buildings with existing heating systems or equipment for pools, spas, or pool and spa combinations.

SECTION 140.0 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES

Nonresidential, high-rise residential and hotel/motel buildings shall comply with all of the following:

- (a) The requirements of Sections 100.0 through 110.12, and 160.7(b) applicable to the building project (mandatory measures for all buildings).
- (b) The requirements of Sections 120.0 through 130.5 (mandatory measures for nonresidential, high-rise residential and hotel/motel buildings).
- (c) Either the performance compliance approach (energy budgets) specified in Section 140.1 or the prescriptive compliance approach specified in Section 140.2 for the Climate Zone in which the building will be located. Climate zones are shown in FIGURE 100.1-A.

NOTE to Section 140.0(c): The Commission periodically updates, publishes, and makes available to interested persons and local enforcement agencies precise descriptions of the Climate Zones, which is available by zip code boundaries depicted in the Reference Joint Appendices along with a list of the communities in each zone.

NOTE to Section 140.0: The requirements of Sections 140.1 through 140.9 apply to newly constructed buildings. Section 141.0 specifies which requirements of Sections 140.1 through 140.9 also apply to additions or alterations to existing buildings.

NOTE: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, and 25943, Public Resources Code.

Section 150.0(p) Mandatory Features and Devices

(p) Pool Systems and Equipment Installation. Any residential pool system or equipment installed shall comply with the applicable requirements of Section 110.4, as well as the requirements listed in this section.

1. *Pump sizing and flow rate* for Single-Family Buildings.

A. All installed Dedicated-Purpose Pool pPumps and Replacement Dedicated-Purpose Pool pPump motors ~~installed~~ shall be listed in the Commission’s directory of certified equipment and shall comply with the Appliance Efficiency Regulations.

B. All pump flow rates shall be calculated using the following system equation:

$$H = C \times F^2$$

WHERE:

H is the total system head in feet of water.

F is the flow rate in gallons per minute (gpm).

C is a coefficient based on the volume of the pool: 0.0167 for pools less than or equal to 17,000 gallons. 0.0082 for pools greater than 17,000 gallons.

- C. Filtration pumps shall be sized, or if programmable, shall be programmed, so that the filtration flow rate is not greater than the rate needed to turn over the pool water volume in 6 hours or 36 gpm, whichever is greater; and
 - D. ~~Replacement Dedicated-Purpose Pool Pump mMotors used for filtration with a capacity of 1 hp or more shall be multispeed shall meet the applicable standards set forth in 20 CCR § 1605.3 of the Appliance Efficiency Regulations;~~ and
 - E. ~~Dedicated-Purpose Pool Pumps shall meet the applicable standards set forth in 20 CCR § 1605.1(g)(7) of the Appliance Efficiency Regulations. Each auxiliary pool load shall be served by either separate pumps or the system shall be served by a multispeed pump; and~~
EXCEPTION to Section 150.0(p)1E: Pumps less than 1 hp may be single speed.
 - F. ~~Multi-speed Dedicated-Purpose Pool pPumps with more than one speed~~ shall have controls which default to the filtration flow rate when no auxiliary pool loads are operating; and
 - G. For ~~multi-speed Dedicated-Purpose Pool pPumps with more than one speed~~, the controls shall default to the filtration flow rate setting within 24 hours and shall have an override capability for servicing.
2. **System piping.**
- A. A length of straight pipe that is greater than or equal to at least 4 pipe diameters shall be installed before the pump; and
 - B. Pool piping shall be sized so that the velocity of the water at maximum flow for auxiliary pool loads does not exceed 8 feet per second in the return line and 6 feet per second in the suction line; and
 - C. All elbows shall be sweep elbows or of an elbow-type that has a pressure drop of less than the pressure drop of straight pipe with a length of 30 pipe diameters.
- 3. **Filters.** Filters shall be at least the size specified in NSF/ANSI 50 for public pool intended applications.
 - 4. **Valves.** Minimum diameter of backwash valves shall be 2 inches or the diameter of the return pipe, whichever is greater.

SECTION 160.7 – MANDATORY REQUIREMENTS FOR COVERED PROCESSES

(a) **Elevators.** Elevators shall meet the requirements of **Section 120.6(f)**.

(b) **Pool and spa systems.** Pool and spa systems available to multiple tenants or to the public shall comply with the applicable requirements of Section 110.4. Pool and spa systems installed for exclusive use by a single tenant shall comply with the applicable requirements of Section 150.0(p)~~2, Section 150.0(p)3, and Section 150.0(p)4~~.

NOTE: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8 and 25943, Public Resources Code.

1.1 Reference Appendices

Appendix JA15 – Criteria for Solar Swimming Pool or Spa Heating System, Heat Pump Pool Heaters, and On-Site Renewable Energy or Site Recovered Energy

JA15.1 Purpose and Scope

Joint Appendix JA15 provides the eligibility criteria for energy efficiency measures on solar swimming pool or spa heating systems, and sizing for heat pump pool heaters (HPPH).

JA15.2 Solar Pool or Spa Heating Systems

Solar swimming pool or spa heating systems shall be certified and rated by the Solar Rating and Certification Corporation (ICC-SRCC), the International Association of Plumbing and Mechanical Officials, Research and Testing (IAPMO R&T), or by a listing agency that is approved by the Executive Director.

Solar thermal collectors and solar pool heaters shall be listed and labeled in accordance with Table 110.4-B. The installed system shall meet the following eligibility criteria:

- (a) The system shall be installed according to manufacturer’s instructions.
- (b) The system shall be installed in the exact configuration for which it was rated. The system shall have the same collector(s), piping, pump, vacuum relief valve, controls, and other components used to establish the rated condition.

JA15.3 HPPH Sizing

A HPPH shall be sized using the HPPH manufacturer’s specifications. The following sizing provisions shall be applicable if the HPPH manufacturer’s specifications do not include information on HPPH sizing:

- (a) Determine desired pool temperature in °F.
- (b) Determine average temperature for the coldest month of pool use in °F.
- (c) Determine temperature rise in °F by subtracting the average temperature for the coldest month from the desired pool temperature.
- (d) Calculate the pool volume in gallons.
- (e) Use equation JA15-1 to determine the Btu/h output requirement of the heat pump pool heater.

Equation JA15-1

$$Q_{out} = V_p \times 8.33 \times \Delta T \div t$$

Where:

Q_{out} is the output heating capacity of the HPPH

V_p is the pool volume in gallons

8.33 is the weight of a gallon of water at 62°F in lbs/gal

ΔT is the pool temperature rise in °F, and shall not exceed 10°F

t is the time in hours and shall not exceed 17.5 hours

Past Data Needs/Stakeholder Information Requests (Round 1)

The Statewide CASE Team received limited responses to the following request and is interested in continuing the conversation on any additional relevant topics.

Mandatory solar heating requirements for pools and spas

- **Energy Savings** – quantifiable savings (in BTUs, kWh, etc.) that can be attributed to a specific measure
 - 1) Improved Savings Calculations – Need field validation studies to support the measure.
 - a) Need California-specific commercial and residential market penetration and demand.
 - 2) Annual Energy Savings Calculations – Need survey-based data for all climate zones in California.
 - b) Thus far we have energy savings data from the following climate zones: Z04, Z10, Z06, Z15, Z08, Z09
- **Technical Feasibility**
 - 1) How is a heat pump pool heater (HPPH) applied in nonresidential pool and spa applications, i.e., what auxiliary heating equipment is typically used with such systems? How would a HPPH handle a cold start and pick-up?
 - 2) Would a HPPH require a heat exchanger or can HPPHs operate independently of the heat exchanger and boiler installed application?
 - 3) What are the possible approaches for heating an Olympic-sized pool year-round somewhere cold like Arcata if gas is not available?
 - 4) With available HPPH technology what is the largest gallons pool for year-round outdoor public use and year-round indoor public use? What is the pool volume limitation if the swimming is seasonal from April to October in California for outdoor public pools?
 - 5) If we could add solar thermal collectors to the year round pool how does this impact the need capacity of a HPPH for a large pool?
 - 6) Under what conditions do unglazed and glazed systems need to be winterized?
 - 7) Following up on question 7 above, do the freeze protection provisions in OG-400 and the freeze tolerance provisions in OG-100 adequately address any freezing-related issues for all 16 California climate zones? Assuming the answer is yes, do you have any concerns with referencing the OG-100 or OG-400 certification directories? The approach is currently being taken in Title 24, Part 6, for solar water heating systems.

- 8) What sizing recommendations do contractors provide to clients? Are they based upon calculations, sizing by pool area, etc.?
- **Market Readiness** – Below are questions on the availability in the market, and certainty regarding performance, reliability, and cost:
 - 1) What are the market segments in pool heating for HPPH/Gas Heating and Solar Heating equipment and installations?
 - 2) Is it by market residential, multifamily or commercial or by size or capacity of the system?
 - 3) What differences are there in the new construction vs. retrofit market for solar pool heating?
 - 4) What information describes the current pool and spa heating practices in California? How often are pools and spas heated seasonally vs. year-round? How does the choice of heating equipment influence heating behavior?
 - 5) What information is available on how pool heating systems are used?
 - 6) Do you have any recommended California-specific data sources citing costs associated with solar pool heating installations?
 - 7) What supplemental pool heating systems are typically used in the field with solar collectors?
 - 8) Similar to question 8 above, what is the percentage of unglazed, glazed, combined PV/glazed, and glycol heat exchange in the residential market? In the commercial market?
 - 9) Can you please confirm how pool and solar contractors collaboratively work on projects dealing with newly constructed buildings and existing buildings?
 - **Non-energy Benefits**
 1. The Statewide CASE recognizes potential reduced water use, GHG emission reductions, and reduced fossil fuel consumption as a result of this measure. We would appreciate further input on potential non-energy benefits.
 2. Sizing considerations – are pool heaters for commercial pools sized only for seasonal use or year-round use?