High-Performance Measure Details

Measure Name
Single Zone Heat Pump with Smart Thermostat

Use Category
SH – Space Heating Electrification

Effective Date
November 9, 2026

Version
3

Measure Code
LM401

Measure Stage
Early Adoption

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Technology Summary

Single-zone heat pumps (SZHPs) provide space heating and cooling to one thermal zone using a vapor-compression cycle. This HPM treats packaged heat pumps, split-system heat pumps, and single-zone ductless (mini-split) heat pumps as one equipment category, and treats smart thermostats, connected thermostats, smart communicating thermostats, and occupant controlled smart thermostats (OCSTs) as one control category. In high-rise multifamily buildings, SZHPs commonly serve individual **dwelling units and sleeping units**, including apartments, condominiums, dormitories, and residential care facilities, where each unit has its own thermostat. Most include **supplementary electric resistance (strip) heat** for defrost tempering, equipment faults, and periods when compressor capacity falls short of the load.

Strip heat delivers heat at a coefficient of performance (COP) of 1.0, while compressor heating operates at a substantially higher COP across most California operating conditions. As a result, the thermostat and unit-controller settings that stage the compressor and lock out strip heat largely determine whether an installed system performs as a heat pump. For California electrification, decarbonization, and grid goals, the impact is greatest on cold mornings and during setback recovery, when unnecessary strip heat adds to both annual energy use and winter peak demand. These settings are typically adjustable at little or no hardware cost, which makes configuration, rather than equipment, the primary opportunity.

Common real-world performance gaps include:

- **High default lockout settings.** Heat pump thermostats commonly use compressor lockout settings in the 30–40°F range, which switch the system to resistance heat even when the heat pump has adequate capacity.[1]
- **Uncoordinated compressor and auxiliary settings.** Compressor cutoffs and auxiliary heat enable temperatures are often set independently. This can produce strip-heat-only operation while the compressor could still run, or simultaneous operation when one source would do.
- **Setback recovery.** Recovery logic can call strip heat after setback. ENERGY STAR added a resistance heat utilization (RHU) metric to its smart thermostat program partly to keep heat pumps from earning savings credit through increased backup heat use during recovery.[2]
- **Undocumented configuration.** Thermostat and unit-controller heating settings are rarely recorded in submittals or startup records, so field operation is difficult to confirm.
- **Unused runtime data.** Many smart thermostats and unit controllers record compressor and auxiliary heat runtime separately, but the data is seldom collected for evaluation or code development.
- **No deemed new construction pathway.** The statewide deemed smart thermostat package (eTRM SWHC039-09, *Smart Thermostat, Residential*) is limited to normal replacement in existing residential buildings, so it does not cover new multifamily construction. Title 24 also requires only a setback thermostat in multifamily dwelling units (§160.3(a)1), so heat pump–specific thermostat configuration is not driven by code.

A 2023 modeling study (*Making the Switch*, ASHRAE Cold Climate Conference Paper C37) evaluated compressor lockout settings of 30°F, 15°F, and none for cold-climate and standard variable-speed heat pumps in five U.S. locations, including Fresno. It concluded that common 30–40°F settings are too high for every location studied, that a 15°F setting is acceptable for warm and mild climates, and that lower settings improve seasonal heating efficiency.

Alignment with CEDA Program Goals

The California Energy Design Assistance (CEDA) program is a Market Support program intended to support the long-term success of California's nonresidential and high-rise multifamily new construction market by advancing decarbonization, accelerating adoption of emerging and high-performance technologies, informing future codes and standards, and helping project teams achieve deeper energy and operational performance. High-Performance Measures (HPMs) support these objectives by creating opportunities for projects to implement, evaluate, and build market experience with technologies and design practices that extend beyond conventional practice.

Projects seeking a CEDA HPM inducement must meet the applicable requirements identified in the following section. Where aligned with Code Readiness priorities, selected projects may also provide market, design, cost, operational, or metered performance information that can help inform future California Codes and Standards activities.

This measure supports CEDA's Market Support objectives by:

[1] Yoh, H., Li, H., Hacker, J., Tharp, R., and Hearnsberger, K. 2023. *Making the Switch: Sizing Heat Pumps for Heating Instead of Cooling and the Operational Impacts.* ASHRAE and SCANVAC HVAC Cold Climate Conference 2023, Paper C37. Energy-modeling study of residential 3-ton variable-speed heat pumps.

[2] ENERGY STAR Smart Thermostats Version 2.0 Draft 1 Specification Webinar (July 2022) and Version 2.0 Draft 2 Method to Demonstrate Field Savings (November 2024). See the ENERGY STAR Smart Thermostats Version 2 development page.

- **Increasing market demand** by showing owners and project teams that heat pump efficiency depends on controls configuration, not only equipment selection, and building demand for thermostats and setups that keep resistance heat to a minimum.
- **Increasing market supply and delivery capability** by making compressor-first staging, auxiliary heat lockouts, coordinated compressor cutoffs, and documented thermostat configuration routine for designers, installing contractors, and commissioning providers on single-zone heat pump projects.
- **Building market partnerships and knowledge** by connecting project teams with manufacturer guidance and collecting feedback on configuration, startup, and operational challenges with heat pump thermostat controls in multifamily dwelling units.
- **Advancing innovation and accessibility** by encouraging the use of available thermostat capabilities, such as runtime reporting, adaptive recovery, and outdoor-temperature-based staging, that improve performance at modest added cost.
- **Supporting Code Readiness and future market transformation** by identifying projects that can provide runtime-by-stage and resistance heat utilization data to help evaluate future Title 24 heat pump control requirements, JA5 updates, and deemed measure pathways.

CEDA Inducement Requirements

This HPM provides a **single-tier pathway** for new construction and qualifying major alterations, including eligible additions, that install single-zone heat pumps serving **dwelling units and sleeping units in high-rise multifamily buildings**, controlled by a qualifying thermostat configured for **compressor-first operation** (see *Technology Summary* for the performance gaps addressed). Eligibility is based on meeting the *Measure Eligibility (ME)*, *System Design Level Requirements (SDLR)*, and *Supporting Documentation Requirements (SDR)* below. CEDA identifies the applicable thermostat pathway during project review. The measure quantity is the **number of qualifying zones**, defined as each single-zone heat pump controlled by its own qualifying thermostat.

The HPM exceeds **2025 Title 24, Part 6** by requiring (1) an **ENERGY STAR certified thermostat** or a **JA5 thermostat with added heat pump functions**, and (2) coordinated outdoor-temperature settings that **lock out auxiliary heat above 30°F** and keep the **compressor available down to 15°F or lower**. Code-required features, including the §110.2(b) supplementary heat controls and the §160.3(a)1 setback thermostat, form the baseline and are not counted as above-code.

Scope is defined by the code-required thermostat baseline, not by building label. The HPM applies where Title 24 requires only a setback thermostat (§160.3(a)1 and §110.2(c) for new systems; §180.2(b)2A for alterations). Where Title 24 already requires a JA5 demand-responsive thermostat, the thermostat itself is code-required and the remaining increment is limited to configuration effort. Those spaces are intentionally excluded: nonresidential buildings, hotel/motel guest rooms, and skilled nursing facilities (§120.2(b)4), and multifamily common use areas (§160.3(a)2Biv; §180.2(b)2Biiia for alterations). See *Measure Exclusions*.

The measure is **technology neutral**. It offers two thermostat pathways and does not prescribe a manufacturer, communication protocol, or equipment configuration. Participating projects can also provide runtime-by-stage data that supports Code Readiness learning on resistance heat use.

Table 1. HPM Pathways

ID	Related Source/Package	Sector	Applies To	Pathway	Category
ST-1	ENERGY STAR Smart Thermostats V1.0	High-Rise MF	Dwelling and sleeping units	ENERGY STAR certified thermostat	SH – Space Heating Electrification
ST-2	Title 24, Part 6, JA5 (2025)	High-Rise MF	Dwelling and sleeping units	JA5 thermostat with heat pump functions	SH – Space Heating Electrification

Notes: ST = smart thermostat pathway; MF = multifamily. ENERGY STAR V1.0 refers to the Version 1.0 Connected Thermostats specification (released December 2016; the category has since been renamed Smart Thermostats). Version 2.0 (latest: Draft 2, November 2024) is not used. JA5 refers to 2025 Title 24, Part 6, Reference Joint Appendix JA5, effective January 1, 2026.

Measure Eligibility (ME) – All Projects

1. Qualifying Scope

1.1 The project shall install one or more **single-zone electric air-source heat pumps** (packaged or split, ducted or ductless) with **supplementary electric resistance heat**, each serving a **dwelling unit or sleeping unit in a high-rise multifamily building** whose thermostat is subject to §160.3(a)1, including systems that comply with §160.3(a)1 under the Exception to §160.3(a)2, or, for alterations, §180.2(b)2A. Single-zone means one thermal zone per refrigeration circuit; the system does not operate as an integrated multi-zone refrigerant system.

1.2 Each qualifying zone shall be controlled by its own thermostat qualifying under **ST-1** or **ST-2** that controls compressor and supplementary heat staging for that heat pump.

1.3 ***Eligibility is based on the configured control function. Installing a smart thermostat alone does not establish eligibility.***

2. Pathway Assignment

2.1 Each qualifying zone is assigned to exactly one pathway.

2.2 A thermostat model that is ENERGY STAR certified shall be claimed under **ST-1**. **ST-2** applies only to models that are not ENERGY STAR certified.

3. Certification Basis

3.1 **ST-1:** The thermostat model shall be listed as certified on the ENERGY STAR Product Finder at the time of equipment submittal, under the *ENERGY STAR Program Requirements for Smart Thermostats, Version 1.0* or a later version.[3]

3.2 **ST-2:** The thermostat shall be certified to the Energy Commission as an Occupant Controlled Smart Thermostat meeting *Title 24, Part 6, Reference Joint Appendix JA5* (JA5.1.1) and provide:

3.2.1 heat pump control mode with compressor-first staging of supplementary heat;

3.2.2 an outdoor-air-temperature auxiliary heat lockout adjustable to the §SDLR 1.1 setpoint, using a wired outdoor sensor, the heat pump equipment, or a weather data service as the outdoor temperature input; and

3.2.3 runtime reporting that separates compressor heating runtime from auxiliary or emergency heat runtime, accessible through the thermostat interface or a data export.

4. Existing Pathways and Combined Measures

4.1 Where a CPUC-approved deemed measure package applies to the thermostat for the project's sector, building vintage, and delivery type, the deemed pathway applies instead of this HPM. eTRM SWHC039-09 (*Smart Thermostat, Residential*) is limited to normal replacement in existing residential buildings; it does not apply to new construction but may apply to thermostat replacements in existing multifamily dwelling units.

4.2 This HPM is limited to the **thermostat and its configuration**. Heat pump equipment may be claimed separately through an applicable deemed measure, the *Heat Pump Deemed Measure Gap Pathway*

[3] ENERGY STAR Version 1.0 Connected Thermostats specification (released December 2016; the category has since been renamed Smart Thermostats). See ENERGY STAR Connected Thermostats for Partners. Version 2.0 remains in development (latest: Draft 2, November 2024). If ENERGY STAR issues a new Smart Thermostats specification, CEDA will review this HPM and publish a revised version as needed. HPM requirements will not change without a documented HPM revision.

HPM, or the *Cold Climate Air Source Heat Pump HPM*. Defrost controls may be claimed separately under the *Defrost Controls for Air-to-Air Heat Pump HPM*.

5. **Eligible Projects**

   5.1 See *Eligible Climate Zones, Building Types, and Project Scopes*.

6. **Code Compliance**

   6.1 Projects shall comply with all applicable 2025 Title 24, Part 6 requirements and applicable state and local codes (see *Code Reference*). CEDA HPM requirements do not replace code compliance obligations.

System Design Level Requirements (SDLR) – Single Tier

These requirements are based on the *ENERGY STAR Program Requirements for Smart Thermostats, Version 1.0* and *2025 Title 24, Part 6, Reference Joint Appendix JA5*. The values in this memo govern; later changes to these sources apply only through a documented HPM version revision. The **30°F auxiliary heat lockout** and **15°F compressor cutoff** are **proposed CEDA criteria**. The lockout aligns with the 30–45°F resistance heat utilization bin in *ENERGY STAR Smart Thermostats Version 2.0 Draft 2* and is more stringent than the 35°F supplementary heat lockout that Title 24 requires for single-family buildings (§150.0(h)7 and §150.0(i)2). Those single-family provisions do not apply to high-rise multifamily or nonresidential buildings, which have no equivalent threshold; they are cited here for reference only. The cutoff is informed by the modeled seasonal performance in *ASHRAE Cold Climate Conference Paper C37* and by published heating performance data for representative packaged commercial heat pumps (3 to 20 nominal tons), which list compressor heating capacity at outdoor temperatures of 0°F or below. These requirements apply to new construction and to qualifying additions and alterations.

1. **Auxiliary Heat Lockout and Compressor Cutoff**

   1.1 ***Supplementary electric resistance heat shall be locked out at outdoor air temperatures above 30°F.***

   1.2 Above the lockout setpoint, supplementary heat may operate only for defrost tempering or in emergency or compressor-fault mode.

   1.3 Where a compressor low-ambient cutoff is configurable in the thermostat or the equipment controls, it shall be set at or below **15°F**, or disabled where the manufacturer permits. Where the manufacturer's published minimum heating operating temperature is above 15°F, the cutoff shall be set at that minimum, and the limit shall be shown in the equipment submittals. In all cases, the cutoff shall be below the auxiliary heat lockout setpoint so that compressor heating remains available whenever auxiliary heat is locked out. Cooling-mode compressor lockouts used for economizer integration are not subject to §SDLR 1.3.

   1.4 Where the heating design outdoor temperature is above the lockout setpoint, the heat pump shall meet **100% of the design heating load** at that temperature without supplementary heat.

2. **Functional Verification**

   2.1 The heat pump control mode, compressor-first staging, auxiliary heat lockout setpoint, and compressor cutoff setpoint (where configurable) shall be set and recorded during startup, commissioning, or controls checkout.

Supporting Documentation Requirements (SDR)

Documentation already included in project drawings, schedules, submittals, Title 24 compliance documents, startup or commissioning records, or cost estimates **does not need to be duplicated**. This section identifies the minimum information needed to verify eligibility, the claimed pathway, and the above-code features. Post-occupancy trend data is not required for eligibility; see *Code Readiness Objectives* for optional monitoring of separately selected projects.

1. **All Projects**

1.1 **Construction Documents and Submittals:** Equipment schedules or submittals identifying each heat pump (model, heating capacity at the design outdoor temperature, supplementary heat capacity, and zone served) and the thermostat model. Where §SDLR 1.3 relies on a manufacturer's minimum operating temperature above 15°F, the submittal shall show that limit. The number of qualifying zones is confirmed from these documents.

1.2 **Certification:** For ST-1, the ENERGY STAR Product Finder listing for the thermostat model. For ST-2, the Energy Commission JA5 certification listing and manufacturer literature showing the §ME 3.2 functions. No additional pathway-specific documentation is required beyond §SDR 1.2.

1.3 **Title 24 Documents:** Compliance documentation identifying the climate zone, heating design outdoor temperature, and design heating load.

1.4 **Installation Verification:** A startup, controls checkout, installer setup record, or a thermostat or unit-controller screenshot, showing the §SDLR 2.1 settings. One record per thermostat model and configuration is acceptable. Installation is confirmed by nameplate photos or CEDA verification.

1.5 **Cost Information:** Available project cost information for the thermostats and configuration effort, such as a contractor or vendor proposal, schedule of values, pay application, purchase order, invoice, bid, or cost estimate.

Incremental Measure Cost

The Incremental Measure Cost (IMC) represents the estimated additional first cost of a qualifying thermostat and its heat pump configuration compared with the code-minimum thermostat for the same single-zone heat pump. IMC is a program-calibration input that supports inducement development and cost-cap screening. It is not a contractor bid, project estimate, or reconciliation value; actual costs vary by product, project, and installer.

The primary cost basis is the CPUC-approved eTRM SWHC039-09 (Smart Thermostat, Residential) cost data (2026 California costs), used as published. Its programmable thermostat base case matches the setback thermostat that Title 24 requires in multifamily dwelling units. The configuration labor and the ST-2 material cost are proposed CEDA calibration assumptions, labeled in the table notes. Values will be revisited as CEDA obtains participating-project cost data.

Base Case

- The same single-zone heat pump (type, capacity, and efficiency) as the Measure Case; heat pump equipment cost is excluded.
- **Dwelling units and sleeping units:** a setback thermostat per §160.3(a)1 and §110.2(c) for new systems, and per §180.2(b)2Ai or §180.2(b)2Aiva for alterations, consistent with the programmable thermostat base case in eTRM SWHC039-09. A §110.12 thermostat is required only when the installer elects certain refrigerant charge or airflow verification procedures (Exception to §170.2(c)3BiaIII; §180.2(b)2Aivb); this does not change the typical baseline.
- Standard installation and setup with manufacturer-default heating settings.

Measure Case

- **ST-1:** an ENERGY STAR certified thermostat. **ST-2:** a JA5 thermostat with the §ME 3.2 functions.
- Configuration of the auxiliary heat lockout and compressor cutoff, and recording of the settings at startup (§SDLR 2.1).
- Installation labor is otherwise equal to the Base Case, consistent with eTRM SWHC039-09.

IMC Values and Normalization

IMC is normalized per **qualifying zone** ($/zone), equal to one thermostat controlling one single-zone heat pump, consistent with the per-unit cost basis of eTRM SWHC039-09. Thermostat cost and configuration effort scale with the number of thermostats, not with heat pump capacity.

IMC = (Measure Material + Measure Labor) – (Base Material + Base Labor)

Table 2. Incremental Measure Cost by Pathway ($/zone)

Offering	Unit	Base Material	Base Labor	Measure Material	Measure Labor	Full Measure Cost	IMC
ST-1	$/zone	$103.19[a]	$35.31[b]	$210.99[c]	$57.38[d]	$268.37	**$129.87**
ST-2	$/zone	$103.19[a]	$35.31[b]	$210.99[e]	$57.38[d]	$268.37	**$129.87**

[a] eTRM SWHC039-09 base case material cost (setback programmable thermostat; 2024 retail pricing including 8.75% tax). [b] eTRM SWHC039-09 labor: 0.40 hr × $75.60/hr × 116.77% (US 2024 to CA 2026 CPI factor) = $35.31; equal for base and measure cases per the package. [c] eTRM SWHC039-09 measure case material cost, Rebate Program value (ENERGY STAR certified smart thermostat). [d] Base labor plus 0.25 hr × $88.28/hr ($22.07) to configure and record the §SDLR 1 settings; proposed CEDA calibration assumption. [e] ST-2 material assumed equal to the SWHC039-09 measure material cost (closest matching offering); a wired outdoor sensor, where needed, is not included; proposed CEDA calibration assumption.

Calculation basis

- **General method:** labor rate = $75.60 × 1.1677 = $88.28/hr (CA 2026).
  - Base labor = 0.40 hr × $88.28 = $35.31.
  - Measure labor = $35.31 + (0.25 hr × $88.28) = $57.38.
- **ST-1 and ST-2:** ($210.99 + $57.38) – ($103.19 + $35.31) = **$129.87/zone**.

These values represent typical incremental costs for the eligible construction types and are intended for program inducement calibration.

Sources

IMC values are informed by CPUC-approved deemed measure cost data and program experience, and are intended to reflect typical market conditions rather than project-specific pricing, including:

- eTRM SWHC039-09, Smart Thermostat, Residential (CPUC Approved; effective January 1, 2026): base and measure material costs and labor hours, rate, and CPI factor.
- *CEDA HPM: Single Zone Heat Pump with Smart Thermostat, Version 2* (January 26, 2026): prior IMC values ($500/zone Essential; $750/zone Premium), for consistency only.

Code Readiness Objectives

This HPM supports CEDA's Code Readiness role by generating field evidence on how heat pump thermostat and unit-controller settings affect resistance heat use in high-rise multifamily dwelling units. For nonresidential and multifamily buildings, Title 24 §110.2(b) sets the order of compressor and supplementary heating operation but does not specify outdoor-temperature thresholds for compressor cutoff or auxiliary heat lockout, unlike the 35°F supplementary heat lockout required for single-family buildings (§150.0(h)7 and §150.0(i)2). Field data from new construction projects can inform future control requirements, acceptance testing, modeling assumptions, and deemed measure updates.

Routine CEDA verification is limited to the documentation listed in the *SDR*. Deeper monitoring applies only to projects separately selected for Code Readiness monitoring. Objectives include:

- Measure field resistance heat utilization, including the 30–45°F bin used in *ENERGY STAR Smart Thermostats Version 2.0 Draft 2*, for configured versus default settings.
- Confirm persistence of lockout and cutoff settings over a heating season, including setting changes, overrides, and emergency heat use.
- Quantify compressor-only operation and peak-demand impacts on cold mornings and during setback recovery by climate zone; modeling suggests warm-climate benefits come mainly from peak-load efficiency.
- Compare thermostat-reported runtime with circuit-level metered energy to evaluate thermostat data as a low-cost verification source.
- Identify common factory and installer default settings and configuration barriers across product types and pathways (ST-1 and ST-2).

Code Readiness Site Monitoring

If selected for Code Readiness monitoring, equipment energy consumption and mechanical system performance may be monitored on-site for a period of up to 12 months. To support performance evaluation and data collection, projects shall provide reasonable access for the installation and operation of metering, sensors, and communication equipment.

Projects equipped with a Building Automation System (BAS), Energy Management System (EMS), or equivalent platform should enable integration of advanced metering devices through the existing system to facilitate data collection and remote access. For projects without a BAS or EMS, the Code Readiness team may install temporary stand-alone data loggers, sensors, and communication equipment as needed to monitor system performance for the duration of the monitoring period.

Instrumentation may be installed or supplemented, where necessary, to measure key system and equipment parameters sufficient to evaluate system performance and operational characteristics. All monitoring equipment will be temporary and installed in a manner that minimizes disruption to normal building operations.

Monitored parameters are not HPM eligibility requirements.

Data Benefits

Collected data will help support:

- Evidence for potential outdoor-temperature lockout and cutoff criteria in future Title 24 cycles.
- Acceptance-test or verification approaches for heat pump thermostat configuration.
- Updated savings and demand assumptions for deemed or custom heat pump control measures.
- Validation of thermostat runtime data as a verification and evaluation source.
- Designer and contractor guidance on heat pump thermostat configuration practices.

Sample Data Points

A sample set of data points that would ideally be collected is provided below for reference. This list will be re-developed for each project based on the infrastructure and need of the monitoring effort:

Data Points to Meter	Unit	Additional Specifications
Minimum/Core Data Points		
Compressor heating runtime	min/hr	From thermostat or unit controller; by stage where available
Auxiliary heat runtime	min/hr	From thermostat or unit controller
Emergency heat runtime	min/hr	From thermostat or unit controller
Outdoor air temperature	°F	Thermostat or equipment sensor, or nearest weather station

Data Points to Meter	Unit	Additional Specifications
Indoor zone temperature	°F	Thermostat sensor
Heating setpoint and schedule	°F	Including setback periods
Configured lockout and cutoff setpoints	°F	Recorded at the start of monitoring and on any change
Calculated/Derived Metrics		
Resistance heat utilization, 30–45°F	%	Per the ENERGY STAR V2.0 Draft 2 method
Auxiliary runtime above lockout setpoint	min	Should occur only during defrost or fault conditions
Defrost events	count/day	From unit controller where available
Peak-hour heating demand	kW	Cold-morning and recovery periods
Optional/Technology-Specific Data Points		
Compressor power	kW	Current transformer (CT) on compressor circuit
Supplementary heat power	kW	Separate CT on resistance heat circuit
Indoor fan power	kW	CT or unit controller
Supply air temperature	°F	Duct sensor or unit controller

Code Reference

The table below identifies current federal and California requirements that may affect the Base Case or Measure Case for this HPM. Applicability varies by equipment type and project scope. Where a related eTRM package exists, detailed applicability is in that package's *Code Requirements* section.

Applicable Codes and Standards

CODE	APPLICABLE CODE REFERENCE	EFFECTIVE DATE	CODE REVIEW DATE
2025 Title 24, Part 6 – Space-Conditioning Controls	**§110.2(b)**, controls for heat pumps with supplementary heaters in nonresidential and multifamily buildings, including Exceptions 1 and 2	January 1, 2026	November 2026
2025 Title 24, Part 6 – Thermostats	**§110.2(c)**, setback thermostats (four setpoint periods per 24 hours)	January 1, 2026	November 2026
2025 Title 24, Part 6 – Demand Management	**§110.12(a)**, demand responsive controls, including Reference Joint Appendix **JA5** (Occupant Controlled Smart Thermostats; certification per JA5.1.1)	January 1, 2026	November 2026
2025 Title 24, Part 6 – Multifamily Mandatory	**§160.3(a)1**, dwelling unit setback thermostats per §110.2(c), including the Exception to §160.3(a)2 for systems serving dwelling units and shared-provision common use areas; **§160.3(a)2Biv** and **§160.3(a)2C**, common use area thermostats (§110.12(a)) and heat pump controls (§110.2(b))	January 1, 2026	November 2026
2025 Title 24, Part 6 – Multifamily Mandatory	**§160.3(b)7**, dwelling unit heat pump defrost delay timer; **§160.3(b)8**, capacity variation with third-party thermostats for variable or multi-speed systems	January 1, 2026	November 2026

CODE	APPLICABLE CODE REFERENCE	EFFECTIVE DATE	CODE REVIEW DATE
2025 Title 24, Part 6 – Multifamily Prescriptive	**§170.2(c)3A**, heat pump (CZ 2–15) or dual-fuel heat pump (CZ 1 and 16) for buildings with four or more habitable stories; **§170.2(c)3B**, including the Exception to §170.2(c)3BiaIII (§110.12 thermostat when the RA3.2.3.2 verification procedure is used); **§170.2(c)4E, Exception 2**, heat pump capacity greater than 75% of the design heating load	January 1, 2026	November 2026
2025 Title 24, Part 6 – Multifamily Additions and Alterations	**§180.2(b)2Ai**, new or complete replacement dwelling unit systems (§160.3(a)1); **§180.2(b)2Aiva**, setback thermostats for altered dwelling unit systems; **§180.2(b)2Biiia**, demand responsive thermostats for altered common use area systems	January 1, 2026	November 2026
2025 Title 24, Part 6 – Nonresidential and Hotel/Motel	**§120.2(b)4**, thermostatic controls for single-zone air conditioners and heat pumps per §110.12(a); cited as the basis for *Measure Exclusions* item 1	January 1, 2026	November 2026
Federal Standards – 10 CFR Part 430	**§430.32(c)**, consumer central air conditioners and heat pumps (single-phase, under 65 kBtu/h; SEER2/HSPF2)	January 1, 2023	November 2026
Federal Standards – 10 CFR Part 431	**§431.97(i), Table 19**, air-cooled, three-phase commercial package air conditioners and heat pumps under 65 kBtu/h	January 1, 2025	November 2026
Federal Refrigerant Regulations – 40 CFR Part 84	**§84.54(c)(1)**, installation restriction on new residential and light commercial air-conditioning and heat pump systems with GWP of 700 or greater (excluding VRF); systems with all specified components manufactured or imported before January 1, 2025 may be installed until January 1, 2026	January 1, 2025	November 2026
CARB Refrigerant Regulations – 17 CCR	**§95374, Table 3**, GWP limit of 750 for new air-conditioning equipment	January 1, 2025	November 2026

*Single-family requirements cited elsewhere in this memo (§150.0(h)7 and §150.0(i)2) are for reference only and are not listed because they do not apply to high-rise multifamily buildings. Heat pump efficiency for equipment covered by 10 CFR Parts 430 and 431 is **federally preempted** and sets the equipment Base Case; thermostats are not covered by those standards. ENERGY STAR Smart Thermostats Version 2.0 (Draft 2, November 2024) remains in development and is tracked separately as a program reference. Newer standards, test methods under development, and active CASE proposals may be tracked separately as technical or Code Readiness references.*

Eligible Climate Zones, Building Types, and Project Scopes

Eligible Climate Zones

This high-performance measure applies statewide in **California Climate Zones 1–16** (Title 24). The climate zone is confirmed from the project's Title 24 compliance documentation.

Eligible Building Types

This high-performance measure applies to:

- **High-Rise Multifamily**: Buildings with **four (4) or more habitable stories above grade**, limited to **dwelling units and sleeping units** whose thermostats are subject to §160.3(a)1 (or §180.2(b)2A for alterations). This includes apartments, condominiums, dormitories, and residential care facilities (e.g., assisted living) that Title 24 classifies as multifamily (Occupancy Group R-2, nontransient congregate residences in Group R-3, and Group R-4).

Eligibility is based on the qualifying system and its code-required thermostat baseline, not building type alone. Nonresidential buildings, hotel/motel guest rooms, skilled nursing facilities, and multifamily common use areas are not eligible because Title 24 already requires a JA5 thermostat in those spaces (see *Measure Exclusions*).

Eligible Project Scopes

This high-performance measure applies to:

- **New construction**. Additions and alterations eligible for CEDA participation are covered under the new construction requirements.

This high-performance measure does not apply to (not in scope):

- **Low-rise residential** (single-family and multifamily ≤3 habitable stories above grade).
- Equipment replacement outside CEDA eligibility.

Measure Exclusions

The following are not eligible under this HPM:

1. **Spaces where Title 24 already requires a JA5 demand-responsive thermostat.** In these spaces the thermostat is code-required, so the increment this HPM adds is limited to configuration effort and does not support a stand-alone inducement. These spaces are excluded by design:
    - **Nonresidential buildings** (Occupancy Groups A, B, E, F, H, I, M, S, and U), per §120.2(b)4.
    - **Hotel/motel guest rooms** (Occupancy Group R-1), per §120.2(b)4; many also use packaged terminal heat pumps with integral controls (see item 5).
    - **Skilled nursing and other 24-hour medical care facilities** (Occupancy Group I-2), which follow the nonresidential standards, per §120.2(b)4.
    - **Multifamily common use areas** subject to §160.3(a)2, such as lobbies, fitness rooms, and leasing offices, per §160.3(a)2Biv (§180.2(b)2Biiia for alterations).
2. **Multi-zone and VRF systems**, including multi-split and grouped mini-split systems in which one outdoor unit serves more than one indoor unit. See the *Cold Climate Variable Refrigerant Flow* and *VRF Systems with Occupancy-Based Controls* HPMs.
3. **Dual-fuel or fuel-fired backup heat pump systems.**

4. **Equipment controlled through a building management system** that qualifies under the *Building Management Systems HPM*.
5. **Integral-control equipment that cannot meet §SDLR 1**, such as packaged terminal heat pumps, single-package vertical heat pumps, or room air-conditioner heat pumps whose heating staging is controlled only by unit controls that cannot be configured to the required lockout and cutoff settings.
6. **Default or unconfigured installations**, where a qualifying thermostat is installed with factory-default or installer-default heating settings that do not meet §SDLR 1.
7. **Reprogramming, setting changes, or routine maintenance** of existing thermostats or heat pumps that are not part of a qualifying CEDA project scope.
8. **Projects unable to document the configured settings** required by §SDR 1.4.
9. ***The same recovered energy, incremental cost, or performance benefit shall not be claimed under more than one CEDA HPM.***

Exclusion from this HPM does not necessarily mean exclusion from other CEDA offerings.

CEDA program administrators reserve the right to determine whether claimed measures constitute overlapping scope for the same equipment, controls integration, or monitoring infrastructure.

Reviewer Checklist

HPM Reviewer Checklist: LM401 – Single Zone Heat Pump with Smart Thermostat – V3

Checklist Description: This checklist captures the minimum design and post-installation elements used to confirm HPM inducement eligibility and identify projects for optional Code Readiness monitoring.

Project Name: _____ **Review Date:** _____

Assessment:

☐ Approved
☐ Not approved

Notes:

Reviewer: _____ **Signature:** _____

Reviewer Checklist – High-Performance Measure Requirements

Project Eligibility

☐ Project is new construction or a qualifying addition or alteration within CEDA program scope (*Eligible Project Scopes*).

☐ Project is a high-rise multifamily building in **CA CZ 1–16**, confirmed from Title 24 documents (§SDR 1.3).

Qualifying System Scope

☐ Each claimed zone is served by a **single-zone electric air-source heat pump** with supplementary electric resistance heat, serving a dwelling or sleeping unit whose thermostat is subject to §160.3(a)1 or §180.2(b)2A (§ME 1.1).

☐ Each claimed zone has its own qualifying thermostat controlling compressor and supplementary heat staging (§ME 1.2).

☐ Number of qualifying zones confirmed from schedules or submittals: _____ (§SDR 1.1).

Offering / Tier Selection

Check one pathway for each thermostat model; each zone is assigned to only one pathway, and an ENERGY STAR certified model is always claimed under ST-1 (§ME 2.2). Example: a project using an ENERGY STAR certified model in dwelling units and a non-certified commercial thermostat in common areas claims ST-1 for the dwelling-unit zones and ST-2 for the common-area zones.

☐ **Shared:** Thermostat configured per §SDLR 1 and settings recorded per §SDLR 2.1.

- ☐ **ST-1** – Model listed on the ENERGY STAR Product Finder, Version 1.0 or later (§ME 3.1).
- ☐ **ST-2** – JA5 compliant, with compressor-first staging, outdoor-temperature auxiliary heat lockout adjustable to ≤30°F, and stage runtime reporting (§ME 3.2).

Installation Verification

☐ Auxiliary heat lockout setpoint **≤30°F**; auxiliary heat above the setpoint only for defrost tempering or emergency/fault mode (§SDLR 1.1–1.2).

☐ Compressor cutoff **≤15°F** or disabled, or set at a documented manufacturer minimum, and below the lockout setpoint (§SDLR 1.3).

☐ Where the heating design outdoor temperature is above the lockout setpoint, the heat pump meets **100% of the design heating load** (§SDLR 1.4).

☐ Configuration record provided (startup, controls checkout, setup record, or screenshot); one per model and configuration (§SDR 1.4).

HPM Reviewer Checklist: LM401 – Single Zone Heat Pump with Smart Thermostat – V3

☐ Installation confirmed by nameplate photos or CEDA verification (§SDR 1.4).

Code and Scope Coordination

☐ Zone is not a nonresidential space, hotel/motel guest room, skilled nursing (I-2) space, or multifamily common use area (Excl. 1).

☐ Thermostat is not covered by an applicable deemed measure package (§ME 4.1).

☐ Heat pump equipment or defrost controls claimed under other measures exclude thermostat and configuration costs; no double counting (§ME 4.2, Excl. 9).

☐ System is not multi-zone/VRF, dual-fuel, BMS-controlled, integral-control-only, or default-configured (Excl. 2–6).

Supporting Documentation

☐ Equipment schedules and submittals (§SDR 1.1).

☐ Certification documentation for the claimed pathway (§SDR 1.2).

☐ Title 24 compliance documentation (§SDR 1.3).

☐ Cost information, as available (§SDR 1.5).

Note: Post-occupancy trend logging or extended monitoring is not required for HPM eligibility unless the project is separately selected for Code Readiness monitoring.

Version History Log

Version	Effective Date	End Date	Change Description
1	September 9, 2024	January 25, 2026	Initial release.
2	January 26, 2026	November 8, 2026	Updated format, measure requirements, code references, eligibility, exclusions, and reviewer checklist.
3	November 9, 2026	Active	Overhauled to the current HPM template. Narrowed scope to high-rise multifamily dwelling and sleeping units, where Title 24 requires only a setback thermostat. Consolidated the Essential and Premium tiers into a single tier with two thermostat pathways (ST-1 ENERGY STAR; ST-2 JA5 with heat pump functions). Removed code-duplicative requirements, including demand-response readiness. Added a ≤30°F auxiliary heat lockout and ≤15°F compressor cutoff. Simplified supporting documentation. Re-based IMC to eTRM SWHC039-09 cost data. Corrected measure code to LM401. Updated code references, exclusions, and reviewer checklist.

***Note**: The version identified as 'Active' is the current published version and remains in effect until superseded by a subsequent published version. CEDA may update, replace, or retire High-Performance Measures without prior notice. End dates are assigned to prior versions once superseded.*