High-Performance Measure Details

Measure Name
Cold Climate Air Source Heat Pump

Use Category
SH – Cold Climate Air to Air Heat Pump

Effective Date
November 9, 2026

Version
4

Measure Code
LM401

Measure Stage
Early Adoption & High Priority Data Collection

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Technology Summary

Cold climate air-source heat pumps (ccASHPs) are air-to-air heat pumps designed to maintain heating capacity and efficiency at low outdoor temperatures. They typically use **variable-capacity, inverter-driven compressors**, refrigeration-cycle enhancements, and controls that keep the compressor operating as the primary heat source in cold conditions. In CEDA projects, they commonly serve **high-rise multifamily dwelling units**, **multifamily common areas**, and **small nonresidential zones**. Configurations include ducted and non-ducted split systems, single-package units (including **dual duct packaged terminal heat pumps (DDPTHPs)**), **packaged terminal heat pumps (PTHPs)**, and **single package vertical heat pumps (SPVHPs)**. Variable-speed PTHPs and SPVHPs can now operate at 5°F and below without supplementary electric heat, which makes them a practical electrification option for space-constrained multifamily buildings.

Most California climate zones have moderate heating design temperatures, but cold-climate capability still matters. Equipment that holds capacity at low temperatures can be sized to carry the full heating load **without electric resistance backup**, operates more efficiently at part load through the heating season, and helps limit **winter peak demand growth** as space heating electrifies. These benefits are greatest in inland and mountain climate zones, where design temperatures approach or fall below freezing. At higher elevations, heat pump capacity also drops by roughly **3–4% per 1,000 feet**, which makes low-ambient capacity more important in mountain projects.

This HPM addresses four common gaps:

1. **Standard ratings do not show cold-weather performance.** HSPF2 reflects a single moderate reference climate, SEER2 is a cooling metric, and PTHP and SPVHP ratings report heating only at 47°F. None of these report heating capacity or efficiency at 5°F.
2. **Electric resistance backup can run more than needed.** For nonresidential and multifamily buildings, Title 24 §110.2(b) sets the operating order of compressor and supplementary heat but does not set an outdoor temperature lockout.
3. **Cold climate listings cover different product classes.** The ENERGY STAR Cold Climate designation applies only to single-phase central heat pumps below 65,000 Btu/h. The NEEP Cold Climate Air Source Heat Pump (ccASHP) Specification covers central heat pumps, PTHPs, and SPVHPs. Neither covers three-phase equipment below 65,000 Btu/h, and room heat pumps do not yet have a cold climate listing.
4. **Certification status is easy to misread.** The ENERGY STAR Cold Climate criteria set their own HSPF2 and SEER2 floors and do not include the EER2 floor that applies to base ENERGY STAR certification. AHRI Directory listings report the two statuses separately, so a model can carry the Cold Climate designation without being listed as ENERGY STAR certified.

The most relevant rating and certification references are **AHRI Standards 210/240, 310/380, and 390**; the federal test procedure in **10 CFR Part 430, Subpart B, Appendix M1**, including the H42 low-ambient test at 5°F; the **ENERGY STAR Program Requirements for Central Air Conditioners and Heat Pumps, Version 6.2**, including its Cold Climate criteria; and the **NEEP ccASHP Specification, Version 4.0**. NEEP is developing **Version 5.0** for central heat pumps and a **Cold Climate Room Heat Pump (ccRHP) Version 1.0** specification, which this HPM will incorporate by revision once published.

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:

- **Increasing market demand** by giving project teams and owners a straightforward, listing-based pathway for heat pumps that can carry the full heating load in cold conditions. This encourages designs that use the heat pump as the primary heat source rather than relying on electric resistance backup.
- **Increasing market supply and delivery capability** by encouraging designers and contractors to specify cold climate equipment across central, packaged terminal, and single package vertical product classes, and to configure supplementary heat lockouts at startup.
- **Building market partnerships and knowledge** by aligning with the ENERGY STAR and NEEP cold climate listings that programs and manufacturers already use, and by collecting feedback from designers, contractors, manufacturers, and verification staff on barriers to adoption.

- **Advancing innovation and accessibility** by supporting variable-capacity, cold-climate product categories, including space-saving equipment such as DDPTHPs, PTHPs, and SPVHPs that suit affordable and space-constrained multifamily projects.
- **Supporting Code Readiness and future market transformation** by identifying projects that can provide field data on low-ambient performance, supplementary heat use, defrost behavior, and installed cost. This information can inform future Title 24, deemed measure, and test-procedure activity.

CEDA Inducement Requirements

This HPM provides a **pathway** for **cold-climate-capable heat pumps** in CEDA-eligible **nonresidential and high-rise multifamily new construction** projects. Standard heat pumps are selected and rated around moderate conditions and can lose much of their heating capacity as outdoor temperatures drop, which leads designs to rely on electric resistance backup. This HPM supports equipment with **verified low-ambient performance** and controls that keep the **compressor as the primary heat source**.

Eligibility is based on recognized cold climate listings. Each equipment category qualifies through one pathway in *Table 1*: the **ENERGY STAR Cold Climate designation** or the **NEEP ccASHP Product List** for central heat pumps, the NEEP list for PTHPs and SPVHPs, and **CEDA performance criteria** for three-phase equipment, which neither listing covers. The qualifying listing or criteria are the **HPM performance quantity**. The **IMC normalization quantity** is **rated cooling capacity in tons**.

These listings exceed federal minimum efficiencies and add heating performance requirements at 5°F that are not part of federal or Title 24 requirements. The supplementary heat lockout in this HPM also goes beyond Title 24 §110.2(b), which sets the order of operation but not a lockout temperature.

The measure is **technology-neutral**: any compressor technology or product design that meets the applicable pathway qualifies. Project data on low-ambient performance and supplementary heat use can support Code Readiness learning. The HPM applies to **new construction**, including **additions and alterations eligible for CEDA participation**.

Measure Eligibility (ME) – All Projects

1. **Qualifying Scope**
   1.1. The project shall install one or more **single-zone air-source heat pumps** providing space heating and cooling, in an equipment category and qualification pathway listed in *Table 1*.

Table 1. *Eligible Equipment Categories and Qualification Pathways*

Pathway	Equipment Category	Federal Definition	AHRI Standard	Qualifies By
CC-1	Central air conditioning heat pump: split (ducted or non-ducted) or single-package, including DDPTHPs; single-phase, below 65,000 Btu/h	10 CFR 430.2	210/240	ENERGY STAR Cold Climate designation **or** NEEP ccASHP Product List (HP category)
CC-2	Three-phase air-cooled heat pump: split or single-package, below 65,000 Btu/h	10 CFR 431.92	210/240	CEDA performance criteria (§SDLR 1.2)
CC-3	Packaged terminal heat pump (PTHP) or single package vertical heat pump (SPVHP)	10 CFR 431.92	310/380 (PTHP) 390 (SPVHP)	NEEP ccASHP Product List (PTHP or SPVHP category)
Reserved	*Room heat pump: a room air conditioner that uses reverse cycle refrigeration as its primary heat source*	*10 CFR 430.2*	—	*NEEP ccRHP Specification, Version 1.0, once published (§ME 1.5)*

Notes: Single-package *in CC-1 means a central heat pump with all major assemblies in one cabinet, rated to AHRI 210/240. PTHPs and SPVHPs are separate federal equipment classes and qualify under CC-3.*

   1.2. **Single-zone** means each system serves one thermal zone through one indoor unit, or one packaged unit, and does not operate as an integrated multi-zone refrigerant system.
   1.3. The heat pump shall be the **primary space heating source** for the spaces it serves.
   1.4. Each claimed unit shall be assigned to **one pathway**, based on its federal equipment class.
   1.5. **Room heat pumps (reserved).** NEEP's ccRHP Specification, Version 1.0, is in development. Once it is published, CEDA will add room heat pumps listed under it through a documented HPM revision.

2. **Rating and Certification**
   2.1. Equipment shall be certified to the **AHRI standard** for its category (*Table 1*), with an AHRI Directory listing[1] that matches the **installed equipment**, including the outdoor and indoor unit combination for split systems.
   2.2. **CC-1:** The AHRI listing shall show the **ENERGY STAR Cold Climate designation**, **or** the installed combination shall be listed on the **NEEP ccASHP Product List**.[2] ENERGY STAR certification under the base (non-cold-climate) criteria is **not** required.[3]
   2.3. **CC-2:** The equipment shall meet the CEDA performance criteria in §SDLR 1.2.
   2.4. **CC-3:** The installed model shall be listed on the **NEEP ccASHP Product List** in the PTHP or SPVHP category.

3. **Performance Quantity**
   3.1. The HPM performance quantity is the **qualifying cold climate listing** (CC-1, CC-3) or the **CEDA performance criteria** (CC-2), summarized in *Table 2*.

[1] AHRI Directory of Certified Product Performance: https://www.ahridirectory.org/

[2] NEEP ccASHP Specification (Version 4.0) and Product List: https://neep.org/heating-electrification/ccashp-specification-product-list. NEEP is developing Version 5.0 for central heat pumps and a Cold Climate Room Heat Pump (ccRHP) Version 1.0 specification.

[3] The ENERGY STAR Cold Climate criteria set their own HSPF2 and SEER2 floors and do not include the EER2 floor that applies to base ENERGY STAR certification. AHRI Directory listings report base certification and the Cold Climate designation as separate fields. ENERGY STAR key product criteria: https://www.energystar.gov/products/air_source_heat_pumps/key-product-criteria

4. **Claim Pathway and Interaction with Other HPMs**
   4.1. Each unit shall be claimed under **either** this HPM **or** an applicable CA statewide deemed measure package, **not both**. CEDA will confirm the claim pathway for each unit during project review.
   4.2. DDPTHPs that meet this HPM shall be claimed under this HPM rather than **DMG-NT-1** of the *Heat Pump Deemed Measure Gap Pathway* HPM. DDPTHPs that do not meet this HPM may be evaluated under DMG-NT-1.
   4.3. For multifamily dwelling units, the thermostat serving a qualifying heat pump may also be claimed under the *Single Zone Heat Pump with Smart Thermostat* HPM, which covers the **thermostat only**. The heat pump equipment shall not be claimed under more than one HPM.
5. **Eligible Project Types and Climate Zones**
   5.1. As defined in *Eligible Climate Zones, Building Types, and Project Scopes*.
6. **Code Compliance**
   6.1. All projects shall comply with the **2025 Title 24, Part 6** requirements, applicable federal efficiency standards, applicable federal and CARB refrigerant GWP regulations, and applicable local codes.
   6.2. HPM requirements are intended to be **above code** and do not replace code compliance obligations.

System Design Level Requirements (SDLR) – Single Tier

These requirements apply to **new construction** and to **additions and alterations eligible for CEDA participation**. The cold climate criteria are based on the *ENERGY STAR Program Requirements for Central Air Conditioners and Heat Pumps, Version 6.2*, and the *NEEP ccASHP Specification, Version 4.0*. **The values in this memo govern eligibility**; later changes to either source, including NEEP Version 5.0, apply only through a documented HPM version revision. The **CC-2 criteria** and the **30°F lockout threshold** are **proposed CEDA criteria**; the lockout is consistent with the *Single Zone Heat Pump with Smart Thermostat* HPM.

1. **Cold Climate Performance**
   1.1. **CC-1:** Equipment shall carry the **ENERGY STAR Cold Climate designation** in its AHRI Directory listing, **or** be listed on the **NEEP ccASHP Product List** (HP category).
   1.2. **CC-2:** Three-phase equipment shall meet **all** of the following, which mirror the ENERGY STAR Cold Climate criteria:
      1.2.1. **HSPF2 ≥ 8.5** for non-ducted split systems, or **HSPF2 ≥ 8.1** for ducted split systems and single-package equipment, with **SEER2 ≥ 15.2**, per AHRI 210/240 certified ratings;
      1.2.2. **COP ≥ 1.75 at 5°F** at maximum capacity; and
      1.2.3. **heating capacity at 5°F ≥ 70%** of the nominal heating capacity at 47°F.
      1.2.4. 5°F performance shall be shown by AHRI-reported low-ambient test results where available, or by manufacturer-published extended performance data.
   1.3. **CC-3:** PTHPs and SPVHPs shall be listed on the **NEEP ccASHP Product List**, which requires a **variable-capacity compressor** and **COP ≥ 1.5 at 5°F** at maximum capacity.

Table 2. *Cold Climate Performance Criteria by Pathway (Summary for Reference)*

Pathway and Product Type	HSPF2	SEER2	COP at 5°F	Capacity at 5°F (% of 47°F)
CC-1: ENERGY STAR Cold Climate (Version 6.2)				
Split system, non-ducted	≥ 8.5	≥ 15.2	≥ 1.75	≥ 70%
Split system, ducted; single-package	≥ 8.1	≥ 15.2	≥ 1.75	≥ 70%
CC-1: NEEP ccASHP Specification (Version 4.0), HP category				
Non-ducted	≥ 8.5	≥ 15	≥ 1.75 (max. capacity)	—
Ducted	≥ 7.7	≥ 14.3	≥ 1.75 (max. capacity)	—
CC-2: CEDA Performance Criteria (Three-Phase)				
Split system, non-ducted	≥ 8.5	≥ 15.2	≥ 1.75 (max. capacity)	≥ 70%
Split system, ducted; single-package	≥ 8.1	≥ 15.2	≥ 1.75 (max. capacity)	≥ 70%
CC-3: NEEP ccASHP Specification (Version 4.0), PTHP and SPVHP categories				
PTHP; SPVHP	—	—	≥ 1.5 (max. capacity)	—

Notes: ENERGY STAR measures COP and capacity at 5°F with the Appendix M1 H42 test and also requires a controls verification procedure; no EER2 criterion applies to the Cold Climate designation. NEEP Version 4.0 also requires a variable-capacity compressor (three or more operating speeds, or continuously variable) for the HP, PTHP, and SPVHP categories. For CC-1 and CC-3, the AHRI Directory or NEEP Product List listing, not this summary, determines eligibility.

2. **Supplementary Heat Controls**
   - 2.1. Where supplementary electric resistance heat is installed, it shall be **locked out at outdoor air temperatures above 30°F**.
   - 2.2. Above the lockout setpoint, supplementary heat may operate **only** for defrost tempering or in emergency or compressor-fault mode.
   - 2.3. Where a compressor low-ambient cutoff can be configured, it shall be set **at or below** the lockout setpoint, so compressor heating remains available at every outdoor temperature where supplementary heat is locked out.
   - 2.4. 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.
3. **Dual Duct Packaged Terminal Heat Pumps**
   - 3.1. DDPTHPs shall be configured **without internal electric resistance heating**, and **no separate electric resistance space heating** shall serve the same dwelling unit or space, consistent with DMG-NT-1 of the *Heat Pump Deemed Measure Gap Pathway* HPM.
4. **Functional Verification**
   - 4.1. The supplementary heat lockout and compressor cutoff setpoints (where configurable) shall be **set and recorded** during startup, commissioning, or controls checkout.

Supporting Documentation Requirements (SDR)

Documentation already included in the project drawings, schedules, submittals, control sequences, Title 24 compliance documents, or cost estimate **does not need to be duplicated**. This section identifies the **minimum information needed to verify** the equipment category, the qualifying listing or criteria, and the supplementary heat controls.

1. **Construction Documents**
   - 1.1. Mechanical **schedules and plans** identifying each claimed unit, including **equipment tags**, **manufacturer**, **model numbers** (outdoor and indoor for split systems), **rated capacity**, **electrical phase**, **spaces served**, and any **supplementary heat**.
2. **Equipment Certification and Listing**
   - 2.1. An **AHRI Directory certificate** for each installed model or outdoor and indoor combination.
   - 2.2. **CC-1:** The AHRI certificate showing the **ENERGY STAR Cold Climate designation**, **or** the **NEEP ccASHP Product List** listing for the installed combination. An ENERGY STAR product finder listing is not required.
   - 2.3. **CC-2: Manufacturer-published extended performance data** showing heating capacity and COP at 5°F and nominal heating capacity at 47°F, unless these values appear on the AHRI certificate.
   - 2.4. **CC-3:** The **NEEP ccASHP Product List** listing for the installed PTHP or SPVHP model.
3. **Title 24 Compliance Documentation**
   - 3.1. The project's **Title 24, Part 6 compliance documents** applicable to the claimed equipment.
   - 3.2. Where §SDLR 2.4 applies, the **design heating load** and the heat pump's **heating capacity at the heating design temperature**, as already shown in load calculations, equipment schedules, or selection data.
4. **Supplementary Heat Controls**
   - 4.1. Where supplementary heat is installed, a **startup, commissioning, or controls checkout record**, or a controls submittal, showing the **lockout and compressor cutoff setpoints**.
5. **Dual Duct Packaged Terminal Heat Pumps**
   - 5.1. A manufacturer submittal or model number nomenclature confirming the ordered configuration has **no internal electric resistance heat**, and plans or schedules showing **no separate electric resistance space heating** serving the same dwelling unit or space.
6. **Installation Verification**
   - 6.1. **Nameplate photos** showing model and serial numbers, or equivalent confirmation during CEDA verification, demonstrating that installed equipment **matches the submitted models**.
7. **Cost Information**
   - 7.1. Equipment and installation **cost information as available**, such as itemized invoices, pay applications, schedules of values, or contractor estimates. Fully itemized invoices are not required.

Incremental Measure Cost

The Incremental Measure Cost (IMC) values below are **program calibration inputs** used to support CEDA inducement development and cost-cap screening. They represent normalized estimates of the incremental first cost of installing equipment that meets this HPM's requirements, relative to code-minimum equipment of the same type and capacity.

These values are intended for program planning and inducement calibration only. They are **not** contractor bids, project estimates, or reconciliation values, and actual project costs will vary with equipment selection, site conditions, and market factors.

IMC values are derived **primarily from the cost data in CPUC-approved deemed measure packages** for the same equipment classes, effective January 1, 2026, using the offering closest to the Cold Climate performance level for each equipment type. This keeps the IMC basis consistent with the deemed pathway each unit could otherwise be claimed under. Values will be **revisited as CEDA obtains participating-project cost data**.

Base Case

The Base Case is a **code-minimum heat pump of the same type and capacity**, meeting the federal minimum efficiency for its equipment class: **SEER2 14.3 and HSPF2 7.5** for single-phase split systems and **SEER2 13.4 and HSPF2 6.7** for single-phase single-package equipment under 10 CFR 430.32(c), and the applicable 10 CFR 431.97 minimums for three-phase equipment, PTHPs, and SPVHPs. Code-required controls, including those under Title 24 §110.2(b), are included and not counted as incremental cost. Because each unit is claimed under either this HPM or a deemed package (§ME 4.1), the Base Case is code-minimum equipment, not a deemed-qualifying unit.

Measure Case

The Measure Case is a heat pump that qualifies through a pathway in *Table 1* and meets the System Design Level Requirements. Incremental cost is limited to the **higher-performance equipment premium**. Installation labor is assumed **equal** in both cases, consistent with the referenced deemed packages. Supplementary heat lockout setup is part of normal startup, and no additional commissioning scope is required by this HPM.

IMC Values and Normalization

IMC values are normalized to **$/ton of rated cooling capacity**. This unit matches the claim unit used by the referenced deemed packages and the AHRI-listed capacity, and it tracks the primary cost driver, since equipment price scales with capacity.

IMC = *(Measure Material + Measure Labor) − (Base Material + Base Labor)*

Table 3. *Incremental Measure Cost by Equipment Type*

Offering	Unit	Base Material	Base Labor	Measure Material	Measure Labor	Full Measure Cost	IMC
CC-1/CC-2 split, non-ducted (SWHC050-08)	ton	$1,087	Equal[1]	$2,746	Equal[1]	—	**$1,659**
CC-1 split, ducted; single-package, excluding DDPTHPs (SWHC049-08)	ton	$1,296	$470	$1,783	$470	$2,253	**$487**
CC-1 DDPTHP (CalNEXT ET23SWE0038)	ton	$3,614	$1,807[2]	$3,976	$1,807[2]	$5,783	**$361**
CC-2 split, ducted (SWHC014-09)	ton	$1,354	$1,201	$1,703	$1,201	$2,904	**$349**
CC-2 single-package (SWHC014-09)	ton	$1,261	$1,201	$1,722	$1,201	$2,923	**$461**
CC-3 PTHP (SWHC027-08)	ton	$1,329	$619	$1,636	$619	$2,255	**$307**
CC-3 SPVHP (SWHC014-09 proxy[3])	ton	$1,261	$1,201	$1,722	$1,201	$2,923	**$461**

[1] SWHC050 itemizes labor identically for base and measure cases.

[2] Planning assumption carried over from DMG-NT-1 (CalNEXT ET23SWE0038), applied equally to both cases.

[3] Proposed CEDA calibration assumption. No deemed measure package covers SPVHPs; the SWHC014-09 packaged heat pump offering is the closest single-package commercial equivalent.

Values are rounded to the nearest dollar; IMC values are calculated from unrounded package costs.

Calculation basis*:* For each offering, the IMC is the difference between the published measure case and base case costs for the **matching offering** in the referenced deemed measure package. It follows that package's cost methodology and markups; see the referenced eTRM measure for details.

- **Non-ducted split systems (CC-1 and CC-2)** use the SWHC050-08 tier 5 offering (**SEER2 ≥ 17.8, HSPF2 ≥ 8.5**), whose HSPF2 matches the Cold Climate non-ducted floor: **($905.16 – $358.28) × 2.41 × 1.259 = $1,659/ton**, applying the package's contractor markup and overhead and profit factors.
- **Ducted split and single-package systems (CC-1)** use the SWHC049-08 heat pump offering at **SEER2 ≥ 16.9, HSPF2 ≥ 8.1**, the first offering that meets the Cold Climate ducted and single-package floor: **($1,370.00 – $995.90) × 1.259 × 1.0335 = $487/ton**, applying the package's overhead and profit and city cost index factors. Labor is $373.28 × 1.259 = $470/ton in both cases.
- **Offering selection** is consistent with the average ratings of NEEP-listed products reported by NREL (about HSPF 11.2 and SEER 22.1 for non-ducted single-zone systems, and HSPF 9.7 and SEER 17.6 for centrally ducted systems), so typical cold climate products meet or exceed these offerings.
- **Three-phase ducted split and single-package systems (CC-2)** use SWHC014-09, which covers commercial unitary equipment below 65 kBtu/h, at the **SEER2 ≥ 17.1** offering. SWHC014 offerings are not keyed to HSPF2, so this offering is selected as the closest SWHC014 match to the SEER2 of the SWHC049 offering that meets the Cold Climate HSPF2 floor (*proposed CEDA calibration assumption*): split **$1,703.10 – $1,354.19 = $349/ton** and packaged **$1,721.86 – $1,260.78 = $461/ton**, with labor of $1,200.75/ton in both cases. Non-ducted three-phase split systems use the SWHC050-08 value.
- **PTHPs (CC-3)** use SWHC027-08 heat pump costs: **$1,636.05 – $1,328.65 = $307/ton**, with labor of $70.78/hour × 1.283 inflation adjustment × 6.82 hours = $619/ton in both cases. The SWHC027 measure case is a higher-efficiency PTHP and does not itemize the variable-capacity premium; the result is consistent with the CalNEXT premium for comparable variable-speed DDPTHPs ($361/ton).
- **SPVHPs (CC-3)** use the SWHC014-09 packaged heat pump value (**$461/ton**) as a proxy (*proposed CEDA calibration assumption*).

- **DDPTHPs** use the same CalNEXT ET23SWE0038 basis as DMG-NT-1 (**$250/unit ÷ 0.692 ton = $361/ton**), so the IMC does not change when a DDPTHP is claimed under this HPM instead of DMG-NT-1 (§ME 4.2).
- The deemed package costs reflect the HSPF2 and SEER2 premium. The incremental cost of 5°F performance is not itemized separately in those packages and will be revisited with participating-project cost data.

These values represent typical incremental costs for new construction, including additions and alterations eligible for CEDA participation. They are intended for **program inducement calibration**, not project-specific cost reconciliation.

Sources

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

- eTRM SWHC049-08, *Ducted AC and HP HVAC Equipment, Residential* (2026): https://www.caetrm.com/measure/SWHC049/08/
- eTRM SWHC050-08, *Ductless Heat Pump, Residential* (2026): https://www.caetrm.com/measure/SWHC050/08/
- eTRM SWHC014-09, *Unitary Air-Cooled AC or HP, Under 65 kBtu/hr, Commercial* (2026): https://www.caetrm.com/measure/SWHC014/09/
- eTRM SWHC027-08, *Package Terminal Air Conditioner or Heat Pump, Under 24 kBtu/hr* (2026): https://www.caetrm.com/measure/SWHC027/08/
- CalNEXT, *Double Duct Packaged Terminal Heat Pump Field Demonstration*, ET23SWE0038 (2026): ET23SWE0038 Final Report
- NREL, *Cold Climate Air Source Heat Pumps (ccASHPs) Technology*, NREL/TP-7A40-83290 (2022), used for offering selection only: https://www.nrel.gov/docs/fy22osti/83290.pdf

Code Readiness Objectives

This measure supports CEDA's Code Readiness role by generating **field evidence on how cold-climate-capable heat pumps perform in California new construction**. Most heating hours in California occur at moderate outdoor temperatures, yet winter peak demand and electric resistance backup remain concerns as space heating electrifies. Title 24, Part 6 sets the operating order of compressor and supplementary heat in nonresidential and multifamily buildings but **not an outdoor temperature lockout**, and federal headline ratings do not report low-ambient capacity. Project data can inform future code, deemed measure, and program decisions on both points.

Routine CEDA verification under this HPM is limited to the documentation in the *Supporting Documentation Requirements*. Deeper field monitoring applies **only** to projects **separately selected** for Code Readiness activities.

The objectives include the following:

- **Compare field heating capacity and COP at low outdoor temperatures** with rated and listed values across climate zones and elevations, including Climate Zone 16.
- **Characterize variable-speed PTHPs and SPVHPs** in multifamily applications, where product data and field experience are still limited.
- **Quantify supplementary heat runtime and energy**, and confirm that lockout and compressor cutoff setpoints persist after occupancy.
- **Evaluate whether cold climate equipment reduces annual energy use in moderate California climates** compared with standard heat pumps, through better part-load efficiency.

- **Characterize defrost frequency and duration** and their effect on delivered heating and comfort.
- **Document sizing practice**, including how often designs meet 100% of the design heating load without supplementary heat.
- **Collect installed cost and contractor experience data** to recalibrate IMC values, including the cost of 5°F performance.

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:

- Field-based assumptions on **low-ambient capacity and efficiency** for California climate zones and elevations.
- Evaluation of a **supplementary heat lockout threshold** for nonresidential and multifamily heat pumps in future Title 24 cycles.
- Future **deemed measure development** for cold climate heat pumps, including PTHPs, SPVHPs, and DDPTHPs.
- **Sizing guidance** for heat pumps designed to carry the full heating load.
- **Recalibration of IMC values** using participating-project cost data.

Sample Data Points

A sample set of data points is provided below for reference. This list will be re-developed for each project based on the available infrastructure and the needs of the monitoring effort.

Data Point	Unit	Additional Specifications
Minimum/Core Data Points		
Heat pump electric power and energy	kW, kWh	Outdoor and indoor units, or packaged unit; 1- to 15-minute intervals
Supplementary electric resistance heat power	kW	Separate current transducer on the heater circuit, where installed
Outdoor air dry-bulb temperature	°F	On-site sensor or equipment-reported value
Supply and return air temperature	°F	At the indoor unit, air handler, or packaged unit

Data Point	Unit	Additional Specifications
Operating mode	Heat / Cool / Defrost / Aux / Off	From the equipment controller, thermostat, or BAS
Zone air temperature and setpoint	°F	From the thermostat or zone sensor
Calculated/Derived Metrics		
Delivered heating and cooling capacity	Btu/h	Airflow × ΔT
Operational efficiency	COP / EER	Per interval, binned by outdoor temperature
Heat pump share of heating energy	%	Compressor versus supplementary heat
Part-load ratio	%	Delivered load versus rated capacity
Optional/Technology-Specific Data Points		
Defrost events and duration	count, min	From the controller or inferred from mode and power data
Indoor fan airflow and power	CFM, W	Spot measurements across fan speeds
Space humidity	°F dew point	Report dew point or humidity ratio; pair RH with dry-bulb temperature
Configured lockout and cutoff setpoints	°F	From the controller or thermostat configuration

Code Reference

Applicable Codes and Standards

The table below identifies current federal and California regulatory requirements that may affect the Base Case or Measure Case for this HPM. Applicability varies by **equipment type, building type, and project scope**.

CODE	APPLICABLE CODE REFERENCE	EFFECTIVE DATE	CODE REVIEW DATE
CA Building Energy Efficiency Standards – Title 24, Part 6	**§110.2(b)**, controls for heat pumps with supplementary heaters; §110.2(c), thermostats	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	§110.12(a) and **§120.2(b)4**, demand responsive controls and single-zone thermostatic controls (nonresidential)	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	**§140.4(g)**, electric resistance space heating (nonresidential prescriptive)	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	**§160.3(c)**, heat pump controls in multifamily buildings	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	§141.0(b)2Cii, **Table 141.0-E-1**, space-conditioning system requirements for alterations	January 1, 2026	November 2026
Federal Standards – 10 CFR Part 430	**§430.32(c)**, consumer central air conditioners and heat pumps under 65 kBtu/h, including single-package units and DDPTHPs certified as single-package heat pumps	January 1, 2023	November 2026
Federal Standards – 10 CFR Part 430	§430.23(m) and **Subpart B, Appendix M1**, SEER2/HSPF2 test procedure, including the H42 low-ambient test at 5°F	July 7, 2025	November 2026
Federal Standards – 10 CFR Part 431	**§431.97(i), Table 19**, commercial three-phase air conditioners and heat pumps under 65 kBtu/h (CC-2)	January 1, 2025	November 2026

CODE	APPLICABLE CODE REFERENCE	EFFECTIVE DATE	CODE REVIEW DATE
Federal Standards – 10 CFR Part 431	**§431.97**, minimum efficiency standards for packaged terminal heat pumps and single package vertical heat pumps (CC-3)	Varies by equipment class	November 2026
Federal Refrigerant Regulations – 40 CFR Part 84	**§84.54(c)(1)**, GWP limit of 700 for residential and light commercial AC and HP systems, excluding VRF. Systems with all components manufactured or imported before January 1, 2025 may continue to be installed (91 FR 31284)	January 1, 2025 (amended July 27, 2026)	November 2026
CARB Refrigerant Regulations – 17 CCR	**§95374, Table 3**, GWP limit of 750 for new air-conditioning equipment	January 1, 2025	November 2026

Note: The ENERGY STAR Program Requirements for Central Air Conditioners and Heat Pumps, Version 6.2*, and the* NEEP ccASHP Specification, Version 4.0*, are voluntary specifications. This HPM references them as the performance basis for eligibility, not as code requirements. Newer versions, including NEEP Version 5.0 and the NEEP ccRHP Specification, are tracked separately and apply only through a documented HPM revision.*

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). Projects in Climate Zones 5, 11, 13, 14, and 16 are of particular interest for Code Readiness data collection. 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**, including **dwelling units** and **common areas**.
- **Nonresidential: commercial, public, agricultural, and industrial** facilities where single-zone equipment serves individual zones (e.g., offices, classrooms, lodging, and support spaces).

Eligibility is based on the **qualifying equipment and pathway** (*Table 1*), not on building type alone.

Eligible Project Scopes

This high-performance measure applies to:

- **New construction**, including **additions and alterations eligible for CEDA participation**, which are covered under the same requirements as new construction.

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

- **Low-rise residential** (single-family and multifamily with three or fewer habitable stories above grade).
- **Equipment replacement** projects that do not meet CEDA participation eligibility.

Measure Exclusions

The following are **not** eligible under this HPM:

1. **Equipment that does not qualify through a pathway in *Table 1***, such as central heat pumps without the ENERGY STAR Cold Climate designation or a NEEP listing, PTHPs and SPVHPs not on the NEEP list, and three-phase equipment that does not meet §SDLR 1.2.
2. **Room air conditioners and room heat pumps** certified under the federal room air conditioner product class, until the reserved pathway is added through an HPM revision (§ME 1.5).
3. **Equipment rated at or above 65,000 Btu/h** and **multi-zone systems**, including multi-split systems with one outdoor unit serving multiple indoor units through a shared refrigerant circuit, variable refrigerant flow (VRF) systems, and other AHRI 1230-certified systems.
4. **Water-source, ground-source, water-to-water, and air-to-water heat pumps**, and heat pumps used primarily for process heating or service water heating.
5. **Non-heat-pump equipment**, including air conditioners without heat pump operation, fuel-fired equipment, and electric resistance heating equipment.
6. **DDPTHPs configured with internal electric resistance heat**, or installed with separate electric resistance space heating serving the same dwelling unit or space (§SDLR 3.1).
7. **Equipment claimed under a CA statewide deemed measure package.** Each unit is claimed under either a deemed package or this HPM, not both (§ME 4.1).
8. **Equipment claimed under another CEDA HPM**, including the *Defrost Controls for Air-to-Air Heat Pump* HPM and DMG-NT-1 of the *Heat Pump Deemed Measure Gap Pathway* HPM. Thermostat-only claims under the *Single Zone Heat Pump with Smart Thermostat* HPM are permitted as described in §ME 4.3.
9. **Minor maintenance, like-for-like equipment replacement**, and projects outside CEDA participation eligibility.
10. **Equipment that cannot be documented** with the information required in the *Supporting Documentation Requirements*.
11. **Double counting.** *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. Multi-zone and VRF systems may be evaluated under the *Cold Climate Variable Refrigerant Flow* HPM or the *Heat Pump Deemed Measure Gap Pathway* HPM, and DDPTHPs certified as room air conditioners may be evaluated under DMG-NT-1, as applicable.

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 – Cold Climate Air Source Heat Pump – V4

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

Use this checklist to confirm that the submitted project scope, design documents, and supporting documentation demonstrate compliance with this HPM. Review only the items applicable to the claimed scope.

Project Eligibility

☐ Nonresidential or high-rise multifamily (**4+ habitable stories**) new construction, including CEDA-eligible additions and alterations (§ME 5; *Eligible Project Scopes*)

☐ Climate zone confirmed from Title 24 documents (*Eligible Climate Zones*)

Qualifying System Scope

☐ **Single-zone** air-source heat pump **below 65 kBtu/h**, assigned to **one pathway** by federal equipment class (§ME 1.1–1.4; *Table 1*; Excl. 1–3)

☐ Heat pump is the **primary space heating source** for the spaces served (§ME 1.3)

☐ Unit is **not** claimed under a deemed measure package or another CEDA HPM; SZHP thermostat-only claims allowed (§ME 4.1–4.3; Excl. 7, 8)

Cold Climate Performance *(select one per unit)*

☐ AHRI listing matches the **installed equipment** or outdoor and indoor combination (§ME 2.1)

- ☐ **CC-1** (single-phase central HP): **ENERGY STAR Cold Climate designation** on the AHRI listing **or** listed on the **NEEP ccASHP Product List**; base ENERGY STAR certification **not** required (§ME 2.2; §SDLR 1.1)
- ☐ **CC-2** (three-phase HP): **HSPF2 ≥ 8.5** non-ducted or **≥ 8.1** ducted/single-package, **SEER2 ≥ 15.2**, **COP ≥ 1.75** and **≥ 70% capacity** at 5°F (§SDLR 1.2)
- ☐ **CC-3** (PTHP or SPVHP): listed on the **NEEP ccASHP Product List** in the PTHP or SPVHP category (§ME 2.4; §SDLR 1.3)

Supplementary Heat Controls *(where supplementary heat is installed)*

☐ Supplementary heat **locked out above 30°F**, except defrost tempering or emergency/compressor-fault mode (§SDLR 2.1–2.2)

☐ Compressor cutoff set **at or below** the lockout setpoint, where configurable (§SDLR 2.3)

☐ Heat pump meets **100% of the design heating load** where the design temperature is above the lockout setpoint (§SDLR 2.4)

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☐ Lockout and cutoff setpoints **recorded** at startup, commissioning, or controls checkout (§SDLR 4.1)

DDPTHPs *(if applicable)*

☐ **No internal electric resistance heat**, and no separate electric resistance space heating serving the same dwelling unit or space (§SDLR 3.1; Excl. 6)

Code and Scope Coordination

☐ Complies with Title 24, federal efficiency standards, and refrigerant GWP regulations (§ME 6.1)

☐ Normalization quantity recorded: **rated cooling tons** per equipment type

Supporting Documentation

☐ Schedules and plans showing tags, manufacturer, models, capacity, electrical phase, spaces served, and supplementary heat (§SDR 1)

☐ AHRI certificate, plus the qualifying ENERGY STAR or NEEP listing (CC-1, CC-3) or extended performance data (CC-2) (§SDR 2)

☐ Title 24 compliance documents, plus design heating load and capacity where §SDLR 2.4 applies (§SDR 3)

☐ Lockout and cutoff setpoint record or controls submittal, where supplementary heat is installed (§SDR 4)

☐ DDPTHP configuration documentation, where applicable (§SDR 5)

☐ Installed models match the submittals, by nameplate photos or CEDA verification (§SDR 6)

☐ Cost information, as available (§SDR 7)

Note: Deeper trend logging or metering is required only if the project is separately selected for Code Readiness monitoring.

Version History Log

Version	Effective Date	End Date	Change Description
1	June 14, 2023	May 16, 2024	Initial release.
2	May 17, 2024	February 08, 2026	Removed VRF systems into separate measure.
3	February 09, 2026	November 8, 2026	Updated format, established Essential/Premium tier requirements and supporting documentation; added incremental cost, updated code references, added eligibility/exclusions and created reviewer checklist.
4	November 9, 2026	Active	**Removed the base ENERGY STAR certification requirement**; central heat pumps now qualify with the ENERGY STAR Cold Climate designation or a NEEP ccASHP Product List listing, and PTHPs and SPVHPs qualify through the NEEP list. Added a CEDA performance pathway for three-phase heat pumps and reserved a pathway for cold climate room heat pumps. Consolidated the tiers into a single tier; added a supplementary heat lockout, DDPTHP treatment, and deemed claim-pathway language; rebased the IMC on eTRM cost data; and updated to the current memo format.

***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.*