High-Performance Measure Details

Measure Name
Circuit-Level Metering for High-Rise Multifamily

Use Category
Building Metering – Circuit-Level Metering

Effective Date
December 08, 2025

End Date
N/A

Version
2

Measure Code
LM425

Measure Stage
Early Adoption & High Priority Data Collection

Metering Interest Level
High

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Technology Summary

Multifamily building circuit-level electrical metering provides the ability to collect and analyze data from multifamily residential buildings. Metering this information can help reduce overall spikes in power use and energy cost by providing insight into energy use trends on a per resident level. This measure highlights the importance of focusing on systems within a dwelling unit, from the larger systems (space heating, cooling and DHW) to the smaller systems (kitchen equipment).

For each residence in a multifamily building, electrical metering is installed inside the electrical panel on specific end-use circuits, such as kitchen appliances, hot water heaters, lighting, and/or household equipment. The metering utilizes small current transformers (CT) to measure the current (amps) consumed by each circuit at a high frequency. The metering will also capture data to measure power for the whole electrical panel. An alternative configuration utilizes smart panels that have the end-use load metering and monitoring capabilities built-in, preventing the need for external metering equipment.

Alignment with CEDA Program Goals

The CEDA program supports the implementation of energy efficiency measures that support Code Readiness's Long Term Tactical Plan (LTTP) to drive the goals of electrification, decarbonization, and load reduction.

Projects must meet one of the CEDA Inducement Requirements identified in the next section to receive an inducement and will be evaluated for level of interest in metering to support Code Readiness Objectives.

This measure meets the CEDA program goals as follows:

- **Building partnerships with market stakeholders** by consulting on innovative technologies and best practices in energy efficiency, which can lead to the development of more effective solutions and accelerate the adoption of new technologies. As teams adopt the measure, this increases the volume of engineers able to design the equipment, contractors capable of installing the equipment, and owners able to operate the equipment.
- **Increasing the supply of high-performance measures and all-electric buildings** by combining electrification with energy efficiency, which can result in projects implementing measures to achieve greater energy savings, reduced emissions, and overall improved building performance. As more buildings specify and install circuit-level metering technologies, this helps to increase the overall supply of these technologies in the market for others to use, including beyond new construction.
- **Increasing the demand for high-performance measures and all-electric buildings** by pushing for electrification that drives the need for technological advancements, supporting economic growth opportunities through innovation, and raising awareness of the benefits of electrification to increase consumer adoption. As demand in the market increases for newer technologies, the long-term benefit is increased demand for manufacturers and suppliers to provide additional options available in the market.
- **Advancing new high-performance measure technology** by raising public awareness about new technologies and their benefits, helping build acceptance and demand through market support advocacy efforts that can influence stakeholder decisions that enable technological innovation.
- **Providing Codes & Standards with projects of interest** to collect metered data that will inform future California energy codes.

CEDA Inducement Requirements

The inducement requirements listed below are intended to support the adoption of this metering measure. This measure is focused on gathering additional information on how dwelling units perform with their installed equipment to help inform future code cycles. This measure also supports energy efficiency through recognizing out of place trends and decreasing utility costs for residents. Projects receive inducements based on amount of metered square footage. Projects must satisfy one of the system-level design requirements and provide the required supporting documentation specified below to be eligible for an inducement.

System Design Requirements

1. **Essential level:** Current Transformers
   - 1.1. Install circuit-level metering current transformer (CT) devices in electrical panels for at least 25% of dwelling units (units selected should be representative).
   - 1.2. Design panels to separately meter circuits for each load type required by Title 24, Part 6 (2025), Section 160.6, Table 160.6-B (e.g., lighting, HVAC, plug loads, DHW).
   - 1.3. Provide adequate space in panels for CTs and metering devices so panels close fully and meet NEC/CEC clearance requirements.

1.4. Install equipment per the manufacturer's latest instructions.
1.5. Provide a native data platform with API access or data export capability and support automated data transfer via MQTT, BACnet/IP, Modbus/TCP, or REST API.
1.6. Provide circuit-level energy data at 60-second intervals or faster (near real-time).

2. **Premium level:** Smart Electrical Panels
   2.1. Install smart electrical panels in at least 25% of dwelling units, defined as panels with:
      2.1.1. Integrated circuit-level metering
      2.1.2. Native wired or wireless communication
      2.1.3. Capability to support demand response or load-shedding
   2.2. Design panels to separate meter circuits for each load type required by Title 24, Part 6 (2025), Section 160.6, Table 160.6-B (e.g., lighting, HVAC, plug loads, DHW).
   2.3. Provide a native data platform with API access or data export capability and support automated data transfer via MQTT, BACnet/IP, Modbus/TCP, or REST API.
   2.4. Provide circuit-level energy data at 60-second intervals or faster (near real-time).

Supporting Documentation Requirements

1. **System Design Summary**
   1.1. Product specifications (datasheets and submittals) showing communication protocols and supported Application Programming Interfaces (APIs).
   1.2. System schematic diagrams including:
      1.2.1. One-line electrical diagrams with CT placement and circuit segmentation (where applicable)
      1.2.2. Panel schedules
      1.2.3. Communication backbone layout
2. **Operational Evidence**
   2.1. Photographs showing:
      2.1.1. Installed CTs inside electrical panels (where applicable)
      2.1.2. Metering devices with model/serial numbers visible
   2.2. Screenshots of live system interface showing:
      2.2.1. Main dashboard with circuit-level energy usage
      2.2.2. At least one week of recorded data with timestamps
3. **System Cost**
   3.1. Provide costs broken out by:
      3.1.1. Equipment
      3.1.2. Installation labor
      3.1.3. Commissioning (if applicable)

Code Readiness Objectives

The objectives of Code Readiness site monitoring are to understand the first costs, operating costs, energy usage, peak demand, and indirect benefits associated with the metering of end use equipment.

- Update multifamily building dwelling unit end-use load shapes and operational assumptions for statewide energy use estimation and code enhancements.
- Enhance requirements for regulated thermal system load shifting capabilities in multifamily buildings to cost-effectively shift demand to lower average energy costs and increase grid reliability.
- Require that major multifamily appliances regulated by Title 20 be equipped with load-shifting capabilities.

Data Benefits

- The data will directly help the codes and standards advocacy team support the adoption of more stringent efficiency and peak demand requirements for multifamily buildings. Ultimately, the availability of this data, therefore, will support changes that lead to reduced operating costs of multifamily building systems, such as space heating and cooling heat pumps and domestic hot water heat pumps.
- The data would be used to create higher quality and standardized demand profiles for energy use in multifamily buildings. Unregulated loads like appliances and equipment will indirectly impact regulated building systems like heat pumps. Understanding and anticipating these unregulated loads will create opportunities to predict the building load and its effect on the grid during times when electrical usage is estimated to be high. Such information could lead to greater adoption of thermal storage devices, for example, where heating or cooling capacity is trickle-charged and avoids operating a heat pump at peak demand instances, reducing the stress on the electrical grid.
- Further, the data could inform enhancements to appliance standards in Title 20 and appliance capabilities to modulate electrical demand. Many appliances are now equipped with programmability or scheduling and trends of real electrical demands for those appliances could inform how effectively those appliances could be controlled.

Code Reference

2025 CA Title 24, Part 6, Section 160.6 – Mandatory Requirements for Electric Power Distribution Systems

160.6(a) Service electrical metering*:*

Each electrical service or feeder that provides power to the common use areas (interior and exterior) shall have a permanently installed metering system that measures electrical energy use in accordance with Table 160.6-A.

***Exception to Section 160.6(a):** Service or feeder for which the utility company provides a metering system for the multifamily building that indicates instantaneous kW demand and kWh for a utility-defined period.*

Table 160.6-A - Minimum requirements for metering or submetering electrical load

Metering Functionality	Electrical Services [1] rated 50 kVA or less	Electrical Services rated more than 50 kVA and less than or equal to 250 kVA	Electrical Services rated more than 250 kVA and less than or equal to 1000 kVA	Electrical Services rated more than 1000 kVA
Instantaneous (at the time) kW demand	Required	Required	Required	Required
Historical peak demand (kW)	Not required	Not required	Required	Required
Tracking kWh for a user-definable period.	Required	Required	Required	Required
kWh per rate period	Not required	Not required	Not required	Required

160.6(b) Separation of electrical circuits for electrical energy monitoring:

Electrical power distribution systems shall be designed so that measurement devices can monitor the electrical energy usage of load types according to Table 160.6-B.

***Exception 1 to Section 160.6(b):** For each separate load type, up to 10 percent of the connected load may be of any type.*

***Exception 2 to Section 160.6(b):** Submetered electrical power distribution systems that provide power to dwelling units.*

[1] "Electrical Services" applies to the building services-entrance rating or to the submetering service. For a building with submetering, this applies to the submetering service size to the common use areas.

Table 260.6-B - Minimum requirements for separation of electrical load

Electrical Load Type	Electrical Services rated 50 kVA or less	Electrical Services rated more than 50 kVA and less than or equal to 250 kVA	Electrical Services rated more than 250 kVA and less than or equal to 1000 kVA	Electrical Services rated more than 1000 kVA
Lighting including exit and egress lighting and exterior lighting	Not required	All lighting in aggregate	All lighting disaggregated by floor, type or area	All lighting disaggregated by floor, type or area
HVAC systems and components including chillers, fans, heaters, furnaces, package units, cooling towers, and circulation pumps associated with HVAC	Not required	All HVAC in aggregate	All HVAC in aggregate and each HVAC load rated at least 50 kVA	All HVAC in aggregate and each HVAC load rated at least 50 kVA
Domestic and service water system pumps and related systems and components	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Plug load including appliances rated less than 25 kVA	Not required	All plug load in aggregate Groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf	All plug load in separated by floor, type or area Groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf	All plug load in separated by floor, type or area Groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf
Elevators, escalators, moving walks, and transit systems	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Renewable power source (net or total)	Each group	Each group	Each group	Each group
Loads associated with renewable power source	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Charging stations for electrical vehicles	All loads in aggregate	All loads in aggregate	All loads in aggregate	All loads in aggregate

Eligible Climate Zones and Building Types

Eligible Climate Zones

This measure applies statewide in **California Climate Zones 1-16** (Title 24). Applicants must identify the project's climate zone in the submittal.

Eligible Building Types

This measure applies to:

- **High-Rise Multifamily**: Buildings with **four (4) or more habitable stories above grade**.

Eligible Project Scopes

This measure applies to:

- **New construction**, **additions**, and **major alterations/retrofits** for high-rise multifamily projects where circuit-level metering can be integrated into dwelling unit electrical systems.

Measure Exclusions

This measure excludes the following:

- **Low-rise residential** (single-family and multifamily ≤3 habitable stories above grade).
- **Commercial, public, agricultural, and industrial buildings.**
- **Major alteration/retrofit** projects that replace or upgrade dwelling unit electrical panels but do not reconfigure circuits to separate load types as required by Title 24, Part 6, Section 160.6(b), when the existing wiring does not already meet these segmentation requirements.

Reviewer Checklist

High-Performance Measure Review Checklist: Circuit Level Metering for High-Rise Multifamily

Checklist Description: This checklist captures the elements that must be present in the project design to be eligible for the high-performance measure inducement or consideration for additional site metering.

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

Assessment:

- ☐ Approved
- ☐ Not approved

Notes:

Reviewer: _____ **Signature:** _____

Inducement Requirements - Essential Level	Comments
☐ Were circuit-level metering devices installed in electrical panels for at least 25% of representative dwelling units?	
☐ Were panels designed to separately meter circuits for each load type required by Title 24, Part 6 (2025), Section 160.6, Table 160.6-B?	
☐ Was adequate space provided in panels for CTs and metering devices so panels close fully and meet NEC/CEC clearance requirements?	
☐ Was equipment installed per the manufacturer's latest instructions?	
☐ Was a native data platform with API access or data export capability provided with support for data transfer via MQTT, BACnet/IP, Modbus/TCP, or REST API?	
☐ Is circuit-level energy data able to be provided at 60-second intervals or faster (near real-time)?	

Inducement Requirements - Premium Level	Comments
☐ Were smart electrical panels installed in at least 25% of dwelling units?	
☐ Were panels designed to meter individual circuits for each load type required by Title 24, Part 6 (2025), Section 160.6, Table 160.6-B?	
☐ Was equipment installed per the manufacturer's latest instructions?	
☐ Was a native data platform with API access or data export capability provided with support for data transfer via MQTT, BACnet/IP, Modbus/TCP, or REST API?	
☐ Is circuit-level energy data able to be provided at 60-second intervals or faster (near real-time)?	

Supporting Documentation Requirements for Inducement	Comments
☐ Were product specifications (datasheets and submittals) showing communication protocols and supported Application Programming Interfaces (APIs) provided?	
☐ Were system schematic diagrams provided, including one-line diagrams with CT placement and circuit segmentation, panel schedules, and communication backbone layout?	

- ☐ Were photographs provided showing installed CTs inside electrical panels and metering devices with visible model/serial numbers?
- ☐ Were screenshots provided of the live system showing the main dashboard with circuit-level energy usage and at least one week of recorded data with timestamps?
- ☐ Were costs provided broken out by equipment, installation labor, and commissioning (if applicable)?

Version History Log

Version	Effective Date	End Date	Change Description
1	June 27, 2023	December 07, 2025	N/A
2	December 08, 2025	Current	Updated format, measure requirements, code references, eligibility, exclusions, checklist