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[CEA] Energy Monitoring

Additional submitted attachment is included below.

Energy Monitoring

Energy Code Pre-Rulemaking

Prepared by the **California Energy Alliance**

For the California Energy Commission

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Introduction

The California Energy Alliance (CEA) is a 501(c)(3) non-profit organization dedicated to improving the energy efficiency of the built environment through Codes & Standards, Compliance, and Education. This pre-rulemaking submission is made possible by the collective expertise of CEA's diverse energy stakeholders.

Founded in 2016, CEA is a non-partisan alliance of business, government, non-profits, academic institutions, and energy professionals working towards energy productivity to achieve economic growth, environmental justice, security, and affordability for Californians.

CEA's mission is to bring beneficial, equitable change to energy standards by developing consensus among diverse stakeholders.

1. Measure Name

Energy Monitoring

2. Measure Proponent

California Energy Alliance

3. Building Type

Non Residential

New Construction

4. Building System

Load Management

5. Measure Description

This proposed regulation adds a requirement for the installation submetering that measures and records energy usage. This proposed regulation requires that information is recorded and reported at regular intervals.

This proposal is suggesting to Revise Section 130.5(b) to require electric submeters [rather than just separation of electrical circuits] to the specified circuits to align with the international Energy Conservation Code (IECC), ASHRAE Std. 90.1, and Washington State's energy code.

Mandatory requirement based on electrical service capacity, with depending on service size (from Table 130.5-B)

Section 1305(b) of Title 24 Part 6 Markup Language

SECTION 130.5 –ELECTRICAL POWER DISTRIBUTION SYSTEMS

(b) ~~Separation of Electrical Circuits for~~ Electrical Energy Monitoring. ~~Electrical power distribution systems shall be designed so that measurement~~ Measurement devices ~~can~~ shall be installed to measure, monitor and record the electrical energy usage of load types according to TABLE 130.5-B to enable effective energy management. The electrical energy usage for all loads shall be recorded a minimum of every 15 minutes and reported at least hourly, daily, monthly, and annually. The data for each tenant space shall be made available to that tenant. In buildings having a digital control system, the energy usage data shall be transmitted to the digital control system and graphically displayed. The system shall be capable of maintaining all data collected for a minimum of 36 months.

The CEA welcomes the opportunity to collaborate with Commission and stakeholders to refine this language.

6. Justification

This measure is important for California because it enables more effective energy management with minimal added cost. The required separation of loads is already established under Table 130.5-B, so implementation primarily involves a relatively low cost of adding metering equipment for energy monitoring. This makes it a highly cost-effective way to enhance building performance.

By incorporating submetering, buildings gain the ability to track energy use at a more detailed level, which supports California's broader goals for demand management and peak load reduction. Establishing clear metering standards—including acceptable accuracy for tracking peak kW demand—ensures that building operators can reliably monitor, respond to and manage energy usage patterns.

Submetering improves energy awareness among building operators and occupants. With better visibility into how and where energy is used, it becomes easier to identify inefficiencies, reduce waste, and manage loads more effectively. This leads to more informed decision-making and supports ongoing operational improvements.

In addition, submetering aligns with widely adopted standards such as the International Energy Conservation Code and ASHRAE 90.1, creating consistency across codes and simplifying compliance for designers and building owners.

The measure supports energy benchmarking and regulatory compliance, providing accurate and timely data needed for reporting and performance tracking. Over time, this data enables continuous optimization, resulting in long-term energy and cost savings.

Submetering contributes to California's energy efficiency and sustainability objectives by promoting conservation, improving system transparency, and supporting a more efficient and resilient built environment.

7. Data Needs

Public Data is currently available via the following sources:

- Lawrence Berkeley National Laboratory (LBNL). (n.d.). Using EMIS to Identify Top Opportunities for Commercial Building Efficiency (LBNL-1007250). Retrieved from <https://eta.lbl.gov/publications/using-emis-identify-top-opportunities>.
- Lawrence Berkeley National Laboratory (LBNL). (n.d.). Proving the Business Case for Building Analytics (DOI-10.20357/B7G022). Retrieved from https://eta-publications.lbl.gov/sites/default/files/kramer_provingbuildinganalytics_october2020.pdf.
- Pacific Northwest National Laboratory (PNNL). (n.d.). Impacts of Commercial Building Controls on Energy Savings and Peak Load Reduction (PNNL-25985). Retrieved from <https://buildingretuning.pnnl.gov/publications/PNNL-25985.pdf>.

The CEA invites collaboration with the Commission and industry partners to gather additional data streams necessary.

8. Key Stakeholders

- California Energy Commission
- Contractors
- Installers
- Building owners & facility managers
- Technology providers (metering, EMS)
- Local governments & code officials
- Tenants & occupants
- Compliance and Enforcement ATT
- Design teams (engineers, consultants, contractors)
- Utility Companies

9. Estimated Energy Savings

Studies show that energy monitoring can produce substantial energy savings and greenhouse gas (GHG) reductions. [The U.S. Department of Energy \(DOE\) reports](#) that energy management systems, when combined with active management strategies, can reduce building energy use by 10–30% ([energy.gov](#)). Similarly, the [Environmental Protection Agency \(EPA\)](#) notes that buildings participating in energy benchmarking programs, such as ENERGY STAR Portfolio Manager, achieve an average energy use reduction of 2.4% per year ([energystar.gov](#)). [Research](#) shows that building owners who monitor benchmarking data have consistently reduced their building energy usage by an average of 2.4% per year, demonstrating measurable savings from energy monitoring and benchmarking practices

These findings demonstrate that energy monitoring is both technically feasible and enforceable, offering measurable energy and GHG reduction benefits. By providing accurate, real-time energy feedback, monitoring enables informed decision-making, encourages occupant behavior changes, and supports energy efficiency improvements across building systems.

Energy monitoring also facilitates continuous commissioning, ensuring operational targets are maintained, and supports demand response (DR) programs by allowing precise tracking of energy reductions during peak events

Research from [Lawrence Berkeley National Laboratory \(LBNL\)](#) highlights that Energy Management and Information Systems (EMIS) can identify significant energy-saving opportunities and improve operational efficiency. Likewise, [Pacific Northwest National Laboratory \(PNNL\)](#) demonstrates that advanced building controls, including monitoring, can reduce both energy consumption and peak loads, further enhancing efficiency in commercial buildings.

Energy monitoring reduces GHG emissions by optimizing electricity use, identifying inefficiencies, and enabling data-driven decisions. Continuous tracking of HVAC, lighting, plug loads, and other systems helps reduce energy waste, lower peak demand, and improve operational efficiency. This reduces reliance on fossil-fuel-generated electricity, directly lowering GHG emissions. Additionally, energy monitoring supports compliance with energy codes and sustainability initiatives, making it a critical tool for modern commercial building management.

10. Estimated Costs

There are no additional costs for the separation of loads already specified in Table 130.5-B, this would simply require the minimal cost of adding metering for energy monitoring purposes.

Revising Section 130.5(b) to actually require submeters will only add a small incremental cost beyond what already costs to comply with the section and will result in a tremendous amount of energy consumption reduction and energy cost savings. We are not requiring additional changes to power distribution requirements, it only adds the energy monitoring equipment as described in Table 130.5-B.

The average materials-only cost for adding electrical metering, based on data obtained from key suppliers, varies slightly by service size, with systems serving 50–250 kVA averaging about \$5,700, 250–1000 kVA averaging about \$7,200, and systems over 1000 kVA averaging approximately \$6,700. Overall, this places typical metering material costs in a narrow range of roughly \$5,700 to \$7,200 per service, with costs generally increasing as service size grows due to additional equipment requirements. In the context of new commercial construction, where total electrical material costs often range from \$8 to \$15 per square foot, these metering costs represent a very small fraction—typically well under 1% (approximately 0.1%–0.5%) of the total electrical material budget.

In addition to material costs, installation and engineering checkout services are typically around \$2,500 per service, regardless of size. These engineering check-out services are intended to ensure system reliability and safety and generally include reviewing all engineering documentation and specifications for compliance, conducting a thorough inspection of installed components, performing functional testing to verify proper operation, identifying any safety or compliance issues, documenting findings and recommendations, and providing a detailed report.

To further strengthen the cost-effectiveness assessment, additional data on installation labor, commissioning, and ongoing integration costs would be valuable. Expanding the dataset to include a broader range of real-world project bids and post-installation costs would improve confidence in total cost estimates and provide a more comprehensive understanding of lifecycle costs associated with metering systems.

11. Economic Impacts

Adding energy monitoring requirements to California's energy code results in strong positive economic impacts with relatively low incremental cost. When buildings already comply with load separation requirements (such as Title 24 §130.5(b)), the additional cost is largely limited to meters and minor installation.

Studies show that energy monitoring can deliver measurable energy savings, generally in the range of 1–20%, by enabling improved operations, identifying inefficiencies, and supporting targeted upgrades. For example, research summarized indicates that metering and monitoring systems can uncover significant savings opportunities in commercial buildings. These savings often translate into short payback periods, commonly between 1–3 years, with some case studies reporting payback in less than one year due to reduced energy costs.

Beyond direct savings, energy monitoring improves building asset value and operational performance by enabling more accurate tenant billing, better cost allocation, and enhanced energy management practices. The highlights that submetering supports improved financial management and reduced operating costs in commercial buildings. Additionally, energy monitoring helps reduce operations and maintenance (O&M) costs by enabling early detection of system faults and ongoing performance optimization.

Energy monitoring also provides important grid and demand-side economic benefits. By enabling participation in demand response programs and improving visibility into peak loads, buildings can reduce demand charges and contribute to lowering system-wide infrastructure costs. According to , advanced controls and monitoring strategies can reduce peak demand by approximately 10–20%, further improving cost savings and grid reliability.

In addition to lowering utility costs for building owners and tenants, these measures contribute to broader economic benefits, including reduced need for new energy infrastructure and growth in energy services and technology sectors.

Adding energy monitoring requirements to California's energy code has positive impacts on jobs, private businesses and the broader workforce, primarily by creating demand for skilled labor, supporting local industries, and improving long-term business productivity.

- Job creation and workforce demand:
Expanding energy monitoring drives demand for electricians, controls technicians, commissioning agents, and energy analysts. Installation of submeters, integration with building management systems, and ongoing data analysis requires skilled and trained workforce. The U.S. Department of Energy has found that energy efficiency and building technologies are among the fastest-growing sources of clean energy jobs, supporting sustained employment growth in construction, engineering, and operations.

- Growth of private sector businesses:
The measure supports companies that design, manufacture, install, and maintain metering and energy management systems. This includes electrical contractors, controls vendors, and software providers. Increased code requirements create a stable market signal, encouraging private investment and innovation in energy technologies.
- Upskilling and workforce development:
Energy monitoring increases the need for advanced skills in data analytics, building controls, and energy management. This supports workforce development programs and creates higher-quality jobs with specialized technical expertise, particularly in California's clean energy sector.
- Operational savings that support business growth:
By reducing energy costs (typically 1–20%), energy monitoring improves the financial performance of commercial buildings. Lower operating costs allow businesses to reinvest in staff, expansion, and operations, indirectly supporting job retention and growth.
- Ongoing service and maintenance jobs:
Unlike one-time construction measures, energy monitoring creates continuous demand for commissioning, system optimization, software support, and performance verification, leading to long-term employment opportunities.

Energy monitoring delivers long-term economic value by providing continuous, actionable data that supports sustained energy savings, and compliance with California's energy and climate goals while also having a positive impact on clean energy jobs.

12. Consideration for Readiness

(high, medium, or low)

High

Energy monitoring is considered a high-readiness measure because it is technically feasible, cost-effective, and widely implementable using currently available technology. Key factors supporting this assessment include:

- **Proven technology:** Submeters, energy management systems (EMS), and building analytics are commercially available, reliable, and widely used in both new construction and retrofits.
- **Cost-effectiveness:** Incremental costs are relatively low when Title 24 §130.5(b) load separation is already in place. Typical installed costs per meter range from ~\$1,500–\$5,000, with projected energy savings of 1–20%, leading to short payback periods (1–3 years).
- **Operational readiness:** Building operators and contractors are familiar with metering technology, and integration with building management systems is straightforward.
- **Policy alignment:** The measure aligns with existing energy codes (Title 24), federal guidance (DOE, EPA), and industry standards (ASHRAE 90.1, IECC), supporting immediate adoption.
- **Documented benefits:** Studies from DOE, EPA, LBNL, and PNNL demonstrate reliable energy savings, peak load reduction, and GHG emission reductions across commercial buildings.

13. Conclusion

Given the low incremental cost, mature technology, proven effectiveness, and strong policy support, energy monitoring is highly ready for incorporation into California's energy codes, with minimal barriers to implementation and significant economic and environmental benefits.