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CALSSA Response to the 2028 Energy Code new sizing approach for non-residential PV and BESS Question for Stakeholders

Additional submitted attachment is included below.

July 17, 2026

California Energy Commission
Docket Unit, MS-4
715 P Street
Sacramento, CA 95814

Re: CEC Docket No. 25-BSTD-03 - CALSSA Response to the 2028 Energy Code new sizing approach for non-residential PV and BESS Questions for Stakeholders

Dear California Energy Commissioners and Staff:

CALSSA appreciates the opportunity to comment on the California Energy Commission's (CEC) proposed updates to the 2028 California Energy Code requirements for non-residential photovoltaic (PV) systems and battery energy storage systems (BESS). CALSSA's responses to the CEC's stakeholder questions are provided below.

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1. How are commercial PV systems and BESS sized?

Commercial PV and BESS systems are typically sized to maximize project economics while meeting the customer's operational objectives. Appropriate system sizing depends on the building type, electrical load profile, utility rate structure, available installation space, and whether the primary objective is economic savings or resiliency. PV systems are generally sized to offset as much of the facility's annual electrical consumption as is practical and economically justified.

Depending on the applicable utility tariff and interconnection rules, batteries may charge from excess onsite PV generation, from the electric grid during lower-cost periods, or from a combination of both. They generally discharge during periods of high demand or elevated electricity prices to provide demand charge management and TOU optimization. A rule of thumb is to size battery power (kW) approximately equal to the load being managed with approximately four hours of storage capacity. When rooftop area limits the PV system size, battery capacity is often reduced proportionally because less solar generation is available for charging.

However, for projects where resiliency is the primary objective, batteries are sized according to the critical loads that must remain operational during an outage. In these applications, both battery energy (kWh) and battery power (kW) are important. For example, water treatment facilities may require sufficient battery power to black-start large motors with high inrush currents, meaning power capability can be as important as stored energy.

Small commercial buildings and larger commercial or industrial facilities also differ substantially in operating characteristics, project economics, and available capital. Smaller commercial projects are often designed around TOU optimization and backup of selected critical loads, whereas larger facilities frequently optimize battery operation using sophisticated energy management systems and demand charge management software.

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2. Is the proposed PV and BESS sizing approach for seasonal Median-Load-Day Minimum matching consistent with industry practice for systems designed for load shifting? If not, please describe how it should be changed?

The proposed Seasonal Median-Load-Day Minimum methodology appears to be an improvement over the current methodology. Basing minimum system sizing only on conditioned floor space ignores the varying needs of different customer types. A system based on standard load profiles for expected building occupants should produce more appropriate minimum size values.

In developing specific guidelines for implementing the new approach, the Energy Commission will need to identify standard load profiles and a system for validating builder information on expected business types of future building occupants. Also, a sizing methodology for energy storage should recognize that battery sizing is driven by both power (kW) and energy (kWh) requirements. CALSSA looks forward to participating in discussions to refine the approach.

There are many cases where large system sizes will be economically preferrable to the building occupant, but the general approach under consideration is reasonable as a minimum. The Energy Commission should consider requirements for additional conduit and space set-asides to allow for easy expansion of energy storage.

The proposed methodology appears most applicable to projects whose primary objective is TOU load shifting. Larger commercial and industrial facilities are more commonly designed around demand charge reduction, operational requirements, and resiliency considerations that are not fully captured by a Seasonal Median-Load-Day Minimum methodology.

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3. For commercial PV system and commercial BESS storage costs, what are the customer acquisition costs for newly constructed buildings, either as a line item ($/ft2) or as a fraction of the total cost?

CALSSA does not have sufficient information to provide an estimate for customer acquisition costs associated with commercial PV or BESS installations in newly constructed buildings. These costs are likely better estimated by commercial real estate developers or project developers than by PV or BESS contractors.

4. How do costs for commercial PV systems and BESS in California vary from nationwide costs?

Commercial solar and storage projects are more expensive in California than elsewhere in the United States. One major factor is can higher labor costs, including prevailing wage and union labor requirements. Although solar and storage equipment costs are comparable in California and elsewhere around the country, the many day-to-day costs of running a company and managing a construction site are higher.

Also, California has more complex permitting and regulatory processes compared to other states, including more stringent permitting processes and longer, more complex utility interconnection requirements and procedures. This leads to increased engineering, compliance, and administrative costs and project timelines.

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5. What is the expected useful life of a commercial BESS, under typical charging and discharge cycles (number of cycles or years)?

Large commercial BESS installations are generally expected to have a useful service life of approximately 20 years, assuming roughly 250–365 charge/discharge cycles per year (about one cycle per day). Manufacturer warranties typically range from approximately 15 to 20 years.

Smaller BESS, including residential batteries used in C&I applications, typically carry warranties of approximately 10–15 years.

Actual service life depends on battery chemistry, operating temperature, depth of discharge, cycling frequency, and maintenance practices.

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6. What is the minimum capacity commercial BESS that is available and practical for commercial buildings?

There is no universal minimum size that defines a “commercial” BESS. Smaller commercial buildings can use battery systems originally developed for residential applications.

For larger commercial installations, the smallest battery systems are approximately 100 kW / 200 kWh. Small commercial installations stack together units of 15-25 kW.

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7. What is a typical minimum and maximum state of charge for batteries installed in commercial buildings?

BESS are commonly operated over an accessible state-of-charge (SOC) range of approximately 5% to 95% for large commercial installations. Smaller commercial installations using residential battery systems are often charged to 100% each day and typically discharge to approximately 20%, with discharge below 10% occurring infrequently.

Manufacturers typically maintain internal reserve capacity, allowing customers to utilize most of the battery's rated capacity while protecting battery longevity.

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8. What is a typical roundtrip efficiency for BESS installed in commercial buildings?

Commercial BESS typically achieve round-trip efficiencies of approximately 85%–90%, depending on battery chemistry, inverter efficiency, operating temperature, charge/discharge rate, and overall system configuration.

Manufacturer specifications are generally measured under standardized test conditions, while actual operating efficiency varies with real-world operating conditions.

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9. What are typical BESS charging and discharging control strategies for combined PV and BESS systems (Time-Of-Use, energy arbitrage, peak shaving, traditional predictive, AI predictive, other). If possible, please provide a ranking of the stage of adoption of these technologies: 1 (innovators), 2 (early adopters), 3 (early majority), 4 (late majority), 5 (laggards). Please also explain how the strategy works.

Commercial PV & BESS may employ multiple control strategies simultaneously. The selected strategy depends on the facility’s load profile, utility tariff, customer objectives, PV-to-BESS sizing ratio, whether grid charging is permitted, and whether the project prioritizes economic optimization or resiliency.

For smaller commercial systems, TOU optimization and peak shaving are the most common strategies.

For larger commercial and industrial facilities, battery operation is often optimized using sophisticated EMS platforms that combine multiple strategies.

Time-of-use optimization, energy arbitrage, and peak shaving are standard operating strategies for behind-the-meter (BTM) commercial BESS. Demand response participation is becoming increasingly common, although implementation depends on utility programs and market participation rules. Participation in wholesale electricity markets remains limited and may be considered to be at the “innovator” stage of adoption. Sophisticated energy management systems already use predictive algorithms—and, in some cases, machine learning—to forecast building loads, PV generation, and electricity prices. More advanced artificial intelligence (AI)-based optimization is beginning to emerge.

Respectfully,

/s/ Dara Yung

Dara Yung
Director of Codes, Standards, and Permitting
California Solar & Storage Association