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Street Lighting as a Distinct Load Category in the 2026 IEPR Demand Forecast

Additional submitted attachment is included below.

Photometrics.ai
Where Light Meets Intelligence

To:
California Energy Commission
Docket Unit, MS-4
Docket No. 26-IEPR-01
715 P Street
Sacramento, California 95814-5512

Date:
March 10, 2026

Re: Comments on the Draft Scoping Order for the 2026 Integrated Energy Policy Report Update

Dear Chair Hochschild, Vice Chair Gunda, and Commissioner Gallardo:

I submit these comments on the Draft Scoping Order for the 2026 IEPR Update. I am the Founder of Photometrics AI, a software platform that generates optimized dimming schedules for street and roadway lighting through networked lighting controls (NLC). I hold the GISP (GIS Professional) certification, the Community Friendly Lighting Certified (CFLC) credential from the Smart Outdoor Lighting Alliance, and have been a member of the Illuminating Engineering Society since 2013. I hold two U.S. patents on photometric optimization methods, with a continuation application in prosecution. I have 25 years of experience in geographic information systems and 17 years in the lighting industry.

My comments address two of the three proposed topics: the California Electricity Demand Forecast (Topic 1, Docket 26-IEPR-03) and Energy Equity and Environmental Justice (Topic 3, Docket 26-IEPR-05). Street lighting sits at the intersection of both, and I respectfully urge the Commission to include it as a distinct, addressable load category in the 2026 IEPR Update.

1. Street Lighting Is a Significant, Anti-Solar Load That the Demand Forecast Should Model Explicitly

California's three investor-owned utilities collectively serve approximately 1.65 million streetlights, of which roughly 857,000 are utility-owned. These figures are drawn from CPUC data provided to the Legislature during the AB 719 analysis in 2013. Population-proportional estimation using ACS 2023 data and GIS-based spatial joins of census tracts to CEC utility service territory boundaries suggests the current IOU-territory total is approximately 1.72 million, with an estimated 2.2 million streetlights statewide when municipal utility territories are included.

Street lighting operates from dusk to dawn, approximately 4,100 hours per year per the PG&E LS-2 tariff. At a typical 50-watt draw per LED fixture, California's IOU-territory streetlights alone consume an estimated 352 GWh annually. This load has a distinctive and policy-relevant characteristic: it is almost perfectly anti-solar. Street lights activate precisely as photovoltaic generation drops to zero and remains on through the overnight hours when the grid relies on dispatchable generation.

The Commission's own Avoided Cost Calculator already captures the time-differentiated value of energy savings by hour. Street lighting efficiency gains occur entirely during the hours when avoided costs are high: the evening peak and overnight shoulder periods. This means that each kilowatt-hour reduced from street lighting is worth more to the grid than the same reduction during midday surplus hours. The 2026 IEPR demand forecast scenarios should reflect this by modeling street lighting as a distinct load shape with achievable efficiency gains, rather than treating it as a static overnight baseline.

Streetlights frequently activate before the onset of nautical dusk, particularly in summer months when the gap between photocell activation and actual darkness can be substantial. This means streetlights consume energy during the very

hours when ACC values are at their peak: the late afternoon and early evening period that defines the duck curve. Similarly, streetlights often remain at full output through early morning hours when the sun is providing visibility. Quantifying this waste using the Commission's own ACC methodology would establish the time-differentiated value of precision lighting control. The Commission should consider directing staff to measure how far in advance of nautical twilight the average California streetlight activates, and what that gap represents in avoided cost terms.

California has invested heavily in battery energy storage to address the mismatch between solar generation and evening demand. Streetlight dimming can be triggered through existing demand response mechanisms, including the Capacity Bidding Program and Emergency Load Reduction programs, making it a dispatchable demand-side resource that integrates into established grid management frameworks. Precision streetlight dimming addresses the same mismatch that batteries address, but from the demand side: rather than storing energy to serve peak evening load, it reduces the load itself during the hours when the grid is most constrained. The two resources are different in kind but can be dispatched in complementary ways. A key distinction, however, is duration and reliability. Utility-scale batteries typically discharge over a few hours and must be recharged, and that recharging may depend on solar availability. Darkness is reliably present every night for over eleven hours across California. A streetlight dimming schedule does not deplete, does not require recharging, and does not degrade over charge cycles. It is a durable, predictable demand-side resource that complements storage without competing with it for capital, siting, or supply chain resources.

Networked lighting control systems, already deployed across many places in California, enable per-luminaire dimming based on time of night, real-world conditions, and measured need. When paired with photometric optimization software that accounts for actual roadway geometry, fixture overlap, and IES lighting standards, these systems can achieve significant energy reductions without degrading lighting quality or public safety. The technology exists, the infrastructure is largely in place, and the savings occur during the grid's most constrained hours.

2. IOU-Owned Streetlights Make This Actionable Within the Commission's Regulatory Reach

A common objection to streetlight efficiency initiatives is that street lighting is a municipal responsibility and therefore outside the scope of state energy planning. This objection does not hold in California. The CPUC's 2013 data shows that 857,000 streetlights across PG&E, SCE, and SDG&E territories are owned and operated by the utilities themselves, not by local governments. While streetlights have been transferred to municipal ownership since then, recent reporting suggests this number remains substantial. SCE alone reports owning approximately 450,000 streetlights.

Utility-owned streetlights represent a demand-side efficiency resource that can be optimized without municipal procurement processes, city council approvals, or local capital budgets. The IOUs already maintain these fixtures, already pay for the electricity they consume, and in many cases have already deployed or are deploying networked lighting control infrastructure. What is missing is the software intelligence layer that determines how much light each fixture actually needs to produce, at what time, based on the specific conditions at that location.

Including IOU-owned street lighting optimization in the demand forecast would reflect a real and achievable efficiency measure that falls squarely within the Commission's purview over regulated utilities. I encourage the Commission to engage the IOUs in quantifying the demand reduction potential of their existing streetlight networks as part of the 2026 forecast development.

I also recommend that the Commission seriously evaluate transitioning streetlighting to metered rates. Currently, most municipal streetlighting in California is billed on flat-rate tariffs that provide no incentive for efficiency. A municipality that strategically dims its lighting to match actual nighttime conditions sees no reduction in its electricity bill. Moving to

metered rates would align streetlighting costs with the market forces that govern the rest of the electric grid, empowering municipalities to make informed decisions about when and how much to dim, particularly during early morning hours when full output serves no safety purpose. Without metered rates, the price signal that drives efficiency in every other category of electricity consumption is entirely absent from street lighting. Many networked lighting control systems already provide utility-grade energy metering at the fixture level, but there has been little regulatory momentum to approve these systems as revenue-grade meters because most streetlights are not on metered rates to begin with.

3. Lighting Equity Requires Precision, Not Just Presence

The Draft Scoping Order identifies energy equity and environmental justice as a core topic for the 2026 IEPR Update, including progress toward embedding the Commission's JAEDI framework into programs and policies. Street lighting is directly relevant to this effort, though not in the way it is traditionally framed.

For much of the twentieth century, street lighting in American cities was deployed as an instrument of social control. Brighter lighting in lower-income and minority communities was explicitly justified as a crime deterrent, a "policeman always on patrol" and as a surveillance tactic. This approach treated luminous intensity as a proxy for public safety, flooding entire neighborhoods with undifferentiated high-output lighting regardless of the actual needs of the people who lived there. The result was not better-lit communities but over-lit ones: higher energy consumption, increased glare that impairs visibility rather than enhancing it, disrupted sleep from light trespass into residences, and suppressed melatonin production with documented health consequences. Communities should have a say in how their lighting performs.

The equity problem in street lighting is not simply that some communities have too few lights. It is that the historical approach to lighting disadvantaged communities has been blunt, paternalistic, and wasteful. Over-lighting is not a safety strategy. The Illuminating Engineering Society's standards (RP-8-25 for roadways, RP-43-25 for pedestrian areas) specify appropriate illumination levels that vary by roadway classification, pedestrian conflict area, and ambient conditions. Exceeding these standards does not improve safety; it wastes energy, contributes to light pollution and skyglow, harms nocturnal wildlife including migratory birds, and degrades the nighttime environment for residents.

Precision lighting design, enabled by the same networked control and photometric optimization technologies described above, offers a path to genuine equity: delivering the right amount of light where and when it is needed, without the wasteful excess that has historically been imposed on communities with the least political power to object. I urge the Commission to consider, within the JAEDI framework, how intelligent street lighting optimization can simultaneously advance energy equity, reduce environmental burden, and deliver measurable efficiency gains.

The Commission should encourage data-driven decisions about where and when additional lighting can help encourage positive outcomes and discourage negative ones, rather than perpetuating a one-size-fits-all approach that serves neither equity nor efficiency.

4. A Data Gap the 2026 IEPR Update Should Address

To my knowledge, the CEC does not currently track street lighting as a distinct load category in its demand forecast. This is a gap. Street lighting is one of the largest categories of municipal electricity consumption, it operates during the grid's most valuable hours, it is partially under direct utility ownership, and it is subject to significant achievable efficiency gains through existing technology. The 2013 CPUC data from the AB 719 analysis provides a reasonable baseline for IOU-territory streetlight counts, but it is now over a decade old. The Commission should consider directing staff to update

this inventory as part of the 2026 forecast development, potentially in coordination with the CPUC and the IOUs. The Commission should also determine how far in advance of nautical twilight, approximately 30 to 45 minutes after sunset, the average California streetlight turns on, and what that premature activation costs the grid during peak-value hours.

5. Specific Requests

I respectfully request that the Commission: (1) include street lighting efficiency as a modeled variable in the 2026 IEPR demand forecast scenarios, recognizing its anti-solar load characteristics and alignment with Avoided Cost Calculator methodology; (2) direct staff to update the statewide streetlight inventory, beginning with IOU-owned fixtures, as part of the forecast development process; (3) consider street lighting equity within the JAEDI framework, examining how precision lighting design can address the historical over-lighting of disadvantaged communities; (4) evaluate transitioning streetlighting to metered rates to create efficiency incentives for municipalities; and (5) invite participation from street lighting optimization practitioners in the public workshops scheduled for May through December 2026.

I am available to participate in workshops, provide technical data, or support staff analysis on these topics.

Respectfully submitted,

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