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Comment Received From: Ari Isaak
Submitted On: 8/8/2025
Docket Number: 25-EPIC-01

AI-Driven Streetlight Optimization for Energy Efficiency and Grid Flexibility

This proposal seeks EPIC 5 funding to demonstrate and scale AI-driven, GIS-enabled optimization of networked street lighting in California IOU territories. By dynamically adjusting each streetlightâ€™s output to meet safety standards under varying conditions, the project will deliver sustained energy savings of 20â€“30 percent, reduce peak demand through demand side response (including curtailment), and cut emissions in line with SB 350 and SB 100 targets. The solution improves safety and reliability, lowers municipal costs, and ensures equitable benefits by prioritizing disadvantaged communities. This innovation fills a critical market gap, overcoming technical and operational barriers to integrating street lighting into Californiaâ€™s clean energy, grid flexibility, and climate adaptation strategies.

Additional submitted attachment is included below.

1. Please provide the name, email, and phone number of the best person to contact should the CEC have additional questions regarding the research concept:

Ari Isaak
ari@photometrics.ai
858-633-6447

2. Please provide the name of the contact person's organization or affiliation:

EvariLABS LLC

3. Please provide a brief description of the proposed concept that you would like the CEC to consider as part of the EPIC 5 Investment Plan. What is the purpose of the concept, and what would it seek to do? Why are EPIC funds needed to support the concept?

This project will demonstrate and validate a statewide scalable platform for optimizing municipal street lighting to deliver demand response, deep energy efficiency, safety improvements, and environmental benefits. The platform, exemplified by Photometrics AI, integrates with existing networked lighting controls to determine precise dimming levels for each luminaire under varying real world conditions while maintaining compliance with lighting standards.

The concept seeks to:

- Enable compliance grade demand response from unmetered municipal street lighting, providing verifiable peak load reduction during grid emergencies and other high value events.
- Achieve 25 percent or greater baseline energy savings without reducing and often improving transportation safety.
- Dynamically adapt lighting for climate and environmental conditions such as rain, fog, or high migratory bird activity.
- Establish standardized methods and reporting frameworks so utilities can integrate municipal lighting into broader grid flexibility programs.

California's estimated 2 million streetlights within IOU territory represent 1-3% of grid load when on, yet are an untapped flexible demand resource due to lack of metering, analytical tools, and operational frameworks. As the net load curve, commonly referred to as the duck curve, pushes lower (belly) in the middle of the day and higher (face) and later in the evening it becomes increasingly important to strategically leverage our current resources for curtailment and conservation. The face of the duck curve increasingly overlaps with periods when street lighting is on. Current street lighting rates, especially LS2 rates which most street lighting is on, encourages street light owners and operators to waste energy because the bill does not change. Fixed percentage dimming strategies waste potential savings and grid benefits. EPIC funding is needed to:

- Overcome key technical and regulatory barriers through field validated pilots.
- Quantify ratepayer benefits in terms of energy savings, peak load reduction, safety outcomes, and avoided emissions.
- Develop replicable implementation models and integration standards, enabling rapid statewide adoption.

This project aligns directly with EPIC 5 goals for grid reliability, decarbonization, climate adaptation, and equitable access to clean energy benefits.

4. In accordance with Senate Bill 96[i], please describe how the proposed concept will "lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory energy goals." For example, what technical and/or market barriers or customer pain points would the proposed concept address that would lead to increased adoption of clean energy technology or innovation? Where possible, please provide specific cost and performance targets that need to be met for increased industry and consumer acceptance. For scientific analysis and tools, provide more information on what data and information gaps the proposed concept would help fill, and which specific parties or end users would benefit from the results, and for what purpose(s)?

The concept directly addresses the lack of tools and frameworks to integrate California's approximately 2 million municipal streetlights in IOU service territories into demand side response and advanced energy efficiency programs. These lights represent a significant but currently untapped flexible load due to three primary barriers:

1. Technical barrier – Municipal streetlights are generally unmetered, making it difficult to measure and verify load changes for compliance grade participation in demand side response or demand response programs.
2. Analytical barrier – Current dimming strategies are blunt fixed percentage approaches that fail to consider location specific conditions, safety requirements, or dynamic environmental factors.
3. Market barrier – Utilities and municipalities lack standardized methods for integrating streetlight controls into grid management systems and benefiting from using less energy, limiting adoption and investment.

Technological Advancement
The platform will provide an automated, standards based method to determine optimum dimming for each luminaire under varying real world conditions while meeting or exceeding safety and lighting standards. By combining photometric modeling, control system integration, and grid telemetry, the project will enable:

- Verified peak load reduction of at least 50 percent of the connected load during grid events, such as the Capacity Bidding Program (CBP) and/or Emergency Load Reduction Program (ELRP).
- Baseline energy savings of 25 percent or more through optimized dimming profiles.
- Avoided emissions from reduced electricity use, contributing directly to SB 350 and SB 100 clean energy targets.

Data and Information Gaps Filled
The project will generate the first field validated dataset linking luminaire level dimming actions to measured load reduction, safety outcomes, and environmental benefits across multiple IOU territories. This will fill critical gaps in:

- Measurement and verification protocols for unmetered loads.
- Real world safety and performance metrics for adaptive lighting under varying conditions.
- Cost and performance benchmarks for large scale deployment.

Beneficiaries

- Utilities will gain a new verified flexible demand resource that can be dispatched for grid reliability, including both curtailment during the day and energy savings at night.
- Municipalities will achieve measurable energy cost savings while improving transportation safety.
- Regulators will receive data to inform statewide standards and program design.
- Ratepayers will benefit from avoided capacity costs, reduced emissions, safer streets and lower infrastructure costs per CPUC's Distributed Energy Resources Avoided Cost Calculator.

This advancement will overcome the primary technical and market barriers preventing municipal lighting from contributing to California's statutory energy and climate goals and will accelerate the adoption of this innovation statewide.

5. Please describe the anticipated outcomes if this research concept is successful, either fully or partially. For example, to what extent would the research reduce technology or ratepayer costs and/or increase performance to improve the overall value proposition of the technology? What is the potential of the innovation at scale? How will the innovation lead to ratepayer benefits in alignment with EPIC's guiding principles to improve safety,[ii] reliability,[iii] affordability,[iv] environmental sustainability,[v] and equity?[vi]

If fully successful, the project will demonstrate that California's approximately 2 million municipal streetlights in IOU territories can function as a verified, dispatchable demand side response resource while also delivering substantial year round energy savings.

Anticipated Outcomes

- Infrastructure Cost reduction – Reduce municipal lighting energy use by 25 percent or more, saving ratepayers an estimated $15.2 million in annual value, based upon CPUC's Distributed Energy Resources Avoided Cost.
- Rate Cost reduction - If street lighting rates are adjusted to function similarly to how they work in the United Kingdom, for example, this would lower municipal rates which are paid by taxpayers.
- Peak load reduction – Provide 100 MW of dispatchable curtailment capacity during grid emergencies.
- Improved performance – Optimize each luminaire's dimming profile based on location specific conditions to maintain or improve safety and lighting quality.
- Verified measurement – Establish protocols for metering and verifying unmetered loads through integration with networked lighting controls.

Potential at Scale
If deployed statewide, the approach could transform municipal streetlighting from a static, always-on asset into a flexible grid resource, contributing hundreds of MW of peak reduction and over 100 GWh of annual energy savings while maintaining or improving safety standards.

Alignment with EPIC Guiding Principles
- Safety – Maintain required illumination levels for transportation safety.
- Reliability – Provide dispatchable load reduction to improve grid stability during extreme weather and high demand events.
- Affordability – Lower infrastructure costs for IOUs, lower energy costs for municipalities, reducing the financial burden on Californians.
- Environmental sustainability – Avoid ~40,000 metric tons of CO_2 annually from reduced electricity generation.
- Equity – Enable all communities, including disadvantaged and under-resourced areas, to benefit from cost savings, safer streets, and improved air quality.

The research will create validated measurement and verification methods for unmetered municipal loads, opening the door for future integration of adaptive streetlighting into demand side response programs statewide.

6. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed research concept.

The project will track both quantitative and qualitative metrics to evaluate energy, grid, safety, and equity impacts.

Quantitative Metrics
- Baseline energy use – kWh consumption before optimization. (*Affordability, Environmental Sustainability*)

- Energy savings – Percent and total kWh reduction achieved through optimized dimming profiles. (*Affordability, Environmental Sustainability*)
- Peak load reduction – Verified MW reduced during demand side response events, including curtailment periods. (*Reliability, Environmental Sustainability*)
- Cost savings – Annual avoided electricity costs for municipalities and ratepayers. (*Affordability*)
- Emission reductions – Metric tons of CO_2 avoided from reduced generation. (*Environmental Sustainability*)
- Lighting performance – Measured compliance with applicable safety and illumination standards (e.g., RP-8). (*Safety*)

Qualitative Metrics

- Safety perception – Feedback from roadway users and municipal stakeholders on visibility and comfort. (*Safety*)
- Operational reliability – Stakeholder assessment of control system performance during grid events. (*Reliability*)
- Equity outcomes – Inclusion of disadvantaged communities and stakeholder reports on community benefit. (*Equity*)
- Adoption readiness – Municipal and utility willingness to integrate the method into ongoing operations. (*Affordability, Reliability, Environmental Sustainability, Equity*)

These metrics will allow the CEC and partners to evaluate both the technical feasibility and the broader value proposition of adaptive streetlighting as a verified demand side resource.

7. Please provide references to any information provided in the form that supports the research concept's merits. This can include references to cost targets, technical potential, market barriers, equity benefits, etc.

References

- ANSI/IES RP-8-25, *Recommended Practice: Lighting Roadway and Parking Facilities*
- Federal Highway Administration (FHWA), *Proven Safety Countermeasures – Lighting*
- Federal Highway Administration (FHWA), *Roadway Lighting Handbook* (2023)
- Pacific Gas and Electric (PG&E), *Electric Schedule LS-2 – Customer-Owned Street and Highway Lighting*
- Elexon, *Unmetered Supplies: CMS-Capable Equivalent Meters*
- U.S. Patent No. 9,894,736 B2, *Street and Roadway Lighting Distribution Map*
- U.S. Patent Application No. 18/660,680, *Geographic Setpoint Matching System for Outdoor Street Lighting*

Many calculations presented herein are based on conservative assumptions. We welcome the opportunity to provide the supporting methodology and data sources upon request.

8. The EPIC 5 Investment Plan must support at least one of five Strategic Goals:[vii]

a. **Transportation Electrification**
b. **Distributed Energy Resource Integration**
c. **Building Decarbonization**
d. **Achieving 100 Percent Net-Zero Carbon Emissions and the Coordinated Role of Gas**
e. **Climate Adaptation**

Please describe in as much detail as possible how your proposed concept would support these goals.

Our proposed concept supports two of the EPIC 5 Strategic Goals: Distributed Energy Resource (DER) Integration and Climate Adaptation.

Photometrics AI enables precise, real-time control of streetlight energy consumption through optimized dimming schedules based on location, conditions, and safety requirements. By integrating with networked lighting control systems, the platform allows streetlights to act as a flexible DER resource — responding to demand side response signals, curtailment requests, and other grid events. This supports DER integration by giving utilities a new, dispatchable load reduction asset that is predictable, measurable, and verifiable.

The platform also supports climate adaptation by reducing greenhouse gas emissions from electricity generation, improving safety in varying environmental conditions (fog, rain, wildfire smoke), and minimizing light pollution to protect biodiversity. By optimizing lighting to match actual need, municipalities can increase resilience while maintaining illumination standards.

May 29, 2025

To: California Public Utilities Commission
Energy Division
505 Van Ness Avenue
San Francisco, CA 94102
Email: energypolicy@cpuc.ca.gov

From: The California Street Light Association (CALSLA)
56 Hacienda Drive
Tiburon CA 94920
Email: jean@calsla.org

Subject: Letter of Support – Pilot Proposal to Enable Demand Response Using Non-Metered Streetlighting Infrastructure

To the Energy Division:

On behalf of the California Street Light Association (CALSLA), I am writing to express our support for the CPUC's consideration of a proposed pilot to evaluate the use of municipal streetlighting as a demand response resource—specifically, using verified performance data from networked lighting control systems in lieu of interval metering.

The majority of California's municipal streetlighting is unmetered, yet this infrastructure represents a significant opportunity for supporting the state's grid reliability and load management goals. Streetlighting systems account for an estimated one to three percent of total electric grid load and activate at sunset, aligning naturally with peak evening ramp periods known as the "duck curve." As lighting is already a public safety necessity, the ability to precisely dim selected non-critical areas while preserving visibility in high-priority zones makes this a uniquely flexible and publicly accountable load.

CALSLA supports CPUC engagement in this pilot concept, which has been proposed by EvariLABS using the Photometrics AI software platform in conjunction with certified networked lighting controls. The platform enables cities and counties to implement spatially and temporally precise dimming overlays and to respond autonomously to triggers from CAISO, CPUC or utilities, while maintaining compliance-grade reporting for audit and evaluation purposes.

We believe this pilot represents a forward-thinking approach to expanding access to demand-side markets for municipalities and counties, many of whom operate extensive lighting networks but lack access to traditional metered infrastructure. CALSLA looks forward to supporting this effort and to engaging with CPUC staff as the pilot progresses.

Sincerely,

Jean A Bonander
Executive Director
California Street Light Association (CALSLA)

C: Ari Isaak, EvariLABS

Ari Isaak <ari@sdgis.com>

RE: [EXTERNAL] Pilot Proposal Submission: Verified Non-Metered Demand Response Using Streetlighting Controls

Mozafari, Maryam <Maryam.Mozafari@cpuc.ca.gov> Thu, May 29, 2025 at 2:10 PM
To: Ari Isaak <ari@photometrics.ai>

Hi Ari,

Thanks for your email. The CPUC does not directly fund pilots. We do however fund the Electric Program Investment Charge Program (EPIC) that is administered by the California Energy Commission. I suggest reaching out to CEC and or the IOUs for the pilot proposal.

Kindly,

Maryam

Maryam Mozafari (she/her)

Program Supervisor, Demand Response/Load Flexibility

Energy Division, California Public Utilities Commission

(415) 703-2126 | Maryam.Mozafari@cpuc.ca.gov

From: Ari Isaak <ari@photometrics.ai>
Sent: Tuesday, May 27, 2025 9:15 PM
To: DRP Registration <DRP_Registration@cpuc.ca.gov>
Subject: [EXTERNAL] Pilot Proposal Submission: Verified Non-Metered Demand Response Using Streetlighting Controls

Dear Energy Division Staff,

Attached is a formal request from EvariLABS (DBA Photometrics AI) for a CPUC-supported pilot program to evaluate how non-metered municipal street lighting can participate in demand response markets using certified networked controls.

This pilot proposes to use performance-verified dimming from Photometrics AI in conjunction with real-time control systems to respond to autonomous triggers and strategic demand events—without requiring interval metering. We believe

this represents an opportunity to unlock a valuable, scalable resource for grid flexibility and local government participation.

We welcome the opportunity to meet with CPUC staff to discuss this pilot framework and appropriate next steps.

Thank you for your consideration.

Sincerely,--

Ari Isaak, GISP, CFLC

858-633-6447
ari@photometrics.ai