DOCKETED	
Docket Number:	25-EPIC-01
Project Title:	Electric Program Investment Charge 2026–2030 Investment Plan (EPIC 5)
TN #:	265438
Document Title:	E2SOL LLC Comments - E2SOL Input Form - SMART Solar Highway
Description:	N/A
Filer:	System
Organization:	E2SOL LLC
Submitter Role:	Public
Submission Date:	8/8/2025 11:36:42 AM
Docketed Date:	8/8/2025

Comment Received From: E2SOL LLC
Submitted On: 8/8/2025
Docket Number: 25-EPIC-01

E2SOL Input Form - SMART Solar Highway

Additional submitted attachment is included below.

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

Electric Program Investment Charge 2026–2030 (EPIC 5) Research Concept Proposal Form

The California Energy Commission (CEC) is currently soliciting research concept ideas and other input for the Electric Program Investment Charge 2026–2030 (EPIC 5) Investment Plan. For those who would like to submit an idea for consideration, please complete this form and submit it to the CEC by **August 8, 2025**. More information about EPIC 5 is available below.

To submit the form, please visit the e-commenting link: https://efiling.energy.ca.gov/EComment/ECommentSelectProceeding.aspx and select the Docket **25-EPIC-01**. Enter your contact information and then use the "choose file" button at the bottom of the page to upload and submit the completed form. Thank you in advance for your input.

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:

   James Reid
   E: james_reid@e2sol.com
   T: (401)-741-8785

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

   E2SOL 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?

E2SOL proposes the SMART Solar Highway, an innovative project that converts existing highway median barriers into solar-powered, battery-backed energy assets. Custom mounts secure high-efficiency photovoltaic modules above the median, each paired with 1 kWh modular battery storage. The design transforms

passive and underutilized infrastructure into active, power-producing assets. It provides local renewable generation, cuts transmission losses, and strengthens grid resilience without new land disturbance. EPIC funds are required to build and monitor pilot segments, deploy the real-time energy-management platform that coordinates generation and storage, and design an equitable community-solar tariff so low- and moderate-income Californians share directly in the benefits. Early support from EPIC 5 also positions the concept for statewide replication.

4. In accordance with Senate Bill 96[1], 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 Smart Solar Highway advances SB 96 by turning highway barriers into a repeatable clean-energy platform that tackles four persistent gaps: siting, cost, performance, and data. Prefabricated PV-plus-storage modules install entirely within Caltrans right-of-way, cutting permitting time and avoiding land acquisition. Composite mounting rails, tuned aerodynamics, and string-level power electronics are engineered for a 25-year roadside life while maintaining strong energy yields, and an on-site sensor network will capture thermal behavior, structural loading, glare, wildlife interaction, and real-time power quality to inform Caltrans, the CEC, and utilities. A concrete first milestone anchors the business case: E2SOL will execute a seven-cent per kilowatt-hour community-solar PPA with the local Community Choice Aggregator within twelve months of pilot approval, reserving at least thirty percent of annual production for low-income subscribers. This price sits below typical retail rates yet above the wholesale solar average, providing clear bill savings, predictable project revenue, and immediate compliance with equity provisions in Assembly Bill 1260. By meeting this attainable target while generating the state's first high-resolution dataset on elevated roadside PV, the project delivers a practical template for rapid

[1] See section (a) (1) of Public Resources Code 25711.5 at: https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=PRC&sectionNum=25711.5.

replication along thousands of miles of California roadway and directly supports SB 100 milestones for deep decarbonization.

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,[2] reliability,[3] affordability,[4] environmental sustainability,[5] and equity?

If successful, the SMART Solar Highway will offer a validated, scalable approach for integrating solar and storage into highway medians, delivering material ratepayer and environmental benefits. In Sacramento, a 25-mile radius analysis identified 142 miles of usable concrete median barriers, supporting up to 111 megawatts of distributed capacity and an estimated 79,834 megawatt-hours of annual clean generation. That output could power more than 7,200 homes per year while avoiding over 30,000 metric tons of carbon dioxide emissions.

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[2] EPIC innovations should improve the safety of operation of California's electric system in the face of climate change, wildfire, and emerging challenges.

[3] EPIC innovations should increase the reliability of California's electric system while continuing to decarbonize California's electric power supply.

[4] EPIC innovations should fund electric sector technologies and approaches that lower California electric rates and ratepayer costs and help enable the equitable adoption of clean energy technologies.

[5] EPIC innovations should continue to reduce greenhouse house gas emissions, criteria pollutant emissions, and the overall environmental impacts of California's electric system, including land and water use.

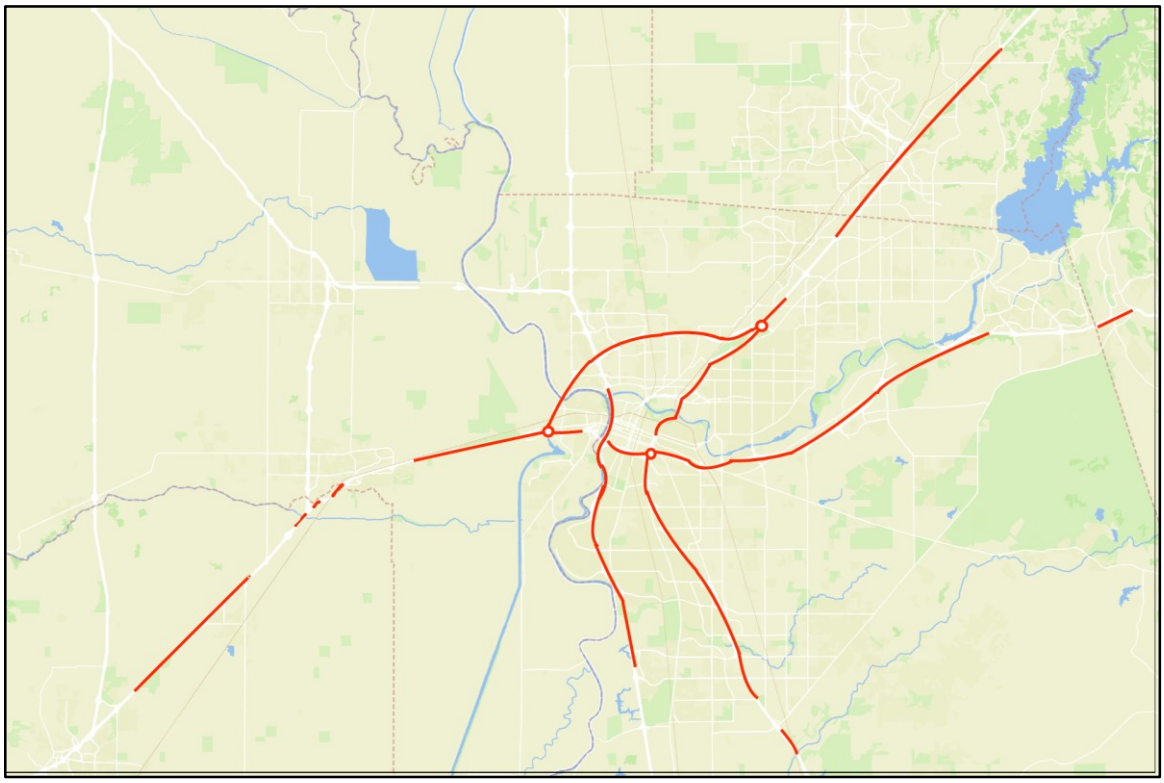

Figure 1: Suitable Concrete Barriers in Sacramento Area (Source: E2SOL LLC)

Deployed at scale across California, the system has the potential to deliver hundreds of megawatts of capacity without requiring new land, lengthy siting processes, or transmission infrastructure, dramatically reducing soft costs that often account for over one-third of total project expenses. Integrated batteries increase the performance and value proposition by enabling peak shaving, ramp rate control, and autonomous operation of critical roadside infrastructure during outages. This strengthens grid reliability in both urban centers and load-constrained regions. Through direct allocation of capacity to community solar subscribers, the project also addresses long-standing equity gaps by delivering tangible savings and clean energy access to lower income Californians, particularly those living near pollution-burdened corridors. The design aligns with the Net Billing Tariff and can export surplus energy to support local demand while minimizing strain on bulk transmission systems. At the policy level, the project reinforces the state's energy security and decarbonization goals by enabling high-performance, behind-the-meter solar on public infrastructure. If even a fraction of the state's highway medians are built out using this model, the resulting capacity could meaningfully shift procurement strategies for utilities while promoting a more localized, climate-resilient grid. In line with EPIC's guiding principles, the innovation improves safety through energy-autonomous

highway systems, enhances reliability with distributed storage, reduces costs by eliminating land-use conflicts, and expands environmental and economic benefits to underserved communities statewide.

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

Project impact will be evaluated through a combination of quantitative performance data and qualitative assessments of replicability, innovation visibility, and policy relevance. Key quantitative metrics include total solar generation (in megawatt-hours annually), greenhouse gas emissions avoided (in metric tons of CO_2 -equivalent, using CEC-standard emission factors), and total energy dispensed through DC fast chargers supported by the system. Charger utilization rates, measured in kilowatt-hours per day and occupancy hours, will indicate system-level value for electric vehicle infrastructure and validate real-world demand. Battery throughput during grid stress events will provide insight into storage responsiveness and operational resilience. Replicable corridor length will be tracked in both miles identified and miles successfully deployed, supporting a clear pathway for statewide scaling. In addition, data on energy exports under the Net Billing Tariff will quantify ratepayer value and local grid benefit. Qualitative indicators will include Caltrans maintenance compatibility feedback, utility interconnection response, and community engagement outcomes such as subscriber enrollment and satisfaction. The visual prominence of the infrastructure along high-traffic corridors will also serve as a critical qualitative signal — reinforcing California's leadership in climate-aligned innovation and visibly demonstrating the feasibility of integrated, multi-benefit energy systems. Public perception surveys and stakeholder interviews will supplement technical performance data to confirm the project's safety, acceptability, and policy alignment. Collectively, these metrics will provide a rigorous foundation for assessing the system's effectiveness, replicability, and contribution to EPIC's goals of safety, reliability, affordability, environmental sustainability, and equity.

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.

E2SOL Teams Up with Yotta Energy to Launch Smart Solar Highway Median Power Infrastructure

E2SOL Solar-Powered Utility Median Barriers on Dubai Highways

https://www.yottaenergy.com/sl-energy-storage

QCell Spec Sheet

8. The EPIC 5 Investment Plan must support at least one of five Strategic Goals:[6]
    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.

The SMART Solar Highway directly supports multiple EPIC 5 Strategic Goals through its integration of solar generation, battery storage, and electric vehicle charging infrastructure into California's transportation corridors. Most prominently, the project advances **Transportation Electrification** by enabling reliable, distributed power for DC fast chargers located along highways, addressing one of the most pressing infrastructure challenges to widespread EV adoption: access to high-capacity, grid-resilient charging in transit-dense regions. By siting energy generation and storage adjacent to EV infrastructure, the project reduces grid congestion, avoids costly substation upgrades, and enhances charging reliability during peak demand or grid disturbances.

Simultaneously, the project demonstrates scalable **Distributed Energy Resource Integration** by transforming passive public infrastructure into active energy assets. The use of modular, elevated PV systems paired with localized batteries allows for behind-the-meter deployment across constrained urban and peri-urban environments. These systems support voltage regulation, peak shaving, and local resilience functions that enhance feeder stability and reduce reliance on centralized power stations.

The concept also contributes meaningfully to the goal of **Achieving 100 Percent Net-Zero Carbon Emissions** by offsetting fossil fuel-based generation with carbon-free electricity. The Sacramento case study alone estimates over 30,000 metric tons of annual avoided CO_2 emissions, with far greater reductions possible at scale. Furthermore, the system's alignment with California's Net

[6] In 2024 the CPUC adopted five Strategic Goals to guide development of the EPIC 5 Investment Plan. A description of the goals can be seen in Appendix A of CPUC Decision 24-03-007 available at:
https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M527/K228/527228647.PDF

Billing Tariff ensures that clean generation supports broader load profiles, not just onsite consumption.

Finally, the project strongly supports **Climate Adaptation** by creating a distributed energy network resilient to wildfire, heatwave, and outage conditions. Integrated batteries allow roadside systems—including lighting, traffic controls, and EV chargers—to remain operational during grid disruptions, and modular deployment across the state's transportation backbone reduces regional vulnerability to single-point failures. By leveraging infrastructure that already exists, the project also avoids environmental degradation, habitat loss, and community displacement, making it a low-risk, high-impact adaptation strategy.

Together, these outcomes illustrate the SMART Solar Highway's alignment with EPIC 5's multi-sector climate priorities and its potential to accelerate a resilient, equitable, and carbon-free energy future.