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California
ENERGY COMMISSION



California Energy Commission

DRAFT COMMISSION REPORT

The Electric Program Investment Charge 2026–2030 Investment Plan

**EPIC 5 Investment Plan
Appendices A-I**

August 2026 | CEC-500-2026-022-AP

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TABLE OF CONTENTS

APPENDIX A: Summary of Investment Plan Development Stakeholder Comments and
Correlated Administrator Responses A-1

APPENDIX B: Equity Matrix with Equity Funding Summary B-1

APPENDIX C: Mapping of Planned Investments to the Electricity System Value Chain C-1

APPENDIX D: Equity Engagement D-1

APPENDIX E: Tribal Engagement E-1

APPENDIX F: Regulatory and Legislative Background..... F-1

APPENDIX G: Acronyms and Abbreviations G-1

APPENDIX H: Glossary H-1

APPENDIX I: CEC Request for EPIC 5 Inflation Adjustment..... I-1

APPENDIX A:

Summary of Investment Plan Development Stakeholder Comments and Correlated Administrator Responses

Docketed Written Comments

TN270556 Mustafa Kemal Isen (Lineer Robotics)

EPIC 5 should address the research and development (R&D) gap in robotic technologies designed for the physical maintenance of energized high-voltage lines to mitigate wildfire risks. While line inspections are well-funded, there is a lack of support for technologies that can perform vegetation clearance and hardware repair without de-energizing lines. Lineer Robotics recommends the creation of milestone-based grants and utility-partnered testbeds to provide startups with much-needed access to energized testing environments, the lack of which is currently a major barrier to commercialization.

California Energy Commission (CEC) Staff Response TN270556: CEC staff appreciates the recommendation to consider robotic technologies designed to maintain lines without de-energization, which is broadly included in potential innovations that could be supported in this Electric Program Investment Charge (EPIC) Investment Plan. Specifically, the Research Topic Area "Supporting Wildfire Mitigation that Manages Risk and Advances Affordability" recognizes the need for development of new technology for ignition prevention and acknowledges a need for improved evaluation of additional impacts to ratepayers, such as outages, caused by wildfire risk mitigation strategies. Specific areas of research would be further developed based on identified need during the solicitation development phase, and partnerships with utilities for validation that the system can be included where appropriate.

TN270558 Christopher Paul Ruch (SMART Local 104)

EPIC 5 should incorporate "High-Road" workforce principles and rigorous standards throughout the program design. Achieving California's climate goals requires a highly skilled workforce capable of properly installing and maintaining complex mechanical systems to ensure they perform as intended. We recommend requiring a "Skilled and Trained Workforce" for all EPIC-funded project phases, including work on modular and factory-assembled systems, to promote family-supporting careers and economic mobility for disadvantaged communities.

CEC Staff Response: See response following TN270598.

TN270598 Jeremy Zeedyk (WSC Workforce Standards)

Workforce quality is an essential program quality and risk management tool for the successful deployment of complex clean energy technologies. Improper installation and maintenance can undermine energy savings and public confidence. The fifth EPIC investment cycle (EPIC 5)

should incorporate "High-Road" principles like state-approved apprenticeship utilization and family-supporting wages. Measurable workforce outcomes, such as apprenticeship utilization and job placement metrics, should be tracked to ensure that public investments advance both innovation and long-term economic opportunity.

CEC Staff Response TN270558 and TN270598: CEC staff acknowledges the importance of workforce upskilling and support as well as the role of High-Road principles in ensuring successful deployment of clean energy technologies. EPIC is focused on developing technology innovations to support California's climate and energy policies, but staff may consider supporting workforce efforts as complementary portions of EPIC-funded projects as EPIC 5 solicitations are developed.

TN270599 BluePoint Planning

EPIC 5 should devote funding to studies and pilots aimed at building social trust and "durable civic infrastructure" to increase the adoption of electrification and energy efficiency technologies. Technological breakthroughs alone are insufficient if the market lacks the trust and social networks required to drive technology uptake. BluePoint Planning recommends that these efforts be technology-agnostic and focused on the outcomes of trust and buy-in, which they identify as critical barriers to achieving the state's statutory energy goals.

CEC Staff Response: CEC staff appreciates the recommendation and would consider opportunities — for example, in Strategic Initiative 4, "Community-Led Clean Energy Capacity Building and Research Incubator for California Native American Tribes (tribes) and Community-Based Organizations (CBOs)" — to support technology-agnostic research that strengthens community trust and adoption pathways. Social science research may be considered within the scope of any of the initiatives that include applied research.

TN270628 Flex Power Control, Inc.

While grid software and orchestration are important, intelligence alone does not move power, and California must prioritize endpoint hardware to enable safe, bidirectional power flow at the customer level. There is a significant commercialization gap for hardware-based systems, which require more extensive validation, safety testing, and manufacturing development than software. Private capital is often unavailable until after certification is achieved. EPIC 5 should specifically support integrated distributed energy resources (DER) and vehicle energy management systems, product characterization, and manufacturing readiness to unlock the value of existing ratepayer-owned assets like electric vehicles (EVs) and rooftop solar.

CEC Staff Response TN270628: CEC staff appreciates the feedback and recommendations regarding the need to prioritize endpoint hardware, address the commercialization gap for hardware-based systems, and support integrated energy management systems that optimize power flow between electric vehicles, solar, batteries, household loads, and the utility grid. These topics are broadly aligned with the scope of potential innovations supported in the proposed EPIC 5 Investment Plan, particularly within initiatives focused on customer-sited resource integration and harnessing the value of transportation electrification for ratepayers. Furthermore, the CEC recognizes the high capital costs and extensive manufacturing validation required

for hardware prototypes compared to software solutions. Specific technology focus areas, product characterization requirements, and manufacturing readiness support would be further scoped and developed during the solicitation development phase to ensure public investments are used effectively.

TN270633 Mark Lefebvre (EcoRecycleTech)

EcoRecycleTech advocates for the integration of circularity and life-cycle considerations into the design of clean energy technologies funded by EPIC 5. Without a deep focus on battery reuse and recycling pathways, the high level of electrification envisioned for California will result in a costly waste problem that current solutions cannot effectively solve. The CEC should emphasize environmental and economic impacts throughout the battery supply chain to ensure a truly sustainable electrified future.

CEC Staff Response TN270633: CEC staff appreciates the recommendation to include battery reuse, recycling, and lifecycle circularity as topics of research in the EPIC 5 Investment Plan. These areas would be in scope in the “Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits” EPIC 5 Strategic Initiative. Staff would work to develop solicitations that also consider the environmental impacts of the battery supply chain.

TN270641 Weikang Li (ExPost Technology Inc.)

ExPost Technology urges the CEC to fund battery circularity, specifically domestic recycling and cathode regeneration, as an explicit research objective in EPIC 5 to reduce dependence on imported materials and lower lifecycle costs. There is a critical gap in lithium iron phosphate recycling, as its economics are currently weak despite lithium iron phosphate's dominance in grid-storage deployments. We recommend that program structures prioritize milestone-based funding for pilot- and demonstration-scale capital costs to help early-stage companies move innovations from the lab to commercial deployment.

CEC Staff Response TN270641: CEC staff appreciates the recommendation to include battery recycling and cathode regeneration as topics of research in the EPIC 5 Investment Plan. These areas would be in scope in the “Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits” EPIC 5 Initiative. Staff would take into consideration the suggestion to prioritize milestone-based funding for demonstration projects.

TN270655 Sandia National Laboratories:

Sandia National Laboratories proposes research into advanced soft magnetic materials (SMMs), which are foundational components for transformers, motors, and high-efficiency power electronics. SMMs have not seen a fundamental commercial breakthrough since the 1980s, creating a "national research gap" that limits the performance of modern wide-bandgap semiconductors and artificial intelligence (AI) data centers. Sandia advocates for EPIC-funded independent validation of next-generation SMMs under California-specific conditions — such as high temperatures and fast-charging cycles — to enable rare-earth-free motors and reduce overall grid losses.

CEC Staff Response: See response following TN270861.

TN270861 Edson Perez (PeraWatt Energy Inc.)

PeraWatt Energy urges the CEC to make RD&D for advanced soft magnetic materials (SMMs) an explicit priority in EPIC 5. SMMs are the cores of transformers and motors, and the lack of innovation in this field has created a bottleneck for efficiency gains in next-generation power electronics. Advanced SMMs are critical for high-frequency electronics like EV chargers, solar microinverters, and data center power converters.

PeraWatt highlights that high-performance SMMs can enable motor designs that reduce or eliminate heavy rare-earth elements, which carry significant supply-chain risks. This technology supports several EPIC goals, including DER integration and 100 percent net-zero carbon, by strengthening domestic supply chains and lowering system costs. They argue that EPIC is uniquely positioned to prove these solutions in California-relevant conditions, where federal funding is limited.

CEC Staff Response TN270655 and TN270861: CEC staff appreciates the recommendations to include SMMs to replace traditional rare earth elements in applications such as motors and transformers as an area of research and development. This type of research would be in scope in the “Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits” EPIC 5 Strategic Initiative.

TN270670 Eric Kuhle (PG&E)

PG&E is supportive of the continued development of the Cal-Adapt Analytics Engine and advanced climate analysis tools within the EPIC 5 Investment Plan. A collaborative, CEC-led effort to innovate in climate data analysis is far more cost-effective and efficient than having each individual utility develop its own separate methods. These tools are essential for helping California electric utilities meet CPUC requirements to explicitly incorporate climate change projections into their investment planning and risk assessments. By funding these ongoing developments, the CEC can ensure that California remains a leader in best-in-practice analytical processes for a dynamic climate science field.

CEC Staff Response TN270670: CEC staff appreciates the support from PG&E for the continued development of innovative climate data and analyses in EPIC 5. These topics and themes would be included in the Research Topic Area “Advancing Energy System Resilience under Climate Change and Extreme Weather.” CEC staff looks forward to collaborating with PG&E and other investor-owned utilities (IOUs) in identifying the development of data and analyses that are most relevant for their investment planning and risk assessments.

TN270691 David G. Victor (UC San Diego Deep Decarbonization Initiative)

David G. Victor, on behalf of the UC San Diego Deep Decarbonization Initiative, recommends that EPIC 5 include behavioral field research and driver-centric experiments to better understand the human dimension of EV charging. Current load forecasting models often rely on idealized assumptions of charging flexibility that lack empirical evidence, potentially leading to significant discrepancies in actual power grid impacts. By funding real-world studies in California, the CEC can more accurately forecast load profiles and identify effective

interventions to encourage midday charging, ultimately improving ratepayer affordability and grid integration.

CEC Staff Response TN270691: CEC staff appreciates the recommendation to include behavioral field research and driver-centric experiments to complement technical studies. This type of research would be in scope of the proposed EPIC 5 Strategic Initiative 1, "Harnessing the Value of Transportation Electrification for Ratepayers."

TN270701 Calectra, Inc.

Calectra advocates for EPIC 5 to fund pilot- and demonstration-scale systems for electrifying process heating in heavy industries like steel and cement. The massive operating scales of heavy industry present a unique challenge for commercialization. Targeted CEC support would bridge the gap between promising lab-scale innovations and commercially viable industrial solutions, leading to reduced emissions and lower energy costs.

CEC Staff Response TN270701: CEC staff appreciates the support of pilot- and demonstration-scale technologies to electrify industrial process heating, including applications in energy-intensive industries such as steel and cement. These technologies and applications would fall within the scope of the Strategic Initiative 8 "Cost-Effective Industrial Decarbonization."

TN270779 Miguel Sierra Aznar

Miguel Sierra Aznar expresses support for EPIC's focus on clean energy technology safety, supply chains, and life-cycle benefits while urging the Commission to remain technology-neutral and include resources like wind, geothermal, and tidal. He suggests establishing a centralized safety information resource for battery and energy storage technologies, modeled after the "Hydrogen Tools" program, to serve as a trusted guide for developers and emergency responders. Furthermore, he recommends that research into domestic supply chains prioritize cost-effectiveness and identify specific technical or regulatory bottlenecks to ensure R&D produces practical, actionable outputs.

CEC Staff Response TN270779: CEC staff appreciates the commenter's support of the EPIC 5 initiative on safety, supply chain, and life-cycle benefits. Staff intends for this initiative to consider the safety, supply chain, and life-cycle benefits of a variety of clean energy technologies like renewable generation as well as energy storage, so the suggested areas would be in scope. The development of cost-effective technology will be critical to help ensure long-term cost benefits to IOU ratepayers. The suggestion of a centralized energy storage safety resource to help standardize best practices across the state could be aligned with the proposed scope of Strategic Initiative 6 "Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits."

TN270782 Miguel Sierra Aznar

Miguel Sierra Aznar supports the goal of better understanding the health, air quality, and community impacts of electrification but emphasizes the need for transparent, standardized, and peer-reviewed assessment methods. He cautions against creating new, potentially difficult-to-maintain dashboards, suggesting instead that the initiative focus on creating

durable reference datasets and guidance that can be integrated into existing, widely used platforms. This approach would ensure that the resulting metrics provide consistent, reliable signals for designing ratepayer-protective policies and programs.

CEC Staff Response TN270782: Staff appreciates these comments and the support for the goal of improving understanding of the health, air quality, and community impacts of electrification. Staff agrees that research should be based on transparent, standardized, and peer-reviewed methods. We also appreciate the suggestion to develop durable datasets and guidance that can be integrated into existing platforms where appropriate. At the same time, staff believes there is an important role for public-facing tools, dashboards, and app-based resources that translate complex scientific information into practical, actionable insights for electricity ratepayers, policymakers, and program implementers. As this Research Topic Area moves forward, we would consider opportunities to leverage existing platforms where appropriate in balance with user-friendly decision-support resources where they address unmet needs and provide clear value to California ratepayers.

TN270823 Navin Menon

Navin Menon writes in strong support of the continued advancement of factory-built housing through EPIC 5. He argues that modular construction provides a major opportunity to apply proven industrial manufacturing practices — such as standardized processes and strategic capacity management — to the housing sector. These methods can overcome the inconsistent timelines and variable quality associated with traditional construction.

Menon encourages the CEC to support programs that validate factory-built solutions through demonstrated improvements in manufacturing productivity and schedule certainty. By adopting these manufacturing principles, California can make zero-carbon housing more accessible and deliver sustainable housing at scale.

CEC Staff Response: See response following TN270862.

TN270526 Vamsi Kumar Kotla

Zero-carbon modular housing can deliver significant ratepayer value by standardizing clean energy integration and reducing the high soft costs of site-by-site upgrades. Factory economies of scale can lower the costs of heat pumps, solar, and battery storage while providing resilience benefits for tribal and wildfire-rebuild housing. EPIC 5 should treat homes as repeatable deployment platforms rather than one-off construction projects to achieve broader building decarbonization goals.

CEC Staff Response: See response following TN270862.

TN270639 Heather Wallace

Heather Wallace requests that EPIC 5 prioritize zero-carbon modular housing as a scalable and efficient platform for clean energy deployment. Combining offsite construction methods with a standardized suite of technologies — including solar, battery backups, and heat pumps — allows manufacturers to create housing that is both more attainable and highly resilient.

Funding research and development in this area will help establish modular building as a primary tool for meeting California's energy and housing goals.

CEC Staff Response: See response following TN270862.

TN270643 The Future Organization, LLC

EPIC 5 must treat zero-carbon modular housing as a critical intersection for achieving goals related to energy efficiency, affordability, and resilience for vulnerable populations. California cannot meet its statutory climate or housing targets without public agency support to streamline the adoption of all-electric, solar-and-storage-equipped modular homes. By prioritizing this scalable deployment platform, the state can foster ease of adoption in the marketplace for affordable energy-efficient solutions.

CEC Staff Response: See response following TN270862.

TN270700 Rani Chand, Zero-Carbon Modular Housing:

Rani Chand requests that EPIC 5 prioritize zero-carbon modular housing as a scalable platform for deploying clean energy technology. Offsite construction methods allow for the repeatable and efficient integration of solar, battery backups, and heat pumps into new homes from the start. Funding for research, development, and demonstration in this area is a way to deliver more attainable and resilient housing across California's communities.

CEC Staff Response: See response following TN270862.

TN270702 Kanoj Kumar

Kanoj Kumar encourages EPIC 5 to support zero-carbon modular housing as a practical strategy to align California's housing and clean-energy goals. Moving construction offsite can reduce delays while making it easier to consistently include efficiency measures like solar and battery storage in home designs. Kumar argues that R&D funding would help validate this construction model to deliver cleaner, more resilient housing at a much greater scale.

CEC Staff Response: See response following TN270862.

TN270703 Karnail Chand

Karnail Chand argues that California should treat zero-carbon modular housing as a core component of its clean-energy infrastructure strategy. By building homes offsite and integrating clean energy systems from the beginning, the state can reduce construction friction while ensuring homes are efficient and resilient. He urges EPIC 5 to support the necessary research and development to test, improve, and scale this modular approach statewide.

CEC Staff Response: See response following TN270862.

TN270832 John Spencer

John Spencer, an aerospace industry advisor, supports EPIC 5 investment in factory-built housing as a way to bring advanced manufacturing principles into the modular home sector. He argues that California will not meet its housing or climate goals through traditional

construction alone and that repeatability in a controlled environment is key to reducing waste and shortening timelines.

Spencer recommends that EPIC 5 treat zero-carbon modular housing as a scalable deployment platform that can integrate solar, batteries, heat pumps, and high-performance insulation. He urges the program to fund projects that measure outcomes directly, including production cycle time, installation duration, and construction waste reduction.

CEC Staff Response: See response following TN270862.

TN270836 Brandon Weiss (Vitruv LLC)

Vitruv LLC urges the Commission to dedicate EPIC 5 funding to zero-carbon modular housing as a clean-energy deployment platform. They frame modular housing as a repeatability mechanism that allows for the factory-line integration of high-performance envelopes, heat pumps, solar generation, and battery storage. This approach reduces the soft costs and variable quality associated with site-built construction where each home is treated as a one-off product.

They recommend that EPIC 5 support R&D on grid-interactive controls for factory-built homes, enabling them to serve as aggregated DERs for demand response and virtual power plants. Vitruv argues that this platform addresses both California's housing shortage and its decarbonization goals simultaneously. They advocate for open data on real-world performance to inform future building standards and utility programs.

CEC Staff Response: See response following TN270862.

TN270840 Arezou Sadoughi, Ph.D.

Dr. Arezou Sadoughi supports EPIC 5 investment in factory-built housing, emphasizing the potential for massive improvements in delivery speed and carbon reduction. Shifting modular production to controlled environments can reduce construction timelines from 14 months to 3–4 weeks — a 90 percent reduction — while cutting embodied carbon by up to 50 percent.

Dr. Sadoughi recommends that EPIC 5 prioritize projects that clearly document outcomes like production cycle time, installation speed, and assembly efficiency. Additionally, the evaluation of high-performance building materials, such as insulation systems with low global-warming-potential (GWP) blowing agents, that can provide better thermal performance and faster installation in a factory setting should be part of future research.

CEC Staff Response: See response following TN270862.

TN270859 Ivan Grijalva (AADAP, Inc.)

Ivan Grijalva, representing AADAP and the West Adams WorkSource Center, supports continued investment in zero-carbon modular housing as an engine for workforce development. He highlights the potential for factory-built housing to create accessible pathways into skilled trades and advanced manufacturing careers. By shifting construction into controlled environments, modular housing provides safer and more predictable employment while supporting upskilling and career growth.

He frames zero-carbon modular housing as an opportunity to expand participation in clean-energy industries for workers. Grijalva encourages EPIC 5 to support scalable approaches that integrate housing production, energy efficiency, and job quality. This model is viewed as a way to simultaneously address California's housing shortage and its decarbonization targets while connecting workers to high-quality jobs.

CEC Staff Response: See response following TN270862.

TN270862 Aaron Lubrano (Sugarpine Engineering)

Aaron Lubrano of Sugarpine Engineering supports EPIC 5 investment in zero-carbon modular housing, specifically to improve the coordination of mechanical, electrical, and plumbing systems. He notes that many building performance issues are caused by inconsistent field coordination and systems that are difficult to commission after installation. Factory-built housing moves this integration into a controlled environment where solar, storage, and ventilation can be coordinated earlier.

Lubrano frames modular construction as an opportunity to reduce field conflicts, simplify commissioning, and deliver more predictable long-term energy performance. He encourages the CEC to prioritize EPIC 5 investments that treat factory-built housing as a reliable platform for well-coordinated, high-performance building systems. This approach ensures that energy efficiency technologies are tested more consistently than they would be in traditional site-built projects.

CEC Staff Response TN270823, TN270526, TN270639, TN270643, TN270700, TN270702, TN270703, TN270832, TN270836, TN270840, TN270859, TN270862: Staff appreciates the many comments emphasizing the importance of efficient construction pathways to advance California's clean energy goals; these comments align with the intent of the Whole-Home Retrofit Solutions Research Topic Area. CEC staff is considering complementary strategies that streamline delivery, enhance quality control, and integrate clean energy systems by accelerating electrification through rapid, high-efficiency whole-home retrofit solutions. Solicitation development and continued research, demonstration, deployment, and validation would help to determine the scalability, cost-effectiveness, and operability of these approaches in supporting statewide decarbonization.

TN270801 California Center for Sustainable Communities (CCSC) at UCLA

The California Center for Sustainable Communities (CCSC) at UCLA provides the following comments across the EPIC focus areas:

- *Transportation Electrification:* The CEC should prioritize the deployment of bi-directional EV charging solutions. Bi-directional charging can provide resilience to the grid, increase the utilization of intermittent renewable generation capacity, shave peak electricity demand, and maximize the life cycle value of vehicle battery energy storage systems.
- *Distributed Energy Resources:* The CEC should coordinate with the CPUC to centralize and standardize energy and DER data reporting. For instance, while CEC hosts the majority of datasets and analysis products related to California's energy industry, demand, and prices, the CPUC hosts a limited set, including CEDARS and DGStats. The

CEC should explore with the CPUC whether there may be opportunities to streamline jurisdiction over data hosting and tools to minimize upgrades needed by CPUC.

The CEC should also work to standardize DER telemetry data formatting and access to improve visibility for energy forecasting and grid operations, as new types of DER devices (for example, smart thermostats, HVAC) and their proprietary communication protocols proliferate.

Finally, CEC and CPUC should explore the costs and benefits of establishing a statewide DER device registry to record data on DER asset locations, types, nameplate ratings, and other relevant technical capabilities. The statewide DER registry should capture device nameplate data and program enrollment information but should not be responsible for collecting dynamic device telemetry.

- *Building Electrification:* Electrification measures should only be considered after the implementation of whole-home energy efficiency retrofits. Without better-performing buildings, the state's residents will incur higher electricity costs, which many can't afford, particularly in disadvantaged communities.

The problem of split incentives remains a clear obstacle to many programs. Here it is likely that the state will need to impose mandates, starting with home retrofits, accompanied by no-interest revolving loan funds to support the financial cost of implementation.

CEC should also work to better understand the potential contribution of balcony solar arrays coupled to small batteries in facilitating net-load reductions and bill savings for different classes of customers that have otherwise not benefited from the adoption of rooftop solar and net-metering tariffs.

- *Energy System Reliance:* Demand response is a key element that can be leveraged to support energy system reliability as an alternative to traditional, highly expensive, pole and wire utility infrastructure capacity investments. Greater insight into the potential for demand response programs to achieve peak load reductions at the circuit level is undervalued and understudied. CEC could fund this type of analysis with a focus on commercial and industrial end uses.
- *Building Community Energy Resilience and Reliability:* This area is also closely related to wildfire planning and calls for a strong deployment of community solar systems and microgrids. Community solar systems and microgrids can reduce the impacts of Public Safety Power Shutoff (PSPS) events on diverse communities. Current IOU risk management practices are primitive and reactionary, causing significant impacts on communities and putting vulnerable people who rely on electricity for life-saving needs in harm's way.
- *Life Cycle Assessment:* CCSC would also like to support CEC's interest in Life Cycle Assessment (LCA) of energy system technologies as LCAs can reveal unintended greenhouse gas (GHG) emissions from the extraction, manufacturing, transportation, and installation of equipment. No energy system physical infrastructure is without impacts, but this information is critical in evaluating alternative pathways for ongoing decarbonization efforts.

- *Commercial and Industrial Decarbonization*: The decarbonization of these sectors is complex and differentiated in many regards — end uses, equipment, size of firm, age of equipment, and building construction, to name a few. We suggest that CEC and CARB more clearly align their research such that there is better information sharing and potential scope for funding bigger, more substantive projects.

CEC Staff Response TN270801: CEC staff appreciates your recommendations and provides the following responses:

- On “Transportation Electrification,” bidirectional EV charging would be within the scope of the EPIC Investment Plan, under the Research Topic Area titled “Reducing Barriers to Beneficial Bidirectional Charging.”
- On “Distributed Energy Resources,” CEC staff appreciates the recommendations to centralize and standardize energy and DER data reporting and formatting and streamline data hosting and tools. These data-driven priorities would be included within the scope of the proposed EPIC 5 Investment Plan. Specific data frameworks, device registries, and formatting protocols would be further evaluated and scoped based on identified research gaps during the solicitation development and workshop phases. To maximize the impact of public investments and minimize administrative duplication, the CEC would continue to work closely with the CPUC and other parties to leverage coordination opportunities.
- On “Building Community Energy Resilience and Reliability,” this proposed Research Topic Area acknowledges the disparate extent of outages — including PSPSs — as well as of their impacts on communities. It also recognizes the need to develop community-specific insights and targeted portfolios of pragmatic solutions to improve resilience and reduce harm, with a focus on situations that utilities are not currently positioned to resolve. Various community resilience solutions could be considered, such as microgrids, mobile renewable power, heat resilience, and strategies focused on the availability of critical services.
- On “Commercial and Industrial Decarbonization,” staff appreciates the comments recognizing the complexity of decarbonizing California’s commercial and industrial sectors. CEC staff are working closely with the California Air Resources Board (CARB) to coordinate research and maximize the impact of state investments. Staff would also prioritize projects with broad applicability and the potential to deliver the greatest benefits. While EPIC funding is limited and constrains individual project size, staff would continue to consider opportunities to support impactful research and demonstration projects within available resources.
- On “Building Electrification,” staff appreciates the comments underscoring the importance of building electrification and the need to prioritize whole-home energy efficiency improvements before installing electric end-use technologies. CEC staff recognizes that better-performing buildings are essential to managing energy costs for residents, particularly in disadvantaged communities, and that split incentives continue to pose challenges for widespread adoption of retrofit measures. In addition, staff acknowledges the potential value of emerging solutions such as balcony-mounted solar paired with small batteries and would consider opportunities

to further understand their contribution to ratepayers who have not traditionally benefited from rooftop solar or net-metering programs.

- On “Life Cycle Accounting,” the CEC appreciates the supportive comments on the value of studying lifecycle impacts of clean energy technologies. The CEC recognizes that developing and managing clean energy technologies must take into consideration environmental lifecycle impacts in decision-making and promote innovative solutions where possible to ensure a sustainable energy future for California.

TN270806 Bellus Ventures II Management Co., LLC

Bellus Ventures submits comments advocating for the inclusion of domestic phytomining of nickel as a recognized research topic within the EPIC 5 plan to strengthen critical material supply chains. Phytomining uses hyperaccumulator plants, such as the California native, *Streptanthus polygaloides*, to naturally extract nickel from serpentine soils and concentrate it into biomass feedstock for hydrometallurgical refining. This process offers a low-impact, in-state source of battery-grade nickel, addressing the current 90 percent U.S. reliance on imported refined nickel.

Bellus supports the “Strengthening Critical Materials Supply Chains for Clean Energy Technologies” research topic and encourages the CEC to include first-of-a-kind refining of domestically grown (phytomining-derived) nickel-bearing material into battery-grade product as an eligible, fundable activity, complementing rather than duplicating federal support for early-stage research.

CEC Staff Response TN270806: CEC staff appreciates the suggestion to include phytomining for critical materials like nickel as a research area. If this technology is applied to critical materials in the supply chain for energy storage, wind power, or other renewable generation, this type of research could be considered under proposed Strategic Initiative 6 “Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits.”

TN270809 Noble Thermodynamic Systems, Inc.

Noble Thermodynamic Systems expresses strong support for the EPIC 5 Cost-Effective Industrial Decarbonization Initiative. They advocate for an outcome-oriented, technology-agnostic approach that includes pathways like clean firm power; hydrogen; carbon capture, utilization, and storage (CCUS); and grid-integrated clean DERs. Additionally, process-integrated clean DER, including process-integrated clean heat and power, should be considered within this initiative. They emphasize that industrial decarbonization must be evaluated not only by emissions reductions but also by its impact on grid reliability, local air quality, and ratepayer affordability.

Noble further recommends that the CEC structure its First-of-a-Kind (FOAK) deployment support to remain competitive and accessible throughout the five-year EPIC 5 period. They propose a staged funding structure (for example, pre-seed, techno-economic assessment/life cycle assessment, seed) that allows qualified California innovators to enter at the appropriate stage of maturity. This approach aims to avoid locking funds into early projects that may not

deliver the strongest long-term results while supporting local innovation and workforce training.

CEC Staff Response TN270809: CEC staff appreciates the comments and support for the Cost-Effective Industrial Decarbonization Initiative. In developing the EPIC 5 Investment Plan, CEC staff are focused on delivering benefits, including improved affordability, grid reliability, local air quality, and safety, to ratepayers throughout the electricity system. Staff appreciates your recommendations regarding staged funding structures and would consider these approaches during the planning and implementation of the appropriate EPIC 5 initiatives.

Regarding the FOAK funding structure, the CEC intends to assemble resources that would address various stages in the lead-up to deployment. Staff appreciates the suggestion to develop criteria for entry at various stages and would consider this approach during solicitation and program development.

TN270817 Jason Cotrell (Sperra)

Sperra, a company pioneering marine infrastructure for renewable energy, urges the CEC to include explicit funding for three critical research areas in EPIC 5:

- Offshore wind foundation and anchor infrastructure. California's floating offshore wind targets require domestically manufactured concrete foundations and anchors that reduce cost, embodied carbon, and supply chain risk.
- Port development for offshore wind manufacturing. California needs not only a staging and integration terminal but also a statewide port strategy that enables multiple ports — Los Angeles, Long Beach, Humboldt Bay, San Diego, San Francisco — to participate in offshore wind supply chain development. Targeted EPIC funding for port planning, CEQA review, and pilot demonstration of modular manufacturing systems would allow smaller ports and innovative small businesses to contribute meaningfully to offshore wind deployment without being crowded out by large fixed-infrastructure projects alone.
- Canal solar and co-located clean energy infrastructure. California's canal system represents a largely untapped opportunity to generate solar energy, conserve water, and reduce land use simultaneously.

Sperra is concerned that the current draft plan lacks sustained funding for utility-scale offshore renewable energy and front-of-the-meter innovation. Sperra recommends a statewide port strategy that enables multiple California ports to participate in the offshore wind supply chain, as well as R&D for 3D-printed canal solar canopy systems that conserve water and reduce land use.

Sperra also encourages the CEC to continue early-stage programs, including the California Sustainable Energy Entrepreneur Development Initiative (CalSEED), Realizing Accelerated Manufacturing and Production for Clean Energy Technologies (RAMP), and The California Test Bed Initiative (CalTestBed), as they are essential for hardware companies with long development cycles and high prototype costs.

CEC Staff Response: Regarding offshore wind and port readiness development, the CPUC and the PICG did not include offshore wind development as a priority investment area for the EPIC 5 investment cycle.

Regarding canal solar and co-located clean energy infrastructure, CEC staff appreciates Sperra's support in researching solar over canal waterways to address both efficient clean energy generation and resource conservation simultaneously. The CEC is currently funding a segment of research on this topic with UC Merced and is in alignment with Sperra on valuing the benefits of expanding possible research on solar over California's extensive water canal systems as well as other solar-over-water technologies. With regard to Sperra's last comment, please see response following TN270855.

TN270820 Edward McGlone (Peak Energy)

Peak Energy, a developer of passively cooled sodium-ion battery energy storage systems (BESS), supports the EPIC 5 plan with a focus on non-lithium technologies. They argue that incumbent lithium-ion variations require costly refrigeration systems that increase safety risks, noise, and ratepayer costs. Peak Energy encourages the CEC to support the development of non-lithium BESS for all applications, noting that passively cooled systems represent an effective climate adaptation strategy to handle increasing ambient temperatures. Peak Energy also supports objectives related to smart planning tools, community-scale decarbonization, and domestic supply chains. Peak Energy recommends that EPIC 5 solicitations be designed to advance emerging technologies that minimize parasitic losses from cooling and energy conversion. They also support an equity-focused initiative to deploy lower-cost, integrated solar and storage solutions for disadvantaged communities, renters, and tribes.

CEC Staff Response TN270820: CEC staff appreciates the suggestion to include non-lithium energy storage technology within the EPIC 5 Investment Plan. Under the proposed initiative "Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits," the battery safety and critical material supply chain topics encompass both lithium and non-lithium battery technologies. Staff also values the support for equity-focused deployment of lower cost, integrated solar-plus-storage solutions for disadvantaged communities, renters, and tribes as well as the consideration of passively cooled systems as an effective climate adaptation strategy. Ensuring that clean energy benefits reach all Californians remains a central objective of EPIC.

TN270821 Douglas Davenport (Prospect Silicon Valley)

Douglas Davenport provides selective comments on the EPIC 5 draft initiatives. First, the term "renters" must be accompanied by an acknowledgment of the landlord-tenant connection, as both entities are critical to achieving intended building decarbonization impacts. For community-scale decarbonization, he recommends clarifying that systems should encompass all residential buildings, including multi-family units.

Regarding the proposed Pre-Commercial Grid Tech Incubator, Davenport encourages the CEC to consider multiple or overlapping programs to ensure equal benefit across all three IOU territories. On the CBO Incubator, he recommends it prioritize solutions, awareness, capacity building, and clear metrics for return on investment.

CEC Staff Response TN270821: CEC staff appreciates the recommendations. Regarding the Grid Tech Incubator, the CEC has initiated discussions with all three IOUs, which have all expressed an interest in collaborating to advance these technologies. Staff also appreciates the comment highlighting the importance of the landlord–tenant relationship in achieving meaningful building decarbonization outcomes. CEC staff acknowledges that framing around “renters” should reflect the interconnected roles of both tenants and property owners, particularly where split incentives and decision-making authority affect retrofit and electrification efforts. Staff also appreciates the recommendation to clarify that community-scale decarbonization systems should encompass all residential buildings, including multifamily properties, and would consider this framing to better align program planning with the full range of housing types and interested parties involved.

TN270822 California Lighting Technology Center (CLTC)

The California Lighting Technology Center (CLTC) urges the CEC to prioritize research on the cybersecurity and interoperability of customer-sited DERs. As California relies more on DERs for demand response and virtual power plants (VPPs), the communications architectures for devices like smart inverters, gateways, and thermostats expand the potential cybersecurity attack surface. Research is needed to understand how compromised platforms could affect both individual customer systems and overall grid operations.

CLTC highlights that cybersecurity events could lead to inaccurate reporting of DER availability, undermining confidence in VPP programs and diminishing the value of public investments. They recommend research into secure communications architectures, protocol translation, and methods for validating DER status. Particular focus should be given to coordination systems for multiple behind-the-meter (BTM) devices, as these will be increasingly important for future grid infrastructure.

CEC Staff Response TN270822: Staff recognizes that addressing the expanded cybersecurity attack surface of communication architectures for devices like smart inverters, gateways, and thermostats is critical. Research into secure communications architectures, protocol translation, and BTM device coordination systems is vital to prevent compromised platforms from affecting grid operations or undermining confidence in VPP program availability. These topics are broadly aligned with the objectives of the EPIC 5 Investment Plan, particularly within research topics focused on customer-sited resource integration and interoperability. Specific technology focus areas, testing procedures, and security protocols would be further scoped and developed based on identified research gaps during solicitation development and workshops.

TN270830 The Energy Coalition (TEC)

The Energy Coalition (TEC) provides the following recommendations for the CEC to consider in its EPIC 5 Investment Plan:

- Ensure allocation of funding to include a small number of bold, cross-cutting community-scale demonstrations - the value of community decarbonization comes from the integration of measures, not from any single measure deployed on its own. The

draft initiatives address these elements, but distribute them across separate Strategic Goals, where they are likely to be solicited as separate single-topic projects. EPIC 5 should prioritize a small number of high-impact, precedent-setting, integrated community-scale demonstrations that complement the wider distribution of single-topic projects. At least one opportunity should allow for an integrated demonstration of programs under all five Strategic Goals, within various disadvantaged communities. Outcomes would include the creation of shared systems infrastructure for financing, procurement, and collaborative governance, with structured peer learning across grantees.

- Include local distribution energy market and transactive structures in the Equity-Focused DER Solutions for Disadvantaged and Vulnerable Communities (DVCs) topic — the draft topic identifies VPP participation, community microgrids, multifamily DER packages, and innovative ownership and financing as demonstration categories. TEC recommends adding community-scale, local energy market structures as an explicit category. A community choice aggregator (CCA) is a viable near-term market maker for such a structure. These outcomes are additive to the grid-centric dispatch that the newest generation of VPPs provides in DVCs.
- Leverage the CEC's data authority and tools, prioritize open data access, and treat Basset-Avocado Advanced Energy Community's findings as Value of DER inputs — access to customer and grid data was a persistent constraint that EPIC 5 should systematically address. Project-level device application programming interfaces were cost-prohibitive or unavailable from manufacturers; utility meter data access through third-party services was fragile; and the distribution-grid data needed to assess locational value, including volt-VAR sensitivity,¹ was absent from IOU Integration Capacity Analysis maps. TEC supports inclusion of the Advancing Customer-Sited DER Integration and interoperability topic and recommends that it prioritize open, standardized, customer-authorized data Advanced Metering Infrastructure 2.0 access rather than additional proprietary protocols and that it include a grid-edge gateway as a cost-effective path to interoperable dispatch.
- Pair electrification with solar and storage, and prioritize research that avoids panel and structural constraints — low-income participants expressed real concern that electrification on its own would raise their bills, and many would default to gas absent further support. Pairing electrification with on-site solar and storage, or community solar, is what made the affordability case credible. The draft plan already identifies panel constraints and plug-and-play DERs, but TEC recommends the following additional elements under this topic: smart load management and load-sharing (circuit splitters) approaches that avoid panel upgrades where the existing panel is safe; low-power and 120-volt appliance configurations; and business models that resolve the landlord-renter split incentive.
- Make the community, not the individual building, the unit of intervention — TEC supports the draft Neighborhood-Level Decarbonization topic and recommends that it

¹ A measure of how changes in reactive power (measured in volt-amperes reactive, or VARs) affect voltage at a specific location on the electric power system.

extend beyond thermal networks to integrated electric packages at neighborhood scale, combining efficiency, solar, storage, and electrification with a CBO coordination layer.

- Demonstrate CCA-led delivery models for community energy resilience — TEC found that resilience hubs are frequently held in the planning stage by procurement, financing, and host-commitment barriers, and that a standardized, CCA-led delivery model can create a project pipeline, standardize contracting, and provide economies of scale that move projects to construction.
- Community-Led Capacity Building and Non-Energy Impacts — TEC supports the draft Community-Led Clean Energy Capacity Building and Research Incubation initiative. TEC recommends that EPIC 5 continue and accelerate non-energy impact research.
- TEC strongly supports the inclusion of “renter-focused, minimally-disruptive retrofits” as a research focus — new technologies are needed to improve on the current portfolio of 120-volt products in terms of GHG reductions and the range of co-benefits, as well as to bring down both the upfront investment and the ongoing utility costs. While building scale retrofits will ultimately be needed, low-income renters need access to more immediate solutions that address the growing risks from high heat and air pollution, and that can be implemented without the need for property-owner intervention.

CEC Staff Response TN270830: CEC staff appreciates the recommendations and provides the following responses:

- On “bold, cross-cutting community-scale demonstrations,” CEC staff appreciates the recommendation to support a number of cross-initiative community-scale demonstrations. Strategic Initiative 2 could contribute to DER integration, load flexibility, resilience, innovative financing, and community governance approaches. Strategic Initiative 4 could strengthen the capacity of tribes and CBOs to help design, implement, and learn from these demonstrations. Strategic Initiative 5 could support integrated building- and community-scale decarbonization strategies, including electrification, renewable energy, smart controls, load management, and shared infrastructure. Strategic Initiative 9, in focusing on adaptation, is oriented to integrated community-level solutions that synchronize across conditions, needs, self-determination, and technological potentials; it could contribute tools, technologies, and analyses that improve community resilience to grid outages, extreme weather, and wildfire risks, particularly in the areas most vulnerable to outages. CEC staff will consider opportunities to coordinate across these initiatives and promote structured knowledge sharing among and informed by related projects.
- On “local distribution energy market and transactive structures,” CEC staff agrees that local energy markets and transactive structures could advance affordability, resilience, and equitable DER participation. Multiple topics could support community-scale approaches for coordinating and compensating localized grid services. Community choice aggregators (CCAs) and other local entities could potentially serve as important partners or market administrators in developing and testing these models.
- On “data access, open standards, and grid-edge gateways,” CEC staff agrees that secure, standardized, and customer-authorized data access is essential to scalable DER integration. The proposed topics emphasize vendor-neutral data architectures, interoperability, gateway technologies, and improved access to customer, device,

and distribution-system data. Findings from Basset-Avocado Advanced Energy Community and other prior and ongoing EPIC projects could also inform future research where relevant.

- On “pairing electrification with solar and storage,” CEC staff agrees that pairing electrification with solar, storage, and flexible load management can improve affordability and resilience. CEC staff appreciates the emphasis on smart load management strategies, low-power and 120-volt appliance configurations, and approaches that help avoid costly panel upgrades — particularly for households facing financial constraints. There are numerous relevant topics that could support smart panels, plug-and-play technologies, load-sharing approaches, and other strategies that reduce or avoid costly electrical upgrades. They could also support business and financing models that address landlord-renter split incentives.
- On “community-scale decarbonization,” CEC staff appreciates the detailed comments highlighting the value of community-scale decarbonization and the importance of integrating measures that support affordability, equity, and community-driven implementation. The recommendation to treat the community, rather than the individual building, as the unit of intervention aligns with broader equity goals, and staff acknowledges the potential of neighborhood-level packages that combine efficiency, solar, storage, and electrification with coordination from trusted community-based organizations.
- On “CCA-led resilience delivery models,” CEC staff agrees that CCAs may be well positioned to help move community resilience projects from planning to implementation. The Equity-Focused DER Solutions topic could support demonstrations of approaches led by CCAs and other entities to standardize procurement, financing, contracting, customer participation, and long-term operations. The topic would also remain open to feedback on locally appropriate delivery partners.
- On “community-led capacity building and non-energy impacts,” CEC staff appreciates the comment and acknowledges TEC’s support for continued exploration of non-energy impacts within community-led capacity-building efforts.
- On “Renter-focused, minimally disruptive retrofits,” CEC staff recognize the need for business models that address landlord-tenant split incentives to ensure renters and property owners can both benefit from clean-energy improvements. CEC staff also appreciates the support for renter-focused, minimally disruptive retrofit solutions and the call for continued innovation to reduce upfront costs, lower utility bills, and expand access to clean-energy benefits for all Californians. Relevant topics could support plug-and-play technologies, direct install approaches, flexible ownership models, and coordinated DER packages. Strategic Initiative 2 could complement building decarbonization research by integrating these solutions with solar, storage, dynamic rates, and demand-flexibility programs.

TN270831 SWITCH Energy, Inc.

SWITCH Energy recommends that EPIC 5 maintain a focus on transportation electrification, specifically scaling managed charging as a grid resource. They emphasize the need to prioritize the multifamily customer segment, which remains significantly underserved due to high infrastructure costs, power constraints, and landlord-tenant split incentives. They suggest

funding seamless integrations that allow property managers to handle heating, cooling, and EV charging with a single solution.

A major technical recommendation from SWITCH is for the CEC to allow flexibility in Energy Star requirements for funded infrastructure. They explain that current EPA certification practices tie specific hardware to specific charging management systems, creating costly barriers for network providers like SWITCH that procure various hardware models. They suggest allowing equipment to be eligible if approved by a credible third-party list, such as those from Electric Power Research Institute (EPRI) or Electric Vehicle Charging Association of North America, to avoid excluding innovative vendors.

CEC Staff Response TN270831: CEC staff appreciates the support for the “Scale Managed Charging as a Grid Resource” Research Topic Area and recognizes the importance of expanding equitable access for the multifamily customer segment. CEC staff would consider the innovations described to address unique constraints of the multifamily sector compared to single-family housing, which also aligns with the “Strategic Electrification of Emerging Transportation End-Uses” Research Topic Area. Specific eligibility requirements would be determined during the solicitation development phase to align projects with the EPIC 5 Strategic Goals, Strategic Objectives, Strategic Initiatives, and Research Topic Areas, as well as the evolving standards landscape.

TN270833 Zora Chung (ReJoule)

Zora Chung, CFO of ReJoule, supports the need for investment in a circular economy for aged EV batteries. While internal combustion engine vehicles have established supply chains for end-of-life value, the same does not yet exist for EVs, partly due to the high transportation and handling costs of hazardous battery materials. ReJoule recommends EPIC 5 funding to pool resources for repairing, remanufacturing, and repurposing these batteries to keep them in circulation.

Additionally, ReJoule supports the Regional Energy Innovation Cluster (REIC) model, noting that startups like ReJoule have directly benefited from the Southern California Energy Innovation Network (SCEIN) and Los Angeles Cleantech Incubator in navigating funding and bringing R&D to market. ReJoule encourages the CEC to expand its incubator focus beyond just grid technology to address all EPIC 5 goals, emphasizing the importance of California's leadership as federal support faces uncertainty.

CEC Staff Response TN270833: CEC staff appreciates ReJoule’s comment highlighting the importance of advancing a circular economy for end-of-life batteries. EPIC has made significant investments in battery second-use through previous funding cycles. While this remains an important area for California’s clean energy transition, any future EPIC funding would build on prior investments by addressing remaining research gaps and advancing innovations and commercialization for ratepayer benefit. Battery second-use could be considered, in particular, during solicitation scoping and development as part of the “Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits” EPIC 5 Initiative.

Regarding ReJoule's comments on the REIC model, please see response following TN270855.

TN270834 EPRI

EPRI provides comments focused on leveraging their existing tools, eRoadMAP and GridFAST, to support EPIC 5 objectives and address gaps identified in three topic areas/initiatives: Strategic Electrification of Emerging Transportation End-Uses, Accelerating Grid Connections of Clean Resources and Beneficial Loads, and Data and Planning Tools for Grid Infrastructure Investments and Coordinating Customer Decisions. eRoadMAP is a planning tool that combines vehicle location and behavior data to identify "hotspots" for EV load at a highly granular level, helping utilities plan grid upgrades efficiently. GridFAST is a data exchange platform that connects EV customers and utilities early in the energization process to identify necessary infrastructure investments.

EPRI suggests that the CEC build upon these tools rather than duplicating efforts, particularly for identifying pending loads from EV charging plazas and data centers. They recommend modifying these tools to include building loads and data center requirements to create holistic planning resources. EPRI also suggests exploring common data frameworks and standardized service applications to improve transparency for all grid stakeholders.

CEC Staff Response TN270834: CEC staff appreciates EPRI's suggestion to build upon existing tools like eRoadMAP and GridFAST designed to help utilities prepare for a reliable and more affordable EV transition. CEC agrees that these types of tools are broadly aligned with Research Topic Areas including "Strategic Electrification of Emerging Transportation End-Uses," "Accelerating Grid Connection of Clean Resources and Beneficial Loads," and "Data and Planning Tools for Grid Infrastructure Investments and Coordinating Customer Decisions." CEC would consider the development status of such tools during implementation of EPIC 5 to avoid duplication and identify opportunities for further innovation.

TN270835 Vycarb Inc.

Vycarb Inc. introduces permanent water-based bicarbonate carbon storage as an alternative to traditional geologic carbon capture and storage. Their technology converts point-source CO₂ into bicarbonate stored in natural waters using containerized, sensor-controlled reactors. They argue that geologic storage is limited by high capital costs, geographic dependence, and minimum volume thresholds that exclude most distributed industrial emitters in California.

Vycarb recommends that EPIC 5 recognize bicarbonate storage as an eligible pathway for cost-effective industrial decarbonization, particularly for small-to-mid-volume facilities like bioenergy plants, landfills, and wastewater treatment plants. They highlight that their process bypasses energy-intensive purification and compression while providing permanence of over 1,000 years. They also emphasize their direct molecular Measurement, Reporting, and Verification approach, which uses real-time sensors to verify carbon storage and ensure ecosystem safety.

CEC Staff Response TN270835: CEC appreciates the feedback highlighting the importance of alternatives to geologic carbon dioxide sequestration. CEC staff recognizes the important role that carbon capture can play in industrial decarbonization,

as reflected in CARB's most recent Scoping Plan. For the EPIC 5 Investment Plan, staff would consider a variety of pathways, including alternative utilization approaches, under relevant topics.

TN270838 Kevin Davis (Blue Planet)

Blue Planet supports the Cost-Effective Industrial Decarbonization initiative, focusing on CCUS via carbon mineralization. Their technology converts captured CO₂ into coarse and fine limestone aggregate for use in concrete, which is the second-most consumed material on Earth. This process captures not only CO₂ but also other harmful pollutants like particulate matter and nitrogen oxides.

Blue Planet recommends prioritizing technologies that reduce parasitic loads, noting that their mineralization pathway avoids energy-intensive CO₂ purification. They advocate for decarbonization strategies that support carbon utilization, creating durable markets for captured carbon in building materials like concrete aggregate. This approach allows for deep decarbonization of infrastructure while minimizing the need for permanent state subsidies.

CEC Staff Response TN270838: CEC staff appreciates the comments supporting CCUS through carbon mineralization and other innovative approaches. CEC staff recognizes the importance of developing cost-effective pathways for industrial decarbonization and would consider relevant technologies and approaches in the EPIC 5 Investment Plan.

TN270841 Arne Jacobson (Schatz Energy Research Center)

Dr. Arne Jacobson, Director of the Schatz Energy Research Center, highlights the high societal returns on innovation investment, noting that every \$1 invested can yield an \$8 return. While acknowledging rate pressure on California ratepayers, he argues that the small EPIC surcharge is justified by these returns. He emphasizes that a robust EPIC portfolio is essential for meeting climate and equity targets simultaneously.

Jacobson points out that wildfire-related costs are a primary driver of rising electricity rates in California. He recommends that EPIC 5 prioritize R&D for climate adaptation and wildfire risk mitigation to improve affordability. Specifically, he supports draft initiatives focused on community resiliency through DERs and capacity building for Tribes and CBOs to address historic inequities in energy access.

CEC Staff Response TN270841: CEC staff appreciates the support for the topics focused on climate adaptation, wildfire risk mitigation, community resilience, and capacity building for tribes and CBOs. The Research Topic Area framings are consistent with the suggestions to focus on improving affordability and energy equity simultaneously and on building community energy resilience for areas historically underserved in energy access.

TN270842 Lawrence Berkeley National Laboratory

Lawrence Berkeley National Lab provides feedback on the following topics:

- Customer-sited Resource Integration and Interoperability - recent research from the CalFlexHub project has shown that nonconformance with communication protocols

prevents implementation of demand flexibility in some devices. The following are needed: funding the investigation and development of a performance rating system, developing standardized test procedures, performing laboratory testing, and developing a formal certification ecosystem to verify devices as being “demand-flexibility” ready to provide objective information on the conformance of individual devices. This work could go a long way to help end users select devices that are better suited to support demand flexibility and load shifting.

- Scaling Energy Resources and Load Flexibility - we encourage the funding of research into the digitization of these workflows to simplify and engage far greater levels of customer participation. The research fund would support: (1) standardizing and formalizing demand response program requirements (eligibility criteria, flexibility metrics, compensation models, data protocols); (2) characterizing building asset capabilities in a machine-readable format; (3) developing tools that automatically identify which building assets qualify for which demand response programs based on program requirements; and (4) creating interoperable frameworks that automate enrollment, participation decisions, bidding, flexibility forecasting, billing, settlement, and payment processing.
- Pre-commercial Grid Tech Incubator — we would like to highlight the potential synergies that may be available through the intellectual property pipeline within the National Laboratories, especially through the Cradle 2 Commerce (C2C) and Incubating Market-Propelled Entrepreneurial-mindset at the Labs (IMPEL) programs, funded by the U.S. Department of Energy. These programs could aid the Commission through matchmaking of technically vetted startups across a number of relevant domains.
- Whole Home Retrofits — under the proposed activity to “demonstrate nondestructive and nondisruptive diagnostic tools,” we note that it would be good to fund earlier-stage technologies as well as the demonstration and deployment of high-Technology Readiness Level (TRL) technologies at or near commercial availability. Further, we would like to encourage the inclusion of the transparent building envelope (windows and their retrofits) in this topic area. Effective window retrofits require accurate characterization of existing windows, yet documentation is often unavailable.
- Thermal Energy Networks and Energy Resource Coordination — funding for developing design workflows for the district energy system that include system configuration selection and detailed design, with the help of dynamic simulation for integrating the thermal and grid modeling, would help lower long-term energy costs and improve resilience.
- Wildfire Mitigation and Risk Reduction (specifically the proposed activity on technology innovation for wildfire risk reduction — we strongly recommend that the program consider funding the investigation of building materials, technologies, and practices that harden the building and make it less likely to be damaged or destroyed by wildfire.

CEC Staff Response TN270842: CEC staff appreciates the recommendations and provides the following responses:

- On “Customer-sited Resource Integration and Interoperability,” CEC staff recognizes that nonconformance with communication protocols remains an obstacle that prevents the successful implementation of demand flexibility. The proposed strategies to fund the investigation and development of a

performance rating system, standardized test procedures, laboratory testing, and a formal certification ecosystem to verify devices as demand-flexibility compatible are potentially valuable research pathways to address these obstacles. Providing objective conformance information may be an effective approach to help end users select technologies that are optimized to support both their own needs and demand flexibility and load shifting. These topics are broadly aligned with the potential innovations intended for support within the EPIC 5 Investment Plan. The specific technical focus areas, standardized testing protocols, and verification methodologies would be further scoped, refined, and developed based on identified research gaps during the solicitation development phase and future workshops.

- On “Scaling Energy Resources and Load Flexibility,” CEC staff appreciates the comments on the value of research into how digitization could support simplifying and streamlining enrollment and participation in demand-side programs. Streamlining and standardizing program eligibility evaluations, enrollment, participation, bidding, flexibility forecasting, billing, settlement, and payment processing via methods such as digitization and automation are within the scope of the EPIC 5 Investment Plan. Specific demonstration and technology focus areas would be scoped through workshops and other public engagement as part of developing individual solicitations.
- On “Pre-commercial Grid Tech Incubator,” CEC staff welcomes the opportunity to collaborate with existing programs such as C2C and IMPEL. These entities are welcome to provide input during solicitation scoping as well as apply to provide services where there is overlap with their areas of expertise and professional networks.
- On “Whole-Home Retrofits,” CEC staff would be open to funding projects with both low- and high-TRL technologies depending on the specific scoping of a solicitation; appropriate TRLs to target would be determined during the investment plan implementation phase. CEC staff appreciates the comment, which aligns directly with the intent of the Whole-Home Retrofit Solutions topic. This topic is designed to prioritize energy-efficiency-first approaches, and nondestructive, nondisruptive diagnostic tools are essential for enabling that sequence. Demonstrating high-TRL tools at or near commercial availability is important for near-term deployment, and earlier-stage technologies can improve characterization of existing building conditions, particularly in rental housing. Transparent building envelope systems, including windows and their retrofit solutions, are a critical part of this. Effective window retrofits depend on accurate assessment of existing assemblies, yet field conditions are rarely well-documented. Incorporating advanced diagnostic methods for envelope and fenestration characterization will strengthen right-sizing of heating, ventilation, and air conditioning (HVAC) systems, reduce retrofit costs, and improve whole-home performance. Including both early-stage and near-commercial diagnostic technologies in this topic area would help ensure that Whole-Home Retrofit Solutions are technically robust, scalable, and capable of supporting California’s broader decarbonization and load-flexibility objectives.

- On “Thermal Energy Networks and Energy Resource Coordination,” CEC staff appreciates the recommendation on particular areas of research to improve resilience and lower costs. CEC staff will consider this recommendation during solicitation development.
- On “Wildfire Mitigation and Risk Reduction,” staff appreciates the input to consider technologies to harden buildings against wildfire. The Research Topic Area “Supporting Wildfire Mitigation that Manages Risk and Advances Affordability” acknowledges the need for technology innovation, including for reduction in the impacts of utility-caused wildfire, recognizing that reducing consequences of fires will lessen utility liability costs. The specific research areas to focus on would be further developed based on identified research gaps at the time of solicitation development, from the perspective of bringing benefits to California ratepayers.

TN270843 Sarah Matsui (Nextpower)

Nextpower recommends that EPIC 5 prioritize research that increases the utilization of existing grid infrastructure through direct current (DC)-coupled architectures. These systems integrate solar, battery storage, and other resources to reduce conversion losses and lower interconnection costs relative to traditional alternating current (AC)-coupled configurations. Research should evaluate performance, economics, interoperability, controls, and scalability, including potential benefits such as reduced interconnection costs, deferred distribution infrastructure upgrades, and improved resilience during grid outages.

Nextpower also advocates for repowering architectures for California's aging solar fleet, using existing generation sites and interconnection infrastructure to increase productivity and operational flexibility. Particular emphasis should be placed on repowering strategies that combine solar generation, battery storage, and flexible end-use loads through DC-coupled architectures. Research should assess the technical, economic, and grid benefits of utilizing existing interconnection capacity more efficiently, supporting load growth with lower infrastructure costs, improving resilience, and accelerating deployment timelines relative to greenfield development.

Finally, Nextpower supports exploring grid-supportive microgrids that integrate flexible high-utilization loads, such as computing infrastructure, that can respond dynamically to grid conditions and absorb excess renewable generation. Particular attention should be given to high DC/AC ratio renewable energy facilities, point-of-interconnection, front-of-meter, and customer-sited architectures that increase utilization of renewable generation and existing interconnection infrastructure while supporting grid reliability and reducing infrastructure costs. Demonstrations should evaluate how flexible loads can absorb excess renewable generation, reduce curtailment, improve utilization of existing transmission infrastructure, and lower overall system costs associated with serving rapidly growing electric demand.

CEC Staff Response TN270843: Staff appreciates the comments and agrees there is potential for DC architectures to increase efficiency and provide other benefits relative to AC-coupled systems. Similarly, CEC staff agrees there is significant potential for flexible loads, including from computing infrastructure, to help balance variable renewable generation and shift consumption to off-peak times. These advancements

are within the scope and could be explored under several proposed EPIC 5 Strategic Initiatives, including Strategic Initiative 2 (Leveraging DERs and Load Flexibility for Affordability and Grid Reliability) and Initiative 3 (Accelerating Grid Connection of Clean Energy Resources and Beneficial Loads).

TN270844 Maia Cheli (Schatz Energy Research Center)

Maia Cheli of the Schatz Energy Research Center provides the following comments on selected topics:

- Developing equity-focused DER solutions: this is a critical component for enabling communities to mitigate and adapt to climate change without deepening existing social divides. Wildfire and weather extremes are prompting Californians toward a more flexible and responsive grid; in this period of reimagination and restructure, we can and should choose to design for equity and accessibility. We request that the CEC support innovations advancing equity in both rural and urban environments and facilitate information exchange across DER projects so that regions can learn from each other's insights and developments
- Tribal Energy Capacity Building and Mentorship: as a technical service provider in the design and development of microgrids and other resilient energy systems, we have seen the strong, positive impact of knowledge exchange and mentorship across tribal communities. Ultimately, these exchange programs drive down infrastructure costs and increase implementation success by enabling tribal utilities and energy teams to learn from each other's experiences and develop culturally appropriate energy systems that meet tribal priorities. We request that the Commission support at least two regional incubators, reflecting the diversity and long distances between tribes across the state.
- Supporting Wildfire Mitigation that Manages Risk and Advances Affordability: we support this effort to include innovation at the critical nexus of fire risk, electric power infrastructure, and community resilience — and we urge EPIC administrators to maintain a holistic view of these issues, including natural and landscape-level solutions alongside engineered ones.
- Supporting strategies and alliances that enable rural and tribal landscapes to strengthen local resilience, advance tribal energy sovereignty, improve system reliability, and shape future grid evolution: rural landscapes are at the forefront of energy systems change due to wildfire risk, weather exposure, and limited redundancies in available public services. These communities can also therefore be incredibly motivated and generative of novel, right-sized advancements to meet climate change. We are excited for this proposal to support strategies and alliances that will catalyze rural and tribal strengths towards a clean and resilient next generation grid.

CEC Staff Response TN270844: CEC staff appreciates the recommendations and provides the following responses:

- On "Developing Equity-Focused DER Solutions," CEC staff agrees that equity-focused DER solutions could address the distinct needs and conditions of both rural and urban communities. The proposed topic is intended to support approaches that improve affordability, resilience, and access to clean energy benefits across diverse community contexts. CEC recognizes the importance of facilitating information

exchange among funded projects so that lessons, tools, and successful approaches can be shared across regions and inform broader replication.

- On “Supporting Wildfire Mitigation that Manages Risk and Advances Affordability,” CEC staff appreciates the support and recommendation to maintain a holistic view of risk reduction. This framing is consistent with the proposed initiative, which recognizes the opportunity to draw from a portfolio of risk management techniques and leverage advances made in other sectors.
- On “Tribal Energy Capacity Building and Mentorship,” CEC staff recognizes the value of peer-to-peer learning, mentorship, and technical knowledge exchange in supporting tribal energy sovereignty and successful project implementation. As CEC staff develop a future funding opportunity under this proposed initiative, we would consider how to address regional diversity and geographic distance among tribes, including whether regional incubator models or similar approaches could best support tribal capacity building.
- Under the “Building Community Energy Resilience and Reliability” Research Topic Area, CEC staff appreciates this supportive comment and agrees that tribes are leading the development of innovative, integrated solutions that strengthen tribal and rural resilience, uphold tribal energy sovereignty, and advance a successful clean energy transition statewide. The proposed research would be designed to foster these innovative contributions, information exchange and evaluation, and to help overcome key barriers that inhibit their successful implementation and broader impact.

TN270845 Raya Power, Inc.

Raya Power is developing modular solar and battery systems designed for renters and homeowners with incompatible roofs who are currently locked out of traditional rooftop solar. Their systems are designed not to backfeed to the grid, eliminating the need for complex grid interconnection. They support expanding the "Equity-Focused DER Solutions" Research Topic Area to explicitly include single-family homes, as these residents often lack the authority or financing to commit to full solar systems.

Raya Power also supports expanding activities related to energy system resilience under climate change. They urge the CEC to pilot promising technological solutions in communities highly exposed to wildfire risks, such as PSPS zones, alongside the development of data and modeling tools. Raya Power expresses readiness to engage with staff on the design of demonstration projects for these modular systems.

CEC Staff Response TN270845: CEC agrees that renters and residents of single-family homes may face barriers to accessing DERs. The proposed topic does not exclude single-family homes and could support scalable solutions that improve DER access and resilience in communities facing wildfire, outage, or PSPS risks. Specific demonstration and technology focus areas would be scoped through workshops and other public engagement as part of developing individual solicitations.

TN270846 Association for Energy Affordability (AEA)

The Association for Energy Affordability (AEA) provides the following comments:

- **DER Integration** — AEA strongly encourages continued investment in DER strategies and technologies that reduce grid impacts while enhancing flexibility and resilience. AEA recommends focusing on control strategies and communication protocols for central heat pump water heating systems, which are often the largest energy load in multifamily buildings. They argue that these systems have significant potential for thermal energy storage but currently lack standardized optimization frameworks. AEA also suggests investment in small, BTM battery systems and plug-in solar as practical solutions for low-income multifamily renters.
- **Building Decarbonization** — AEA urges the CEC to prioritize comprehensive retrofit strategies that combine electrification with building envelope improvements to reduce the size and cost of needed HVAC systems. They emphasize the need for field demonstrations in under-resourced communities that include long-term service agreements and resident education. Finally, they call for improved access to utility data to identify the most favorable rate structures for property owners and residents to mitigate potential bill increases.
- **Climate Adaptation, Health, and the Cost of Whole-Home Electrification** — AEA encourages continued research into the relationships among electrification, indoor environmental quality, health outcomes, and healthcare utilization. Stronger evidence generated through epidemiological, longitudinal, and quasi-experimental studies would help residents, policymakers, and building owners make more informed decisions. Equally important is translating research findings into practical decision-making tools that can inform investments, program design, and policy development. Expanded datasets and stronger evidence could ultimately support the integration of health, comfort, and indoor air quality metrics into programs, incentive structures, and future code development.

CEC Staff Response TN270846: CEC staff appreciates the recommendations and provides the following responses:

- On “DER Integration,” CEC staff appreciates the recommendations from the AEA regarding DER integration, specifically the emphasis on optimizing multifamily building loads and supporting low-income renters. Staff recognizes that central heat pump water heating systems represent a major energy load in multifamily configurations and hold significant potential for thermal energy storage that is currently limited by a lack of standardized optimization frameworks. Additionally, staff acknowledges that small, BTM battery systems and plug-in solar arrays have potential to serve as highly practical, scalable solutions to extend clean energy and resilience benefits directly to low-income multifamily renters. These topics are broadly aligned with the goals of the EPIC 5 Investment Plan, particularly within draft research topic areas focused on advancing customer-sited DER integration and interoperability and delivering equity-focused DER solutions for disadvantaged communities and multifamily segments. The specific technology focus areas, communication protocol requirements, and deployment parameters for multifamily and renter-focused innovations would be further evaluated, scoped, and refined based on identified market gaps during the solicitation development phase and associated workshops.

- On “Advancing Health and Air Quality Research to Inform Building and Transportation Electrification in California” Research Topic Area comments, staff appreciates the feedback and support. Staff agrees that additional research is needed to better understand the relationships among electrification, indoor air quality, health outcomes, and healthcare utilization, particularly through policy-relevant epidemiological, longitudinal, and quasi-experimental studies. Staff also agrees that translating research findings into practical decision-support tools is essential to help ratepayers, policymakers, building owners, and EPIC Program Administrators make informed decisions. The proposed Research Topic Area would address these needs by advancing California-specific evidence, data analytics, and decision-support resources that could inform investments, program design, incentives, and future building standards while maximizing benefits to electricity ratepayers.
- On “Building Decarbonization,” CEC staff appreciates the comments emphasizing the importance of advancing affordable building electrification systems for residential homes and the role of whole-home retrofit solutions in reducing long-term energy costs. CEC staff appreciates the recommendation to further explore control strategies and communication protocols for central heat pump water-heating systems, which represent a significant load in many multifamily buildings. Staff also recognizes the value of comprehensive retrofit approaches that pair electrification with building envelope improvements to reduce equipment size, lower upfront costs, and improve overall performance. Staff appreciates the recommendation in support of continuing field demonstrations. The suggestion to prioritize demonstrations in under-resourced communities, supported by long-term service agreements and resident education, is an important component of advancing equitable and effective decarbonization strategies.

TN270847 Matt Roberts (University of California [UC] Berkeley)

Matt Roberts, from the Center for the Built Environment at UC Berkeley, encourages the CEC to expand the Building Decarbonization Initiative to include whole-life carbon and embodied carbon quantified via LCA. He argues that addressing embodied emissions is critical to ensure that decarbonization is holistic rather than simply shifting emissions from one life cycle stage to another. He recommends strategies that target both the supply chain of materials and the construction demand for them.

Roberts recommends aligning this work with ongoing research at CARB focused on low-carbon building materials. He points out that embodied emissions can be equal to or greater than operational emissions and that assessment protocols like ISO 14040 already exist to guide this R&D. He urges the CEC to fund demonstrations that yield deeper emissions reductions by considering materials in an efficient and whole-life manner.

CEC Staff Response TN270847: CEC staff appreciates the recommendation to include embodied emissions and decarbonizing construction materials. These topics are within the scope of Research Topic Area, “Decarbonizing Construction Materials for Cost-Effective Infrastructure.”

TN270858 Paul Raftery (UC Berkeley)

Paul Raftery, of the Center for the Built Environment at UC Berkeley, advocates for in-depth efficiency measures as a necessary precursor and complement to building electrification. He notes that efficiency-first approaches can yield deeper and more cost-effective emissions reductions than electrification alone. Recent research showed a 70 percent reduction in fossil gas consumption in two large office buildings through HVAC controls and plant retrofits before any electrification occurred.

Raftery argues that efficiency measures shrink the size, first cost, and embodied carbon of subsequent heat pump installations while reducing grid impact. They also help overcome the "spark gap" between gas and electric rates, making projects more financially viable for building owners. He encourages the CEC to fund tools and demonstrations that characterize the savings potential and implementation costs of these sequenced efficiency measures.

CEC Staff Response TN270858: CEC staff appreciates these comments and agrees that traditional energy efficiency measures are a critical and foundational complement to building electrification activities, particularly given the differences between electric and gas rates. The Research Topic Areas within the Building Decarbonization initiative are intended to function as an integrated, high-level strategy rather than siloed efforts, and staff would continue to consider the interdependent nature of energy efficiency and electrification as the investment plan moves toward implementation and funding.

Staff also acknowledges the importance of energy-efficiency-first approaches in advancing affordable electrification for residential homes. In-depth efficiency measures including automated building controls serve as both a necessary precursor and a complementary strategy to electrification, with evidence showing that such measures can deliver substantial and cost-effective emissions reductions prior to the installation of electrification technologies.

CEC staff further appreciates the recommendations regarding support tools and continued field demonstrations that characterize the savings potential and implementation costs of sequenced efficiency measures, particularly within whole-home retrofit solutions. These insights would help inform strategies that enhance affordability, performance, and overall benefits for building owners and residents as electrification expands.

TN270860 Loren Lutzenhiser

Loren Lutzenhiser argues that residential decarbonization policy often targets an "imagined ideal consumer" who is financially able and eager to replace gas appliances with heat pumps. In reality, he notes, less than 10 percent of California households currently have heat pumps, and a large portion of the population (44 percent) are renters with no control over their building systems. Without addressing these "human dimensions," large-scale decarbonization will likely fail.

Lutzenhiser states that "a necessary supplement to an engineering-driven 'optimized-technology-development-will-lead-to-decarbonization' framework would also incorporate a more social science-informed 'people-choosing-and-using technologies imperfectly' framework." He recommends specific research into mechanisms of action, information

landscapes, and consumer trust issues at play in decarbonizing end uses, noting that trusted information about decarbonization is scarce for both renters and disadvantaged homeowners. He urges the CEC to support right-sized technologies for multifamily living spaces and to identify community-level group-purchase or mutual-aid initiatives. He also highlights the "data desert" surrounding real-world energy use, noting that utility meter data is often inaccessible to researchers and the public.

CEC Staff Response TN270860: CEC staff appreciates these comments highlighting the real-world challenges residents face in the decarbonization transition. Previous EPIC research projects have considered social behaviors; for example, feedback surveys from occupants and installers have shed light on the human aspects of technology implementation. These insights into how information landscapes shape consumer choices and how these dynamics affect equitable participation in the transition are deeply valued and could help inform more effective, community-aligned approaches moving forward.

Under the proposed building decarbonization initiative, the expanded performance data, improved installation practices, and community-scale demonstrations are intended to help build confidence in new technologies over time. Staff also recognizes the importance of access to real-world energy-use data. Several Research Topic Areas include expanded metering, field data collection, and analytical tools that will help improve understanding of household energy use and support equitable and scalable deployment. Staff appreciates the commenter's emphasis on community-level approaches and notes that the "Neighborhood-Level Decarbonization" proposed Research Topic Area provides opportunities to explore shared, coordinated models that may complement future community-based strategies. Social science research may be considered within the scope of any of the proposed EPIC 5 initiatives that include applied research.

TN270413 Cyrus Rustomji (South 8 Technologies)

The CEC should continue funding of REICs and SCEIN in the EPIC 5 Investment Plan. The clusters are vital "on-ramps" that connect clean energy startups with utilities, investors, and academia to bridge the gap between research and commercial market entry. Sustaining investment in these proven regional programs is more important than ever given the current uncertainty of federal support for clean energy.

CEC Staff Response: See response following TN270855.

TN270479 Robin Ihnfeldt (General Engineering & Research)

GE&R expresses strong support for SCEIN based on the direct benefits her energy startup received from the program. SCEIN provides essential connections to utilities, investors, and government agencies, serving as a critical "on-ramp" for bringing her company's innovations to market. The network has a proven return on investment and is instrumental in creating a thriving clean energy economy in California.

CEC Staff Response: See response following TN270855.

TN270557 Tanya Barham (Community Energy Labs)

Critical support from New Energy Nexus, CalTestBed, and SCEIN has led to millions in recurring revenue and private investment for Community Energy Labs. The REICs are the "connective tissue" that helps founders survive the "inevitable lows" of building a climate tech company by providing technical validation, proposal writing support, and access to an innovative community. Community Energy Labs urges the CEC to continue nurturing this early-stage pipeline to maintain California's reputation as a leader in clean technology and job creation.

CEC Staff Response: See response following TN270855.

TN270559 Kurt Rustin

Kurt Rustin emphasizes that startups are the "lifeblood" of the innovations needed to address California's energy challenges and that REICs serve as the critical support infrastructure for these innovators. He lends his support to the continued operation of REICs in EPIC 5 to ensure that the state's startup ecosystem remains well-funded and state-of-the-art. These clusters help funnel billions of federal and private dollars into California for the benefit of its residents.

CEC Staff Response: See response following TN270855.

TN270582 GreenTech Motors Corp.:

GreenTech Motors Corporation encourages the CEC to establish a dedicated EPIC funding track for clean energy hardware prototypes to bridge the resource gap between initial concept validation and market readiness. Hardware innovations require significantly more capital and manufacturing validation than software but often lack structured "follow-on" support after completing early-stage programs like CalSEED. GreenTech Motors Corp cites its high-efficiency motor-drive platform as an example of a high-impact technology that could better reach the marketplace with dedicated pathways for pilot deployment and field validation.

CEC Staff Response: See response following TN270855.

TN270583 Scott Anders Comments (University of San Diego):

SCEIN has delivered an 80:1 return on investment, helping 82 companies raise \$727 million and create 853 jobs. The regional innovation clusters are highly effective drivers of California's strategic goals and are essential for transitioning research into the market where climate benefits are realized. We recommend that EPIC 5 leverage this existing decade-long investment to support pre-commercial technologies across all strategic objectives, rather than just a select few.

CEC Staff Response: See response following TN270855.

TN270601 Patricia McNeil (Westwood Aerogel):

Westwood Aerogel voices support for extending the CalSEED program as well as extending its scope to support technology development beyond prototype development. Westwood Aerogel is interested in research areas related to battery fire safety for stationary units and EVs, transportation safety when shipping and storing new and end-of-life lithium-ion batteries,

building efficiency, and advanced manufacturing opportunities for building a circular economy within California.

CEC Staff Response: See response following TN270855.

TN270663 Marty Turock

Marty Turock, a clean energy consultant and founder of SCEIN, expresses "bewilderment" that the EPIC 5 draft appears to phase out the existing REICs and CalSEED program in favor of three new, unproven incubators. He highlights numerous success stories, such as Ivy Energy and Nuvve, to demonstrate that the current ecosystem already delivers significant benefits to disadvantaged communities and drives critical innovations in vehicle-to-grid and VPPs. Turock warns that starting new programs from scratch will create a multi-year "gap" in operational support, potentially causing the loss of synergistic networks and highly skilled resources, and recommends instead embedding new priorities within the proven existing infrastructure.

CEC Staff Response: See response following TN270855.

TN270671 Cleantech San Diego

Cleantech San Diego strongly urges the CEC to explicitly include continued funding for REICs and SCEIN in the EPIC 5 plan. The organization characterizes REICs as essential "on-ramps" that bridge the gap between energy entrepreneurs and the resources, utilities, and investors required to scale clean energy technologies. They highlight a massive 80:1 return on investment for SCEIN and a statewide impact that has attracted \$5.5 billion in follow-on funding and created 6,500 jobs since 2021. Given current federal funding uncertainty, Cleantech San Diego argues that maintaining these proven regional programs is critical for protecting California's national competitive advantage and ensuring a resilient clean energy future.

CEC Staff Response: See response following TN270855.

TN270794 Scott Anders and Venkat Shastri (University of San Diego):

Scott Anders and Venkat Shastri from the University of San Diego advocate for leveraging the CEC's decade of investment in SCEIN and other regional clusters to support pre-commercial technologies. They highlight that SCEIN has delivered a massive 80:1 return on investment, helping companies raise \$727 million in funding and create 853 full-time jobs while securing hundreds of patents. They argue that sustaining these proven regional "on-ramps" is more critical than ever due to uncertain federal support and is essential for moving research into the market where actual climate benefits are realized.

CEC Staff Response: See response following TN270855.

TN270796 Sector-Rise:

Rick Azer, President of Sector-Rise, urges the CEC to maintain funding for REICs, describing them as essential for incubating new technologies that support the state's clean energy interests, such as electric vehicles. Drawing on his ten years of experience as a technical advisor for SCEIN, he emphasizes the program's success in driving economic and environmental results, including over \$700 million in follow-on funding for startups. Azer

asserts that continuing to invest in these proven regional programs is vital for California to maintain its national leadership in energy innovation.

CEC Staff Response: See response following TN270855.

TN270811 James Zanewicz (Connect)

James Zanewicz, CEO of Connect, writes in support of SCEIN, a regional infrastructure model developed by Cleantech San Diego. He argues that breakthrough technologies require more than just funding; they need trusted pathways to technical expertise, utilities, and pilot opportunities. SCEIN provides this critical on-ramp for entrepreneurs, ensuring that innovative energy technologies are properly vetted and positioned to benefit California's economy.

SCEIN has delivered proven success, helping 81 clean energy companies raise \$727 million in follow-on funding and create over 850 jobs, an estimated 80-to-1 return on the CEC's investment. He urges the Energy Commission to continue prioritizing the REIC model within the EPIC 5 Investment Plan. Sustaining this locally rooted infrastructure is viewed as essential for maintaining California's leadership in energy innovation during a period of federal funding uncertainty.

CEC Staff Response: See response following TN270855.

TN270812 Anna Kulow (Lucky Peak Innovations LLC)

Anna Kulow expresses concern over the draft EPIC 5 plan's proposal to phase out the existing REIC network in favor of three new, narrower incubators. Replacing a proven statewide system with new, unproven programs would create major barriers to California's climate goals. Specifically, it would abandon the infrastructure that helps early-stage companies bridge the pilot valley of death.

The proposed incubators are redundant, as the existing clusters already work extensively with tribes, CBOs, and disadvantaged communities. Standing up new incubators would cause a multi-year capability gap, as the personnel and institutional knowledge built over the last decade would disperse. The CEC should sustain the existing REIC model and instead add dedicated resources within it to address any new specific objectives.

CEC Staff Response: See response following TN270855.

TN270813 Arun S.K. Raju (UC Riverside / CE-CERT)

Dr. Arun S.K. Raju, representing the Center for Environmental Research and Technology (CE-CERT) at UC Riverside, writes to support the continuation of programs that aid early-stage clean energy startups. Programs such as CalTestBed, REICs, and CalSEED are critical components of the state's innovation pipeline.

These programs facilitate vital collaboration between industry and academia, helping to move novel technologies toward commercial deployment under real-world conditions. UC Riverside strongly urges the Commission to continue these programs to accelerate decarbonization across various sectors.

CEC Staff Response: See response following TN270855.

TN270814 Benton Moore (The Brink SBDC)

Benton Moore, Director of The Brink SBDC at the University of San Diego, supports the continued funding of SCEIN. The Brink, a partner of Cleantech San Diego, works closely with SCEIN to advise startups in sectors like EV charging, solar, and battery technology. SCEIN is a vital accelerator that connects regional energy entrepreneurs with the investors, grants, and utilities necessary for commercialization. CEC funding for SCEIN is essential for maintaining the local clean energy economy and positioning California as a global leader in advanced energy technology.

CEC Staff Response: See response following TN270855.

TN270815 Petra Stegmann (Connect)

Petra Stegmann, representing Connect, advocates for the continued support of REICs, including SCEIN, in the EPIC 5 Investment Plan. The REICs are the backbone of California's clean energy innovation ecosystem, acting as trusted regional launchpads. These clusters ensure that new technologies are rigorously vetted and demonstrated to be cost-effective before they are deployed at scale.

The REICs help reduce barriers to entry for startups by connecting them with essential partners like academic institutions, government agencies, and labor. Sustaining this funding is portrayed as critical for maintaining California's national leadership in energy innovation.

CEC Staff Response: See response following TN270855.

TN270816 California Clean Energy Fund (New Energy Nexus)

New Energy Nexus provides comments on EPIC 5 based on a decade of experience administering programs like CalSEED and CalTestBed. They argue that the greatest barriers to clean energy commercialization are no longer purely technical but rather concern the ability of innovators to navigate complex ecosystems of testing, manufacturing, and community engagement. They encourage EPIC 5 to support the connective tissue that allows California's research infrastructure to function as a coordinated system.

Additionally, public innovation funding can expand participation for women- and minority-led companies while improving commercial outcomes. The CalSEED and CalTestBed programs have delivered significant impacts to California, including more than \$2.4 billion in follow-on funding.

New Energy Nexus recommends that EPIC 5 prioritize shared infrastructure, such as pilot manufacturing and battery testing facilities, that can help California retain innovation, strengthen domestic supply chains, create quality jobs, and build long-term industrial competitiveness. They also recommend that EPIC 5 support tribal energy sovereignty through models like the Tribal Energy Sovereignty Accelerator.

CEC Staff Response: See response following TN270855.

TN270819 Gretel von Son (Connect)

Gretel von Son, COO at Connect, writes in support of SCEIN and the REICs as critical bridges between concept and commercialization. She emphasizes that the collaboration fostered by

these programs — which bring together startups, utilities, labor, and academia — strengthens both the regional innovation ecosystem and California’s clean energy future. She strongly encourages the CEC to maintain its support for these established networks in the EPIC 5 Investment Plan.

CEC Staff Response: See response following TN270855.

TN270855 Mert Akin (EELI Technology, Inc.)

Mert Akin, founder of EELI Technology, writes to support continued funding for early-stage clean energy innovation programs like CalSEED and CalTestBed. EELI develops advanced electrochemical technologies for domestic lithium and critical mineral recovery, and he emphasizes that non-dilutive funding for pilot-scale validation is often the factor that determines whether breakthrough technologies advance toward commercialization.

Akin encourages the CEC to prioritize research on grid resilience and domestic material supply chains. He highlights that flexible support for partnerships between startups, national labs, and universities can significantly accelerate innovation. This investment is framed as essential for creating long-term economic and environmental benefits for California ratepayers.

CEC Staff Response TN270413, TN270479, TN270557, TN270559, TN270582, TN270583, TN270601, TN270663, TN270671, TN270794, TN270796, TN270811, TN270812, TN270813, TN270814, TN270815, TN270816, TN270819, TN270855: CEC staff appreciates the multiple comments supporting the entrepreneurial ecosystem, including the REICs, CalSEED, and CalTestBed. Staff agrees that funding entrepreneurs and supportive services is key to the development and successful commercialization of the technologies needed to achieve the EPIC Strategic Objectives and intends to provide funding for many of the critical functions described in the comments. CEC initially proposed an objective to encompass the various types of entrepreneurial support that EPIC has provided in the past (for example, Regional Energy Innovation Clusters, CalSEED, RAMP). However, the CPUC declined to include such an objective in its Decision (D).26-02-037. At a workshop in December 2025, the CEC proposed a funding initiative that spanned the Strategic Goals and Strategic Objectives and would exclusively fund support for entrepreneurs commercializing technologies that address the gaps identified in the Policy + Innovation Coordination Group process. CPUC feedback indicated that such an initiative was too broad and that administrators should identify specific areas where commercialization challenges faced by entrepreneurs were critical barriers to meeting the Strategic Objectives. This position was reinforced in D.26-02-037, which, as noted in the comments, stated that entrepreneurial support could be proposed in the investment plan as funding topics or initiatives.

In response to this feedback, after analysis of the current state of clean energy technology deployment and major barriers to meeting the EPIC Strategic Goals, and in alignment with the Strategic Objectives defined by the CPUC, the CEC has scoped the Grid Tech Incubator and First-of-a-Kind topics as targeted evolutions of entrepreneurial support. In addition, the CEC has included support for early-stage technology development, testing and validation, and/or pilot matchmaking services in a number of topics of the proposed EPIC 5 Investment Plan.

The CEC encourages members of the entrepreneurial ecosystem to remain active and involved in the process by participating in public workshops to scope new solicitations and serving as applicants, when appropriate.

TN270866 MCT Global Enterprises LLC doing business as LIS Analytics

LIS Analytics proposes a research concept to address a "measurement gap" in California's electrical distribution infrastructure caused by the rapid expansion of data centers. They argue that while data centers represent significant peak demand, the harmonic distortion and transient stress they inject into the grid are invisible to conventional utility systems that sample at 15-minute intervals. To bridge this gap, the LIS Engine is a physics-based platform that operates on high-frequency (1 kilohertz) waveform data to quantify equipment stress and provide Permanent Load Reduction estimates for more accurate interconnection planning.

LIS Analytics recommends that EPIC 5 fund a demonstration project at university physical plants to validate this methodology and benchmark it against open-source tools. This project would provide the CEC and utilities with measured harmonic injection data and documented screening methods to comply with emerging North American Electric Reliability Corporation reliability standards.

CEC Staff Response TN270866: CEC staff appreciates the recommendation.

Technologies and operational strategies for maintaining reliability and power quality while accelerating energization of large variable loads, such as data centers, would be within the scope of the proposed Strategic Initiative 3 — Accelerating Grid Connection of Clean Energy Resources and Beneficial Load. Specific demonstration and technology focus areas would be scoped through workshops and other engagements as part of solicitation scoping.

TN270871 Priyanka Mohanty (United Auto Workers Center for Manufacturing a Green Economy)

Priyanka Mohanty, representing the United Auto Workers Center for Manufacturing a Green Economy, advocates for a robust industrial policy that centers high-road manufacturing within California. While California is a global leader in clean tech innovation, these technologies are often manufactured elsewhere, depriving the state of tax revenue and high-quality jobs. By prioritizing domestic production and well-paying union jobs, California can build the political buy-in necessary for the energy transition while delivering more affordable products to ratepayers.

To support this vision, EPIC 5 should help startups navigate the "valley of death" by providing access to patient capital and a coordinated financing landscape. She specifically proposes the creation of a California High-Road Financing Consortium to align public and private investment around companies that commit to sustainable business practices and community benefits. This approach aims to ensure that public investments in R&D translate into local economic growth and a resilient, competitive clean energy marketplace.

CEC Staff Response TN270871: CEC staff appreciates the recommendation to offer funding opportunities for California's companies navigating scale-up, manufacturing, and financing barriers. EPIC 3–4 funded the RAMP solicitation to manufacture clean

energy technologies in California, and the EPIC 5 proposal includes, for instance, the First-of-a-Kind funding topic, which will provide patient capital and assist in creating capital stacks for commercial-scale industrial decarbonization deployment. In addition, EPIC 5 includes support for startups within a number of topics that focus on technology development. EPIC is focused on developing technology innovations to support California's climate and energy policies, but staff may consider supporting workforce efforts as complementary portions of EPIC-funded projects as EPIC 5 solicitations are developed. For example, FOAK and other commercialization efforts focused on the strategic objectives could support projects that generate secondary benefits related to jobs and tax revenues. CEC staff encourages engagement during EPIC public workshops and solicitation development processes.

TN270874 Photometrics AI / EvariLABS LLC

Photometrics AI identifies municipal and utility-scale street lighting as a major controllable load class currently missing from the EPIC 5 draft initiatives. With approximately 1.7 million streetlights in California's IOU territories, they argue that these networked luminaires represent a predictable resource that operates during the grid's highest-value evening hours. They calculate that optimized dimming and precise timing could avoid approximately \$17.5 million annually in utility system costs across the state while providing significant demand-response potential through programs like the Emergency Load Reduction Program.

The central barrier to utilizing this resource is that unmetered streetlights currently lack an accepted pathway for measurement, verification, and settlement. Photometrics AI recommends that EPIC 5 fund demonstrations of networked-lighting-control-based metering to establish the valuation methods needed for regulatory consideration. They emphasize that this flexibility can be achieved without compromising public safety by using precision software to reduce only imperceptible over-illumination, benefiting all ratepayers, including disadvantaged communities.

CEC Staff Response TN270874: CEC staff appreciates the feedback highlighting the potential value of street lighting as a controllable load; the insights on optimized, energy-efficient lighting controls; and the recommendation to explore pathways for measurement and verification while maintaining public safety and supporting equitable benefits for all communities. Staff will consider these recommendations and approaches in the EPIC 5 Investment Plan and its implementation under the appropriate initiatives.

TN270884 Joshua Simmons (Tribal Energy and Climate Collaborative and Prosper Sustainably)

Joshua Simmons, co-director of the Tribal Energy and Climate Collaborative, provides comprehensive feedback on the need for tribal-specific programming and funding carveouts across all EPIC 5 categories. He highlights that tribes are often ideal for DER and microgrid initiatives because reservations function as integrated communities. However, he notes that tribes face unique barriers, such as complex Bureau of Indian Affairs rights-of-way processes and a lack of basic power access in some remote rural areas.

Simmons advocates for EPIC 5 to support capacity building, training, and tribal-led innovation ecosystems that can help pre-commercial technologies navigate the path to commercialization.

He specifically recommends exploring utility-operated off-grid systems for remote tribes to avoid costly and wildfire-prone infrastructure upgrades, as well as advancing transactive energy models. By investing in tribal energy sovereignty and BTM microgrids, the state can simultaneously meet its climate goals and help tribes achieve greater economic self-sufficiency and resilience.

CEC Staff Response TN270884: Staff appreciates the detailed feedback regarding tribal energy needs and the barriers that can affect tribal participation in clean energy projects. Proposed Strategic Initiative 4 — Community-Led Clean Energy Capacity Building and Research Incubator for California Native American Tribes and Community-Based Organizations — is designed to support sustained engagement through training, mentorship, and regular opportunities for participant input. Staff also recognizes the importance of tribal-specific capacity building and appreciates the commenter’s recommendations related to tribal-led innovation ecosystems and pathways that help pre-commercial technologies advance toward deployment. These suggestions align with the goals of Strategic Initiative 4 to strengthen technical capacity and expand opportunities for tribes to lead clean energy innovation.

The “Building Community Energy Resilience and Reliability” Research Topic Area recognizes that rural areas and tribes host much of the needed infrastructure while also often being subject to low reliability and power shutoffs or having premises that are not connected to the grid at all. It also acknowledges the current and emerging role of tribes in providing resilience for both tribes and surrounding areas and emphasizes the importance of centering tribal energy sovereignty in fostering reliability and resilience solutions. Accordingly, the research would focus on the resilience and energy needs (including lack of basic energy access), solution performance, barriers, opportunities, and contexts of tribes as well as of other areas that are especially vulnerable to outages and their impacts.

In future EPIC 5 solicitation scoping, staff would consider how to support tribal-driven research, demonstration, and commercialization pathways, including examining the feasibility of approaches such as utility-operated off-grid systems for remote communities and emerging models like transactive energy. These concepts would be evaluated in the context of tribal energy sovereignty, resilience needs, and the broader objectives of the EPIC 5 research portfolio.

TN270980 Julie Kalansky and Dan Cayan (Scripps Institute of Oceanography)

Drs. Kalansky and Cayan emphasize Scripps Institute’s longstanding partnership with the CEC and their support of EPIC 5’s focus on DERs, demand flexibility, and climate resilience. They highlight that improved, probabilistic forecasting of key weather variables — such as solar irradiance influenced by cloud cover and wind — is essential for successfully scaling DERs. Scripps notes that its existing large-ensemble, high-resolution, and emerging AI-based regional forecast systems can enhance grid-relevant forecasting to support these goals.

For the resilience and climate adaptation initiative, Scripps strongly supports continued investment to fill critical gaps in data and modeling tools to inform grid infrastructure, operational, and adaptation analysis and to emphasize the importance of continual investment

in downscaling and advancing localized climate projections to support a resilient energy sector. Scripps stresses that some key high-risk climate processes — particularly coastal marine layer dynamics and complex wind regimes that affect both renewable generation and wildfire risk— are insufficiently captured by coarse global models and require integrated modeling strategies. Scripps recommends a combined approach using targeted dynamical downscaling (at ~1 kilometer and ~10 kilometer scales), expanded observational datasets, and advanced AI/machine learning methods to reduce computational burdens while increasing spatial and temporal detail. They conclude that enhanced historical records, forecasts, and climate projections will strengthen utility preparedness for extreme weather and climate impacts and express support for continued collaboration with the CEC.

CEC Staff Response TN270980: CEC staff appreciates these comments and examples on the need for improved weather forecasting as well as improved localized projections of climatic processes of importance to California’s increasingly renewable electricity grid. The research gaps identified are consistent with takeaways from prior EPIC-funded research that informed the scope of the “Advancing Energy System Resilience Under Climate Change and Extreme Weather” Research Topic Area. Solicitations under this research area would identify specific data and research gaps and could consider these proposed research areas.

TN271046 Zach Detweiler (Radify Metals)

Radify Metals expresses strong support for the EPIC 5 draft initiative aimed at strengthening critical material supply chains for clean energy technologies. The United States currently faces a 100 percent dependency on foreign imports, specifically from China, for heavy rare earth materials that are essential for high-efficiency EV motors and generators. Radify Metals aims to reshore these refining capabilities using innovative, non-toxic methods, thereby reducing geopolitical risks and supporting the modernization of California's electrical infrastructure.

CEC Staff Response TN271046: CEC staff appreciates the support of the proposed “Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits” EPIC 5 Initiative. This initiative would target innovative upstream and midstream processes to enhance production of critical materials, such as rare earth elements, so the innovations described would be in scope.

TN270950 Mark Isaacs, GS Research

Mark Isaacs highlights significant gaps in the innovation ecosystem based on his experience developing high-performance, affordable net-zero energy housing and accessory dwelling units in Chico. There is a lack of follow-on support from various California programs, such as Bringing Rapid Innovation Development to Green Energy (BRIDGE) and California Next-Generation Energy Technologies (CalNEXT) programs, that has stalled innovations from transitioning to the marketplace. Isaacs calls for the state to provide more proactive problem-solving partnerships and streamlined approval processes, particularly regarding the Department of Housing and Community Development, to ensure that clean energy solutions can effectively address California's affordable housing shortage.

CEC Staff Response TN270950: CEC staff appreciates the comments supporting the innovation ecosystem through “problem-solving partnerships” and other innovative

approaches. CEC staff recognizes the importance of developing cost-effective pathways for decarbonization and would consider these collaborative solutions and approaches in the implementation of the EPIC 5 Investment Plan and its implementation under the appropriate initiatives.

Public Workshop Oral and Q/A Comments

CEC staff responses listed below are those that were given during the workshop. Following the workshop, all verbal feedback from participants was reviewed and noted by CEC staff, even in those instances where there was no verbal response from staff during the workshop.

Strategic Initiative 1: Harnessing the Value of Transportation Electrification for Ratepayers

Hari Venkata

Hari Venkata inquired whether there were initiatives for AI and digital twin-based solutions aimed at predicting EV battery degradation to improve vehicle-level efficiency.

CEC Staff Response: Staff responded that the current focus is on EV-grid interaction and charging infrastructure. Battery degradation is a critical factor for bidirectional charging, and the technology could be considered in future plan refinements.

Richard Schorske

Richard Schorske commented that there are significant market barriers to multifamily housing EV charging and urged the CEC to be less prescriptive with funding. He suggested more flexible, "liberal" approaches, such as focusing on units enabled for sharing, Level 1 charging, and integrated BTM solar and storage.

CEC Staff Response: Staff noted and appreciated this comment.

Josh Simmons

Josh Simmons emphasized the need for tribal participation and "carve-outs" in funding, noting that tribal communities require DERs like solar and storage for resiliency and to mitigate grid impacts. He asked how tribes have been incorporated into the programming so far.

CEC Staff Response: Staff confirmed that tribes and rural communities would fall under the "Strategic Electrification of Emerging Transportation End Uses" topic due to their unique barriers and would be considered a priority for future implementation. Additionally, proposed initiatives under the DER Integration goal include topics specifically targeted toward tribes.

Doug Kollmyer

Doug Kollmyer asked if fuel cells would be eligible for funding to support remote EV charging.

CEC Staff Response: Staff replied the proposed "Strategic Electrification of Emerging Transportation End Uses" topic is inclusive of solutions involving DERs to supplement grid capacity in remote areas to support EV charging. Eligibility for specific DERs like fuel cells would be considered as solicitations are scoped out.

Mark Blakeley

Mark Blakeley raised concerns about the theft and destruction of charging cables and asked if the CEC would fund "bring-your-own-cable" technologies.

CEC Staff Response: Staff confirmed interest, noting that an active EPIC 4 project is already piloting this approach and that it shows promise for further advancement.

Josh Cohen

Josh Cohen emphasized the need for flexibility in multifamily charging applications and asked how the CEC is addressing the intersection of charging as both a transportation and building/built environment issue.

CEC Staff Response: CEC staff would be exploring the intersection among transportation electrification, building decarbonization, and DER integration through technologies like smart panels and flexible service connections to maximize existing capacity.

Sebastian Sarria

Sebastian Sarria shared a study indicating that managed EV charging has been less effective than anticipated, with low enrollment even when high incentives were offered.

CEC Staff Response: CEC staff appreciated the data and would review the study.

Strategic Initiative 2: Leveraging Distributed Energy Resources and Load Flexibility for Affordability and Grid Reliability

David Meyers (GridTractor)

David Meyers expressed support for the three priorities but warned that they must be addressed holistically, focusing on the economics of deployment after pilots to ensure scalability. He argued that there is a proliferation of too many standards and protocols, which discourages vendor adoption; instead, the goal should be to reduce and decide upon specific standards. He also noted that without economic coordination, vendors might only participate in lucrative pilots (like VPP capacity payments) while "walling off" customers from other beneficial programs like dynamic pricing.

CEC Staff Response: Staff appreciated the feedback and encouraged him to submit his comments to the docket so they could be formally reflected upon and taken into account.

Hari Venkata

Hari Venkata described his work on digital twins and AI-based solutions for energy efficiency, specifically an agentic platform for microgrid energy management. He asked about the expected timeline for a vendor with a ready-made solution to move into field testing or production under the EPIC 5 program.

CEC Staff Response: Staff explained that the proposed investment plan must first be approved by the CPUC. Afterward, the process of developing solicitations (including RFIs and workshops) could take a year to a year and a half. Staff noted that actually starting a pilot requires a solicitation to be scoped, developed, evaluated, and awarded.

Orly Hasidim (Universal Devices)

Orly Hasidim agreed with the need for a holistic approach to standards, citing the success of open automated demand response (OpenADR) as a revolutionary communication standard. She asked if the CEC would consider supporting an open-source platform designed to integrate various products, protocols, and standards for DER integration.

CEC Staff Response: CEC staff stated that an open-source platform could align with their vision, particularly regarding device-to-device integration and BTM coordination. Staff reiterated that the CEC is interested in simplifying and streamlining standards rather than creating redundant ones and invited her to provide more technical details in a written comment.

Adam Jorge (Sonoma Clean Power)

Adam Jorge encouraged the CEC to ensure projects are not "compartmentalized" and can integrate across the proposed activities. He echoed the need for post-pilot scalability and suggested that pilots include deep economic or barrier studies to help future projects. He also voiced support for the program's equity focus and innovative ownership models.

CEC Staff Response: Staff acknowledged the helpful comments.

Josh Simmons (Tribal Energy and Climate Collaborative)

Josh Simmons highlighted that tribal communities are ideal for DER load flexibility initiatives because their homes, buildings, and businesses are often highly integrated. He advocated for prioritizing tribal access to funding and emphasized the need for capacity building and training. He asked if the investment plan had considered transactive energy models, especially given the advancements in AI.

CEC Staff Response: Staff agreed on the importance of taking tribal opportunities into account and requested that Simmons share information on the topic via the docket for further follow-up.

Strategic Initiative 3: Accelerating Grid Connection of Clean Resources and Beneficial Loads

Kurt Rustin (Watson Water)

Kurt Rustin advocated for solar technologies on non-traditional terrains, specifically water-based solar, to address right-of-way issues and reduce grid stress. He noted a current lack of data regarding where these systems can best benefit the grid.

CEC Staff Response: Staff responded that a subsequent initiative in the workshop would address this topic specifically.

David Meyers

David Meyers inquired about the types of technology domains needed for the proposed pre-commercial incubation hub and whether there would be specific parameters regarding project size and investment.

CEC Staff Response: Staff explained that the CEC is keeping the plan high-level to remain flexible but welcomes specific technology input. Staff added that while early-

stage funding might be relatively small, specific budget details would be determined during the solicitation stage.

Josh Simmons (Tribal Energy and Climate Collaborative)

Josh Simmons advocated for tribal funding carve-outs, capacity building, and support for off-grid, non-wire solutions for remote communities where grid connection is not cost-effective.

CEC Staff Response: Staff noted the EPIC Program’s history of partnering with tribes, including funding many microgrid projects, and explained that off-grid, non-wires solutions may only provide broader ratepayer benefits in specific cases where grid infrastructure is not needed to serve other customers.

Scott Anders (Energy Policy Initiative Center) and Jason Anderson (Cleantech San Diego)

Both speakers highlighted the success of existing REICs and asked if the new incubator would leverage this established infrastructure rather than starting a new effort. They urged the CEC to make the incubator cross-cutting across all strategic objectives instead of limiting it to grid tech.

CEC Staff Response: Staff confirmed the incubator would be a new EPIC 5 program, but emphasized the intent to leverage the expertise and resources developed by the existing networks over the last decade.

Edson Perez (Perawatt Energy)

Edson Perez supported the focus on solid-state transformers and asked about the scope of funding for hardware components like magnetic cores, which often bottleneck performance.

CEC Staff Response: Staff confirmed that the CEC is interested in a wide range of technology readiness levels, including early-stage core materials advances and prototype validation.

Venkat Shastri (University of San Diego)

Venkat Shastri reinforced the value of existing innovation clusters, noting they have developed proven processes to help small companies move products into useful pilots. He recommended that the CEC treat the work of these clusters as a cross-cutting resource for all priorities.

CEC Staff Response: Staff noted this comment.

Strategic Initiative 4: Community-Led Clean Energy Capacity Building and Research Incubation for California Native American Tribes and CBOs

Josh Simmons

Josh Simmons advocated for the eligibility of tribal consortia to work together on these programs. He proposed the creation of a tribal-specific accelerator or incubator program (similar to existing regional clusters) that would allow tribes to facilitate their own partnerships, pilots, and investments. He noted that tribes often deploy clean energy technologies at a higher per capita rate than the rest of the state, presenting a mutually beneficial opportunity for tribal self-sufficiency and state clean energy goals.

CEC Staff Response: Staff clarified whether he was suggesting tribes act as program administrators, which Simmons confirmed, noting that infrastructure like the Southern California Tribal Chairman Association is already in place to support such a role. Staff has noted this comment.

Maia Cheli

Maia Cheli raised concerns about the "singular" nature of the proposed incubator, questioning how it would support the geographic and cultural diversity of tribes across the vastness of California. She warned against placing the "burden of knowledge" for the entire state on a single technical team or consortium.

CEC Staff Response: Staff responded that the CEC will take geographic diversity into account and welcomed further engagement on how to make that support viable.

Jamie Garrett

Jamie Garrett inquired about the specific vision for CBOs and whether their role was primarily for project deployment. She also echoed previous comments urging the CEC to leverage existing REICs. They argued that these well-established networks already have significant reach with CBOs and tribes and that using them would allow new initiatives to be immediately successful by connecting startups with the necessary partners, labor, and academia.

CEC Staff Response: Staff explained that the intention is to provide training and mentorship so that CBOs can serve as "trusted ambassadors" in their communities. This role involves community engagement and scoping out project locations early so that residents are knowledgeable and trusting when future funding opportunities arise.

Strategic Initiative 5: Innovative Approaches to Building and Community-Scale Decarbonization

Alex Ferrarese (ReMo Homes)

Alex Ferrarese advocated for zero-carbon modular housing as a way to standardize clean energy deployment, reduce costs, and improve quality control across various housing types. He also noted that factory-built housing improves worker well-being by providing a safer, more predictable work environment.

CEC Staff Response: Staff agreed on the benefits of modular homes and suggested this feedback could be integrated into the topic of whole-home retrofit solutions.

Stephanie Pincetl (UCLA)

Stephanie Pincetl complimented the CEC on prioritizing whole-home retrofits to improve energy efficiency and cooling affordability. She shared resources regarding a data access group and noted that future initiatives will require negotiation between the CEC and the CPUC.

CEC Staff Response: Staff acknowledged the resources provided.

Marty Turock

Marty Turock shared information about a breakthrough 120-volt electric water heater that is affordable and capable of being aggregated into VPPs. He urged the CEC to remain technology-agnostic rather than focusing exclusively on heat pump water heaters (HPWHs).

CEC Staff Response: Staff responded that using general terms like "water heating" in the plan would provide the flexibility to include technologies beyond just heat pumps.

Chris Ruch (Smart Local 104)

Chris Ruch emphasized the importance of high-road workforce principles, stronger accountability measures, and specialized training to ensure workers can successfully deploy and maintain new technologies. He argued that true equity requires addressing low wages and creating pathways to high-quality careers.

CEC Staff Response: Staff acknowledged the gap in specialized installation knowledge and confirmed that workforce training is a continuing priority for EPIC 4 and 5.

Maia Cheli (Schatz Energy Research Center)

Maia Cheli requested that the CEC consider regional differences in building envelope needs and existing heating solutions when developing proposal parameters, noting that remote rural communities relying on wood heat have different needs than coastal areas.

CEC Staff Response: Staff acknowledged the comment and indicated that regional considerations would be considered as these proposed initiatives and topics are further developed.

Patrick Carter (City of Petaluma)

Patrick Carter recommended including municipal pools in the "hard-to-decarbonize" commercial buildings category, noting that gas boilers for pools are one of the largest municipal uses of gas.

CEC Staff Response: Staff suggested this might align with a later initiative on industrial decarbonization, but also offered to coordinate with other teams to consider the suggestion.

Strategic Initiative 6: Advancing the Clean Energy Transition While Protecting Communities and Ecosystems

Kurt Rustin (Watson Water)

Kurt Rustin advocated for the use of non-traditional terrain solar technologies. He suggested that these avenues are promising for deploying resources in ecosystems that are not environmentally fragile, as opposed to using more traditional solar methods.

CEC Staff Response: Staff acknowledged and thanked him for the comment.

Maia Cheli

Maia Cheli inquired whether there were more specifics regarding the technologies or environmental impacts the CEC is focusing on, particularly concerning life cycle issues like mining, battery systems, and offshore wind.

CEC Staff Response: Staff responded that there is no specific assignment of technologies; rather, all clean energy categories — including solar, battery storage, wind, geothermal, and hydro — are relevant. Staff will allow for feedback on specific

technology impacts or categories that need further investigation to prioritize where the impact would be greatest and is most needed.

Strategic Initiative 7: Enhancing Clean Energy Technology Safety, Supply Chains, and Life Cycle Benefits

Edson Perez (Perawatt Energy)

Edson Perez advocated for the inclusion of SMMs in the initiative to strengthen critical material supply chains. He explained that using alternatives like iron and nitrogen can reduce reliance on high-risk materials such as nickel and cobalt in power electronics. He also noted that more efficient stator cores made from these materials reduce the need for rare earth materials in motor rotors.

CEC Staff Response: Staff responded that the CEC aims to incorporate various technologies where critical materials are relevant, noting that motors for wind turbines and electric vehicles are big components that fit the initiative.

Zora Chung (ReJoule)

Zora Chung highlighted the potential of second-life EV batteries as a domestic feedstock for stationary storage. She pointed out that the current ecosystem is fragmented, with many used batteries ending up in salvage yards that lack the specialized skills or resources to handle them. She suggested funding to help consolidate this system.

CEC Staff Response: Staff acknowledged that second-life batteries are a critical component of the EV supply chain that EPIC has funded previously and agreed the topic aligns with the current proposed initiative to build on and advance that foundation of existing work.

Richard Schorske

Richard Schorske raised concerns about the lack of alignment among authorities having jurisdiction (AHJs) regarding safety and fire permitting standards for batteries. He noted that inconsistent local interpretations cause significant permitting delays and urged the CEC to lead an effort to standardize these safety criteria. He also called for better alignment on LCA environmental criteria for batteries and solar panels to ensure carbon intensity is accurately measured.

CEC Staff Response: Staff confirmed that aligning AHJs is a primary goal of the program's proposed safety topic to help speed up permitting timelines for emerging technologies.

Strategic Initiative 8: Cost-Effective Industrial Decarbonization

Stephanie Pincetl

Consider including agricultural fossil gas use as a research focus. It accounts for a significant share of California's fossil gas consumption (about 17.5 percent) but is often overlooked compared to urban and industrial uses. The commenter also encouraged attention to industrial and commercial gas use more broadly.

CEC Staff Response: Staff responded that food processors are considered a core industry in California and confirmed the CEC plans to address the needs of that subsector.

Workshop Q/A Chat Question

An anonymous attendee inquired how electric ratepayers benefit from addressing industrial customers currently served by gas and whether there is collaboration with Gas R&D or IOUs.

CEC Staff Response: Staff explained that while they coordinate with the strategically funded Gas R&D program, industrial electrification significantly increases electricity demand, which can disrupt the system. Staff noted that by demonstrating technologies that defer or eliminate the need for expensive infrastructure upgrades, the program improves affordability for every ratepayer in California, as those infrastructure costs are typically spread across the entire ratepayer base.

Strategic Initiative 9: Leading Innovation in Electricity Sector Resilience and Adaptation

Josh Simmons (Tribal Energy and Climate Collaborative)

Josh Simmons encouraged the CEC to prioritize tribal energy sovereignty by funding BTM microgrids, which offer tribes greater control and cost-reduction than in-front-of-the-meter systems. He also advocated for tribal carve-outs in funding and support for capacity building to help tribes overcome the challenges of complex microgrid deployments.

CEC Staff Response: Staff responded that these points are being considered for the “Leading Innovation in Electricity Sector Resilience and Adaptation” initiative and that BTM microgrids are also considered in coordination with initiatives focused on DER deployment.

Gregory Smith (Flex Power Control)

Gregory Smith asked whether the efforts for grid hardening and resiliency were focused solely on large-scale systems or if they also included building-level solutions to provide resiliency or hardening.

CEC Staff Response: Staff clarified that the “Leading Innovation in Electricity Sector Resilience and Adaptation” initiative would include consideration of building-scale systems for energy resiliency.

Jeremy Zeedyk (Western States Council of Sheet Metal Workers)

Jeremy Zeedyk strongly supported workforce development but urged the CEC to adopt more enforceable high-road workforce standards, such as apprenticeship requirements and hands-on competency testing. He argued that proper installation and maintenance are essential for project reliability and ratepayer protection.

CEC Staff Response: Staff thanked him for the perspective.

Nidhi Upadhyaya (Ryzone)

Nidhi Upadhyaya inquired whether the climate adaptation track prioritized generating new data products, specifically high-resolution and hyperlocal climate downscaling.

CEC Staff Response: Staff confirmed that scoping for this proposed initiative could include micro-scale climate data downscaling and other new data development.

Maia Cheli

Maia Cheli asked about the extent of cross-agency coordination to reduce reporting burdens for under-resourced communities and to integrate energy resilience with broader community resilience efforts.

CEC Staff Response: Staff stated CEC intends to learn from agencies like California Governor's Office of Emergency Services and noted ongoing coordination with the Governor's Office regarding statewide climate assessments.

David Meyers

David Meyers recommended that EPIC solicitations require proposers to conduct a literature review of previous EPIC-funded projects to ensure that new funds are used to advance technology rather than rehashing prior work.

CEC Staff Response: Staff acknowledged the suggestion.

General Feedback:

Benton Moore (The Brink, University of San Diego)

Benton Moore highlighted the success of REICs in connecting startups with capital and expertise, noting that the EPIC 5 plan positions California as a world leader in advanced energy.

CEC Staff Response: Staff has noted this comment.

Kurt Rustin (Watts on Water)

Kurt Rustin advocated for continued funding for startup support infrastructure (REICs) and for the development of analysis tools to support non-traditional solar deployment, such as systems built on water, to avoid land-use conflicts.

CEC Staff Response: Staff appreciated the comments.

Derrick Tang (New Energy Nexus)

Derrick Tang emphasized the need for "connective tissue" within the clean energy ecosystem, arguing that helping stakeholders work together through coordinated networks is as vital as funding the technology itself.

CEC Staff Response: Staff noted this comment.

Zora Chung (ReJoule)

Zora Chung shared how REICs helped her startup transition from R&D to the commercial market and urged California to sustain these investments despite federal funding uncertainty.

CEC Staff Response: Staff noted this comment.

Edson Perez (Perawatt Energy)

Edson Perez uplifted the importance of SMM R&D to improve the efficiency of EV charging equipment and reduce reliance on critical minerals.

CEC Staff Response: Staff noted this comment.

Marty Turock

Marty Turock expressed disappointment that funding for the entrepreneurial "connective tissue" was missing from the EPIC 5 budget and shared several success stories of startups (for example, Ivy Energy, Nuvve, Zendi) that benefited from REIC support. He urged the CEC to reconsider this allocation to protect the innovation pipeline.

CEC Staff Response: Staff encouraged the submission of this feedback as written comments for the record.

Tanya Barham (Community Energy Labs)

Tanya Barham detailed how her company successfully navigated the "valley of death" into full commercialization and job creation through the support of multiple REICs and CalSEED grants. She urged the CEC to keep the innovation pipeline healthy at every stage.

CEC Staff Response: Staff noted this comment.

APPENDIX B:

Equity Matrix with Equity Funding Summary

Table B-1 below shows a mapping of the CEC’s proposed Research Topic Areas to the California Disadvantaged Communities Advisory Group (DACAG) Equity Framework.² The DACAG developed an initial equity framework in 2018 to ensure that equity was placed front and center when considering any climate investment/intervention administered by the CEC or CPUC. The equity framework was updated in 2024 to reflect learning and guidance developed through the DACAG process.

The framework topics are of particular importance when prioritizing equity and centering priority communities in the development, implementation, and impacts of programs related to Senate Bill (SB) 350 (De León, Chapter 547, Statutes of 2015) and other relevant clean energy programs and policies. A full description of the [Equity Framework](https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/infrastructure/disadvantaged-communities/2024-dacag-equity-framework.pdf) is available at: <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/infrastructure/disadvantaged-communities/2024-dacag-equity-framework.pdf>.

Direct impacts are expected as a direct result of project implementation, whereas indirect impacts are expected from the research and technology innovation advancements more broadly. Equity benefits are not limited to the topics highlighted in the matrix; rather, the EPIC Program considers equity to be a cross-cutting theme that is applied whenever directing investments. To ensure inclusivity, the CEC targets “equity-in,” meaning increased participation from DVCs and enhanced diversity within the program, projects, and funded organizations. The CEC also targets “equity-out,” or access to affordable and reliable clean energy and direct benefits from project implementation.

² As a technology R&D program, EPIC does not directly address consumer protection in any proposed EPIC 5 Strategic Initiative or Research Topic; thus, consumer protection was not included in the Equity Matrix (Table B-1). Rather, through investments that work to advance clean energy technologies, EPIC is supporting consumer protection by demonstrating and de-risking the adoption of emerging clean energy technologies.

Table B-1: EPIC 5 Equity Matrix

Research Topic Area	Non-Energy benefits	Affordability	Access, Outreach and Education	Community Engagement	Health and Safety	Financial Benefits and Economic Development	Workforce Development	Metrics, Evaluation, and Accountability
1.1 Scaling Managed Charging as a Grid Resource								
1.2 Reducing Barriers to Beneficial Bidirectional Charging								
1.3 Strategic Electrification of Emerging Transportation End Uses								
2.1 Advancing Customer-Sited DER Integration and Interoperability								
2.2 Improving Grid-Orchestrated DER Coordination and Market Integration								

Research Topic Area	Non-Energy benefits	Affordability	Access, Outreach and Education	Community Engagement	Health and Safety	Financial Benefits and Economic Development	Workforce Development	Metrics, Evaluation, and Accountability
2.3 Equity-Focused DER Solutions for DVCs								
3.1 Innovations in Bridging Solutions for Fast Grid Connections								
3.2 Technology Alternatives to New Lines and Rights-of-Way								
3.3 Data and Planning Tools for Grid Infrastructure Investments and Coordinating Customer Decisions								
3.4 Pre-Commercial Grid Tech Incubator								
4.1 California Native American Tribal Energy Capacity Building and Mentorship Incubator								

Research Topic Area	Non-Energy benefits	Affordability	Access, Outreach and Education	Community Engagement	Health and Safety	Financial Benefits and Economic Development	Workforce Development	Metrics, Evaluation, and Accountability
4.2 CBO Clean Energy Capacity Building and Research Incubator								
5.1 Advancing Affordable Building Electrification Systems for Residential Homes								
5.2 Whole-Home Retrofit Solutions								
5.3 Neighborhood Level Decarbonization								
5.4 Advanced Decarbonization Pathways for Difficult-to-Decarbonize Commercial Buildings								
6.1 Innovation in Clean Energy Environmental Impact Assessment and Mitigation								

Research Topic Area	Non-Energy benefits	Affordability	Access, Outreach and Education	Community Engagement	Health and Safety	Financial Benefits and Economic Development	Workforce Development	Metrics, Evaluation, and Accountability
6.2 Advancing Health and Air Quality Research to Inform Building and Transportation Electrification in California								
7.1 Advancing the Safety of Next-Generation Storage Solutions								
7.2 Strengthening Critical Materials Supply Chains for Clean Energy Technologies								
7.3 Enhancing Energy Storage Performance and Longevity through Advanced Battery Analytics								
8.1 Grid-Integrated Industrial Electrification for Affordability and Reliability								

Research Topic Area	Non-Energy benefits	Affordability	Access, Outreach and Education	Community Engagement	Health and Safety	Financial Benefits and Economic Development	Workforce Development	Metrics, Evaluation, and Accountability
8.2 Decarbonizing Construction Materials for Cost-Effective Infrastructure								
8.3 Affordable Clean Chemical Production								
8.4 First-of-a-Kind Deployment for Difficult-to-Decarbonize Industrial Sectors								
9.1 Advancing Energy System Resilience Under Climate Change and Extreme Weather								
9.2 Supporting Wildfire Mitigation that Manages Risk and Advances Affordability								

Research Topic Area	Non-Energy benefits	Affordability	Access, Outreach and Education	Community Engagement	Health and Safety	Financial Benefits and Economic Development	Workforce Development	Metrics, Evaluation, and Accountability
9.3 Building Community Energy Resilience and Reliability								

Legend:



=Direct Benefits



=Indirect Benefits

Source: CEC Staff

APPENDIX C:

Mapping of Planned Investments to the Electricity System Value Chain

Table C-1 illustrates how the Research Topic Areas of the EPIC 5 Investment Plan map to the electricity system value chain, which CPUC specifies as grid operations/market design, generation, transmission, distribution, and demand-side management.

Table C-1: CEC EPIC 5 Investment Plan Research Topics Mapped to Electricity System Value Chain

Research Topic Area	Grid Operations/ Market Design	Generation	Transmission	Distribution	Demand-Side Management
1.1 Scaling Managed Charging as a Grid Resource	X			X	X
1.2 Reducing Barriers to Beneficial Bidirectional Charging	X			X	X
1.3 Strategic Electrification of Emerging Transportation End Uses	X				X
2.1 Advancing Customer-Sited DER Integration and Interoperability	X			X	X
2.2 Improving Grid-Orchestrated DER Coordination and Market Integration	X			X	X
2.3 Equity-Focused DER Solutions for DVCs	X			X	X
3.1 Innovations in Bridging Solutions for Fast Grid Connections	X		X	X	
3.2 Technology Alternatives to New Lines and Rights-of-Way	X		X	X	

Research Topic Area	Grid Operations/ Market Design	Generation	Transmission	Distribution	Demand-Side Management
3.3 Data and Planning Tools for Grid Infrastructure Investments and Coordinating Customer Decisions	X		X	X	
3.4 Pre-Commercial Grid Tech Incubator	X		X	X	
4.1 California Native American Tribal Energy Capacity Building and Mentorship Incubator				X	X
4.2 CBO Clean Energy Capacity Building and Research Incubator				X	X
5.1 Advancing Affordable Building Electrification Systems for Residential Homes				X	X
5.2 Whole-Home Retrofit Solutions				X	X
5.3 Neighborhood-Level Decarbonization				X	X
5.4 Advanced Decarbonization Pathways for Difficult-to-Decarbonize Commercial Buildings				X	X
6.1 Innovation in Clean Energy Environmental Impact Assessment and Mitigation		X			X
6.2 Advancing Health and Air Quality Research to Inform Building and Transportation Electrification in California	X	X			X
7.1 Advancing the Safety of Next-Generation Storage Solutions	X				X

Research Topic Area	Grid Operations/ Market Design	Generation	Transmission	Distribution	Demand-Side Management
7.3 Strengthening Critical Materials Supply Chains for Clean Energy Technologies					X
7.2 Enhancing Energy Storage Performance and Longevity through Advanced Battery Analytics					X
8.1: Grid-Integrated Industrial Electrification for Affordability and Reliability	X				X
8.2: Decarbonizing Construction Materials for Cost-Effective Infrastructure	X				X
8.3: Affordable Clean Chemical Production	X				X
8.4: First-of-a-Kind Deployment for Difficult-to-Decarbonize Industrial Sectors	X				X
9.1 Advancing Energy System Resilience Under Climate Change and Extreme Weather	X	X	X	X	
9.2 Supporting Wildfire Mitigation that Manages Risk and Advances Affordability	X	X	X	X	
9.3 Building Community Energy Resilience and Reliability	X	X	X	X	X

APPENDIX D:

Equity Engagement

The EPIC Program is committed to addressing barriers to adoption of advanced clean energy technologies in environmental and social justice (ESJ) communities while directing investments in research, development, and deployment for greatest impact. The CEC held two workshops with ESJ-related representatives as part of its development of the EPIC 5 Investment Plan — one workshop was held with ESJ-related organizations and one workshop was held with subject matter experts (SMEs) from the DACAG. At both workshops, CEC staff presented proposed Strategic Initiatives to solicit feedback. A summary of the comments and feedback received at the two workshops is below.

The CEC will continue engagement with ESJ groups and the DACAG throughout EPIC 5 Investment Plan development and implementation phases. The CEC will engage ESJ groups and the DACAG in the scoping of specific grant funding opportunities in which they have expressed significant interest.

Summary of Comments and CEC Staff Responses to ESJ Roundtable

CEC staff held a roundtable discussion with representatives from ESJ-related organizations on April 16, 2026. Representatives from the following organizations participated in the roundtable discussion: Brightline Defense, Central California Environmental Justice Network (CCEJN), California Environmental Justice Alliance (CEJA), Center on Race, Poverty & the Environment (CRPE), Communities for a Better Environment (CBE), Greenlining Institute, Leadership Council for Justice and Accountability (LCJA), Physicians for Social Responsibility — Los Angeles (PSR-LA), and Self-Help Enterprises. Comments received from the roundtable participants and CEC staff responses are summarized below:

Brightline Defense:

Brightline Defense asked whether the CEC saw any research or data gaps related to large loads, such as data centers, and their impact on grid reliability.

CEC Staff Response: Effectively integrating large loads onto the grid without disrupting reliability or adversely impacting affordability is the core focus of Strategic Initiative 3 — Accelerating Grid Connection of Clean Energy Resources and Beneficial Load. This proposed initiative seeks to support the development and demonstration of advanced technologies and approaches for electric infrastructure planning and operations. These innovations would increase grid capacity and the ability to accommodate new demand, reduce the risk of stranded investments, and improve capital efficiency and grid utilization.

Central California Environmental Justice Network (CCEJN):

CCEJN commented that areas in Fresno are seeing large solar projects being proposed and developed. They supported more research to better understand the local impacts of such

projects, such as fire risk and air quality. They also suggested more research on life-cycle impacts and decommissioning potential of large renewable generation and storage projects so that local communities can better understand the impacts of such projects.

CEC Staff Response: These topics were included as part of the scope of two proposed Strategic Initiatives: 6 — Advancing the Clean Energy Transition While Protecting Communities and Ecosystems and 7 — Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits.

California Environmental Justice Alliance (CEJA):

CEJA commented that while clean energy resources are continuing to come online in California, the benefits of those deployments are not equitably distributed — noting that many residents still experience the negative impacts of living near fossil gas plants. CEJA urges the CEC to consider how clean energy research and deployment can help these communities retire these fossil plants and other polluting infrastructure.

CEJA expressed support for research related to DER integration and increasing load flexibility and expressed interest in long-duration storage technologies. CEJA also asked how the CEC intends to keep communities engaged during the next phases of EPIC implementation.

CEC Staff Response: CEJA’s comments are relevant to three proposed Strategic Initiatives: 6 — Advancing the Clean Energy Transition While Protecting Communities and Ecosystems, 7 — Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits, and 8 — Cost-Effective Industrial Decarbonization, which support the Strategic Goal of Achieving 100 Percent Net-Zero Carbon Emissions and the Coordinated Role of Gas. Collectively, these proposed initiatives would support innovations that target the hardest-to-decarbonize sectors that are expected to be the last users of fossil gas resources. The proposed initiatives represent a combination of strategies that can increase the reliability of clean, intermittent generation; reduce emissions from the most difficult-to-decarbonize sectors; and integrate complementary objectives for human health and environmental sustainability.

Regarding long-duration storage technologies, proposed Strategic Initiative 7 — Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits — intends to support research to improve the safety and standards related to storage technologies, which may include long-duration storage technologies.

Center on Race, Poverty & the Environment (CRPE)

CRPE urged the CEC to account for ongoing community engagement, not only during the investment plan development process but also during implementation. Community engagement and building trust both take time, so having continued opportunities for engagement and feedback is important to the success of EPIC projects.

CRPE also emphasized the need to develop affordable clean energy solutions, noting that electricity rates are important but there is a barrier to communities that cannot afford to invest in DER or home upgrades.

CRPE also inquired whether rail electrification was in the scope of EPIC 5 and how that may intersect with grid reliability and flexibility.

CEC Staff Response: The CEC remains committed to ensuring that CBOs and DVCs have continued and ongoing opportunities to participate in and inform EPIC investments. For example, once an investment plan is approved by the CPUC, the CEC moves into the implementation phase where it will develop specific funding opportunities stemming from the investment plan. As part of the process to develop those solicitations, CEC staff will often hold scoping workshops and invite interested parties to comment and help shape the specific scope of a particular funding opportunity. Additionally, if projects involve technology demonstrations in DVCs, the CEC requires the participation of a CBO to help represent the community where the project is taking place.

CEC staff appreciates and acknowledges the importance of continued, ongoing opportunities for community engagement during both planning and implementation. Proposed Strategic Initiative 4 — Community-Led Clean Energy Capacity Building and Research Incubator for California Native American Tribes and CBOs — is designed to support sustained engagement through training, mentorship, and regular opportunities for participant input. Staff also recognizes the value of considering non-energy impacts identified by communities, where these perspectives can help inform equitable and effective clean-energy solutions.

Additionally, proposed Strategic Initiative 5 — Innovative Approaches to Building and Community-Scale Decarbonization — includes several proposed Research Topic Areas that seek to support development of building electrification technologies that can be adopted without requiring costly electrical upgrades.

Rail electrification is not included in the scope of EPIC 5. The CPUC led a process to develop Strategic Goals and Strategic Objectives for EPIC 5, and rail electrification was not included as part of a goal or objective, so the CEC's proposed initiatives do not include rail electrification as a research area.

Communities for a Better Environment (CBE):

CBE commented that they have observed that limited access to data has hindered community planning processes. Much of the available data is at the system level and does not reflect what households are experiencing. CBE urges the CEC to consider opportunities to better track bill impacts, energy burden, and broader affordability impacts at community levels.

CEC Staff Response: The CEC's EPIC 5 Investment Plan proposes multiple initiatives to address the need for more granular data availability to support better local community decision-making. Strategic Initiative 2 — Leveraging DERs and Load Flexibility for Affordability and Grid Reliability — seeks to support innovations that will help customer-owned energy resources work together more effectively within homes and businesses. Part of this effort includes improving access to data on local energy generation and consumption so that residents and businesses can better manage their energy planning. Additionally, Strategic Initiative 9 — Leading Innovation in Electricity Sector Resilience and Adaptation — seeks, in part, to increase granularity and better localize climate data so that local communities can better incorporate and use these data to support local planning efforts.

Greenlining Institute:

Greenlining Institute commented that affordability is a top-level concern — for example, there is tension between building EV infrastructure, how that infrastructure may impact the grid's need for upgrades, and how those upgrades would affect customer bills. Greenlining Institute urges the CEC to find pathways to advance clean energy while prioritizing affordability.

Greenlining Institute also asked how the future role of gas intersects with EPIC planning efforts.

CEC Staff Response: CEC staff appreciates the comments — prioritizing affordability while continuing to support decarbonization and electrification is a core theme of the CEC's proposed initiatives under the EPIC 5 Investment Plan. For example, Research Topics under proposed Strategic Initiative 1 — Harnessing the Value of Transportation Electrification for Ratepayers, Strategic Initiative 3 — Accelerating Grid Connection of Clean Energy Resources and Beneficial Load, and Strategic Initiative 5 — Innovative Approaches to Building and Community-Scale Decarbonization have a common theme of investing in innovations that will allow for greater electrification while maximizing utilization of the existing grid. This can help support connecting increasing loads from transportation and building electrification while putting downward pressure on rates.

Regarding the intersection of gas with EPIC planning, three proposed Strategic Initiatives — 6 —Advancing the Clean Energy Transition While Protecting Communities and Ecosystems; Strategic Initiative 7 — Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits; and Strategic Initiative 8 — Cost-Effective Industrial Decarbonization support the EPIC 5 Strategic Goal of Achieving 100 Percent Net-Zero Carbon Emissions and the Coordinated Role of Gas. Collectively, these initiatives would support innovations that target the hardest-to-decarbonize sectors that are expected to be the last users of fossil gas resources.

Leadership Council for Justice and Accountability (LCJA):

LCJA supported the CEC's proposed initiative on building and community-scale decarbonization. LCJA stressed the need to align electrification efforts with residents' day-to-day lives, balancing the desire to electrify with the need to not increase electric bills.

LCJA also supported the CEC's proposed initiative on protecting communities and the environment — noting that Fresno is seeing large energy projects coming into the community and there is a need to better understand the full environmental impact of these projects.

CEC Staff Response: CEC staff appreciate the comments. Strategic Initiative 5 — Innovative Approaches to Building and Community-Scale Decarbonization would invest in development and demonstration of building electrification technologies (for example, 120-volt heat pumps, induction cooktops, and HPWHs) that avoid the need for costly electrical infrastructure upgrades. These technologies can help increase access to electrification technologies while prioritizing affordability.

Additionally, Strategic Initiative 6 — Advancing the Clean Energy Transition While Protecting Communities and Ecosystems intends to fund research to better assess the environmental impacts of clean energy technologies and develop siting and mitigation strategies aimed at accelerating clean energy deployment while reducing costs and

minimizing harmful outcomes. One of the goals of this research would be to better inform local communities of the scope of potential impacts of proposed energy projects in their communities.

Physicians for Social Responsibility — Los Angeles (PSR-LA):

PSR-LA commented that it is important for EJ communities to stay involved in research implementation through models such as advisory groups. This helps ensure that research is not focused on generating profit for industries. PSR-LA asked the CEC if there would be opportunities for communities to propose their own research topics for consideration for EPIC funding.

PSR-LA also commented that community-scale building and industrial decarbonization are important topics for EPIC to focus on.

CEC Staff Response: CEC staff appreciate the comments. As mentioned above, the CEC will continue to provide opportunities for CBOs and DVCs to participate in and inform development of funding opportunities once the EPIC 5 investment cycle moves into the implementation phase, including regular opportunities for participant input. Additionally, proposed Strategic Initiative 4 — Community-Led Clean Energy Capacity Building and Research Incubator for California Native American Tribes and CBOs — directly supports this by providing structured engagement, training, and support for community-driven research concepts that can inform future funding opportunities. Staff also acknowledges the importance of community-scale building and industrial decarbonization, which are reflected in proposed EPIC 5 Research Topic Areas.

Self-Help Enterprises:

Self-Help Enterprises encouraged the CEC to align EPIC research with existing programs as much as possible to avoid confusion.

Self-Help Enterprises also commented that more granular data at local levels is needed to better support community planning efforts — high-level data can especially misrepresent small rural communities.

CEC Staff Response: CEC staff works closely with the California Public Utilities Commission (CPUC) and IOU EPIC Administrators to align on overall strategy for EPIC planning and implementation. The CEC also coordinates closely with sister agencies such as CARB to ensure that research efforts are complementary and supportive of other work occurring in the state.

Regarding data granularity, as discussed above, the EPIC 5 Investment Plan proposes multiple initiatives that seek to increase access, granularity, and usability of energy and climate data for local communities.

Summary of Comments and CEC Staff Responses to DACAG SME Meeting

CEC staff held a meeting with subject matter experts from the DACAG on May 4, 2026. Participants from the DACAG were: Roman Partida-Lopez, Elena Krieger, and Chris Walker.

Comments received from the DACAG participants are organized by proposed initiative and summarized below:

Strategic Initiative 1: Harnessing the Value of Transportation Electrification for Ratepayers

DACAG SME Comment: The SME commented that the grid's condition is not the same throughout California; it tends to be weaker in disadvantaged communities, posing a challenge for them to participate in the energy transition. If the CEC is considering pilots in DVCs, it will be helpful to consider including funding for infrastructure such as panel and feeder upgrades.

CEC Staff Response: CEC appreciates the comment. Supporting electrification of end-uses such as transportation and buildings in the face of varying electrical infrastructure is a core theme of Strategic Initiative 1 — Harnessing the Value of Transportation Electrification for Ratepayers, Strategic Initiative 3 — Accelerating Grid Connection of Clean Energy Resources and Beneficial Load, and Strategic Initiative 5 — Innovative Approaches to Building and Community-Scale Decarbonization. Another common theme among these initiatives is to maximize utilization of the existing grid while supporting increased load from electrification. While panel and feeder upgrades may be necessary in some locations, EPIC 5 proposed research intends to focus on developing technologies and strategies to support electrification while avoiding costly infrastructure upgrades where possible.

Strategic Initiative 2: Leveraging DERs and Load Flexibility for Affordability and Grid Reliability

DACAG SME Comment: The SME suggested that research under this initiative could generate data on the level of uptake of existing DERs in DVCs, as this is an existing knowledge gap. Additionally, this initiative looks to have good interaction with the resilience-related initiative.

CEC Staff Response: CEC staff appreciates the comment. CEC staff consider this suggestion as EPIC 5 moves into the implementation phase and specific funding opportunities are being developed.

Strategic Initiative 3: Accelerating Grid Connection of Clean Resources and Beneficial Loads

DACAG SME Comment: The SME suggested that CEC consider including workforce development as part of this initiative, as a lack of staffing has been causing delays and issues with distribution-level grid installations.

There is also a gap in knowledge about interconnection time and costs inside and outside of DVCs, so that may be an area of investigation.

CEC Staff Response: The EPIC Program primarily focuses on developing and demonstrating technology solutions, though supporting workforce training and development has been included as part of EPIC projects in the past as supplementary efforts. The CEC will consider this suggestion as EPIC 5 moves into the implementation phase.

Strategic Initiative 4: Community-Led Clean Energy Capacity Building and Research Incubation for California Native American Tribes and CBOs

DACAG SME Comment: The SME suggested that the CEC consider including housing, public health, and other related organizations as participants in the proposed incubators.

Incubators such as the ones proposed in this initiative could also help build a pipeline of communities ready to deploy clean energy technologies. This effort could help keep communities interested, engaged, and better prepared to secure funding when available.

CEC Staff Response: CEC staff appreciates the suggestion to include housing and public health organizations as part of potential incubators funded through this proposed initiative. Specific participants and requirements would be scoped out during the solicitation development process.

Strategic Initiative 5: Innovative Approaches to Building and Community-Scale Decarbonization

DACAG SME Comment: The SME commented in support of efforts to support building electrification while avoiding costly service panel upgrades. However, the SME suggested the CEC should be cautious in supporting potential short-term solutions such as meter socket adapters that may support limited electrification but could lead to more costly upgrades in the future.

CEC Staff Response: CEC staff appreciates the comment. Supporting electrification while prioritizing affordability is a core theme of the proposed EPIC 5 Investment Plan. During solicitation development, CEC staff will carefully consider the pros and cons of different potential technology solutions to avoid possibilities of stranded assets or obsolete solutions.

Strategic Initiative 6: Enhancing Clean Energy Technology Safety, Supply Chains, and Life-Cycle Benefits

DACAG SME Comment: The SME was supportive of the focus on life-cycle impacts of technologies and suggested the CEC consider inclusion of human rights and environmental health impacts of the clean energy supply chain.

Also, the SME was supportive of EPIC researching improvements to battery safety and suggested the CEC consider including community education elements along with the battery safety research.

CEC Staff Response: CEC staff appreciates the comment. Human rights impacts of the clean energy supply chain fall outside the scope of EPIC, which is focused on developing technology innovation to support California climate and energy policies. However, environmental health impacts of the energy supply chain, especially the portions located in California, would fall within the scope of EPIC, and staff would consider this during solicitation development for research under this proposed initiative. Similarly, community engagement and education elements could be in scope of research related to battery safety improvements.

Strategic Initiative 8: Cost-Effective Industrial Decarbonization

DACAG SME Comment: The SME suggested the CEC consider including “cradle-to-cradle” approaches for reducing construction material GHG impacts as part of this initiative.

Commenters also asked whether data centers and geothermal resources would be included as part of this initiative.

CEC Staff Response: Regarding construction materials, Strategic Initiative 8 — Cost-Effective Industrial Decarbonization — would include research aimed at decarbonizing construction materials including cement, steel, and glass. CEC staff could consider recycling and reuse of construction materials as part of this research during solicitation development phases.

Regarding data centers, Strategic Initiative 3 — Accelerating Grid Connection of Clean Energy Resources and Beneficial Load — would include technologies to better connect beneficial large loads, which could include data centers.

Regarding geothermal resources, Strategic Initiative 5 — Innovative Approaches to Building and Community-Scale Decarbonization — would include proposed research on community-scale decarbonization that could examine geothermal energy as a district heating source.

Strategic Initiative 9: Leading Innovation in Electricity Sector Resilience and Adaptation

DACAG SME Comment: The SME commented that many strategies that support resilience could also have grid benefits — the SME suggested the CEC incorporate this grid value to help finance grid resilience investments.

CEC Staff Response: CEC staff appreciates the comment and would consider this suggestion during solicitation development for research under this proposed initiative.

APPENDIX E: Tribal Engagement

The CEC has committed more than \$35 million to EPIC technology demonstration and deployment projects in partnership with California Native American tribes (tribes) to strengthen energy resiliency through demonstration of microgrids, energy storage, and related technologies. These partnerships have advanced innovative energy technologies while demonstrating opportunities to improve resilience and provide broader community benefits for tribes and surrounding areas.

EPIC 5 would build both on these investments and the relationships and experience developed through them. As tribal partnerships have expanded across the CEC, tribal perspectives have increasingly informed not only where technologies are demonstrated, but also the broader research priorities needed to support climate adaptation, energy sovereignty, resilience infrastructure, workforce development, environmental protection, and other local goals.

The remainder of this appendix outlines three key activities that provide context for this broader evolution. Collectively, the activities illustrate an expanding role for tribal perspectives and leadership in informing energy research priorities, including the information, capabilities, and partnerships needed to support long-term decision-making under climate change.

Informational Proceeding on Tribal Affairs and Tribal Energy Sovereignty

In March 2025, the CEC opened an Informational Proceeding to inform the agency's tribal affairs work, including efforts supporting tribal energy sovereignty.³ As part of the proceeding, the CEC convened 11 regional roundtables across California to gather perspectives from tribes and other participants. Although these roundtables were not designed specifically to inform EPIC 5 development, the EPIC 5 process was discussed, and the perspectives shared informed elements of this proposed investment plan. The proceeding also included a two-day Statewide Summit on Tribal Energy Enterprise and Workforce Development,⁴ which contributed additional input relevant to the proposed plan.

Across these activities, tribes identified priorities including strengthening energy infrastructure, energy system performance, and energy access; expanding energy workforce and enterprise development; supporting climate adaptation; addressing environmental impacts; and sustaining tribal leadership in defining and advancing their clean energy futures.

³ See Order No. 25-031706, [Order Instituting an Informational Proceeding on Tribal Affairs and Tribal Energy Sovereignty](https://efiling.energy.ca.gov/GetDocument.aspx?tn=262276&DocumentContentId=98790) (https://efiling.energy.ca.gov/GetDocument.aspx?tn=262276&DocumentContentId=98790), and the associated docket (25-OIIP-01) available at [California Energy Commission: Docket Log](https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=25-OIIP-01) (https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=25-OIIP-01).

⁴ The Summit was held April 23-24, 2026. See the [Final Notice Tribal Affairs Statewide Summit on Tribal Energy Enterprise and Workforce Development](https://efiling.energy.ca.gov/GetDocument.aspx?tn=269419&DocumentContentId=106513). https://efiling.energy.ca.gov/GetDocument.aspx?tn=269419&DocumentContentId=106513. A [recording](https://youtu.be/7eNRYBWUxEg) for Day 2 of the event is available at https://youtu.be/7eNRYBWUxEg.

Tribal Roundtable Feedback on Research Investment Plans

On February 10, 2026, CEC staff held a tribal roundtable with representatives from several tribes to gather input for its proposed EPIC 5 Investment Plan and its Gas Research and Development 2026–2027 Budget Plan. While the feedback shared during the roundtable is not publicly available, the feedback was considered when revising the proposed initiatives.

California Tribal Gap Analysis

In addition, the California Tribal Gap Analysis, commissioned by the CEC and the Strategic Growth Council, gathered statewide tribal input on a range of energy-related needs and priorities that also informed the CEC’s draft EPIC 5 Investment Plan.⁵

⁵ California Energy Commission and California Strategic Growth Council. April 2026. [California Tribal Gap Analysis: Final Report](https://sgc.ca.gov/wp-content/uploads/07_Attachment-A_02.25.26.pdf). https://sgc.ca.gov/wp-content/uploads/07_Attachment-A_02.25.26.pdf.

APPENDIX F:

Regulatory and Legislative Background

California has established a track record of setting and attaining ambitious goals for addressing climate change and advancing a clean energy future for all. In 2016, California reached its Assembly Bill (AB) 32 (Núñez, Chapter 488, Statutes of 2006) goal of 1990-level GHG emissions four years ahead of its 2020 target. Similarly, in 2018, the state met its goal of 33 percent renewable energy two years ahead of its 2020 target.

EPIC research supports California's continued global leadership in clean energy policy. Investments in technology innovation will play a key role in enabling the significant technology and infrastructure deployment required to meet the state's clean energy and climate goals. This proposed EPIC 5 Investment Plan represents an important contribution to scaling up energy technology innovation of key existing and emerging technologies across major energy-related sectors. Illustrative examples of California climate and energy policy that EPIC 5 would support are outlined below.

SB 350: Reducing GHG Emissions, Increasing Renewable Generation, and Doubling Energy Efficiency by 2030

SB 350 (De León, Chapter 547, Statutes of 2015) established clean energy, clean air, and GHG reduction goals, including reducing GHG emissions to 40 percent below 1990 levels by 2030 and to 80 percent below 1990 levels by 2050. SB 350 increased California's renewable electricity procurement goal from 33 percent by 2020 to 50 percent by 2030. SB 350 also requires the state to double statewide energy efficiency savings in electricity and gas end uses by 2030.

SB 100: 100 Percent Clean Electricity by 2045

Under the landmark bill SB 100 (De León, Chapter 312, Statutes of 2018), renewable energy and zero-carbon resources must supply 100 percent of electric retail sales to end users and state loads by 2045. In the 2021 SB 100 Joint Agency Report, the SB 100 Core scenario shows 145 GW of utility-scale capacity additions — twice the generation capacity in California today — needed by 2045. Recent advancements in clean energy technologies make these deployment levels achievable, including significant cost reductions in key technologies, such as solar photovoltaics and battery storage.

AB 3232: 40 Percent Reduction in Greenhouse Gas Emissions from Buildings by 2030

California is charting a course for building decarbonization, which is critical to the state's goals for economywide decarbonization. The CEC issued a report on opportunities for GHG emission reductions in the building sector, as called for in AB 3232 (Friedman, Chapter 373, Statutes of 2018). Examples of barriers to building decarbonization include lack of customer familiarity with advanced energy-efficient electric appliances; up-front cost of electric panel upgrades needed for more efficient electric technologies; use of high-GWP refrigerants in heat pumps;

high capital and operating cost for electric boilers when compared to gas-fired boilers in large buildings; lack of availability of large heat pumps with low-GWP refrigerants for commercial building applications; and the cost of envelope retrofits for existing buildings.

Executive Order N-79-20: 100 Percent Zero-Emission Vehicles by 2035

Executive Order N-79-20 (2020) established statewide targets for 100 percent of passenger vehicle sales to be zero-emission by 2035, for all off-road and drayage operations to be zero-emission by 2035, and for all medium- and heavy-duty vehicle fleets to consist of zero-emission vehicles by 2045, where feasible. Reaching these goals is central to addressing climate change and realizing California's clean energy future. This commitment was reaffirmed in Executive Order N-27-25.

SB 846: Load Shift Goal

SB 846 (Dodd, Chapter 239, Statutes of 2022) directed the CEC to develop a goal for shifting load to reduce net peak electrical demand and recommend policies to increase demand response and load shifting, along with other actions necessary to support California's clean energy transition and grid reliability. In response, the CEC developed a statewide load-flexibility goal of 7,000 megawatts.

As part of that analysis, the CEC recommended that California continue to invest in both load-modifying and resource planning and procurement load flexibility, creating robust industries for bill management under time-varying rates, funding for load-modifying programs, and development of supply-side load-flexibility resources, and allowing customers to choose the rates and programs that work best for them. Considerable uncertainty exists in the estimates of recent load flexibility impacts of time-of-use rates and economic supply-side demand response. To realize the load-shift goal, California must define a comprehensive accounting methodology that is consistent across load flexibility resources.

SB 1020: Clean Energy, Jobs, and Affordability Act

SB 1020 (Laird, Chapter 361, Statutes of 2022) revises state policy to provide that eligible renewable energy resources and zero-carbon resources supply:

- 90 percent of all retail sales of electricity to California end-use customers by December 31, 2035.
- 95 percent of all retail sales of electricity to California end-use customers by December 31, 2040.
- 100 percent of all retail sales of electricity to California end-use customers by December 31, 2045.
- 100 percent of electricity procured to serve all state agencies by December 31, 2035.

AB 1279: Net Negative GHG Emissions by 2045

AB 1279 (Muratsuchi, Chapter 337, Statutes of 2022) established the policy for California to achieve net-zero GHG emissions as soon as possible, but no later than 2045, and achieve and maintain net negative GHG emissions thereafter, and to ensure that by 2045, statewide anthropogenic GHG emissions are reduced to at least 85 percent below the 1990 levels.

APPENDIX G:

Acronyms and Abbreviations

The list of acronyms and abbreviations below is included in both the EPIC 5 Investment Plan and its Appendices to support readability and ease of reference for users who may access either volume independently.

Term	Definition
AB	Assembly Bill
AC	Alternating current
AEA	The Association for Energy Affordability
AEC	Advanced Energy Community
AHJ(s)	Authorities having jurisdiction
AI	Artificial intelligence
BESS	Battery energy storage system
BTM	Behind-the-meter
CACE	Community Assistance for Climate Equity
CalEnviroScreen	California Communities Environmental Health Screening Tool
CalFlexHub	California Load Flexibility Research and Deployment Hub
California ISO	California Independent System Operator
CalMTA	California Market Transformation Administrator
CalSEED	California Sustainable Energy Entrepreneur Development Initiative
CARB	California Air Resources Board
CAVA(s)	Climate Adaptation and Vulnerability Assessment(s)
CBE	Communities for a Better Environment
CBO(s)	Community-based organization(s)
CCEJN	Central California Environmental Justice Network

CCA	Community choice aggregator
CCUS	Carbon capture, utilization, and storage
CDPH	California Department of Public Health
CEC	California Energy Commission
CEJA	California Environmental Justice Alliance
CHOIR	Coordinated, Holistic Orchestration of Inverter-Based Resources
CLTC	California Lighting Technology Center
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CPUC	California Public Utilities Commission
CRPE	Center on Race, Poverty & the Environment
D.	Decision
DACAG	Disadvantaged Community Advisory Group
DC	Direct current
DER(s)	Distributed energy resource(s)
DERMS	Distributed energy resources management system
DOE	United States Department of Energy
DVC	Disadvantaged and Vulnerable Community
EPIC	Electric Program Investment Charge
EPIC 5	The Fifth EPIC Investment Cycle
EPRI	Electric Power Research Institute
ESJ	Environmental and social justice
EV	Electric vehicle
EVSE	Electric vehicle supply equipment
FOAK	First-of-a-kind

FSC(s)	Flexible service connection(s)
ft ²	square-foot
GFO	Grant funding opportunity
GHG	Greenhouse gas
Go-Biz	Governor's Office of Business and Economic Development
GRC	General rate case
GW	Gigawatt
GWP	Global warming potential
HEET	CEC's Healthy, Equitable Energy Transition Working Group
HPWH	Heat pump water heater
HVAC	Heating, ventilation, and air conditioning
IEPR	Integrated Energy Policy Report
INDIGO	Industrial Decarbonization and Improvement of Grid Operations
IOU	Investor-owned utility
IRP	Integrated Resource Plan
kWh	Kilowatt-hour
LCA	Life cycle assessment
LCJA	Council for Justice and Accountability
LDES	Long-duration energy storage
Li-ion	Lithium-ion
LSE	Load-serving entity
M&V	Measurement and verification
MDHD	Medium- and heavy-duty
MW	Megawatt
MWh	Megawatt-hour

NO ₂	Nitrogen dioxide
OEM	Original equipment manufacturer
Next EPIC Challenge	Reimagining Affordable Mixed-Use Development in a Carbon-Constrained Future Program
NFPA	National Fire Protection Association
OpenADR	Open automated demand response
PEZERR	Power Electronics for Zero-Emission Residential Resilience
PG&E	Pacific Gas and Electric Company
PICG	Policy + Innovation Coordination Group
PM _{2.5}	Fine particulate matter
PSPS	Public Safety Power Shutoff
PSR-LA	Physicians for Social Responsibility — Los Angeles
PV	Photovoltaic
R.	Rulemaking
R&D	Research and development
RAMP	Realizing Accelerated Manufacturing and Production for Clean Energy Technologies
RAMP	Risk Assessment and Mitigation Phase
RD&D	Research, development, and demonstration
RDD&D	Research, development, demonstration, and deployment
REIC	Regional Energy Innovation Cluster
SB	Senate Bill
SCE	Southern California Edison Company
SCEIN	Southern California Energy Innovation Network
SDG&E	San Diego Gas & Electric
SME(s)	Subject matter expert(s)

SMM(s)	Soft magnetic material(s)
SO ₂	Sulfur dioxide
TEC	The Energy Coalition
TEN	Thermal energy network
TRL	Technology Readiness Level
UC	University of California
UL	Underwriters Laboratories
V	Volt
V2B	Vehicle-to-building
V2G	Vehicle-to-grid
V2X	Vehicle-to-everything
VGI	Vehicle-grid integration
VPP	Virtual power plant
VPP-FLEX	Virtual Power Plant Approaches for Demand Flexibility
ZEV	Zero-emission vehicle

APPENDIX H:

Glossary

This glossary is included in both the EPIC 5 Investment Plan and its Appendices to support readability and ease of reference for users who may access either volume independently.

For additional information on commonly used energy terminology, see the following glossary links:

- [California Energy Commission Energy Glossary](https://www.energy.ca.gov/resources/energy-glossary), available at <https://www.energy.ca.gov/resources/energy-glossary>
- [California Air Resources Board Glossary](https://ww2.arb.ca.gov/about/glossary), available at <https://ww2.arb.ca.gov/about/glossary>
- [California Public Utilities Commission Glossary of Acronyms and Other Frequently Used Terms](https://www.cpuc.ca.gov/glossary/), available at <https://www.cpuc.ca.gov/glossary/>

Behind-the-Meter (BTM): Electricity resources located on the customer side of the utility meter that serve on-site load, including solar photovoltaic, batteries, electric vehicle charging, and flexible loads, and may interact with the grid through exports or load management. Resources located on the utility side of the utility meter are sometimes referred to as front-of-the-meter (FTM).

California Load Flexibility Research and Deployment Hub (CalFlexHub): Established through the EPIC program in 2021 and administered by Lawrence Berkeley National Laboratory, CalFlexHub conducts electricity sector technology research, demonstration, and deployment projects that increase the use and market adoption of advanced, interoperable, and flexible demand technologies and strategies as electric grid resources and facilitate integration of distributed energy resources.

California Market Transformation Administrator (CalMTA): CalMTA, a CPUC program established by CPUC Decision 19-12-021, is tasked with accelerating market uptake of high-impact energy efficiency and decarbonization technologies by addressing structural barriers through targeted interventions and support for products such as room heat pumps, induction cooktops, and heat pump water heaters.

CalSEED: The California Sustainable Energy Entrepreneur Development Initiative (CalSEED) is an EPIC-funded program administered by nonprofit New Energy Nexus that provides small grants to entrepreneurs and researchers to advance their clean energy concepts or prototypes.

CalTestBed: The California Test Bed Initiative is an EPIC-funded program administered by nonprofit New Energy Nexus that provides clean energy entrepreneurs access to testing facilities to accelerate technology commercialization.

Carbon capture, utilization, and storage: This term refers to the process of capturing carbon dioxide, either from a concentrated stream or from the atmosphere, then containing it for further use or storage.

Carbon dioxide (CO₂): Carbon dioxide, a naturally occurring gas, also referred to as carbon, is also a by-product of burning fossil fuels (such as oil, gas, and coal), burning biomass, land-

use changes, and industrial processes (for example, cement production). It is the principal anthropogenic greenhouse gas (GHG) that affects the Earth's radiative balance. It is the reference gas against which other GHGs are measured and therefore has a global warming potential of 1.

Carbon neutrality: Carbon dioxide and other GHG emissions generated by sources such as transportation, power plants, and industrial processes must be less than or equal to the amount of carbon dioxide that is stored, both in natural sinks such as forests and mechanical sequestration such as carbon capture and sequestration. Executive Order B-55-18 established a target for California to achieve carbon neutrality by 2045 and maintain net negative emissions thereafter. For more information, see the [CARB Carbon Neutrality](https://ww2.arb.ca.gov/our-work/programs/carbon-neutrality) Web page (<https://ww2.arb.ca.gov/our-work/programs/carbon-neutrality>).

Climate: Climate is the average course or condition of the weather at a place, usually over a period of years, as exhibited by temperature, wind velocity, and precipitation. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. Climate, in a wider sense, is the state, including a statistical description, of the climate system.

Climate change: Climate change refers to a change in the state of the climate that can be identified (for example, by using statistical tests) by changes in the mean or variability (or both) of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic (human-induced) changes in the composition of the atmosphere or in land use. Anthropogenic climate change is defined by the human impact on Earth's climate, while natural climate changes are the natural climate cycles that have been and continue to occur throughout Earth's history.

Anthropogenic climate change is directly linked to the amount of fossil fuel burning, aerosol releases, and land alteration from agriculture and deforestation.

Combustion: The chemical process of burning, which produces gases and particulate matter that can affect air quality.

Community choice aggregator (CCA): The term used to describe a local government that procures power on behalf of its residents, businesses, and municipal accounts from an alternative supplier while still receiving transmission and distribution service from its existing utility provider.

Decarbonization: The process by which countries, individuals, or other entities aim to reduce or achieve zero-fossil carbon emissions. This typically refers to a reduction of the carbon emissions associated with electricity, industry, and transport. Decarbonization involves increasing the share of no- or low-carbon energy sources (renewables such as solar and wind) and decreasing the use of fossil fuels. "Decarbonizing homes and businesses" means replacing the emissions from how we heat, cool, cook, and power our buildings with advanced, energy-efficient systems that enhance health, comfort, and affordability while significantly reducing carbon intensity. "Community decarbonization" refers to the process of reducing carbon emissions at the local level through clean energy, energy efficiency, and community-led decision-making, ensuring that the benefits of cleaner air, lower costs, and greater resilience are shared equitably across the community.

Demand flexibility: The ability of customers to reduce or increase load (electricity demand) in response to grid conditions, usually through a proxy price signal or system operator or utility signal and facilitated by automation (also called “load flexibility”).

Distributed energy resources (DERs): A diverse category of devices and technologies that connect to the electric grid at the distribution level, either directly connected to a distribution utility’s wires or on an end-use customer’s premises behind the utility meter. Examples include distributed generation and storage, electric vehicles and charging stations, grid-interactive buildings and microgrids, and more traditional demand response or load flexibility resources.

Distributed energy resources management system (DERMS): A distributed energy resources management system controls systems and software that are implemented by utilities to increase visibility, awareness, and grid benefits from distributed energy resources.

Disadvantaged community: “Disadvantaged community” refers to the areas throughout California where residents suffer most from a combination of economic, health, and environmental burdens. These burdens include poverty, high unemployment, air and water pollution, presence of hazardous wastes, as well as high incidence of asthma and heart disease. One way that the state identifies these areas is by collecting and analyzing information from communities all over the state. CalEnviroScreen, an analytical tool created by the California Environmental Protection Agency, combines different types of census tract-specific information into a score to determine which communities are the most burdened or “disadvantaged.” Disadvantaged communities are those designated as representing the 25 percent highest-scoring census tracts in CalEnviroScreen Tool 4.0. For more information, see the California Office of Environmental Health Hazard Assessment’s [CalEnviroScreen](https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40) Web page (<https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40>).

Disadvantaged Communities Advisory Group (DACAG): The Clean Energy and Pollution Reduction Act of 2015 (also known as Senate Bill 350) called upon the California Public Utilities Commission (CPUC) to help improve air quality and economic conditions in disadvantaged communities by, for example, changing the way the state plans the development and future operations of power plants, and rethinking the location of clean energy technologies to benefit burdened communities. In addition, SB 350 required the CPUC and the CEC to create a group representing disadvantaged communities to advise the agencies in understanding how energy programs impact these communities and could be improved to benefit these communities.

Disadvantaged (and) Vulnerable Communities (DVCs): California Public Utilities Decision 20-08-046 states “Disadvantaged Vulnerable Communities consist of communities in the 25 percent highest scoring census tracts according to the most recent version of the California Communities Environmental Health Screening Tool (CalEnviroScreen), as well as all California tribal lands, census tracts with median household incomes less than 60 percent of state median income, and census tracts that score in the highest 5 percent of Pollution Burden within CalEnviroScreen, but do not receive an overall CalEnviroScreen score due to unreliable public health and socioeconomic data.”

Distributed Energy Resources (DER) Action Plan: A CPUC planning document that outlines a vision of DERs over the next several years, and serves as a roadmap in coordinating activities across multiple proceedings as California continues its commitment to greenhouse gas emission reduction and reform of utility distribution planning, investment, and operations.

Electric Program Investment Charge (EPIC) Program: The CEC’s EPIC Program invests in scientific and technological research to accelerate the transformation of the electricity sector to meet the state’s energy and climate goals. Investments of about \$150 million annually support research and development in renewable energy, energy storage, electric system resilience, and electric technologies for buildings, businesses, and transportation. For more information, see the [CEC EPIC](https://www.energy.ca.gov/programs-and-topics/programs/electric-program-investment-charge-epic-program) Web page (<https://www.energy.ca.gov/programs-and-topics/programs/electric-program-investment-charge-epic-program>) and the [CPUC Energy Research, Development, and Deployment](https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/energy-research-development-and-deployment) Web page (<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/energy-research-development-and-deployment>).

End use, end user: End use refers to the final applications for which energy is ultimately used, such as heating, power generation, transportation, or a combination of these applications. An end user is the person who ultimately uses the energy (or associated innovation). This term is preferred over “user” because it provides more specificity, distinguishing the final user from other roles like developers or intermediaries.

Energy efficiency: Energy efficiency means adapting technology to meet consumer needs while using less energy. The CEC adopts energy efficiency standards for appliances and buildings, which reduces air pollution and saves consumers money. The CPUC regulates ratepayer-funded energy efficiency programs and works with the IOUs, other program administrators, and vendors to develop programs and measures to transform technology markets within California using ratepayer funds. For more information, see the [CEC Energy Efficiency](#) Web page and the [CPUC Energy Efficiency](#) Web page.

Environmental and Social Justice Action (ESJ) Plan: The CPUC created the Environmental and Social Justice (ESJ) Action Plan to serve as both a commitment to furthering ESJ principles, as well as an operating framework with which to integrate ESJ considerations throughout the agency’s work.

Environmental and social justice (ESJ) communities: ESJ communities are predominantly communities of color or low-income communities that are underrepresented in the policy setting or decision-making process, subject to a disproportionate impact from one or more environmental hazards, and likely to experience disparate implementation of environmental regulations and socioeconomic investments in their communities. The definition includes “Disadvantaged Communities” designated by the California Environmental Health Screening (CalEnviroScreen) Tool, all California tribal lands as defined in 18 U.S.C. 1151 subsection (a), low-income households with incomes below 80 percent of the area median income, and low-income census tracts with aggregated household incomes that are less than 80 percent of area or state median income.

Equity (energy equity): Energy equity is the principle of fairness in burden sharing and is a basis for understanding how the impacts and responses to climate change, including costs and benefits, are distributed in and by society in equal ways. It is often aligned with ideas of equality, fairness, and justice and applied with respect to equity in the responsibility for, and distribution of, climate impacts and policies across society, generations, and gender, and in the sense of who participates and controls the processes of decision-making.

Follow-on funding: This report uses the term “follow-on funding” to describe when an EPIC recipient receives subsequent EPIC funding from the CEC for a project that meets the statutory criteria under Public Resources Code Section 25711.5(h)(4)(A)-(F).

Greenhouse gas (GHG): GHGs are those gaseous constituents of the atmosphere, natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth’s surface, the atmosphere itself, and clouds. This property causes the greenhouse effect. Water vapor, carbon dioxide, nitrous oxide, methane, and ozone are the primary GHGs in the Earth’s atmosphere. Moreover, there are several entirely human-made GHGs in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, dealt with under the Montreal Protocol. Besides carbon dioxide, nitrous oxide, and methane, the Kyoto Protocol deals with the GHGs sulfur hexafluoride, HFCs, and perfluorocarbons. In response to Assembly Bill 32 (California Global Warming Solutions Act of 2006), the definition of GHGs in Health and Safety Code Section 38505 includes nitrogen trifluoride in addition to those defined under the Montreal and Kyoto Protocols.

Global warming potential (GWP): GWP is an index to measure how much infrared thermal radiation a greenhouse gas would absorb over a given timeframe after it has been emitted to the atmosphere. The unit of measurement is expressed as a multiple of the radiation that would be absorbed by an equivalent mass of added carbon dioxide, which has a GWP of 1.

Heat pump water heater (HPWH): The U.S. Department of Energy defines heat pump water heaters as appliances that use electricity to move heat from the surrounding air into a tank of water, rather than generating heat directly like conventional electric resistance heaters.

High Road careers: This term refers to pathways with jobs that are framed by California Jobs First as quality, family-sustaining, and created through economic development that invests in workers and innovation rather than solely competing on low wages. These roles offer living wages, benefits, safe work conditions, worker voice, and reliable schedules that are often supported by state programs like the High Road Training Partnerships and High Road Construction Careers, focused on sectors like green energy, construction, and healthcare.

Investor-owned utility (IOU): Investor-owned utilities (IOUs) provide transmission and distribution services to all electric customers in their service territories. The utilities also provide generation service for “bundled” customers, while “unbundled” customers receive electric generation service from an alternate provider, such as a community choice aggregator. California has three large IOUs offering electricity service: Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas & Electric.

Load flexibility: The ability of customers to reduce or increase load (electricity demand) in response to grid conditions, usually through a proxy price signal or system operator or utility signal and facilitated by automation (also called “demand flexibility”).

Low-income communities: This term refers to communities within California census tracts with median household incomes at or below either of the following levels: 1) 80 percent of the statewide median income or 2) the applicable low-income threshold listed in the state income limits updated by the Department of Housing and Community Development and filed with the Office of Administrative Law pursuant to subdivision (c) of Section 50093 of the Health and Safety Code.

Methane: Methane (CH₄) is one of the six GHGs to be mitigated under the Kyoto Protocol and is the major component of natural gas. Emissions also occur as a result of dairy and livestock operations and disposal of organics in landfills, and the management of these organics represents a major mitigation option. Methane is a short-lived climate pollutant. Unlike carbon dioxide, which lasts for about 100 years in the atmosphere, reductions of methane can create a relatively quick reduction in global warming.

Open automated demand response (OpenADR): An open-source standard for secure and interoperable communication of demand response and demand flexibility signals to end-use devices.

Photovoltaic (PV): This term refers to materials that generate an electric potential or current when exposed to sunlight.

Renewable integration: Renewable integration is the technical and operational process of connecting renewable energy sources to the electric grid while maintaining reliability, stability, and real-time balance between supply and demand. Essentially, this term refers to making renewable energy a seamless part of our communities.

Smart thermostat: A smart thermostat is one that can be controlled with an internet-connected device such as a phone, tablet, or smart speaker.

Sustainability: A dynamic process that guarantees the persistence of natural and human systems equitably.

Transportation electrification: This term refers to the replacement of fossil fuels in the transportation sector with electrical power.

Utility: A utility is an organization supplying the community with electricity, gas, water, or sewage.

Vehicle-to-Building (V2B): This term refers to leveraging bidirectional energy transfer capability to discharge from an electric vehicle to a home or building.

Vehicle-to-Everything (V2X): This term refers to leveraging bidirectional energy transfer capability to discharge from an electric vehicle to any entity that may affect, or may be affected by, the electric vehicle.

Vehicle-to-Grid (V2G): This term refers to leveraging bidirectional energy transfer capability to discharge energy from an electric vehicle to the electric grid.

Vehicle-to-Home (V2H): An application in which an electric vehicle supplies power from its battery to a home, functioning as a backup power source during grid outages.

Vehicle-Grid Integration (VGI): This term refers to any method of altering the time, charging level, or location at which grid-connected light-duty electric vehicles, medium-duty electric vehicles, heavy-duty electric vehicles, off-road electric vehicles, or off-road electric equipment charge or discharge in a manner that optimizes plug-in electric vehicle or equipment interaction with the electrical grid and provides net benefits to ratepayers.

Virtual Power Plant (VPP): An aggregation of distributed energy resources (DERs), such as energy storage, smart thermostats, and/or electric vehicles, which are capable of balancing

electrical loads and providing utility-scale and utility-grade grid services like a traditional power plant.

APPENDIX I:

CEC Request for EPIC 5 Inflation Adjustment

Background

CPUC Decision D.20-08-042 provided EPIC Administrators with the ability to propose budget adjustments in their EPIC 5 Investment Plan applications to account for the rate of inflation, as calculated using the California Department of Finance’s California Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) method.⁶

This appendix serves as the CEC’s request to adjust its portion of the EPIC budget for the EPIC 5 Investment Cycle (2026–2030).

Approach

An appropriate inflation adjustment rate can be calculated by comparing the observed California CPI-W indices for the EPIC 4 investment period (2021–2025) with the forecasted California CPI-W indices for the EPIC 5 investment period (2026–2030).⁷

The California Department of Finance reports the following historical and forecasted California CPI-W indices for the EPIC 4 and EPIC 5 investment periods:⁸

Year	California CPI-W Indices
2021	288.71
2022	310.57
2023	321.23
2024	330.85
2025	341.54
2026	355.25
2027	366.24
2028	377.95

⁶ California Public Utilities Commission. 2020. [Decision 20-08-042](https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M346/K225/346225760.PDF). OP 3. August 27, 2020. California Public Utilities Commission. <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M346/K225/346225760.PDF>.

⁷ The methodology presented here is consistent with the methodology presented by the CEC, and adopted by the CPUC, the last time an inflation adjustment was approved for the EPIC budget, during the transition from EPIC 2 to EPIC 3 in [D.18-01-008](https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M206/K319/206319491.pdf) (<https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M206/K319/206319491.pdf>). D. 18-01-008 OP 6 approved the use of a forecasted California-specific CPI-W to calculate inflation adjustments as opposed to a backward-looking average originally required by [D.12-05-037](https://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF) (https://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF). D.18-01-008 OP 5 allowed the CPUC to “. . . use any reasonable method to adjust the triennial EPIC collection amount for inflation.”

⁸ Data is from the April 2026 version of the California Department of Finance [Consumer Price Index Calendar Year Averages](https://dof.ca.gov/forecasting/economics/economic-indicators/inflation/) (<https://dof.ca.gov/forecasting/economics/economic-indicators/inflation/>).

2029	390.12
2030	402.59

The average CPI-W index for the EPIC 4 period is 318.58.

The average CPI-W index for the EPIC 5 period is 378.43.

The projected inflation between these two investment periods is then:

$$(378.43 - 318.58) / 318.58 = 0.1879 \text{ or } 18.79\%$$

Applying this inflation rate to the CEC's portion of the EPIC 5 budget yields the following:⁹

$$\$740,000,000 \times 1.1879 = \$879,046,000$$

In the interest of simplicity, the CEC rounds this calculation to \$879 million. This methodology results in an inflation adjustment of \$139 million added to the CEC's EPIC 5 budget, as compared to the CEC's EPIC 4 budget.

⁹ CPUC [Decision 26-02-037](https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M601/K366/601366656.PDF) (https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M601/K366/601366656.PDF) Appendix B clarified that the unadjusted EPIC 5 budget is \$925 million. The CEC's 80 percent portion of that budget is \$740 million, which serves as the starting point for the proposed EPIC 5 inflation adjustment.