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EPIC 5 Research Concept Proposal Form

Additional submitted attachment is included below.



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

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

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

1. Please provide the name, email, and phone number of the best person to contact should the CEC have additional questions regarding the research concept:
 - a. David Ung
 - b. david.ung@twelve.co
 - c. Representative prefers not to share phone number on documents that may become publicly available.
2. Please provide the name of the contact person’s organization or affiliation:
 - a. Twelve Benefit Corporation (dba Twelve)
3. Please provide a brief description of the proposed concept that you would like the CEC to consider as part of the EPIC 5 Investment Plan. What is the purpose of the concept, and what would it seek to do? Why are EPIC funds needed to support the concept?
 - a. California has many technical leaders in carbon management, including carbon utilization. Twelve encourages the EPIC 5 Investment Plan to include a broad funding topic on research and development support for the 1) technical innovation and 2) scale-up of carbon utilization technologies to enable manufacturing and commercial deployment. This would maintain and grow California’s leadership in the carbon management space. For example,

Twelve's carbon transformation technology is able to transform CO₂ to value-added products such as e-fuels and materials.

- b. EPIC funds are needed to support these concepts because the funding landscape has evolved. While private funding via venture capital is available, there is less funds available for climate technologies and it is difficult to leverage those funds for core R&D.
- c. Twelve encourages the focus on R&D, scale-up, and manufacturing support as deploying novel technologies in California can be difficult to do a range of factors including logistics, policy, and economics. Supporting the core R&D, scale-up, and enabling manufacturing will enable CA's carbon management leaders to continue to grow and deploy their tech to continue down the cost curve. This will bring economic benefits such as jobs to California state, and as the technology continues down the cost curve, will ultimately lead to deployment of these technologies in CA. Furthermore, as the technology is deployed, low-carbon products will become available to Californians.

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

- a. Twelve's carbon utilization technology will enable the production of low-carbon products, such as synthetic e-fuels. Twelve's technology can produce e-fuels like sustainable aviation fuel (SAF) to be used in commercial aircraft. Additional R&D to improve the performance of Twelve's technology, and/or scale-up the technology for manufacturing, will continue to reduce the cost of producing these alternative carbon products and enable their entry into the marketplace. As the costs continue to fall due to increased technical performance, there will be increased availability and adoption.

- b. In line with CA's statutory energy goals in SB 905, AB 209, AB 32, and SB 32, Twelve's technology create products from captured CO₂ that reduce GHG emissions by more than 85% compared to their fossil-based incumbents and producing CO₂-based fuels.
5. Please describe the anticipated outcomes if this research concept is successful, either fully or partially. For example, to what extent would the research reduce technology or ratepayer costs and/or increase performance to improve the overall value proposition of the technology? What is the potential of the innovation at scale? How will the innovation lead to ratepayer benefits in alignment with EPIC's guiding principles to improve safety,ⁱⁱ reliability,ⁱⁱⁱ affordability,^{iv} environmental sustainability,^v and equity?^{vi}
 - a. Twelve's carbon transformation technology enables the production of low-carbon products like e-fuels or chemical products. Twelve is currently focused on sustainable aviation fuel as a beachhead market. In 2022, CA consumed almost 83M barrels of jet fuel. Under current blending regulations, Twelve could supply 41.5M barrels/year of SAF to the state of CA. Twelve has SAF purchase agreements with International Airlines Group, Alaska Airlines, and Shopify. Supporting the broad R&D for this technology would accelerate the deployment and production of this SAF, thereby accelerating the decarbonization of CA's aviation sector. Twelve's fuel is produced via an ASTM-certified pathway and is drop-in compatible with existing aircraft. Other technologies to decarbonize aviation (e.g. electrification) have a much longer technical development pathway due to the high energy density needed.
 - b. A successful innovation will further enable access to clean air for communities near airports where Twelve's SAF E-Jet® is used. Air pollution from aircrafts can lead to negative impacts on respiratory and cardiovascular health. These benefits will go to workers on runways and often low-income residents near airports, as SAF produces less NO_x, SO_x, and particulates when burned. The positive impact of SAF on DACs has been supported by research from Sandia National Labs, which shows 74% of the SAF-related benefits going towards disadvantaged communities around SeaTac airport.
6. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed research concept.

- a. This would depend on the specifics of the specific R&D supported by EPIC but metrics could include performance metrics for the core technology (voltage, current density), or development for commercially relevant and deployable systems (e.g. active area, multi-cell measurements instead of single cell, etc).
7. Please provide references to any information provided in the form that supports the research concept's merits. This can include references to cost targets, technical potential, market barriers, equity benefits, etc.
- a. Twelve has published a thorough overview of sustainable aviation fuels, comparing the advantages of Twelve's E-Jet fuel versus biomass derived SAF. It is well accepted that e-fuels will be necessary in the coming years to meet the demand for aviation decarbonization as biomass feedstocks are limited. Please see the report here: <https://www.twelve.co/post/know-your-saf>
8. The EPIC 5 Investment Plan must support at least one of five Strategic Goals:^{vii}
- a. Transportation Electrification
 - b. Distributed Energy Resource Integration
 - c. Building Decarbonization
 - d. Achieving 100 Percent Net-Zero Carbon Emissions and the Coordinated Role of Gas
 - e. Climate Adaptation

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

This concept would support “transportation electrification” and “achieving 100% net-zero carbon emissions and the coordinated role of gas” through the electrification of fuel production for aviation. Significant technology innovation is needed for hard-to-decarbonize sectors such as aviation, which is a challenge to decarbonize due to the high energy densities needed. Electrification is not amenable for standard commercial flights and would also require a significant overhaul of the logistics and supply chain in the aviation sector. Twelve's E-Jet® sustainable aviation fuel is drop-in compatible with existing aircraft and would leverage existing supply chains.

About EPIC

The CEC is one of four EPIC administrators, funding research, development, and demonstrations of clean energy technologies and approaches that will benefit electricity ratepayers of California's three largest investor-owned electric utilities.

EPIC is funded by California utility customers under the auspices of the California Public Utilities Commission.

To learn more about EPIC, visit: <https://www.energy.ca.gov/programs-and-topics/programs/electric-program-investment-charge-epic-program>

EPIC 5 documents and event notices will be posted to:
<https://www.energy.ca.gov/proceeding/electric-program-investment-charge-2026-2030-investment-plan-epic-5>

Subscribe to the EPIC mailing list to stay informed about future opportunities to inform the development of EPIC 5:
<https://public.govdelivery.com/accounts/CNRA/signup/31897>

i See section (a) (1) of Public Resources Code 25711.5 at:
https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=PRC§ionNum=25711.5.

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

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

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

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

vi EPIC innovations should increasingly support, benefit, and engage disadvantaged vulnerable California communities (DVC). (D.20-08-046, Ordering Paragraph 1.) DVCs 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.

vii In 2024 the CPUC adopted five Strategic Goals to guide development of the EPIC 5 Investment Plan. A description of the goals can be seen in Appendix A of CPUC Decision 24-03-007 available at:

<https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M527/K228/527228647.PDF>