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Geologic Hydrogen

Additional submitted attachment is included below.

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

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

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

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

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

   Sophie Broun
   sophie@anning.io
   (832) 726 6049

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

   Sophie Broun, CEO Anning Corporation

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?*

   Brief description
   Anning Corporation is a stimulated geologic hydrogen company. We are evaluating the potential of this new resource in California. If successful, it could be the largest supply of clean hydrogen at a cost of production that is competitive with gasoline. Geologic hydrogen has the potential to be a step change in the clean energy landscape.
   We use iron rich rocks deep in the subsurface to leverage natural processes and produce clean, safe and reliable hydrogen. Geologic

hydrogen has the potential to provide baseload 24/7 reliable clean electrons to the California energy grid or bulk product to fuel transportation and industry.

Purpose of the concept

The main purpose of the concept is to understand if iron rich rock formations in California can be used to produce hydrogen at commercial rates using technologies similar to those already used in geothermal.

What would it seek to do?

The EPIC funds would be used for exploratory drilling. Anning plans to collect geoscience data and perform laboratory testing to better understand production potential.

Why are EPIC funds needed?

A project like this is the first of a kind. To our knowledge, no commercial stimulated geologic hydrogen project has been attempted in the US. EPIC funds are needed to progress this project until the technology is mature enough to be supported by traditional capital markets. We aim to sequentially de-risk the technology through our phased exploration program. EPIC funds will be a catalyst to better understand the potential of this new energy resource and hopefully open up the market in California to many successful projects.

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

Barriers

- Technical Barriers: Does hydrogen generate in the subsurface at commercial rates in California? Can it be produced at commercial rates?

  Whilst there are many technical barriers, our concept proposes collecting appropriate rock samples, performing rock characterization, modeling and laboratory tests to better understand the pathway to solving some of the technical barriers currently faced by the industry.

- Market Barrier: Demonstrate reliable production for downstream off takers.
  Reliable production is also one of the largest market barriers. The proposed work program will allow us to obtain the information needed to model long term offtake.

- Cost targets. For widespread hydrogen adoption, the cost must be competitive with existing fuel sources. For bulk hydrogen, 1kg of hydrogen equates to approx. 1 gallon of gasoline for vehicle use. The estimated cost of production for geologic hydrogen calculated by IEA and featured in Sandia National Laboratories[1] geologic hydrogen overview is $0.5-1 per kg making it a significantly lower cost fuel option for the Californian market which currently averages ~$4.50/gallon.
  .
- Data and information gaps the concept would help fill
  There needs to be more focus and effort on scientifically appropriate tests of the stimulated geologic hydrogen generative potential of target rock in California.

- Parties and end users who would benefit from the results.
  These results will help to calibrate our exploration model and understand with a much higher degree of accuracy the potential resource quantity and cost of production. Information from the testing will also guide the ecosystem including infrastructure build outs and the hydrogen road map.

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]

   Anticipated Outcomes
   If successful – Anning will move forward with developing a portfolio of exploration opportunities and eventually have multiple projects in California supplying clean hydrogen.

[1] Sandia National Laboratories, 2025, Exploring Geologic Hydrogen: A New Frontier for Affordable, Reliable Energy Security https://energy.sandia.gov/programs/fossil-energy/subsurface-storage/geologic-hydrogen-capabilities/geologic-hydrogen/

Ratepayer Benefits – Cost

As mentioned earlier, predictions on the cost of production of geologic hydrogen are significantly lower than the equivalent gasoline price. Geologic hydrogen can also be converted to electricity which will likely be at a much lower cost than existing generation leading to large savings for ratepayers. Ratepayers will also benefit from the clean nature of geologic hydrogen through lower air pollution.

Innovation at Scale

If successful at our first project, we aim to scale up and integrate the local workforce to ensure opportunities are created in California for technology development, engineering, project management and operations.

Alignment with ratepayer benefits and EPIC's guiding principles

Anning is committed to being a trusted partner and responsible operator in the communities where we work. We believe this resource can bring jobs, investment and affordable clean energy to California while caring for the environment. Our values are well aligned with the EPIC guiding principles.

- Safety – Stimulated geologic hydrogen will be similar to geothermal projects which have a leading track record of performance and safety.
- Reliability – We will use a sequential exploration program with a focus on demonstrating reliability.
- Affordability – Game changer in affordability if successful. Hydrogen may be produced at a price equivalent to $1/gallon gasoline for bulk product or converted to electricity for clean electrons at potentially a lower price than carbon intensive generation.
- Environmental Sustainability – Very low impact. Will be similar to the many existing geothermal projects in California. Geologic hydrogen is high energy density leading to more energy with less impact.
- Equity – We aim to support the communities where we operate with high quality employment opportunities, re-deploy the legacy oil and gas workforce and minimize any negative externalities. Anning strives to be a trusted partner in the communities where we operate and build a growth industry of the future that is inclusive, supports local businesses and is additive to communities.

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

   The hydrogen production insights we obtain from this proposed research concept will feed directly into our estimates for resource potential in California.

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*.

   United States Geological Survey, 2023, The Potential for Geologic Hydrogen for Next-Generation Energy, Available at https://www.usgs.gov/news/featured-story/potential-geologic-hydrogen-next-generation-energy

United States Geological Survey, 2025, Geologic Hydrogen, Available at https://www.usgs.gov/centers/central-energy-resources-science-center/science/geologic-hydrogen

Sandia National Laboratory, 2025, Exploring Geologic Hydrogen: A New Frontier for Affordable, Reliable Energy Security, Available at https://energy.sandia.gov/programs/fossil-energy/subsurface-storage/geologic-hydrogen-capabilities/geologic-hydrogen/

ARPA-E, 2024, U.S. Department of Energy Announces $20 Million to 16 Projects Spearheading Exploration of Geologic Hydrogen, Available at https://arpa-e.energy.gov/news-and-events/news-and-insights/us-department-energy-announces-20-million-16-projects-spearheading-exploration-geologic-hydrogen

BloombergNEF, 2023, Green Hydrogen to Undercut Gray Sibling by End of Decade, Available at, https://about.bnef.com/insights/clean-energy/green-hydrogen-to-undercut-gray-sibling-by-end-of-decade/

Curcio E, 2025, Techno-economic analysis of hydrogen production: Costs, policies, and scalability in the transition to net-zero, International Journal of Hydrogen Energy, Volume 128, 15 May 2025, pages 473 – 487, https://www.sciencedirect.com/science/article/abs/pii/S0360319925016234

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.

Transportation Electrification

- Clean hydrogen for transportation fuel. This hydrogen can either be used in the vehicle by passing it through a fuel cell that produces electricity from

hydrogen onboard or to provide clean electricity into the grid to be used in electric vehicles.

Distributed Energy Resource Integration

- There may be suitable locations across California that could allow for diverse supply locations to power the grid where most needed. The EPIC concept will enable us to make informed decisions about possible locations to explore. Anning also can meet resiliency and flexibility grid goals as production sites are self-contained with low interdependencies.

Achieving 100 Percent Net-Zero Carbon Emissions

- The creation of stimulated geologic hydrogen is a clean process using natural reactions in the subsurface. The hydrogen will be net-zero carbon emissions and can be used as bulk product for clean fuel or for electricity generation. We expect to have a low environmental impact and make a significant contribution to reducing air pollution, lowering greenhouse gas emissions, reducing gas consumption and growing jobs at locations across California.

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&sectionNum=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