

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

ENERGY DIVISION

**Agenda ID: 19794
RESOLUTION G-3584
September 23, 2021**

R E S O L U T I O N

Resolution G-3584. The California Energy Commission requests approval of its Fiscal Year 2021-2022 methane gas research budget including two hydrogen research projects.

PROPOSED OUTCOME:

- Approves the California Energy Commission's (CEC's) *Natural Gas Research and Development Program, Proposed Budget Plan for Fiscal Year 2021-22* with a budget of \$24 million, pursuant to California Public Utilities Commission Decision (D.) 04-08-010.

SAFETY CONSIDERATIONS:

- This Resolution approves and prioritizes \$4 million to advance fossil methane gas infrastructure safety and integrity projects. Successful research in this area will support safe infrastructure operation including monitoring ground movement around pipelines, mitigating natural force damages, and developing and demonstrating plastic pipeline repair and integrity improvement.
- This Resolution approves up to \$3.5 million to quantify exposures to indoor pollutants in multifamily homes that cook with natural gas or alternatives.

ESTIMATED COST:

- Approves \$24 million in ratepayer costs for Fiscal Year 2021-2022, as previously authorized by D.04-08-010.

By Advice Letter 1-G, Filed on April 1, 2021

SUMMARY

This Resolution approves the California Energy Commission's (CEC's) *Natural Gas Research and Development Program Proposed Budget Plan for Fiscal Year 2021-22* (the FY2021-22 Plan). The Natural Gas Research and Development Program (Gas R&D Program) was established pursuant to Decision (D.) 04-08-010. The California Public Utilities Commission (CPUC) approves the CEC's proposed \$24 million budget.

BACKGROUND

Procedural History

In 2002, the CPUC instituted Rulemaking (R.) 02-10-001 to implement Assembly Bill 1002 (Wright, 2000).¹ In that proceeding, the CPUC addressed various issues related to the design and implementation of a surcharge to fund gas public purpose programs, resulting in D.04-08-010.

D.04-08-010 establishes certain criteria for gas research and development (Gas R&D) projects to be approved under this program, namely that the projects:

- 1) Focus on energy efficiency, renewable technologies, conservation, and environmental issues.
- 2) Support State energy policy.
- 3) Offer a reasonable probability of providing benefits to the general public.
- 4) Consider opportunities for collaboration and co-funding opportunities with other entities.

Additionally, the Decision defines public interest Gas R&D activities as those which "are directed towards developing science or technology, 1) the benefits of

¹ Available at https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=199920000AB1002.

which accrue to California citizens and 2) are not adequately addressed by competitive or regulated entities.”²

D.04-08-010 also designates the CEC as the administrator of the Gas R&D Program. The CEC administers various public interest research programs and is publicly accountable, being subject to the Bagley-Keene Open Meeting Act and the Public Records Act.³ The CEC selects funding areas, which the CPUC then reviews and approves.

D.04-08-010 reserves ultimate oversight for the CPUC. The CPUC is responsible for adopting the Gas R&D Program, and for setting the surcharge to fund it. The Decision clarifies that the CPUC has final responsibility to “approve and resolve administration, funding, project approval, or other matters, and make a final decision.”⁴ The Decision further designates the CPUC’s Energy Division to serve as the CPUC’s advisor.

Starting with the FY2014-15 Gas R&D Plan, Resolution G-3484 (2013) requires the CEC to provide an accounting, by research area, of then-current unspent funds in the Gas R&D Program, including encumbrances and expiration dates. This requirement shall remain in place for each fiscal year’s proposed budget, until otherwise directed by the CPUC.

Budget

D.04-08-010 establishes a zero-based budget for the Gas R&D Program. Historically, each year the CEC has requested, and the CPUC has approved, the maximum budget increase over the previous year. Starting at \$12 million for 2005, the Gas R&D Program budget increased by the maximum annual amount allowed of \$3 million each year until 2009. In 2009, the budget reached the maximum amount allowed of \$24 million per year and has remained at this level to the present.⁵

² D.04-08-010 at 25.

³ D.04-08-010 at 31.

⁴ D.04-08-010 at 32.

⁵ D.04-08-010 at 38.

In the FY2021-22 Plan, the CEC continues to request the maximum \$24 million. The CEC has historically been granted the use of 10 percent of Gas R&D funds for program administration. The FY2021-22 Plan similarly requests \$2.4 million, or 10 percent of the overall budget, for program administration.

Request for State Fiscal Year 2021-2022

On April 1, 2021, the CEC filed Advice Letter 1-G seeking approval of its proposed FY2021-22 Natural Gas R&D Plan. The plan detailed seven research initiatives addressing five research areas involving methane gas produced from fossil or biogenic sources – energy efficiency, renewable energy and advanced generation, natural gas infrastructure safety and integrity, energy-related environmental research, and transportation. Including program administration, the budget for the seven research initiatives totaled \$24 million for the fiscal year.

The Industrial Carbon Capture and Utilization research initiative proposes RD&D that identifies research gaps and develops cross-cutting technologies for carbon capture and use in the industrial sector. The initiative develops a roadmap for such carbon capture and utilization to identify research gaps, prioritize research needs, and provide recommendations for research funding. The proposed research also establishes an energy baseline of existing carbon capture that includes a quantitative basis of the energy requirements and associated costs that can be used to compare improvements in energy efficiency and economic improvements as well as inform a life-cycle assessment. Finally, the initiative performs fundamental research on enabling technologies addressing carbon capture effectiveness and carbon utilization.

The research initiative Technologies for Monitoring Ground Movement Around Pipelines and Mitigating Natural Force Damages will fund the development and demonstration of remote sensing and monitoring technologies with real-time and intelligent sampling, monitoring algorithms, and data management approaches to monitor ground movement around pipelines and develop strategies to reduce the risk of potential damages. The research aims to develop and demonstrate remote sensing and monitoring technologies to monitor ground movement around pipelines that may otherwise not be detectable during

right-of-way patrols. The initiative will also evaluate stress/strain in the pipeline and conduct stress/strain analysis for pipe bending and denting from movement.

The research initiative Technology Development and Demonstration for Plastic Pipeline Repair and Integrity Improvement develops and demonstrates technologies that advance the overall integrity of plastic pipelines in California. The research areas include technologies to measure or monitor plastic pipes for early notification of potential risks and risk mitigation and to predict and mitigate various types of damages to pressurized plastic pipelines, such as gouges, cracks, and anomalies. The research areas also include new and cost-effective technologies to repair plastic pipe damages without the need of pipe squeeze-off, gas by-pass, or excavation to access the pipe. The research also demonstrates technologies to evaluate, measure, or monitor the performance of repaired plastic pipe systems, including various system components, such as joints and fittings. Finally, the research demonstrates robotic internal inspection and repair technologies for small-diameter plastic pipelines and emerging technologies that minimize or avoid natural gas service interruption during pipeline repair.

The research initiative Developing and Demonstrating Hydrogen-Based Power Generation Systems will fund the development and demonstration of power generation technologies that can run efficiently on high blends of hydrogen in the fuel stream, including modifications to current power generation technologies. The research also aims to advance system efficiency, emissions reductions, and safe operation of power generation technologies.

The research initiative Quantify Exposures to Indoor Pollutants in Multifamily Homes That Cook with Natural Gas or Alternatives will quantify actual human exposures to indoor air pollutants, including PM_{2.5} and NO₂, in multifamily homes that cook with natural gas or alternatives. Research aims include quantifying human exposures to indoor air pollutants in multifamily homes to assess the benefits of eliminating natural gas-based cooking and providing an empirical basis for exposure assessments to address knowledge gaps in understanding health impacts associated with indoor air quality issues resulting from cooking with gas.

The research initiative Location-Specific Analysis of Decommissioning to Support Long-Term Gas Planning conducts location-specific analysis of promising candidate sites for decommissioning (e.g., those with known pipe integrity and corrosion issues), examining the implications of decommissioning on the remaining gas system (e.g., changes in gas system operating pressures). Research areas include conducting location-specific analysis of promising candidate sites for pipeline decommissioning regarding impacts such as gas system operating pressures; bridging the gap between high-level gas system planning and local decommissioning pilots; and examining approaches such as hydraulic modeling to consider gas system operations.

The Advanced Hydrogen Refueling Infrastructure Solutions for Heavy Transport research initiative focuses on developing advanced hydrogen refueling infrastructure components and systems for high-capacity stations that can support the transition of heavy transport applications to zero-emission hydrogen fuel cell technology. Possible research areas include but are not limited to developing advanced hydrogen refueling infrastructure components and systems for high-capacity stations serving heavy-duty fuel cell electric vehicles; demonstrating improved hydrogen fueling infrastructure to increase fill rates, improve reliability, and reduce the cost of dispensed hydrogen; and developing stations with dedicated hydrogen production.

NOTICE

Notice of AL 1-G was made by publication in the Commission's Daily Calendar. The California Energy Commission states that a copy of the Advice Letter was mailed and distributed in accordance with Section 4 of General Order 96-B.

PROTESTS

Advice Letter 1-G was not protested.

DISCUSSION

The CPUC has reviewed and evaluated the CEC's *Natural Gas Research and Development Program: Proposed Budget Plan for Fiscal Year 2021-22* based on the following:

- Consistency with D.04-08-010
- Consistency with Resolution G-3484 (2013) Accounting Requirements
- Consistency with Resolution G-3571 (2020) Direction for FY2021-22 Plan
- Reasonableness of budget request

Consistency with D.04-08-010

D.04-08-010 requires the CEC to provide an annual plan to Energy Division outlining its proposed projects. The CEC presented a draft FY2021-22 Plan in a public workshop held on January 29, 2021, and received feedback from stakeholders. In accordance with Resolution G-3571 which approved the CEC's FY 2020-21 Plan, the CEC submitted its FY 2021-2022 Natural Gas R&D Plan via a Tier 3 Advice Letter on April 1, 2021. Energy Division reviewed the CEC's plan and found it to be submitted properly in compliance with the Decision.

D.04-08-010 also requires that Gas R&D projects: 1) Focus on energy efficiency, renewable technologies, conservation and environmental issues, 2) Support State energy policy, 3) Offer a reasonable probability of providing benefits to the general public, and 4) Consider opportunities for collaboration and co-funding opportunities with other entities. Consistent with criteria 1 – 3, the CEC's proposed budget for the FY2021-22 Plan allocates the \$24 million budget to the following program areas:

- Energy Efficiency (\$6.1 million)
- Renewable Energy and Advanced Generation (\$4.0 million)
- Natural Gas Infrastructure Safety and Integrity (\$4.0 million)
- Energy-Related Environmental Research (\$3.5 million)
- Transportation (\$4.0 million)

The CEC allocates 10 percent of the maximum annual plan budget (\$2.4 million) to program administration. Appendix A of this Resolution delineates the CEC's proposed budget allocations and Appendix B provides a table of projects for FY2021-22.

The basic program areas meet the criteria for public interest Gas R&D projects identified in the Decision. The CEC reasonably selected Gas R&D program areas,

allocated the program's budget to the different program areas, and provided a detailed accounting of stakeholder input on the proposed plan.

Consistent with criterion 4, the CEC discusses efforts to avoid duplication of funding and opportunities for co-funding of projects in their FY2021-22 Plan.

The CEC's plan meets all requirements of D.04-08-010.

Consistency with Resolution G-3484 (2013) Accounting Requirements

Resolution G-3484 directs the CEC to include in their proposed budget an account, by research area, of then-current unspent funds in the program, including encumbrances and expiration dates.⁶ Guided by D.04-08-010, the research areas have historically included some variant of:

- Energy Efficiency
- Renewable Energy and Advanced Generation
- Energy Infrastructure
- Energy-Related Environmental Research
- Natural Gas Transportation

The CEC has two years to encumber Gas R&D Program funds on projects, and an additional four years before such funds expire. After those six years, any remaining unencumbered and unspent funds may be approved for re-investment by the CPUC. The intent of the reporting requirement is to show that the CEC has spent its cumulative authorized budgets in the areas in which the money was

⁶ "Encumbered funds" refers to funds that are committed to projects through an executed contract but have not yet been spent. The CEC has budget authority to encumber funds within two years of authorization. "Spent funds" refers to contracted funds that are spent on a project. "Unspent funds" refers to contracted funds that have not yet been spent on a project or funds that have not been encumbered. The CEC has budget authority to spend encumbered funds within four years of encumbering them through a contract. "Disencumbered funds" refers to previously encumbered funds that become unencumbered because the project has been terminated or was completed under budget or due to other reasons. "Supplemental funds" refers to encumbered but unspent funds that are requested for use on new projects. More detail on the definition of encumbered funds can be found here: www.ebudget.ca.gov/reference/GlossaryOfTerms.pdf

authorized and to provide an accounting of the status of cumulative unspent funds.

In response to this requirement, the CEC provided Appendix C within the FY2021-22 Plan, detailing the amount of approved, encumbered, and disencumbered funds for each fiscal year since FY2014-15. The CEC wrote that an accounting of unspent funds could not be conducted yet because total expenditures from FY2014-15 to FY2020-21 were not known at the time of the drafting of the FY2021-22 Plan. The CEC wrote in its plan that most of the projects from that period are still in progress and that due to COVID-19, the CEC received a one-year extension, until June 30, 2021, to liquidate funds that were encumbered from the FY2018-19 budget plan. Funds from the FY2019-2020 budget plan also have until June 30, 2021, to be encumbered. The CEC wrote that due to those factors, a more complete accounting of unspent funds can be determined after June 30, 2021.

In response to a CPUC data request, the CEC sent an updated version of the table in Appendix C on July 15, 2021, reflecting an additional \$2.29 million in encumbered supplemental funds in FY2019-2020 and an additional \$17.97 million in encumbered funds from FY 2019-2020. That table is provided in Appendix C of this resolution as well. The CEC also responded that all disencumbered funds are special revenue funds that return to the Natural Gas Subaccount, Public Interest Energy Research, Development and Demonstration Fund (3109). The CEC responded that when the disencumbered funds, plus interest, grow to a sizeable amount, the CEC requests spending authority through the legislature via a Budget Change Proposal and submits a budget request to the CPUC as a "supplemental funding request."

We find reasonable the CEC's explanation for why a total accounting of unencumbered— specifically FY2018-19 and FY2019-2020 funds – and unspent funds are not included in the initial FY2021-22 Plan. We expect the CEC to include more detail about unencumbered and unspent funds in its FY2022-23 Plan. The CEC shall also continue to adhere to this reporting requirement for unspent (or unencumbered) funds when it submits each future plan to the CPUC.

If future CEC plans request to use disencumbered funds for new projects in the future, the request should identify the respective research areas the CPUC originally authorized the funding for, as well as encumbrances and expiration dates for these funds, consistent with the direction in G-3484. It is important for the CPUC to have information on which research areas received funds that went unspent in order to recognize any trends and better optimize the Gas R&D budget allocation across research areas.

Consistency with Resolution G-3571 (2020) Direction for FY2021-22 Plan

Resolution G-3571 ordered that the CEC's FY2021-22 Plan address specific concerns on the development and direction of the program. The FY2021-22 Plan requirements fell into three groups: budgeting and reporting, disadvantaged communities' inclusion, and required research topic areas.

Budgeting and Reporting

G-3571, in approving the FY2020-21 Plan, required in Ordering Paragraph 2, that the CEC "shall ensure that, for any use of encumbered and unspent funds the CEC requests for new projects, the CEC's request identifies the respective research areas for which the Commission originally authorized the funding."

The FY2021-22 plan does not request the use of supplemental, unspent funding so no additional reporting is required under Resolution G-3571.

Disadvantaged Communities

G-3571, in approving the FY2020-21 Plan, requested in Ordering Paragraph 8, that the CEC:

- a) Coordinate with the Disadvantaged Communities Advisory Group (DACAG) on the FY2021-22 Plan at an earlier date to provide the DACAG with the option of a live presentation, if desired by the DACAG.
- b) Identify and engage appropriate disadvantaged community stakeholders to provide increased input on how to administer the program equitably. If feedback is not provided from any disadvantaged community stakeholders, the CEC must

demonstrate a good-faith engagement effort and describe any barriers that must be overcome to receive feedback on future plans.

The CEC wrote in its FY2021-22 Plan that it responded to 8(a) by releasing an outreach survey on December 4, 2020, titled "DACAG and Community Member Survey on Natural Gas R&D Initiatives for 2021" on the needs of under-resourced communities, and by presenting its FY 2021-22 Plan to the DACAG at an online January 22, 2021, meeting. In response to CPUC questions, the CEC wrote that it received 20 total responses to the survey although not everyone responded to every question. The responses included calls for more outreach to community stakeholders on the research plan as well as support for reducing natural gas energy costs and safety hazards. The responses expressed substantial opposition to developing and commercializing renewable gas for building use, while split opinions were expressed on developing and commercializing renewable gas for medium- and heavy-duty vehicles.

The CEC's response to 8(b) lists activities undertaken in 2020 to engage stakeholders and solicit participation in R&D projects by a diverse range of applicants. The activities include a wider use of social media platforms to educate and inform communities about the R&D plan; meeting with community leaders, stakeholders, and business leaders; and distributing R&D informational materials at nine listed workshops and a webinar. The CEC also said it was advancing an outreach plan to ensure women, minorities, LGBTQ individuals, and disabled veterans are informed and educated about R&D Program activities. In addition, the CEC said it was assisting applicants in understanding how to apply for CEC program funding; advancing efforts to address energy-related challenges and opportunities in under-resourced communities; and tracking, monitoring, and reporting on the participation of California-based entities as well as women-, minority-, and disabled-veteran-owned businesses and small business as recipients of R&D awards, as defined by CPUC General Order 156.⁷

In response to CPUC questions, the CEC wrote that the listed outreach activities helped shape the proposed FY2021-22 budget plan by identifying research gaps

⁷ Available at: <http://docs.cpuc.ca.gov/publisheddocs/published/g000/m152/k827/152827372.pdf>

and needs such as research into industrial decarbonization, hydrogen for transportation and generation, strategic and equitable decommissioning of the natural gas system, continued safety and integrity concerns, and indoor air quality issues due to natural gas appliance use. The CEC wrote that feedback received during outreach efforts prompted its energy efficiency research program to shift away from addressing natural gas efficiency in buildings and to instead focus on the more difficult to decarbonize industrial sector.

The 2021-22 Plan also lists the projects in disadvantaged or low-income communities that have received natural gas R&D funds from the CEC since FY2016-17. The plan noted that of the total 47 project sites, five selected during this time period were in a disadvantaged community, and 20 project sites were in a low-income community. The plan also described several natural gas R&D projects that are engaging with residents of disadvantaged and low-income communities.

Finally, the 2021-22 Plan notes the use of tools such as a high-accuracy mapping system that is improving the safety and integrity of natural gas infrastructure throughout the state, including disadvantaged and low-income communities. The plan also notes that the CEC has launched EmpowerInnovation.net, a CEC-wide networking platform designed to reduce barriers to clean energy funding by sharing information about research funding and partnering opportunities with diverse communities.

The CPUC finds that these steps are consistent with the ordering paragraph.

Coordination with CPUC

Resolution G-3571 required the CEC to coordinate with the CPUC on helping to notice and facilitate discussion on the proposed FY2021-22 Plan. That included allowing for the option of presenting the Natural Gas Research and Development Program: Proposed Budget Plan to the CPUC Commissioners during a CPUC Commissioner Committee Meeting. The CEC complied with these G-3571 requirements, including by presenting the plan to the CPUC's Emerging Trends Committee on June 9, 2021.

Required Research Topic Areas

G-3571 requested that the CEC's FY2021-22 Plan:

- a) Consider the Assembly Bill 3232 (Friedman, 2018) report when developing the FY2021-22 Plan and future plans, when it becomes available.
- b) Consider the Long-Term Technological Development Strategy to Meet Aggressive Statewide Decarbonization Goals, funded in FY2019-20, when developing the FY2021-22 Plan (if available) and future plans as they become available.
- c) Consider any research gaps that might emerge due to recent budget decreases/reallocations in response to COVID-related economic impacts, behavioral changes such as stay-in-place orders leading to greater indoor air concerns, and needs for efficiency and potential co-funding opportunities that the Natural Gas R&D program can provide to limit the impact of these gaps on California energy goals.

Regarding AB 3232, which required the CEC to draft a Building Decarbonization Assessment in conjunction with the CPUC, the California Air Resources Board and the California Independent System Operator, the draft of the staff report was submitted to the state Legislature on May 9, 2021, after the submission of the CEC's FY2021-22 gas R&D plan. Given that timeline, the CPUC expects the CEC to explain how it considered the report's finding in its FY2022-23 gas R&D plan. In response to CPUC questions, the CEC wrote that the AB 3232 report contents applicable to natural gas R&D will be considered in the development of that FY2022-23 Natural Gas R&D Program Budget Plan and in subsequent plans.

Similarly, at the time of drafting the FY2021-22 plan, the CEC had not completed a Long-Term Natural Gas Research Strategy to Meet Aggressive Statewide Carbon Neutrality Goals because the Request for Proposal for the report was only released on January 20, 2021. In response to CPUC questions, the CEC wrote that a draft report is expected near the end of 2023 and once those findings are available, they will serve as a key input for the development of future Natural Gas R&D Program plans. With that timeline in mind, the CPUC expects the CEC to explain how it has considered the research strategy in its future gas R&D plans.

Regarding COVID 19-related impacts, the FY2021-22 gas R&D plan does not specify how such concerns were incorporated into the research initiatives. The only research initiative addressing indoor air concerns, Quantify Exposures to Indoor Pollutants in Multi-Family Homes That Cook with Natural Gas or Alternatives, was required by Resolution G-3571. In response to CPUC questions, the CEC wrote that its FY2021-22 Plan did not directly address COVID-19 impacts because CEC staff were concerned that by the time the plan was approved and solicitations developed, the impacts and needs around COVID-19 would have changed. With research results not available for at least a year or two at a minimum, the CEC wrote that the timeline would be too long to make the urgent impact needed. We find that to be a reasonable explanation for the absence of research directly related to COVID-19 in the FY2021-22 Plan.

Required Research Topic Areas

Ordering Paragraph 9 of Resolution G-3571 also ordered the CEC to consider the following research initiative examining:

Impacts to indoor air quality from natural gas appliances and improvements that could be realized from technologically feasible levels of fuel blending or electrification.

The CEC addressed this requirement directly in the FY2021-22 Plan by proposing the research initiative, Quantify Exposures to Indoor Pollutants in Multi-Family Homes That Cook with Natural Gas or Alternatives. We find that the CEC's FY2021-22 Plan sufficiently addresses the research topic areas required in G-3571.

Reasonableness of Budget Request

D.04-08-010 provides for CPUC review of the "reasonableness of the funding level, and the overall R&D program" after four years, i.e., some time after FY2009-10. The CPUC has not yet done a comprehensive review of the program. In the interim, we elect to maintain the CEC as the administrator and the maximum funding level at \$24 million per year.

We approve the CEC's proposed budget of \$24 million for FY2021-22. This funding level has no precedential value regarding the overall program review or funding levels beyond FY2021-22, as the CEC must propose a zero-based budget for each fiscal year. Pending an assessment of the reasonableness of the overall R&D program, the maximum limit for program funding at \$24 million is reasonable.

The CEC's request for administrative expenses (\$2.4 million, or 10 percent of the total proposed budget) is an appropriate use of ratepayer funds. This resolution approves the use of \$2.4 million, or 10 percent of the total funding amount of \$24.0 million, for program administration of the projects approved in this plan. We adopt this limit and require the CEC to adhere to it and continue to keep such expenses at 10 percent or less of the maximum annual budget of \$24 million for future budget proposals.

Summary of Assessment of FY2021-22 Plan

The CPUC approves the CEC's proposed \$24.0 million budget as described in its *Natural Gas Research and Development Program: Proposed Budget Plan for Fiscal Year 2021-2022*.

CPUC Guidance for the Fiscal Year 2022-2023 Plan and Beyond

Resolution G-3571 instructed the CEC to take several steps with all future plans to encourage public involvement and provide opportunities for meaningful stakeholder comment on the annual Natural Gas Research and Development Program: Proposed Budget Plan. Those steps are:

- Post the Natural Gas Research and Development Program: Proposed Budget Plan publicly on the CEC's website and notify CPUC of the web address when requesting approval of the plan.
- Distribute the Natural Gas Research and Development Program: Proposed Budget Plan through the CEC's research/R&D community listservs and include the names of the distribution lists served when requesting approval of the plan.

- Consult with Energy Division staff on which CPUC listservs from ongoing CPUC proceedings could be used to circulate a courtesy copy of the submitted proposed plan.
- Consult with CPUC staff to allow for the option of presenting the Natural Gas Research and Development Program: Proposed Budget Plan to the CPUC Commissioners during a CPUC Commissioner Committee Meeting.

The CEC should continue to meet these requirements in filing its next Natural Gas R&D plan.

COMMENTS

Public Utilities Code section 311(g)(1) provides that this Resolution must be served on all parties and subject to at least 30 days public review. Any comments are due within 20 days of the date of its mailing and publication on the Commission's website and in accordance with any instructions accompanying the notice. Section 311(g)(2) provides that this 30-day review period and 20-day comment period may be reduced or waived upon the stipulation of all parties in the proceeding.

The 30-day review and 20-day comment period for the draft of this resolution was neither waived nor reduced. Accordingly, this draft resolution was mailed to parties for comments, and will be placed on the Commission's agenda no earlier than 30 days from today.

FINDINGS

1. The California Energy Commission (CEC) filed its Fiscal Year 2021-2022 Natural Gas Research and Development Program budget and program plan, per Decision (D.) 04-08-010.
2. The CEC's plan meets the requirements of D.04-08-010.
3. The CEC provided the CPUC with the expiration date, encumbrances, and respective research areas for approved funding. The CEC's reporting of budgets and accomplishments adequately meets CPUC's requirements in Resolutions G-3484 and G-3571.

4. Due to timing issues, the CEC did not incorporate findings from the Building Decarbonization Assessment required by AB 3232 in its FY2021-22 Plan.
5. Due to timing issues, the CEC did not incorporate findings from the Long-Term Natural Gas Research Strategy to Meet Aggressive Statewide Carbon Neutrality Goals in its FY2021-22 Plan.
6. The CEC did not specify in its FY2021-22 Plan how COVID 19-related impacts were incorporated in the plan.
7. In 2020, the CEC continued to improve the program's outreach efforts through increased presence both electronically on social media and in-person at conferences and events.
8. The CEC's FY2021-22 Plan sufficiently addresses the research topic area required in G-3571.
9. The CEC's request for \$2.4 million, 10 percent of the total budget, for administrative expenses is appropriate.
10. The CEC's proposed R&D plan and budget in its *Natural Gas Research and Development Program, Proposed Budget for Fiscal Year 2021-2022* should be adopted with a maximum budget of \$24 million.

THEREFORE IT IS ORDERED THAT:

1. The Gas R&D program funding level for FY2021-22 is \$24 million.
2. The CEC's administrative budget is 10 percent of the total budget of \$24 million, or \$2.4 million.
3. In the Fiscal Year 2022-2023 Gas R&D Plan, the CEC shall ensure that, for any use of encumbered and unspent funds the CEC requests for new projects, the CEC's request identifies the respective research areas for which the Commission originally authorized the funding.
4. Whenever possible, unencumbered and unspent funds should be utilized prior to the utilization of new and/or additional ratepayer funds.
5. In developing the Fiscal Year 2022-2023 Gas R&D Plan, the CEC shall:

- a) Consider the Assembly Bill 3232 (Friedman, 2018) report.
6. In developing future Gas R&D plans, the CEC shall:
 - a) Consider the Long-Term Technological Development Strategy to Meet Aggressive Statewide Decarbonization Goals as it becomes available.
 7. The CEC's Natural Gas Research and Development Program: Proposed Budget Plan for Fiscal Year 2021-2022 is approved for a total budget of \$24.0 million.

This Resolution is effective today.

I certify that the foregoing resolution was duly introduced, passed and adopted at a conference of the Public Utilities Commission of the State of California held on September 23, 2021; the following Commissioners voting favorably thereon:

Rachel Peterson
Executive Director

Appendix A

Table 1: Natural Gas R&D Budget Plan Summary FY2021-22

PROGRAM AREA	BUDGET
Energy Efficiency	\$6,100,000
Renewable Energy and Advanced Generation	\$4,000,000
Natural Gas Infrastructure Safety and Integrity	\$4,000,000
Natural Gas-Related Transportation	\$4,000,000
Energy-Related Environmental Research	\$3,500,000
Program Administration	\$2,400,000
TOTAL	\$24,000,000

Source: California Energy Commission *Proposed Budget Plan for Fiscal Year 2021-2022*.

Appendix B

Table 2: Natural Gas R&D Proposed Projects FY2021-22

PROGRAM AREA	PROJECT	DESCRIPTION
Energy Efficiency	Industrial Carbon Capture and Utilization	<p>This initiative proposes RD&D that identifies research gaps and develops cross-cutting technologies for carbon capture and use in the industrial sector. It proposes to do the following:</p> <ul style="list-style-type: none"> • Develop a roadmap for carbon capture and utilization in California’s industrial sector to identify research gaps, prioritize research needs, and provide recommendations for research funding. • Establish an energy baseline of existing carbon capture and utilization technologies. <ul style="list-style-type: none"> ○ This baseline includes a quantitative base of the energy requirements and associated costs that can be used to compare improvements in energy efficiency and economic improvements as well as inform a life-cycle assessment. • Perform fundamental research on enabling technologies in two areas: <ul style="list-style-type: none"> ○ Carbon capture effectiveness – Increase effectiveness, efficiency, and economics of capturing carbon dioxide and related purification. Evaluate and establish the effects of carbon capture on criteria air pollutants (NOx) and particulates. ○ Carbon utilization – Develop novel chemical and biological carbon conversion technologies or improve economics of the existing ones or both.

		<p>The research could remove a barrier to adoption of carbon capture technologies for industries and promote reduction of industrial GHG emissions. The research could also help convert carbon dioxide into commodities connected to different market segments, improve the efficiency of carbon capture equipment, increase the potential to reduce industrial GHG emissions, and improve air quality in underserved communities.</p>
<p>Renewable Energy and Advanced Generation</p>	<p>Developing and Demonstrating Hydrogen-Based Power Generation Systems</p>	<p>This initiative will fund the development and demonstration of power generation technologies that can run efficiently on high blends of hydrogen in the fuel stream, including modifications to current power generation technologies. The research’s goals include:</p> <ul style="list-style-type: none"> • Develop and demonstrate power generation technologies that can run efficiently on high blends of hydrogen including modifications to current power generation technologies. • Advance system efficiency, emissions reductions, and safe operation of power generation technologies. <p>The research could potentially increase hydrogen adoption and reduce use of fossil-based natural gas in power generation.</p>
<p>Natural Gas Infrastructure Safety and Integrity</p>	<p>Technologies for Monitoring Ground Movement Around Pipelines and Mitigating Natural Force Damages</p>	<p>The initiative will fund the development and demonstration of remote sensing and monitoring technologies with real-time and intelligent sampling, monitoring algorithms, and data management approaches to monitor ground movement around pipelines and develop strategies to reduce the risk of potential damages. The research aims to:</p> <ul style="list-style-type: none"> • Develop and demonstrate remote sensing and monitoring technologies to monitor ground movement around pipelines that may otherwise not be detectable during right-of-way patrols.

		<ul style="list-style-type: none"> Evaluate stress/strain in the pipeline and conduct stress/strain analysis for pipe bending and denting from movement. <p>The research is intended to improve the safety and integrity management of natural gas pipelines, which could help decrease direct and indirect GHG emissions.</p>
<p>Natural Gas Infrastructure Safety and Integrity</p>	<p>Technology Development and Demonstration for Plastic Pipeline Repair and Integrity Improvement</p>	<p>This research initiative develops and demonstrates technologies that advance the overall integrity of plastic pipelines in California. The research areas include:</p> <ul style="list-style-type: none"> Technologies to measure or monitor plastic pipes for early notification of potential risks and risk mitigation and predict and mitigate various types of damages to pressurized plastic pipelines, such as gouges, cracks, and anomalies. New and cost-effective technologies to repair plastic pipe damages without the need of pipe squeeze-off, gas by-pass, or excavation to access the pipe. Technologies to evaluate, measure, or monitor the performance of repaired plastic pipe systems, including various system components, such as joints and fittings. Robotic internal inspection and repair technologies for small-diameter plastic pipelines. Emerging technologies that minimize or avoid natural gas service interruption during pipeline repair. <p>This research is intended to improve the safety and integrity of natural gas plastic pipelines and minimize or prevent pipe failures and service interruptions.</p>
<p>Natural Gas-Related Transportation</p>	<p>Advanced Hydrogen Refueling Infrastructure</p>	<p>This initiative focuses on developing advanced hydrogen refueling infrastructure components and systems for high-capacity stations that can support the transition of heavy transport applications to zero-emission hydrogen fuel cell technology. Possible research areas include, but are not limited to:</p>

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	<p>Solutions for Heavy Transport</p>	<ul style="list-style-type: none"> • Developing advanced hydrogen refueling infrastructure components and systems for high-capacity stations serving heavy-duty fuel cell electric vehicles. • Demonstrating improved hydrogen fueling infrastructure to reduce the cost of dispensed hydrogen, increase fill rates, and improve reliability. • Developing stations with dedicated hydrogen production. <p>The research aims to increase demand for low-carbon hydrogen use in heavy transport that can lead to investments in scaled production. The resulting infrastructure could also improve the business case for heavy-duty fuel cell electric vehicle adoption and station deployment.</p>
<p>Energy-Related Environmental Research</p>	<p>Quantify Exposures to Indoor Pollutants in Multifamily Homes that Cook with Natural Gas or Alternatives</p>	<p>This research will quantify actual human exposures to indoor air pollutants, including PM2.5 and NO2, in multifamily homes that cook with natural gas or alternatives. Research aims include:</p> <ul style="list-style-type: none"> • Quantifying human exposures to indoor air pollutants in multifamily homes to assess the benefits of eliminating natural gas-based cooking. • Providing an empirical basis for exposure assessments to address knowledge gaps in understanding health impacts associated with indoor air quality from cooking. <p>The research would provide an empirical basis for understanding the health implications of cooking with various fuels in multifamily homes as well as associated ventilation needs. This information will help determine the health-based need for alternative cooking appliances, such as electric stoves, or additional ventilation strategies or both.</p>
<p>Energy-Related Environmental Services</p>	<p>Location-Specific Analysis of Decommissioning to</p>	<p>The proposed initiative focuses on location-specific analysis of promising candidate sites for decommissioning (e.g., those with known pipe integrity and corrosion issues), examining the implications of decommissioning on the</p>

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	<p>Support Long-Term Gas Planning</p>	<p>remaining gas system (e.g., changes in gas system operating pressures). Research areas include:</p> <ul style="list-style-type: none"> • Conduct location-specific analysis of promising candidate sites for pipeline decommissioning regarding impacts such as gas system operating pressures. • Bridge the gap between high-level gas system planning and local decommissioning pilots. • Examine approaches such as hydraulic modeling to consider gas system operations. <p>This initiative supports state energy planning, providing an analytical basis for identifying potential locations for targeted gas pipeline decommissioning.</p>
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Source: California Energy Commission *Proposed Program Budget Plan for Fiscal Year 2021-22*.

Appendix C

Natural Gas Research Funds Encumbered Within Two Years of Budget Approval

Research Area	CPUC FY 2014-15 Approved Budget Plan	Total FY 2014-15 Funds Encumbered	Total FY 2014-15 Funds Disen- cumbered	CPUC FY 2015-16 Approved Budget Plan	Total FY 2015- 16 Funds Encum- bered	Total FY 2015-16 Funds Disen- cumbered* **
Energy Efficiency	\$8.60	\$7.48	\$0	\$7.10	\$7.10	\$0
Renewable Energy and Advanced Generation	\$3.50	\$2.48	\$0	\$5.80	\$5.80	-\$1.18
NG Infra-structure Safety, Integrity*	\$2.50	\$4.68	\$0	\$1.00	\$1.00	\$0
Energy-Related Environmental Research*	\$3.00	\$3.62	\$0	\$3.30	\$3.30	\$0
Transportation	\$4.00	\$3.34	\$0	\$4.40	\$4.40	-\$1.50
TOTAL	\$21.60	\$21.60	\$0	\$21.60	\$21.60	-\$2.68

Amounts shown in table are in millions and rounded to the nearest \$10,000.

Source: California Energy Commission* In Resolution G-3507 (June 25, 2015), the CPUC directed the CEC to prioritize natural gas research and development projects on climate change, drought, and natural gas safety. The CEC shifted funding to these high-priority research areas when strong research proposals were received.

*** For the FY 2015-16 Budget Plan Disencumbered Funds, \$1.18 million was canceled in FY 17-18 and included in the FY 2019-20 Supplemental Budget Plan Request; \$1.5 million was canceled in FY 18-19 and has not yet been requested in a supplemental budget plan.

Natural Gas Research Funds Encumbered Within Two Years of Budget Approval

Research Area	CPUC FY 2016-17 Approved Budget Plan	Total FY 2016- 17 Funds Encum- bered	Total FY 2016-17 Funds Disen- cumbered** *	CPUC FY 2017-18 Approved Budget Plan	Total FY 2017-18 Funds Encumbered	Total FY 2017-18 Funds Disen- cumbered
Energy Efficiency	\$7.10	\$5.20	\$0	\$6.60	\$4.57	\$0
Renewable Energy and Advanced Generation	\$4.40	\$5.02	\$0	\$4.00	\$4.00	\$0
Natural Gas Infrastructure Safety, Integrity*	\$4.00	\$3.87	\$0	\$5.00	\$5.82	\$0
Energy-Related Environmental Research*	\$2.60	\$2.69	\$0	\$3.00	\$3.46	\$0
Transportation	\$3.50	\$4.81	-\$1.99	\$3.00	\$3.75	\$0
TOTAL	\$21.60	\$21.59	-\$1.99	\$21.60	\$21.60	\$0

Amounts shown in table are in millions and rounded to the nearest \$10,000.

Source: California Energy Commission

* In Resolution G-3507 (June 25, 2015), the CPUC directed the CEC to prioritize natural gas research and development projects on climate change, drought, and natural gas safety. The CEC shifted funding to these high-priority research areas when strong research proposals were received.

*** For the FY 2016-17 Budget Plan Disencumbered Funds, \$900,000 was canceled in FY 17-18 and included in the FY 2019-20 Supplemental Budget Plan Request; \$1.1 million was canceled in FY 19-20 and has not yet been requested in a supplemental budget plan.

Natural Gas Research Funds Encumbered Within Two Years of Budget Approval

Research Area	CPUC FY 2018-19 Approved Budget Plan	Total FY 2018-19 Funds Encum- bered	Total FY 2018- 19 Funds Disencum- bered	CPUC FY 2019-20 Approved Budget Plan	Total FY 2019-20 Funds Encumbere d	Total FY 2019-20 Funds Disencumbere d
Energy Efficiency	\$6.00	\$9.32	\$0	\$9.00	\$7.99	\$0
Renewable Energy and Advanced Generation	\$3.00	\$0	\$0	\$3.00	\$2.89	\$0
Natural Gas Infrastructure Safety, Integrity*	\$5.60	\$5.60	\$0	\$2.00	\$1.58	\$0
Energy-Related Environ-mental Research*	\$3.00	\$4.36	\$0	\$0	\$0	\$0
Transportation	\$4.00	\$2.31	\$0	\$6.60	\$6.50	\$0
Natural Gas Strategic Plan (Cross-Cutting)	\$0	\$0	\$0	\$1.00	\$1.00	\$0
Natural Gas Small Grant Program	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL	\$21.60	\$21.60	\$0	\$21.60	\$19.96	\$0

Amounts shown in table are in millions and rounded to the nearest \$10,000.

Source: California Energy Commission

Natural Gas Research Funds Encumbered Within Two Years of Budget Approval

Research Area	CPUC FY 2019-20 Supplemental Budget Plan	CPUC FY 2019-20 Supplemental Funds Encumbered	CPUC FY 2019-20 Supplemental Funds Disencumbered
Energy Efficiency	\$1.00	\$0	\$0
Renewable Energy and Advanced Generation	\$0	\$0	\$0
Natural Gas Infrastructure Safety, Integrity*	\$2.00	\$2.00	\$0
Energy-Related Environmental Research*	\$2.00	\$0	\$0
Transportation	\$0	\$0	\$0
Natural Gas Strategic Plan (Cross-Cutting)	\$0	\$0	\$0
Natural Gas Small Grant Program	\$2.29	\$2.29	\$0
TOTAL	\$7.29	\$4.29	\$0

Amounts shown in table are in millions and rounded to the nearest \$10,000.

* In Resolution G-3507 (June 25, 2015), the CPUC directed the CEC to prioritize natural gas research and development projects on climate change, drought, and natural gas safety. The CEC shifted funding to these high-priority research areas when strong research proposals were received.

** For the FY 2019-20 budget plan, approved on January 31, 2019, the CEC has committed the budget plan balance from FY 2019-20 and is executing agreements and encumbering funds.

*** Funds Disencumbered:

Source: California Energy Commission