

APPENDIX A:

Policies Supported by FY 2023-24 Gas R&D Program Initiative Themes

Policies Supported by Gas Leakage Mitigation Theme

- Senate Bill 1371 (Leno, Chapter 525, Statutes of 2014) requires reporting and mitigation of emissions from CPUC-regulated gas pipeline facilities. The bill requires gas corporations to file a report summarizing utility leak management practices, a list of new natural gas leaks by grade, a list of open leaks that are being monitored or are scheduled to be repaired, and a best estimate of gas loss due to leaks.
- Senate Bill 1383 (Lara, Chapter 395, Statutes of 2016) sets targets for statewide reductions in short-lived climate pollutant emissions, including a reduction in methane emissions by 40 percent below 2013 levels by 2030.
- Senate Bill 1440 (Hueso, Chapter 739, Statutes of 2018) requires CPUC in consultation with CARB to consider policies that support the development and use of renewable gas that reduce short-lived climate pollutants in the state. CPUC Decision 22-02-025 established short- and medium-term biomethane procurement targets for regulated gas utilities.
- Assembly Bill No. 1496, Chapter 604, Section 39731 (Thurmond, 2015) requires CARB to undertake monitoring and measurements of high emission methane "hot spots", life-cycle greenhouse gas emissions analysis of natural gas produced and imported into California, and review and assess the atmospheric reactivity of methane as a precursor to the formation of photochemical oxidant.
- Final 2022 Integrated Energy Policy Report Update, Chapter 4: Emerging Topics¹
 - As part of the CEC's continuing assessment of the role of hydrogen in achieving the state's decarbonization goals, the "Role of Hydrogen in California's Clean Energy Future" section provided an overview of how hydrogen is used today and a look ahead to emerging opportunities, including pursuit of a California Hydrogen Hub, that will shape the state's hydrogen future. The report also addressed the need to minimize hydrogen leakage for climate, safety, and economic reasons.
- CPUC Decisions on the Role of Hydrogen as a Long-Term Decarbonization Strategy²
 - The CPUC adopted two decisions to assess the feasibility and safety considerations of using clean hydrogen to decarbonize the gas system and hard-to-electrify industries. These include a feasibility study for the SoCalGas Los Angeles Link project, a clean hydrogen pipeline system, as well as joint gas utility pilot projects that will evaluate standards for and impacts of blending hydrogen into the gas pipeline system.
- Assembly Bill 209: Clean Hydrogen Program³ Directed the CEC to establish, among other clean energy programs, a Hydrogen Program that provides financial incentives to in-state clean

¹ California Energy Commission, 2022, *Draft 2022 Integrated Energy Policy Report*, Publication Number: CEC-100-2022-001-CMD.

² California Public Utilities Commission, 2022, *CPUC Acts To Advance Understanding of Hydrogen's Role As Decarbonization Strategy*, <https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-acts-to-advance-understanding-of-hydrogen-role-as-decarbonization-strategy>.

³ California Legislative Information, 2022, *Assembly Bill No. 209 Energy and Climate Change*, https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB209.

hydrogen projects for the demonstration or scale-up of the production, processing, delivery, storage, or end use of hydrogen. CEC is required to prioritize projects that reduce sector-wide emissions and maximize air quality, equity, health, and workforce benefits.

Policies Supported by Building Decarbonization Theme

- [Assembly Bill 3232](#) (Friedman, Chapter 373, Statutes of 2018): directed CEC to develop a *California Building Decarbonization Assessment*, (2021) which provides a framework to tackle the challenges in developing a path toward reducing greenhouse gas emissions associated with California's buildings.
- Integrated Energy Policy Report (IEPR) [Volume 1: Building Decarbonization](#) (2021): includes recommendations to accelerate decarbonization of buildings in California.
- [Senate Bill 1112](#) (Becker, Chapter 834, Statutes of 2022) requires the Energy Commission, on or before December 31, 2023, to prepare and submit a report to that describes any statutory changes necessary to improve access to federal funding for financing or investment solutions to provide zero-emission, clean energy, or decarbonizing building upgrades.
- [California Energy Code](#) is a component of the California Building Standards Code, updated every three years through the collaborative efforts of state agencies including the California Building Standards Commission and the CEC. The Code ensures that new and existing buildings achieve energy efficiency and preserve outdoor and indoor environmental quality through use of the most energy efficient technologies and construction.
- [Senate Bill \(SB\) 1477](#), Low-emissions Buildings and Sources of Heat Energy, requires the CPUC to develop, in consultation with the CEC, two programs (Building Initiative for Low-Emissions Development and Technology and Equipment for Clean Heating) aimed at reducing greenhouse gas emissions associated with buildings.

Policies Supported by Leveraging Federal Opportunities Theme

- Assembly Bill 1279 (2022): requires the state to achieve net zero greenhouse gas emissions (GHG) as soon as possible, but no later than 2045, and achieve and maintain net negative greenhouse gas emissions thereafter. The bill also requires California to reduce statewide GHG emissions by 85 percent compared to 1990 levels and directs the California Air Resources Board to work with relevant state agencies to achieve these goals.
- Integrated Energy Policy Reports: assesses major energy trends facing California's electricity, gas, and transportation fuel sectors and provides policy recommendations.
- Executive Order B-55-18: requires that California's economy achieve carbon neutrality by 2045.
- CPUC Decisions and Resolutions: directs CEC to consider research on topics based on CPUC proceedings and policies. Such as, D.04-08-010 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.

APPENDIX B: CPUC Resolution G-3484 Funding Encumbrance — Unspent Funds

Per the CPUC’s request in Resolution G-3592 and consistent with Resolution G-3484, Appendix B shows the research funds from FY 2014–15 to FY 2022-23 Gas R&D Program budget plans encumbered and unspent. Each budget plan approved by CPUC describes estimated allocations of funding among the Gas R&D research areas.

The CEC’s Gas R&D program budget process allocates funding to CPUC-approved research areas/initiatives that are subsequently acted upon by developing specific projects selected through competitive solicitations. Encumbered funds refer to funds that are committed to a specific project, which has been approved at a Business Meeting and the agreement package has been executed (signed by both parties). Funds Unspent refers to funds that have not been encumbered to an executed agreement (contract or grant), or previously encumbered funds that become unencumbered because the agreement has been canceled, or due to other reasons. Following CPUC’s request in Resolution G-3555, the CEC will ensure that for any use of encumbered and unspent funds that the CEC requests for new projects, the request will identify the respective research areas for which the CPUC originally authorized the funding.

FY 2022-23 Gas R&D Budget Plan Funds Encumbered

| Research Area | CPUC FY 2022-23 Approved Budget Plan | FY 2022-23 Current Budget Plan | Total FY 2022-23 Funds Encumbered | Total FY 2022-23 Funds Unspent |
|-------------------------------------|---|---|--|---|
| Targeted Gas System Decommissioning | \$3.50 | \$3.50 | \$0 | \$3.50 |
| Decarbonization of Gas End Uses | \$13.00 | \$13.00 | \$0 | \$13.00 |
| Energy Efficiency | \$1.50 | \$1.50 | \$0 | \$1.50 |
| Entrepreneur Development | \$3.60 | \$3.60 | \$0 | \$3.60 |
| TOTAL | \$21.60 | \$21.60 | \$0 | \$21.60 |

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

FY 2022-23 Gas R&D Budget Plan, approved March 16, 2023, in part, by CPUC Resolution G-3592. CPUC modified the \$3.6 million budget for Entrepreneur Development (CalSEED Initiative) and directed the CEC to submit a new proposal for reallocating the \$3.6 million via a Tier 2 Advice Letter. This letter was provided to CPUC by May 15, 2023.

Source: California Energy Commission

FY 2021-22 Gas R&D Budget Plan Funds Encumbered

| Research Area | CPUC FY 2021-22 Approved Budget Plan | FY 2021-22 Current Budget Plan | Total FY 2021-22 Funds Encumbered | Total FY 2021-22 Funds Unspent** |
|--|---|---|--|---|
| Energy Efficiency | \$6.10 | \$6.10 | \$0 | \$6.10 |
| Renewable Energy and Advanced Generation | \$4.00 | \$4.00 | \$0 | \$4.00 |
| Gas Infrastructure Safety and Integrity | \$4.00 | \$4.00 | \$0 | \$4.00 |
| Energy-Related Environmental Research | \$3.50 | \$3.50 | \$0 | \$3.50 |
| Transportation | \$4.00 | \$4.00 | \$0 | \$4.00 |
| TOTAL | \$21.60 | \$21.60 | \$0 | \$21.60 |

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

***Energy Efficiency: \$6.1m will be committed to upcoming solicitation(s) scheduled for summer 2023. As the focus is on improving industrial carbon capture efficiency/performance and/or utilization, the funds could provide cost share for federal grants (e.g., DOE) or as a standalone targeted solicitation.*

***Renewable Energy and Advanced Generation: \$4m has been committed to solicitation GFO-22-504 and anticipates executing between 2 to 4 agreements and encumbering \$4.5m of FY2022-2023 funds in the second half of 2023.*

***Gas Infrastructure Safety and Integrity: \$4m has been committed to solicitation GFO-22-503 and anticipates executing two agreements and encumbering funds in the summer of 2023.*

***Energy-Related Environmental Research: \$3.5m will be committed to upcoming two anticipated solicitations. These solicitations are anticipated to be released in Q3 (Quantifying Exposure to Indoor Air Pollutants in Multi-Family Homes) and Q4 (Location-Specific Analysis of Decommissioning to Support Long-Term Gas Planning).*

***Transportation: \$4m has been committed to solicitation GFO-22-502 and anticipates executing agreements and encumbering funds in the second half of 2023.*

Source: California Energy Commission

FY 2020-21 Gas R&D Budget Plan Funds Encumbered

| Research Area | CPUC FY 2020-21 Approved Budget Plan | FY 2020-21 Current Budget Plan | Total FY 2020-21 Funds Encumbered | Total FY 2020-21 Funds Unspent** |
|--|---|---|--|---|
| Energy Efficiency | \$3.00 | \$3.00 | \$1.77 | \$1.23 |
| Renewable Energy and Advanced Generation | \$4.00 | \$4.00 | \$4.00 | \$0 |
| Gas Infrastructure Safety and Integrity | \$9.10 | \$9.10 | \$9.10 | \$0 |
| Energy-Related Environmental Research | \$1.50 | \$1.50 | \$1.50 | \$0 |
| Transportation | \$4.00 | \$4.00 | \$4.00 | \$0 |
| TOTAL | \$21.60 | \$21.60 | \$20.37 | \$1.23 |

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

***Energy Efficiency: The remaining \$1.23m of encumbered funds is included in the Proposed FY 2023-24 Gas R&D Supplemental Budget Plan – Leveraging Cost Share Opportunities.*

Source: California Energy Commission

FY 2019-20 Gas R&D Supplemental Budget Plan Funds Encumbered

| Research Area | CPUC FY 2019-20 Approved Supplemental Budget Plan | FY 2019-20 Supplemental Current Budget Plan | CPUC FY 2019-20 Supplemental Funds Encumbered | CPUC FY 2019-20 Supplemental Funds Unspent** |
|--|--|--|--|---|
| Energy Efficiency | \$1.00 | \$1.00 | \$0 | \$1.00 |
| Renewable Energy and Advanced Generation | \$0 | \$0 | \$0 | \$0 |
| Gas Infrastructure Safety and Integrity | \$2.00 | \$2.00 | \$2.00 | \$0 |
| Energy-Related Environmental Research* | \$2.00 | \$2.00 | \$2.00 | \$0 |
| Transportation | \$0 | \$0 | \$0 | \$0 |
| Gas Strategic Plan (Cross-Cutting) | \$0 | \$0 | \$0 | \$0 |
| Gas Small Grant Program | \$2.29 | \$2.29 | \$2.29 | \$0 |
| TOTAL | \$7.29 | \$7.29 | \$6.29 | \$1.00 |

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

***Energy Efficiency: as of June 30, 2022, unspent funds \$1.00m has been committed to solicitation GFO-22-501 and CEC anticipates executing agreements and encumbering funds in the summer of 2023.*

Source: California Energy Commission

FY 2019-20 Gas R&D Budget Plan Funds Encumbered

| Research Area | CPUC FY 2019-20 Approved Budget Plan | FY 2019-20 Current Budget Plan | Total FY 2019-20 Funds Encumbered | Total FY 2019-20 Funds Unspent** |
|--|---|---|--|---|
| Energy Efficiency | \$9.00 | \$9.63 | \$7.99 | \$1.64 |
| Renewable Energy and Advanced Generation | \$3.00 | \$2.89 | \$2.89 | \$0 |
| Gas Infrastructure Safety and Integrity* | \$2.00 | \$1.58 | \$1.58 | \$0 |
| Energy-Related Environmental Research* | \$0 | \$0 | \$0 | \$0 |
| Transportation | \$6.60 | \$6.50 | \$6.50 | \$0 |
| Gas Strategic Plan (Cross-Cutting) | \$1.00 | \$1.00 | \$1.00 | \$0 |
| Gas Small Grant Program | \$0 | \$0 | \$0 | \$0 |
| TOTAL | \$21.60 | \$21.60 | \$19.96 | \$1.64 |

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

***Energy Efficiency: As of June 30, 2022, unspent funds \$1.64m have been committed to solicitation GFO-22-501, CEC anticipates executing agreements and encumbering funds in the summer of 2023.*

**The CEC reallocated \$630,000 from the Renewable Energy and Advanced Generation, Gas Infrastructure Safety and Integrity and Transportation research areas due to strong proposals in high-priority research areas.*

Source: California Energy Commission

FY 2018-19 Gas R&D Budget Plan Funds Encumbered

| Research Area | CPUC FY 2018-19 Approved Budget Plan | FY 2018-19 Current Budget Plan | Total FY 2018-19 Funds Encumbered | Total FY 2018-19 Funds Unspent |
|--|---|---|--|---|
| Energy Efficiency | \$6.00 | \$9.32 | \$9.32 | \$0 |
| Renewable Energy and Advanced* Generation | \$3.00 | \$0 | \$0 | \$0 |
| Gas Infrastructure Safety and Integrity | \$5.60 | \$5.60 | \$5.60 | \$0 |
| Energy-Related Environmental Research | \$3.00 | \$4.36 | \$4.36 | \$0 |
| Transportation* | \$4.00 | \$2.31 | \$2.31 | \$0 |
| TOTAL | \$21.60 | \$21.60 | \$21.60 | \$0 |

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

Source: California Energy Commission

**The CEC reallocated \$3.32m from the Renewable Energy and Advanced Generation and Transportation research areas to Energy Efficiency due to strong proposals in high-priority research areas.*

**The CEC reallocated \$1.36m from the Renewable Energy and Advanced Generation research area to Energy-Related Environmental Research due to strong proposals in high-priority research areas.*

FY 2017-18 Gas R&D Budget Plan Funds Encumbered

| Research Area | CPUC FY 2017-18 Approved Budget Plan | FY 2017-18 Current Budget Plan | Total FY 2017-18 Funds Encumbered | Total FY 2017-18 Funds Unspent** |
|--|---|---|--|---|
| Energy Efficiency* | \$6.60 | \$4.57 | \$4.57 | \$0 |
| Renewable Energy and Advanced Generation | \$4.00 | \$4.00 | \$4.00 | \$0 |
| Gas Infrastructure Safety and Integrity | \$5.00 | \$5.82 | \$5.82 | \$0 |
| Energy-Related Environmental Research | \$3.00 | \$3.46 | \$3.46 | \$0 |
| Transportation | \$3.00 | 3.75 | \$2.89 | \$.87 |
| TOTAL | \$21.60 | \$21.60 | \$20.73 | \$.87 |

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

*The CEC reallocated \$2.03m from Energy Efficiency to Gas Infrastructure Safety and Integrity, Transportation, Energy-Related Environmental Research research areas due to strong proposals in high-priority research areas.

**Transportation: as of June 30, 2022, unspent funds \$.87m from terminated projects will be included in the Proposed FY 2023-34 Gas R&D Supplemental Budget Plan – Gas Leakage Mitigation.

Source: California Energy Commission

FY 2016-17 Gas R&D Supplemental Budget Plan Funds Encumbered

| Research Area | CPUC FY 2016-17 Supplemental Approved Budget Plan | FY 2016-17 Supplemental Current Budget Plan | Total FY 2016-17 Supplemental Funds Encumbered | Total FY 2016-17 Supplemental Funds Unspent |
|--|--|--|---|--|
| Energy Efficiency* | \$.91 | \$0 | \$0 | \$0 |
| Renewable Energy and Advanced Generation | \$0 | \$0 | \$0 | \$0 |
| Gas Infrastructure Safety and Integrity | \$1.70 | \$2.61 | \$2.61 | \$0 |
| Energy-Related Environmental Research | \$2.70 | \$2.70 | \$2.70 | \$0 |
| Transportation | \$0 | \$0 | \$0 | \$0 |
| TOTAL | \$5.31 | \$5.31 | \$5.31 | \$0 |

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

*The CEC reallocated \$.91m from Energy Efficiency to Gas Infrastructure Safety and Integrity research area due to strong proposals in high-priority research areas.

Source: California Energy Commission

FY 2016-17 Gas R&D Budget Plan Funds Encumbered

| Research Area | CPUC FY 2016-17 Approved Budget Plan | FY 2016-17 Current Budget Plan | Total FY 2016-17 Funds Encumbered | Total FY 2016-17 Funds Unspent** |
|--|---|---|--|---|
| Energy Efficiency* | \$7.10 | \$5.20 | \$4.03 | \$1.18 |
| Renewable Energy and Advanced Generation | \$4.40 | \$5.02 | \$5.02 | \$0 |
| Gas Infrastructure Safety and Integrity* | \$4.00 | \$3.87 | \$3.87 | \$0 |
| Energy-Related Environmental Research | \$2.60 | \$2.69 | \$2.69 | \$0 |
| Transportation | \$3.50 | \$4.82 | \$2.19 | \$2.63 |
| TOTAL | \$21.60 | \$21.60 | \$17.79 | \$3.81 |

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

**The CEC reallocated \$1.9m from Energy Efficiency to Renewable Energy and Advanced Generation, Energy-Related Environmental Research, and Transportation research areas due to strong proposals in high-priority research areas.*

**The CEC reallocated \$.13m from Gas Infrastructure Safety and Integrity to Renewable Energy and Advanced Generation research area due to strong proposals in high-priority research areas.*

***Energy Efficiency: as of June 30, 2022, unspent funds \$1.18m from terminated projects will be included in the Proposed FY 2023-24 Gas R&D Supplemental Budget Plan – Leveraging Cost Share Opportunities.*

***Transportation: as of June 30, 2022, unspent funds \$2.63m from terminated projects will be included in the Proposed FY 2023-34 Gas R&D Supplemental Budget Plan – Gas Leakage Mitigation.*

Source: California Energy Commission

FY 2015-16 Gas R&D Supplemental Budget Plan Funds Encumbered

| Research Area | CPUC FY 2015-16 Supplemental Approved Budget Plan | FY 2015-16 Supplemental Current Budget Plan | Total FY 2015-16 Supplemental Funds Encumbered | Total FY 2015-16 Supplemental Funds Unspent |
|--|--|--|---|--|
| Energy Efficiency | \$0 | \$0 | \$0 | \$0 |
| Renewable Energy and Advanced Generation | \$0 | \$0 | \$0 | \$0 |
| Gas Infrastructure Safety and Integrity | \$1.50 | \$1.50 | \$1.50 | \$0 |
| Energy-Related Environmental Research | \$2.10 | \$2.10 | \$2.10 | \$0 |
| Transportation | \$0 | \$0 | \$0 | \$0 |
| TOTAL | \$3.60 | \$3.60 | \$3.60 | \$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 gas research and development projects on climate change, drought, and gas safety. The CEC shifted funding to these high-priority research areas when strong research proposals were received.

Source: California Energy Commission

FY 2015-16 Gas R&D Budget Plan Funds Encumbered

| Research Area | CPUC FY 2015-16 Approved Budget Plan | FY 2015-16 Current Budget Plan | Total FY 2015-16 Funds Encumbered | Total FY 2015-16 Funds Unspent** |
|--|---|---|--|---|
| Energy Efficiency | \$7.10 | \$7.10 | \$7.10 | \$0 |
| Renewable Energy and Advanced Generation | \$5.80 | \$5.80 | \$4.62 | \$1.18 |
| Gas Infrastructure Safety and Integrity | \$1.00 | \$1.00 | \$1.00 | \$0 |
| Energy-Related Environmental Research | \$3.30 | \$3.30 | \$3.30 | \$0 |
| Transportation | \$4.40 | \$4.40 | \$2.90 | \$1.50 |
| TOTAL | \$21.60 | \$21.60 | \$18.91 | \$2.68 |

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

***Renewable Energy and Advanced Generation: unspent funds \$1.18 has been included in a supplemental budget plan approved by CPUC.*

***Transportation: as of June 30, 2022, unspent funds \$1.50m from terminated projects will be included in the Proposed FY 2023-34 Gas R&D Supplemental Budget Plan – Gas Leakage Mitigation.*

Source: California Energy Commission

FY 2014-15 Gas R&D Budget Plan Funds Encumbered

| Research Area | CPUC FY 2014-15 Approved Budget Plan | FY 2014-15 Current Budget Plan | Total FY 2014-15 Funds Encumbered | Total FY 2014-15 Funds Unspent |
|---|---|---|--|---|
| Energy Efficiency* | \$8.60 | \$7.48 | \$7.48 | \$0 |
| Renewable Energy and Advanced Generation* | \$3.50 | \$2.48 | \$2.48 | \$0 |
| Gas Infrastructure Safety and Integrity | \$2.50 | \$4.68 | \$4.68 | \$0 |
| Energy-Related Environmental Research | \$3.00 | \$3.62 | \$3.62 | \$0 |
| Transportation* | \$4.00 | \$3.34 | \$3.34 | \$0 |
| TOTAL | \$21.60 | \$21.60 | \$21.60 | \$0 |

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

*The CEC reallocated \$2.18m from Energy Efficiency and Renewable Energy and Advanced Generation research areas to Gas Infrastructure Safety and Integrity research area due to strong proposals in high-priority research areas.

*The CEC reallocated \$.62m from Transportation and Renewable Energy and Advanced Generation research areas to Energy-Related Environmental research area due to strong proposals in high-priority research areas.

Source: California Energy Commission

APPENDIX C:

Public Comment and CEC Responses

The California Energy Commission (CEC) appreciates the comments and questions received during and in response to a public workshop, the two coordination meetings with California Public Utilities Commission (CPUC) staff, and two meetings with the Disadvantaged Communities Advisory Group (DACAG) representatives on proposed initiatives for the FY 2023-24 Gas Research and Development (Gas R&D) Program Budget Plan. The workshop and meetings are summarized below. The comments and CEC staff responses for each are provided in the following sections:

- On September 28, 2022, and December 14, 2022, CEC staff held coordination meetings with CPUC staff to present the proposed budget plan and received questions and comments from CPUC staff that provided helpful input and perspective on specific research topics and suggested potential research areas.
- On January 24, 2023, CEC staff held a public workshop to present the proposed budget plan and received comments from stakeholders supporting the proposed initiatives and offering helpful input and perspective on specific research topics. CEC staff also received written public comments that have informed this proposed plan.
- On January 18, 2023, CEC staff met with representatives of the DACAG, and on January 20, CEC staff met with the full DACAG to present the proposed budget plan. In these meetings, CEC staff received comments from stakeholders supporting the proposed initiatives and offering helpful input and perspective on specific research topics as they relate to under-resourced community needs.

CPUC Staff Coordination Meeting Comment Summary and CEC Responses

Staff from CEC's Energy Research and Development Division held meetings with staff from CPUC's Energy Division and Safety and Enforcement Division. At the meeting, CEC staff presented the four proposed initiatives for the FY 2023-24 Gas R&D Program Budget Plan. The CEC appreciates the helpful questions and comments from CPUC staff during the coordination meeting. Below is a summary of CPUC staff comments and CEC staff responses organized by initiative. Staff received clarifying questions, not comments, regarding the building decarbonization and cost-share initiatives, which are not included here. Regarding the Entrepreneurial Development initiative, CPUC staff had questions regarding the scope of the prospective work area, the expertise of the third-party administrator, and overhead rates. As noted in the FY 2023-24 Gas R&D Program Budget Plan, CEC removed the proposed Entrepreneurial Development initiative from the FY 2023-2024 Budget Plan due to the guidance received in Resolution G-3592.

Initiative Theme: Gas Leakage Mitigation

Comment Received:

CPUC staff asked for an update on the hydrogen funding that the CEC will administer following the State Budget Acts of 2021 and 2022, and whether there were updates for 2023.

CEC Response:

The Clean Hydrogen Program was established by AB 209 (The Energy and Climate Change budget bill, Chapter 251, Section 12, Chapter 7.6, Article 4, enacted in September 2022) to demonstrate or scale-up hydrogen projects that produce, process, deliver, store, or use hydrogen derived from water using eligible renewable energy resources, or produced from these eligible renewable energy resources.⁴ CEC is administering \$100 million of General Funds for the Clean Hydrogen Program. A staff workshop was held on December 1, 2022, to discuss program scope and project eligibility, requirements, and considerations. The Clean Hydrogen Program is not intended to advance hydrogen leakage mitigation solutions. The proposed technical scope is to stimulate increased production and use of clean hydrogen in California through strategic demonstration and deployment of large-scale centralized clean hydrogen production, onsite/distributed clean hydrogen production and use, and federal cost share.

Comment Received:

CPUC staff suggested research into tools for evaluating gas market issues relating to rising gas and electric prices during the winter of 2022-23. CPUC staff also asked if there were research opportunities in improving efficiency of gas storage operations, pipeline safety, or efficient upgrades for compressors.

CEC Response:

The CEC has an active portfolio of Gas R&D Program projects focused on improving gas infrastructure safety and integrity. A recent solicitation (GFO-22-503 Gas Pipeline Safety and Integrity Research to Support Decarbonization)⁵ intends to fund research projects on 1) using remote and embedded sensors to monitor and assess risk of natural force damages to gas pipelines and 2) non-destructive inspection technologies to evaluate the integrity of plastic pipelines more effectively. The CEC also has ongoing projects demonstrating the use of an array of embedded sensors (optical, electromagnetic, acoustic, pressure) to enable continuous and high-resolution gas storage well integrity monitoring. The Innovative Gas Leakage Monitoring and Mitigation Solutions initiative will expand on this portfolio and seek to improve efficiency and cost-effectiveness of methane leakage monitoring and mitigation.

CEC staff is also engaging with the California Geologic Energy Management Division (CalGEM) to determine underground gas storage research and innovation opportunities in the context of their active rulemakings⁶, such as the SB 463 Chemical Inventory and Root Cause Analysis rulemaking. CEC staff is sharing research findings from past and ongoing Gas R&D Program-funded projects on quantitative risk assessment frameworks and well integrity monitoring technologies. This engagement will inform future solicitation scoping for the Innovative Gas Leakage Monitoring and Mitigation Solutions initiative, implementation of the approved Large-Volume Hydrogen Storage in California for Targeted Use Cases initiative from the FY22-23 Plan, and planning efforts for the FY24-25 Plan.

Regarding gas markets and interplay with the electricity system, the initiative titled Scaled-Up Gas Decommissioning Pilots and Integrated Planning Tools from the FY22-23 Gas R&D Program Budget Plan (and proposed for additional funding in the FY23-24 Plan) includes a complementary applied research component to develop an enhanced, data-driven tool that considers cost impacts of gas and electricity system interactions.

Comment Received:

⁴ CEC. 2022. [Clean Hydrogen Program](https://www.energy.ca.gov/programs-and-topics/programs/clean-hydrogen-program#:~:text=The%20Clean%20Hydrogen%20Program%20provides,help%20reduce%20sector%2Dwide%20emissions). <https://www.energy.ca.gov/programs-and-topics/programs/clean-hydrogen-program#:~:text=The%20Clean%20Hydrogen%20Program%20provides,help%20reduce%20sector%2Dwide%20emissions>.

⁵ CEC. 2022. GFO-22-503 Gas Pipeline Safety and Integrity Research to Support Decarbonization. <https://www.energy.ca.gov/solicitations/2022-11/gfo-22-503-gas-pipeline-safety-and-integrity-research-support-decarbonization>

⁶ California Department of Conservation. 2023. [Active Rulemakings](https://www.conservation.ca.gov/index/Pages/rulemaking.aspx). <https://www.conservation.ca.gov/index/Pages/rulemaking.aspx>

CPUC staff requested clarification on the public benefit of hydrogen leakage mitigation research if private industry is concerned about losses to improve economics. CPUC staff also requested clarification for how this initiative will coordinate, avoid overlap, and/or explore co-funding opportunities with other hydrogen-related efforts including the recently approved utility hydrogen work including the Angeles Link feasibility studies and Joint IOU Hydrogen Blending Demonstrations, the Hydrogen Leak Mitigation and Regional Clean Hydrogen Hub (ARCHES) hydrogen hub, and other projects funded by the U.S. Department of Energy. CPUC staff also requested clarification on how hydrogen leakage impacts greenhouse gases (GHGs) and climate change including the magnitude of the potential impacts and status of the science.

CEC Response:

Clean hydrogen is a zero-carbon alternative to fossil gas and is actively being explored as a solution for decarbonizing the gas system and hard-to-electrify sectors. Hydrogen has an indirect global warming impact by reacting with other molecules in the atmosphere in a way that extends the lifetime and increases the concentrations of GHGs like methane, ozone, and water vapor. Recent science suggests that the actual warming power of hydrogen in the atmosphere can be two to six times higher than standard estimates depending on the timeframe.⁷ Therefore, the warming effects from hydrogen leakage are considered consequential. There are large uncertainties on the magnitude of its potential impacts, as this will depend on emerging hydrogen supply chain development and knowledge gaps on associated leakage rates. Without appropriate mitigation measures and technologies to support monitoring and quantification, expansion of hydrogen infrastructure will result in commensurate hydrogen leakage, which can lead to economic losses, safety risks, and indirect global warming impacts. Although industry may consider the costs of leakage under a certain threshold acceptable, losses due to leakage can be passed down to customers, impacting affordability.

Considering near-term investments to scaling up clean hydrogen production and use, the timing of this initiative is a critical opportunity to demonstrate hydrogen leakage monitoring technologies and techniques in coordination with early pilots and scale-up efforts. For example, large-scale clean hydrogen production projects funded through the CEC's Clean Hydrogen Program can be prime candidates for demonstrating novel sensor approaches for hydrogen leakage monitoring. This initiative will complement the gas utilities' hydrogen blending pilots and Angeles Link feasibility studies by advancing novel technologies and techniques to enable more effective hydrogen leakage detection, monitoring, and mitigation. CEC staff have been coordinating with ARCHES as participants in the working groups following the concept paper submission. Staff are also supporting evaluation of proposals submitted to ARCHES that would be part of the full proposal to DOE in April. CEC also submitted a Memorandum of Commitment to ARCHES and is considered one of the project partners.

In addition, GFO-22-304, Assessing the Role of Hydrogen in California's Decarbonizing Electric System (which supports the 2021 EPIC Interim Investment Plan initiative titled "The Role of Green Hydrogen in a Decarbonized California—A Roadmap and Strategic Plan"), will fund research focused on production from renewable electricity and end-use conversion technologies for electric sector applications. One of the goals of the research is to help plan and prioritize future hydrogen investments in the context of EPIC and other programs.

Comment Received:

CPUC staff requested clarification on whether the Innovative Gas Leakage Monitoring and Mitigation Solutions initiative targets existing gas infrastructure or new pipelines for hydrogen delivery.

CEC Response:

There is value in hydrogen leakage research for both the existing infrastructure and in new pipelines. This initiative would focus on informing multiple decarbonization pathways including future decommissioning opportunities, dedicated hydrogen pipeline infrastructure, and existing system adaptation for hydrogen-methane blending.

⁷ Ocko, I. B. and Hamburg, S. P., 2022, [Climate consequences of hydrogen emissions](https://doi.org/10.5194/acp-22-9349-2022), Atmos. Chem. Phys., 22, 9349–9368, <https://doi.org/10.5194/acp-22-9349-2022>.

Comment Received:

CPUC requested clarification on whether CEC or other entities like DOE should conduct gas leakage monitoring and mitigation research. CPUC staff also requested information on co-funding opportunities.

CEC Response:

The CEC regularly conducts stakeholder meetings to explore and determine coordination opportunities. The CEC will continue to collaborate with other entities, including the DOE, to determine whether the CEC or other stakeholders should take the lead on research areas. The CEC has a unique opportunity to leverage other active hydrogen investments including the Clean Hydrogen Program (i.e., clean hydrogen production facilities) and Clean Transportation Program (i.e., hydrogen refueling stations) to demonstrate novel hydrogen leakage sensing approaches in the field.

DACAG Meeting Comment Summary and CEC Responses

In addition to the comments below, the DACAG members inquired about the impacts of the Gas R&D Program. Staff provided a link to the latest Gas R&D Program Annual Report, which includes a high-level overview, and a link to Energize Innovation, which includes project specific summaries, including goals and benefits.

The DACAG members asked clarifying questions about how the Entrepreneurial Development and Cost Share initiatives would work, which are not summarized here. As previously noted, CEC removed the proposed Entrepreneurial Development initiative from the FY 2023-2024 Budget Plan Due in response to Resolution G-3592.

Initiative Theme: Gas Leakage Mitigation

Comment Received:

Hydrogen Leak Mitigation and Regional Clean Hydrogen Hub (ARCHES)

The DACAG supports research to improve hydrogen leak mitigation to address safety and indirect climate change impacts from hydrogen infrastructure. We further support this research where it can be co-located with methane leakage monitoring and detection improvements (see below). This includes studying leakage of blended fuel streams and behavior under the increased pressure required to blend hydrogen into existing gas infrastructure. We request this research be prioritized for systems adjacent to and within disadvantaged communities (DACs). We further suggest studying how leakage might vary as infrastructure ages, including from the direct impact of hydrogen use (e.g., pipeline embrittlement), and the materials and monitoring needed to mitigate aging-related risks. We also recommend that this research and the ARCHES include an economic component (i.e., how do leakage detection and monitoring equipment and activities impact the economics of hydrogen as a fuel as compared to other fuel and generation options with less risk) and that they rapidly increase our understanding of the feasibility and details of potential future markets and use cases for hydrogen. The significant international excitement regarding hydrogen production should be cautiously analyzed with respect to likely/feasible applications so we avoid wasted investment and time. In recent analyses of pathways to the goals and requirements of SB 100, many scenarios do not rely on hydrogen at all, an indicator of the questions still to be answered regarding its viability, applications, costs, and market. As one example, please see recent analysis by Energy Innovation at: <https://www.youtube.com/watch?v=xNqEh6wCWOc> (accessed 2.17.2023).

Gas System and Safety: Methane Leaks

Due to the catastrophic climate impacts and dangerous indoor and outdoor pollution profiles of methane emissions, we recommend moving this priority from the 2024-25 research slate up to the 23-24 research slate. We recommend accelerated deployment of methane sensors and increasing the use of satellite technologies to detect methane leaks. We further recommend that the 24-25 research slate include accelerated gas

decommissioning, prioritizing gas systems with high rates of leakage and further prioritizing the decommissioning of these leaky systems within DACs. In cases where there are proposals to mix hydrogen into existing gas supplies, we recommend analyzing leaks in the context of the operational requirements of these systems and reflecting leakage of all constituents.

CEC Response:

The CEC appreciates the DACAG's support for research to improve hydrogen leakage mitigation to address economic, safety, and climate change impacts. The CEC also acknowledges the DACAG's support for "co-locating this research with methane leakage monitoring and detection improvements, including studying leakage of blended fuel streams and the behavior of blended hydrogen under increased pressure when injected into the existing gas infrastructure system." In response to comments from the DACAG and CPUC staff, CEC revised the proposed initiative theme from Hydrogen Leakage Mitigation to, more broadly, Gas Leakage Mitigation and expanded its scope accordingly. When developing the solicitation, the CEC will consider gaps and opportunities to build on progress made in other hydrogen blending efforts including the Joint IOU Hydrogen Blending Demonstrations and CEC's active research related to safety, integrity, and performance impacts of hydrogen blends on large commercial and industrial equipment, power generation, and infrastructure.

The CEC concurs with DACAG's request that research be prioritized for systems adjacent to and within disadvantaged communities. The CEC acknowledges that disadvantaged communities have experienced a disproportionately negative impact from the energy system due to higher air pollution, energy cost burden, and the proximity of large gas end-uses such as power plants. Gas R&D Program solicitations require or give preference to projects that benefit disadvantaged communities. The future solicitation(s) developed under this gas leakage mitigation initiative may include additional requirements such as a preference for testing and demonstration sites to be located within or adjacent to disadvantaged communities.

The CEC concurs with DACAG's recommendation for the research to study leakage variations with infrastructure age, materials, and monitoring solutions to mitigate aging-related risks, and to study economic impacts of leakage detection and monitoring equipment. The Gas R&D Program has several active and forthcoming projects focused on monitoring and detection needs for aging gas pipelines.

CEC staff concurs with DACAG's comment regarding the need to increase understanding of the feasibility and details of potential future markets and use cases for clean hydrogen, including the economic impacts of leakage detection and monitoring activities. The 2021 SB 100 Joint Agency Report excluded drop-in renewable fuels, including green hydrogen, due to the lack of commercially available technology, inadequate cost and supply data for modeling, or both.⁸ The EPIC Program is funding research to further assess hydrogen's role in California's decarbonizing electric system and potential intersections with other end-use sectors such as transportation and industrial, building on current analyses of SB 100 scenarios and the 2022 Scoping Plan Update.⁹ When developing the future solicitation for this initiative, CEC staff will consider project requirements around these points and explore connections with other Gas R&D Program and EPIC Program funded research to maximize learnings, inform strategic investments, and answer questions regarding hydrogen's viability across end-uses. Additionally, CEC staff will continue to track investments and opportunities to coordinate with the ARCHES hydrogen hub and the AB 209 Clean Hydrogen Program.

⁸ 2021 SB 100 Joint Agency Report: Achieving 100 Percent Clean Electricity in California: An Initial Assessment. March 2021.

⁹ CEC. 2022. GFO-22-304 Assessing the Role of Hydrogen in California's Decarbonizing Electric System. <https://www.energy.ca.gov/solicitations/2022-10/gfo-22-304-assessing-role-hydrogen-californias-decarbonizing-electric-system>

Considering recommendations from CPUC staff and DACAG, the CEC is proposing additional funds for gas decommissioning research in the FY22-23 and FY23-24 Gas R&D Program Budget Plans, leveraging the Scaled-Up Gas Decommissioning Pilots and Integrated Planning Tools initiative from the FY22-23 Plan to fund larger-scale pilot projects to support a cost-effective and equitable gas transition. The CEC also moved the FY24-25 Plan's preliminary research concept titled "Detect and Reduce Fugitive Methane Emissions initiative" to the FY23-24 Plan under the Innovative Gas Leakage Monitoring and Mitigation Solutions initiative.

Initiative Theme: Building Decarbonization

Comment Received: see *Written Public Comment Summary*, below.

Public Workshop Comments and CEC Staff Responses

The CEC appreciates the thoughtful and helpful comments from stakeholders received in response to CEC's January 17, 2023, Gas R&D Workshop, where staff presented proposed initiatives for the FY 2023-24 Gas R&D Program Budget Plan. The CEC requested comments at the January 17, 2023, workshop and via notifications on the CEC website, subscription lists, and docket. A summary of the written comments and CEC's responses is provided below. Please note that for brevity, footnotes included in public comments are not included in this summary.

Written Public Comment Summary and CEC Responses

Initiative Theme: Building Decarbonization

General Comment Received:

Above and beyond the public health aspects of building decarbonization, we support a broader focus on this area, including recommendations to conduct a comprehensive array of commercial, industrial, and residential building decarbonization site pilots at representational scale(s), neighborhood- and community-scale zonal electrification pilots, and/or full gas decommissioning scenarios. Research should consider in-depth study of distribution grid capacity, at-building electrical service capacities and upgrades (including upgrades to the distribution grid), electrification of larger electrical loads within buildings (e.g., HVAC), inclusion of distributed energy resources (solar PV, energy storage, bi-directional electric vehicle charging infrastructure), and grid services provided by coordination between the distribution grid and building energy management systems. Particularly in rural and Tribal areas, building electrification and decarbonization is not yet supported by the contractor ecosystem. Research should be done to improve understanding of the deployment gaps (e.g., skills, product knowledge, access to incentives) that are barriers to contractors and end users conducting building decarbonization projects. Further building decarbonization research should always include an economic impact component to better understand tolerances for disadvantaged communities, particularly low-income participants, in home decarbonization (adopters and non-adopters of home decarbonization solutions).

CEC Response:

Staff are grateful for this compelling suggestion and are working to develop tractable research approaches that better capture the cross-cutting nature of building decarbonization, gas decommissioning, and energy transitions overall. This includes, as DACAG's comment outlines, more fully recognizing the need to negotiate a diversity of geographic, energy infrastructural, technical, socioeconomic, energy user, and supply chain

circumstances and their implications with respect to barriers and opportunities for gas decommissioning, as well as pertaining to the distribution of its benefits and potential costs it entails over near and longer terms. Some elements of this more integrative approach are expected to be reflected in the proposed *Air Pollutant Exposure Assessment* research initiative. Additional elements are anticipated to be covered in the proposed *Targeted Gas System Decommissioning* research initiative, including (1) by selecting diverse pilot decommissioning locations (possibly including a pilot in a tribal or rural area) and deliberately considering the translation from local circumstances to large-scale decommissioning, and (2) by developing data and planning tools that support the more integrative approach that DACAG suggested in its comment, paving a pathway for further coordination across relevant initiatives, programs, and research angles (e.g. technology development, localized needs, and multi-family versus single-family homes). DACAG's suggestions also resonate with recently approved elements of the FY 2022-23 Gas R&D Program Budget Plan, which includes support for integrated planning approaches that "simultaneously address the timing of infrastructure investments and the pragmatics of upgrades. Examples include electrical panel upgrades or workarounds, financing, supply chain and workforce dynamics, and field-vetted replacement technologies and upgrade packages that are attractive to consumers." While the funding allocated for these activities within the FY 2023-24 proposed initiatives is very limited, the CEC will also take DACAG's comments into consideration in scoping future research, including for FY 2024-25 initiative planning.

Initiative Title: Air Pollutant Exposure Assessment in California Residences

Comment Received:

The DACAG supports research into accelerated building decarbonization, including research on the public health implications of cooking. DACAG recommends including indoor air quality concentrations and health outcomes in the context of building quality, kitchens with and without hoods, and before and after weatherization and ventilation upgrades. They also suggest including single and multi-family homes in disadvantaged communities and assessing the demographics of the populations most vulnerable to indoor air pollution. In addition, they recommend conducting a comprehensive array of commercial, industrial, and residential building decarbonization pilots at a variety of scales, neighborhood- and community-scale zonal electrification pilots, and/or full gas decommissioning scenarios. DACAG further suggests that the research should also include an economic impact component to better understand equity and affordability implications for disadvantaged communities, particularly low-income participants.

CEC Response:

The CEC appreciates DACAG's strong support into research on the public health implications of decarbonizing California's residential kitchens. We concur with DACAG's recommendation to include homes (multi- and single family) in disadvantaged communities and to include an assessment of population demographics of exposed populations. These elements are critical to enable understanding of the magnitude and distribution of public health-related impacts of decarbonization, and our research aims to prioritize them accordingly. While the Gas R&D funding proposed here is insufficient to both provide a basis for exposure assessment *and* to investigate health outcomes, it will lay a rigorous, empirically grounded foundation for quantitative assessment of exposures to cooking-related indoor air pollutants in California homes, particularly those in multifamily residences. Ongoing and potential future EPIC research efforts are investigating health outcomes associated with electrification. Thus, DACAG's recommendation that CEC develop a basis for assessing health impacts associated with electrification is being addressed. However, given the substantial investment required to achieve these objectives, research supported through other funding streams is needed to complement and build upon the critical foundation laid by Gas R&D-funded research.

APPENDIX D:

List of 2022 Gas R&D Events

January 2022:

- Staff Workshop to Discuss Proposed Gas Research Initiatives for FY 2022-23
- Pre-Application Workshop – GFO-21-506 – Integrative Corrosion Control in the Gas System

February 2022:

- Pre-Application Workshop – GFO-21-507 – Targeted Hydrogen Blending in Existing Gas Network for Decarbonization

March 2022:

- Staff Workshop: Quantify Indoor Air Pollutants in Multifamily Homes that Cook with Gas Stoves or Alternatives

June 2022:

- Communities, Equity, and Environmental Workshop Regarding Establishing a Long-Term Gas Research Strategy to Achieve Aggressive Statewide Carbon Neutrality Goals
- Technology Workshop Regarding Establishing a Long-Term Gas Research Strategy to Achieve Aggressive Statewide Carbon Neutrality Goals
- IEPR Commissioner Workshop on Role of Hydrogen in California’s Clean Energy Future

October 2022:

- Pre-Application Workshop – GFO-22-502 – Innovative Hydrogen Refueling Solutions for Heavy Transport

December 2022:

- Webinar on Long-Term Gas Research Strategy Recommendations
- Pre-Application Workshop – GFO-22-503 – Gas Pipeline Safety and Integrity Research to Support Decarbonization
- Inaugural meeting of the California Energy Commission’s Healthy, Equitable Energy Transition (HEET) Working Group

APPENDIX E:

FY 2023-24 Gas R&D Equity Framework Topic Definitions

The FY 2023-24 Gas R&D Plan includes the application of the DACAG Equity Framework. The five key equity principles have been adapted to apply to the Gas R&D Program and Electric Program Investment Charge (EPIC Program).

Health and Safety

CEC will direct investments to optimize the health and well-being of California's most vulnerable communities by advancing clean energy technologies that lead to health benefits and impacts, build resiliency, address climate change vulnerabilities, and reduce climate and air-quality-related healthcare costs. For example, advancements in building envelopes and low-carbon cooling technologies will reduce exposure to climate change impacts such as wildfire and extreme heat. Disadvantaged communities will benefit from reduced emissions from advancements in transportation electrification, as well as innovations in load flexibility that can reduce and eliminate the need to run fossil fuel-powered peaker plants.

Access and Education

Accessibility is the extent to which cleantech products and services are usable and available to people from the widest range of backgrounds and capabilities. The CEC strives to remove barriers to clean energy technology adoption, as identified in the SB 350 Barriers Report and by relevant stakeholders. This is accomplished through technology demonstration and deployment (TDD) in under resourced communities, addressing community priorities, supporting relationship-building and partnerships among diverse stakeholders, ensuring meaningful community engagement with community-based organizations as key project partners, and investing in diverse businesses. CEC will address access and education through projects and program administration by (1) enhancing inclusivity by focusing on targeted outreach, meaningful engagement, and knowledge dissemination; (2) ensuring that technologies are applicable to community interests and responsive to local needs; and (3) supporting the sharing of culturally relevant and sensitive project information and educational materials for participating communities. Tracking and evaluating progress of such efforts will ensure that these interventions are successful.

Financial Benefits

CEC investments will lead to technological advancements that lead to financial benefits and cost savings while considering affordability and rate impacts. For example, improved energy efficiency and load flexibility will result in electric bill savings; advancements in energy resilience from energy storage technologies will help reduce financial impacts to businesses facing grid reliability issues; and manufacturing advancements will reduce the costs of clean energy technologies. In addition, CEC EPIC funding can expand community investment by attracting additional public and private funding and building capacity for future grant applications and clean energy project developments CEC recognizes that the value of money varies with income, and EPIC investments will prioritize financial benefits

in under resourced communities to improve energy equity.

Economic Development

CEC investments will support economic development by:

- Funding cleantech start-up companies that are committed to diversity, equity, and inclusion.
- Investing in manufacturing, entrepreneurship, job creation, and training that support workforce development pathways to high-quality careers in California.
- Encouraging hiring for low-income, disadvantaged, and underrepresented populations (including women, re-entry, and so forth).
- Supporting small and diverse business development and contracting.

For example, through support of the Entrepreneurial Ecosystem, the CEC seeks to grow the entrepreneurial talent pool and provide critical support at all stages of the technology development pipeline. TDD projects and manufacturing initiatives support job growth, on-the-job training, and workforce development, and include opportunities in regions facing high rates of unemployment and underemployment.

Consumer Protection

As a technology R&D program, the Gas Research & Development program does not directly address consumer protection in any initiative; thus, consumer protection was not included in the Equity Matrix (Table 3). Rather, through investments that work to advance clean energy technologies, the Gas R&D program is supporting consumer protection by demonstrating and de-risking the adoption of emerging clean energy technologies.

Direct and Indirect Benefits

Direct impacts are expected as a direct result of project implementation. For example, occupant health benefits from indoor air quality improvements from TD&D projects that includes electrification of gas appliances, and economic development from geothermal energy projects that hire local workers and support workforce development.

Indirect impacts are expected more broadly outside of project implementation. For example, indirect health benefits associated with technological advancements of an induction cooktop that will improve indoor air quality but did not include demonstration leading to direct benefits to an occupant and increased economic development as a result of geothermal energy advancements that may lead further adoption and job creation in geothermal energy.

APPENDIX F:

Estimated FY 2023-24 Gas R&D Administration Cost Breakdown

Based on analyses conducted on FY2022-2023 Gas R&D Program administration, an estimated breakdown of Gas R&D Program administration costs is provided below.

| Program Administrative Cost Budget Item | Fiscal Year 2023- 2024 (\$) |
|---|--|
| Investment Plan Development | \$229,643 |
| Project Planning and Initiation | \$504,013 |
| Project Oversight and Governance | \$694,580 |
| Stakeholder Communication, Engagement, and Outreach | \$116,815 |
| Regulatory Support Compliance | \$230,227 |
| Internal Management Coordination | \$77,101 |
| Program and Process Coordination and Improvement | \$63,106 |
| Administrative Activities | \$81,546 |
| Supervision and Personnel | \$271,864 |
| Training and Development | \$131,105 |
| Total | \$2,400,000 |