DOCKETED	
Docket Number:	23-ERDD-02
Project Title:	Gas Research and Development Program
TN #:	253632
Document Title:	Gas R&D Program FY 2024-2025 Budget Plan
Description:	N/A
Filer:	Archal Naidu
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	12/15/2023 8:08:32 AM
Docketed Date:	12/15/2023

Gas R&D Program FY 2024-2025 Budget Plan

December 15, 2023

Agenda

- Welcome and Overview
- Staff Presentations and Clarifying Questions
  - Gas Decommissioning
  - Gas System Safety
  - Renewable Generation
  - Clean Renewable Hydrogen Distribution
  - Building Decarbonization
- General Questions and Public Comment
- Adjourn

Announcements

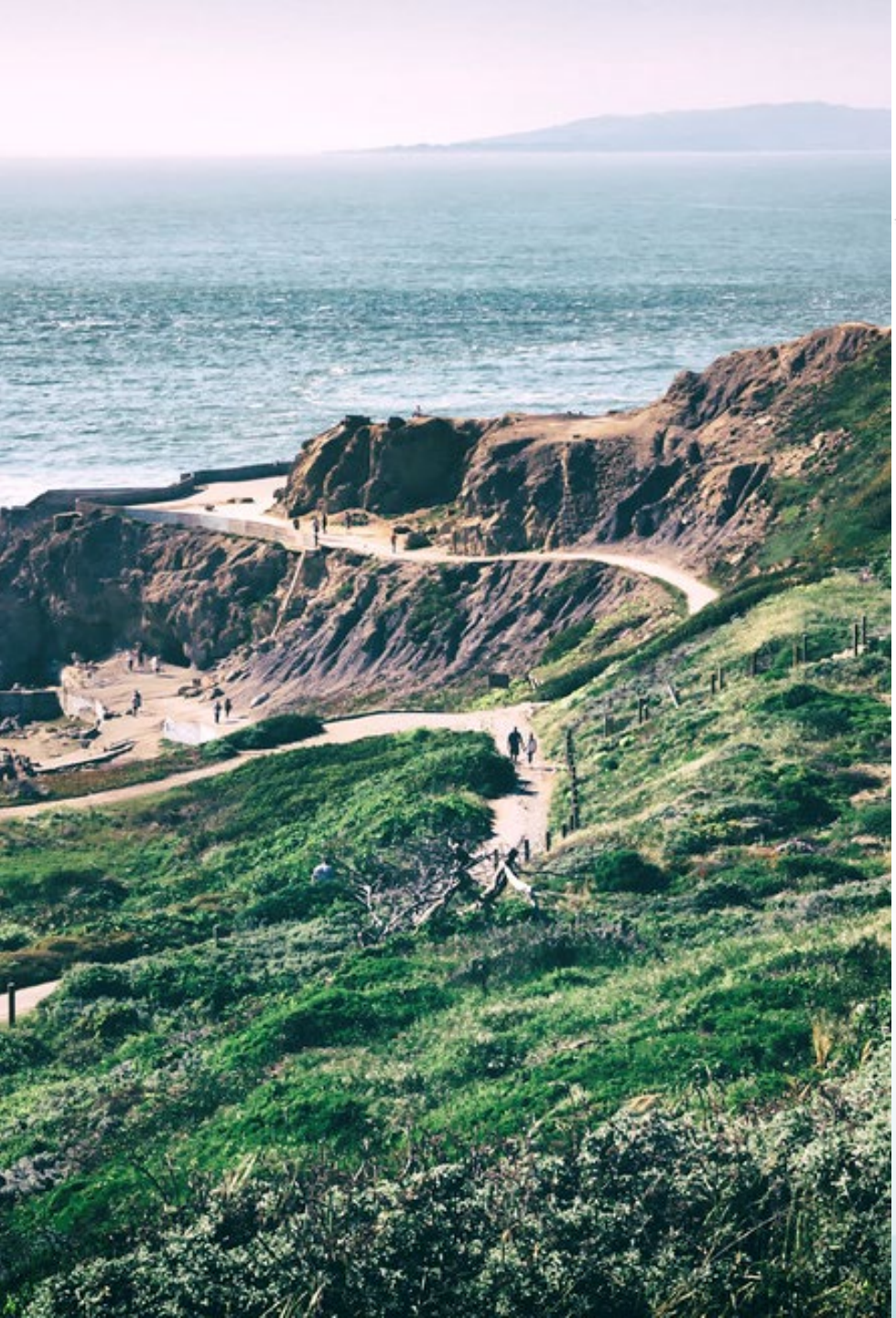
- This workshop is being recorded and will be posted at:

  https://www.energy.ca.gov/events

- Please type your comments and questions in the Q&A window
- Participants will be muted during the presentation
- Workshop materials, including this presentation, will be posted at:
  https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=23-ERDD-02
- Sign up for updates on "Energy Research and Development":
  https://public.govdelivery.com/accounts/CNRA/signup/31719

Introduction

- Research and development to support the transition to clean energy, greater reliability, lower costs, and increased safety for Californians
  - Benefits California citizens
  - Not adequately addressed by competitive or regulated entities
- $24 million annual budget, funded by a surcharge on gas consumption in California
  - Energy efficiency, renewable technologies, conservation, environmental issues, and transportation
  - Supports state energy policy



Developing Initiatives

Informed by:

- Gas R&D authority
  - State policy
  - CPUC Resolutions
- Emerging research trends
  - Roadmaps and strategies
  - CPUC and CEC proceedings
  - Discussion with stakeholders
- Equity considerations

State Energy Policy Drivers

- **SB 32 (2016)**
  - Aims to reduce GHG emissions to 40% below 1990 levels by 2030
- **EO B-55-18 and AB 1279 (2022)**
  - Establishes statewide goal to achieve carbon neutrality as soon as possible and no later than 2045
- **Integrated Energy Policy Report**
  - Policy recommendations that conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety

Developing Initiatives

CPUC Resolutions:

- **Resolution G-3592**
  - Coordinate with the DACAG and disadvantaged community stakeholders
  - Provide information on co-funding, collaboration, and coordination with IOUs and stakeholders
- **Resolution G-3571**
  - Coordinate with CPUC staff (Energy Division & Safety and Enforcement Division) 3 weeks prior to the public workshop
- **Resolution G-3584**
  - Consider the Long-Term Technological Development Strategy to Meet Aggressive Statewide Decarbonization Goals, funded in FY 2019-20

Developing Initiatives

Emerging research trends:

- Long-Term Gas Research Strategy to Achieve Aggressive Statewide Carbon Neutrality Goals
- California Air Resources Board's 2022 Scoping Plan for Achieving Carbon Neutrality
- Relevant CPUC Proceedings
- Integrated Energy Policy Report (2022 and 2023): hydrogen chapter recommendations
- DACAG comments and related dialogues on public health and equity research needs

Developing Initiatives

Diversity & Equity Commitment

To meet CECs commitment to diversity and equity, Energy Commission staff:

- Engage with disadvantaged and underrepresented groups throughout the state
- Improve CEC's application and grant management process to relieve administrative burdens
- Provide preference points to grant applications that support benefits to disadvantaged and/or low-income communities

Developing Initiatives

Stakeholder Feedback

- The California Energy Commission would like to hear your thoughts on the proposed initiatives
- Comments can be provided to the PIER Gas Docket until **January 19, 2024:** https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=23-ERDD-02

General Questions for Stakeholders

1. How can equity considerations be centered in these initiatives?
2. Do you have recommended research approaches or resources?
3. What use cases or opportunities would benefit from these initiatives?
4. What are example performance metrics or targets for project success?
5. Are there other priority areas that the Gas R&D Program should consider? If so, please explain

Comments can be provided to the Docket until January 19, 2024: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=23-ERDD-02

Support Equitable, Safe, and Cost-Effective Decarbonization of California's Gas System

Topic Area: Gas Decommissioning

Presenter: Mithra Moezzi

Background

- Substantial challenges impede decommissioning including:
  - Inertia favoring fossil gas
  - Multidimensional costs & benefits, transition contingencies
  - Diverse community priorities
- Need nimble, rapid research to inform policy, research, developers, planning

Innovations

Complement ongoing research with fieldwork, analysis, and data streams to inform gas transition planning, including:

- Identifying frictions and solutions in the gas transition value chain (e.g., workforce, technology, policy)
- Developing strategies to serve diverse needs and contexts (e.g., hard-to-electrify uses, conditions in rural or tribal areas)
- Empirically tracking air quality impacts & related health implications; evaluating other costs, benefits

Benefits

Informs CEC Gas Decarbonization Proceeding and CPUC Long-Term Gas Planning Rulemaking, supporting benefits for all ratepayers:

- **Environmental Quality:** Helps catalyze conversions of fossil gas end uses to lower carbon alternatives, reducing air pollution
- **Equity:** Illuminates costs, benefits, and their distribution, so inequities can be better tackled
- **Safety:** Helps anticipate patterns of changes in gas use, informing hydraulic modeling and derating decisions
- **Reliability and Integrity:** Informs high-level gas transition planning including California's energy demand forecasts
- **Cost:** Streamlines decommissioning planning by systematically analyzing empirical data, reducing risk of missteps

Comments and Feedback

- What interventions or strategies are successfully encouraging conversion from piped fossil gas, in any sector?
- What studies are analyzing gas interval meter data to understand changes in patterns of gas use, including end use conversion?
- What non-pipeline alternatives appear most effective in conversion from piped gas use?
- What could help manage utility rate and related uncertainties on user decisions to retain or transition from piped fossil gas?

Innovations for Cost-Effective Operation and Maintenance of Critical Infrastructure During the Gas Transition

Topic Area: Gas System Safety

Presenter: Jeffrey Sunquist

Background

- Gas storage wells and transmission pipelines are critical for service reliability and affordability
- Recent regulations have expanded testing, inspection, and monitoring requirements
- R&D is needed to advance more cost-effective and less disruptive methods for meeting safety goals

SoCalGas Playa del Rey underground gas storage facility
Source: LA Times

Innovations

- Improve cost-effectiveness and data quality of non-intrusive well inspection and monitoring technologies
- Demonstrate technologies for non-destructive material properties verification for transmission pipelines
- Improve in-line inspection technologies for small-diameter transmission pipelines

Installation of distributed fiber optic sensing in a gas storage well
Source: LBNL

Benefits

- **Environmental quality:** Minimize the gas system's footprint to help reduce fugitive emissions
- **Equity:** Mitigate risks to surrounding communities and reduce cost burdens on ratepayers
- **Reliability and Integrity:** Reduce service disruptions and enable more targeted maintenance
- **Safety:** Help operators address potential issues before they escalate into larger incidents
- **Costs:** Lower operations and maintenance burdens and maximize capacity of existing infrastructure to lower costs to ratepayers

Comments and Feedback

Gas Storage Wells

1. What are the risks and systemic impacts associated with current well inspection practices?
2. What are some promising non-intrusive inspection and monitoring technologies that can help mitigate these risks and impacts while ensuring well integrity?

Transmission Pipelines

3. What are the economic and environmental benefits of non-destructive technologies for verifying transmission pipeline material properties?
4. What improvements are needed in in-line inspections of narrow-diameter transmission lines?

General

5. Are there other promising innovations that this initiative should target to improve safety, affordability, and equity of gas system operations and maintenance?

Fuel-Flexible Distributed Power Generation

Topic Area: Renewable Generation

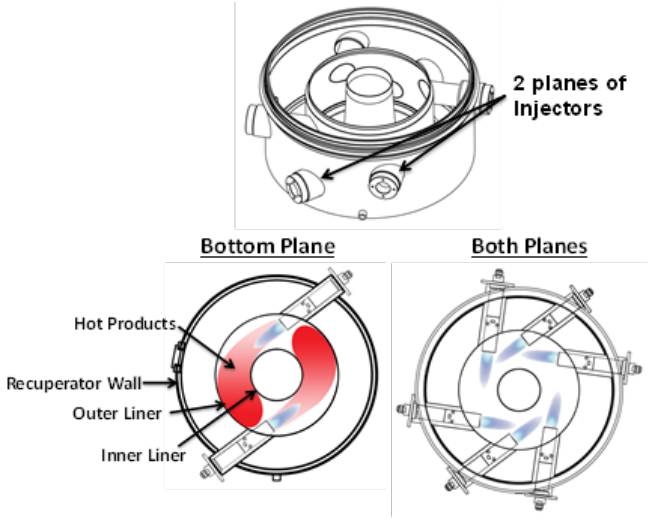
Presenter: Nadia Richards

Background

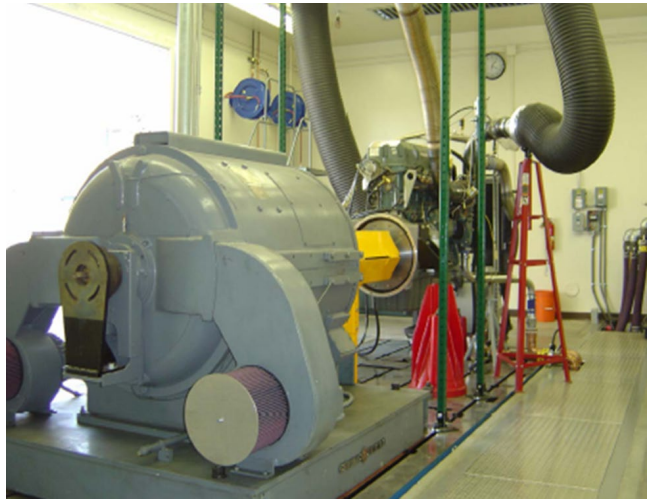
- Generation systems need to evolve in response to decarbonization trends and policies
- Lacking the adaptability to handle renewable fuels that vary in quality, composition, and characteristics
- Very limited developments for smaller-scale distributed power generation for anticipated decarbonized future
- Greenhouse gas and criteria pollutant emissions impact and the power generation performance

Innovations

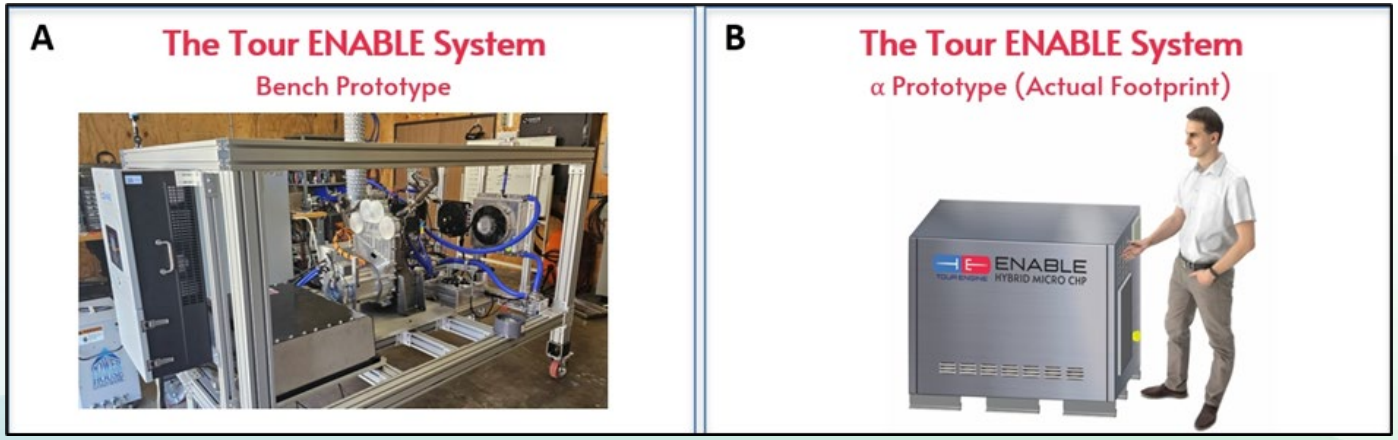
- Prime movers that can operate reliably on varied fuel blends
- Sensor and control system development to enable consistent and low-emissions performance
- Early-stage modeling, lab-scale validation, engineering-scale prototypes, demonstrations in relevant environments



Source: Capstone Green Energy



Source: Enchanted Rock



Source: Tour Engine

Benefits

- **Reliability and Integrity:** Ensures consistent operation amidst a variable fuel supply
- **Safety:** Increases resilience to equipment failures, unplanned outages, and fuel slip/leaks
- **Costs:** Optimizes capital and operational costs of power generation technologies by diversifying fuel sources
- **Equity:** Reduces emissions in under-resourced communities often disproportionately affected by pollution
- **Environmental Quality:** Reduces reliance on fossil gas and encourages transition to renewable fuels while enabling ultra-low emissions

Comments and Feedback

1. How can equity considerations be centered in the fuel-flexible initiative?

2. How would project siting and/or a community benefits plan help address equity considerations?

3. What are the most promising innovations, applications, and technology priorities for fuel-flexible distributed generation?

4. To what extent are you seeing combustion vs. non-combustion technologies as part of fuel-flexible distributed generation in the near- and medium-term?

5. What gaps are there from private sector investment for advancing fuel-flexible generation that are best addressed by the state?

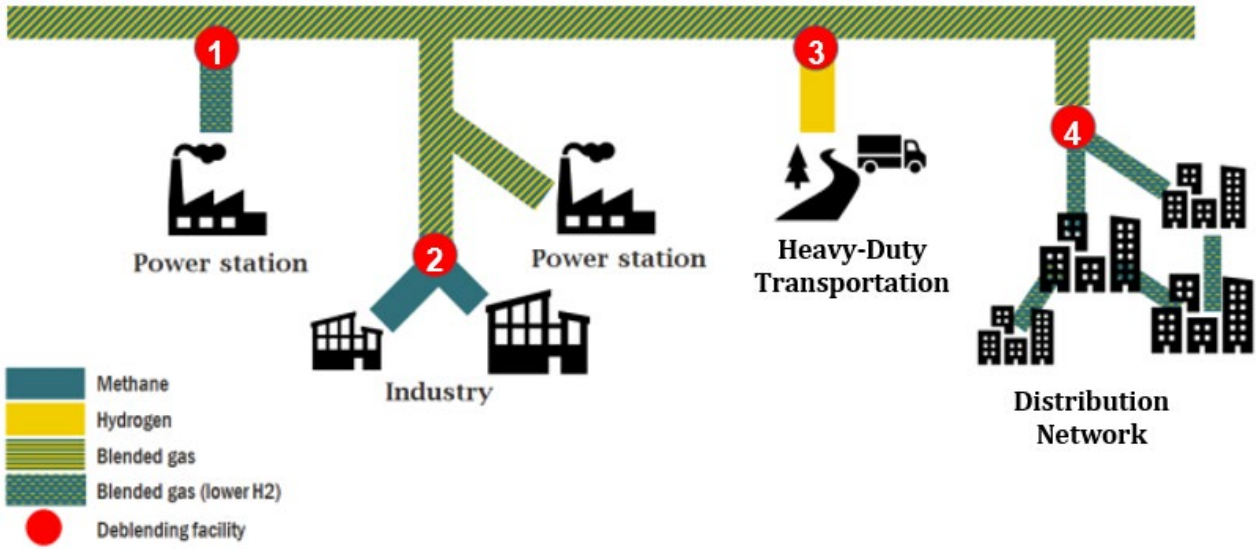
Hydrogen De-blending and Purification

Topic Area: Clean Renewable Hydrogen Distribution

Presenter: Peter Chen

Background

- Systemwide blending becomes concerning as hydrogen concentrations approach 5% by vol
- If widespread hydrogen blending is pursued, de-blending technology can improve safety and cost-effectiveness
- Hydrogen de-blending can enable more strategic control of hydrogen concentrations throughout a blended gas system

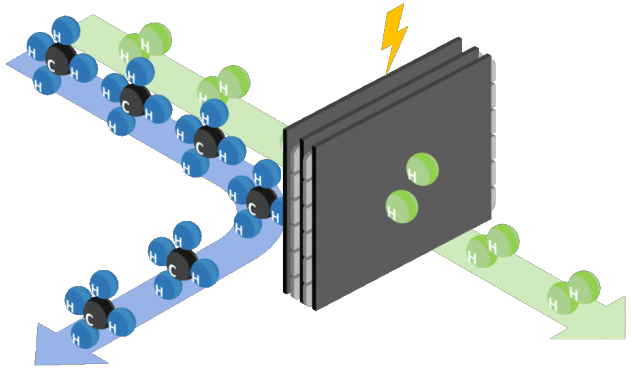


Source: Frontier Economics

Innovations

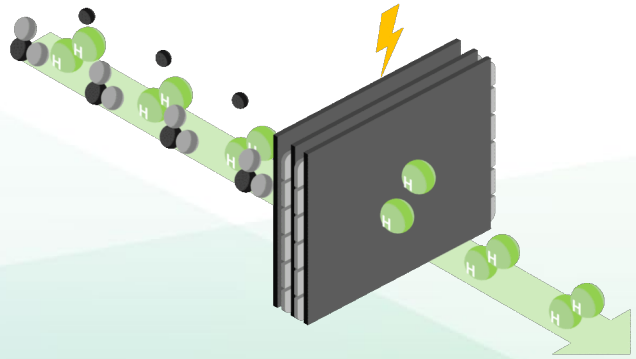
- Demonstrate viability of emerging technologies such as electrochemical hydrogen separation (EHS) and purification
- Advance technologies for de-blending H_2/gas mixtures with low hydrogen concentrations (i.e., 3-20%) and tolerance for non-methane constituents
- Assess the technoeconomic feasibility of hydrogen separation and purification for broader adoption

Electrochemical Hydrogen Separation (EHS)



Source: Siqens GmbH

Electrochemical Hydrogen Purification



Source: Siqens GmbH

Benefits

- **Safety and Cost:** Leverage existing gas infrastructure to allow for safe and cost-effective transmission of higher hydrogen blends while adjusting concentration levels to avoid upgrades for sensitive infrastructure and end uses
- **Reliability and Integrity:** Improve reliability of hydrogen supply by enabling consistent control of hydrogen concentrations, including to levels that avoid potential infrastructure integrity risks
- **Energy Efficiency:** Improve de-blending process efficiency and eliminate trucked hydrogen delivery losses including compression, cooling, and liquefaction
- **Environmental Quality:** Enable hydrogen delivery at scale to reduce emissions and air quality impacts of difficult-to-decarbonize sectors including heavy-duty transportation
- **Equity:** Mitigate costs to ratepayers for maintaining the gas system as it transitions to distribute hydrogen and improve air quality in communities disproportionately affected by pollution

Comments and Feedback

1. Should this research be pursued in the near term? Or wait for clearer policy direction regarding hydrogen blending on a broader scale?
2. Is there a more critical need for an initial technoeconomic analysis or should there be equal focus on research, development, and demonstrations?
3. Is there additional demand for this technology, aside from the use cases discussed in the previous slides?
4. What are some resources that can help further inform this research initiative?
5. What are some promising innovations that can further improve separation efficiency, durability, and performance with low hydrogen concentrations?

Networked Geothermal District Heating Study

Topic Area: Building Decarbonization

Presenter: Jason Tancher

Background

- California has barriers to decarbonizing large commercial buildings
- Research is needed to understand how the latest drilling and geothermal technology may apply to California climate zones and geological conditions

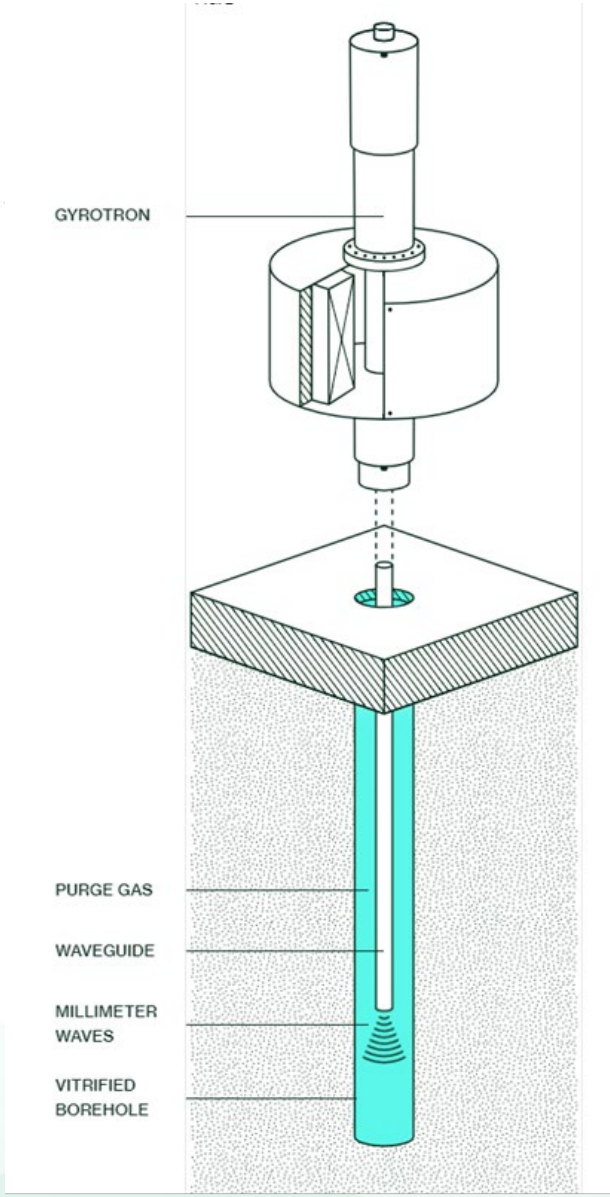
Source: UC Davis Health

Source: DGS

Source: DGS

Innovations

- Review the latest drilling and geothermal technology as a pathway to decarbonizing large buildings in California
- Explore the possibility of repurposing the skills of the gas utility workforce
- Identify feasible technologies and areas that have the highest potential
- Evaluate existing policies, best practices and environmental impacts to inform state policy recommendations



Source: Quaise Energy

Benefits

- **Environmental Quality:** Reduces reliance on fossil gas and encourages transition to renewable fuels
- **Equity:** Reduces emissions in under-resourced communities often disproportionately affected by pollution
- **Reliability and Integrity**: Reduces heating load relying on fossil gas system or large demand on electric grid
- **Safety**: Potentially increases the safety and efficiency of heating systems for residential and commercial ratepayers
- **Costs:** Initial capital investment funded through utility model results in fixed rate that will not increase with inflation or fuel costs

Comments and Feedback

1. What existing studies, geological surveys, or other relevant resources for drilling geothermal wells in CA exist outside of known geothermal resource areas?
2. What are the major obstacles that prevent wider adoption of geothermal heating in CA?
3. Is there interest from hospitals, universities, existing district heating system operators, or other sites in heat (>120°F) sourced from geothermal resources?
4. What type of business models (e.g. gas utilities) could best leverage these (>120°F) geothermal heating resources?
5. Should this initiative include drilling of test wells to evaluate geological and economic feasibility?

Public Comments

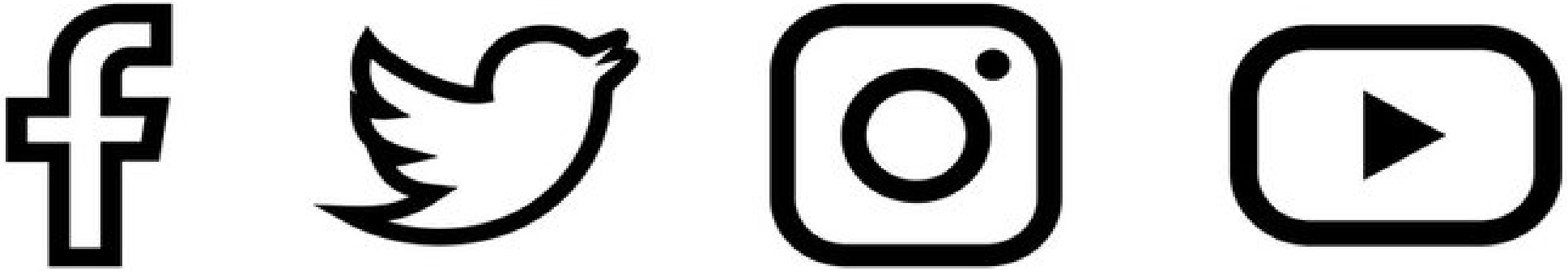
- Please submit your question or comment in the **Question and Answers** window
  - Facilitator will read questions and Initiative Leads will provide responses

Questions for Stakeholders

1. What are some resources that can help inform the research initiatives?
2. Please provide a summary of use cases or opportunities that would benefit from these proposed initiatives
3. Are there any recommended research approaches that could strengthen any of the initiatives?
4. What are example performance metrics or targets that could be used to determine project success?
5. Are there other priority areas that the Gas R&D Program should consider? If so, please provide the proposed scope and a justification, including the urgency for the topic

Next Steps

- Comments can be provided to the Docket until ***January 19, 2024:*** https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=23-ERDD-02
  - Energy Commission staff will consider these comments while developing the *FY 2024-25 Gas R&D Proposed Budget Plan*
- Proposed Budget Plan will be submitted to California Public Utilities Commission for consideration by March 29, 2024
- Solicitations derived from this Budget Plan may be released shortly thereafter, contingent on California Public Utilities Commission approval



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- The Energy Commission can be found on most social media platforms: Facebook, YouTube, Twitter, and LinkedIn
- Energize Innovation provides access to the CEC R&D project resource libraries, tools, and databases

www.energizeinnovation.fund/

Thank You!