



# **CEC Gas R&D Program Update**

2023 NGVTF

Peter Chen, Supervisor  
Energy Research and Development Division  
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# Gas R&D Program Background

- 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, renewables, conservation, environmental issues, and transportation.
  - Supports state energy policy.



# Policy Drivers

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## **Executive Order B-55-18 and AB 1279 (2022):**

- Establishes statewide goal to achieve carbon neutrality as soon as possible, no later than 2045

## **Executive Order N-79-20:**

- Establishes goals to transition light-, medium-, heavy-duty vehicles and off-road equipment to zero-emission wherever feasible.

## **Integrated Energy Policy Report:**

- Assessment of major energy trends and issues facing the electricity, gas, and transportation fuel sectors, including policy recommendations.



# Transportation Gas R&D Portfolio

Prime	Project Title
South Coast AQMD	In-Use Emissions and Fuel Usage Assessment (200 Vehicle Study)
NREL	NGV Research Consortium
GTI	Sierra Northern Hydrogen Locomotive Project
CALSTART	HyZET: A Design and Feasibility Study of a Fuel Cell-Powered Commercial Harbor Craft

Prime	Project Title
Zero Emission Industries	Small Fast Multi-Use Hydrogen Fuel Cell Harbor Craft
Cummins Electrified Power	HyFCT Technology Integration and Demonstration
GTI	Symbio H2 Central Valley Express



# In-Use Emissions and Fuel Usage Assessment

## Summary

- Comprehensive in-use activity and emissions testing program including over 200 HDVs.
- Data collected from large number of NGVs in test pool informed EMFAC2021 updates.
- Activity data informed infrastructure projection models for zero-emission HDVs.
- Identify technology benefits, shortfalls, and opportunities for improvement.

## Status

- Testing completed, final report under development.



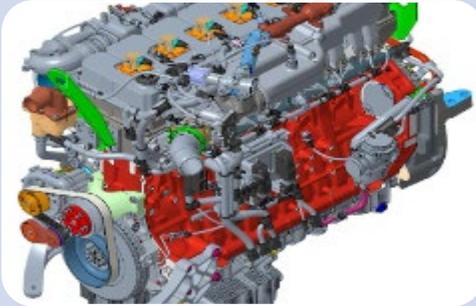
Credit: UC Riverside



Credit: West Virginia University



# NGV Research Consortium



**Cummins:**  
high efficiency  
heavy-duty NG  
engine research

**Active**



**Transient  
Plasma  
Systems:**  
advanced  
ignition system

**Completed**



**US Hybrid:**  
CNG hybrid-  
electric truck  
demonstration

**Active**



**GTI:**  
cost effective  
CNG full fills  
using expander  
pre-cooler

**Active**



# Hydrogen Fuel Cell Demonstrations in Rail and Marine Applications at Ports (H2RAM)

- **GTI/Sierra Northern Railway:** switcher locomotive demonstration at Port of West Sacramento.
- **CALSTART:** tugboat design and feasibility study for implementation Port of Los Angeles.
- **Zero Emission Industries:** small-fast harbor craft and mobile refueler for demonstration at Port of San Francisco and Port of Long Beach.



Credit: Sierra Northern Railway



Credit: Crowley



Credit: Zero Emission Industries



# Hydrogen Fuel Cell Truck Demonstrations for Challenging Duty Cycles



Credit: Cummins



Credit: Symbio

- **Cummins Electrified Power:** hydrogen fuel cell truck demonstration for bulk gas delivery and long haul, LH<sub>2</sub> onboard storage assessment
- **GTI/Symbio:** hydrogen fuel cell truck demonstration for heavy payloads, long routes, and limited refueling opportunities



# Innovative Hydrogen Refueling Solutions for Heavy Transport

- Active solicitation (GFO-22-502) released October 3, 2022.
- Develop and demonstrate innovative hydrogen refueling solutions to support the decarbonization of emerging MDHD on-road and off-road vehicle applications.
  - Reduce hydrogen delivery and refueling costs
  - Improve reliability
  - Enable higher fill rates
  - Minimize energy losses



# Future Gas R&D Initiatives and Concepts

Budget Plan	Initiative/Concept
2023-24	Hydrogen Leakage Detection, Monitoring, and Prevention
2023-24	Air Pollutant Exposure Assessment in California Residences
2023-24	California Sustainable Energy Entrepreneur Development (CalSEED) – Low Carbon Gas
2023-24	Federal and Private Cost Share

Budget Plan	Initiative/Concept
2024-25	<b>Transportation:</b> Advancing innovative onboard hydrogen storage and fuel system solutions
2024-25	<b>Gas System Safety:</b> Deploying innovations to detect and reduce fugitive emissions
2024-25	<b>Gas Decommissioning:</b> Supporting equitable, safe, and cost-effective decarbonization of California's gas system
2024-25	<b>Renewable Generation:</b> Enhancing fuel-flexible power generation
2024-25	<b>Entrepreneur Development:</b> Continuing investments in CalSEED – Low Carbon Gas