DOCKETED	
Docket Number:	19-ERDD-01
Project Title:	Research Idea Exchange
TN #:	230294
Document Title:	Presentation - Scoping Workshop for a Future Solicitation - Fuel Cell Demonstrations in Rail and Marine Applications at CA Ports
Description:	Slides presented by California Energy Commission staff at the October 17, 2019 scoping workshop.
Filer:	Peter Chen
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	10/18/2019 3:06:29 PM
Docketed Date:	10/18/2019

California
Energy Commission
Research & Development

Fuel Cell Demonstrations in Rail and Marine Applications at CA Ports

Scoping Workshop for a Future Solicitation

Energy Research and Development Division

Rey Gonzalez and Peter Chen

October 17, 2019

Workshop Agenda

Time	Topic
10:00 am	Welcome and Introductions ➢ Housekeeping ➢ Commitment to Diversity ➢ Connect with Us
10:10 am	CEC Coordination to Accelerate Zero Emission Heavy-Duty Transportation
10:15 am	Information on Future Solicitation ➢ Natural Gas R&D Program Overview ➢ Research Initiative Background ➢ Solicitation Goals ➢ General Requirements ➢ Data Collection Requirements
10:45 am	Discussion Questions
11:30 am	Questions and Comments
12:00 pm	Adjourn

Housekeeping

- Facilities
- In case of emergency
- WebEx participants
- Workshop slides and the WebEx recording will be posted on our webpage: https://ww2.energy.ca.gov/research/notices/#10172019

Commitment to Diversity

The Energy Commission adopted a resolution strengthening its commitment to diversity in our funding programs. We continue to encourage disadvantaged and underrepresented businesses and communities to engage in and benefit from our many programs.

To meet this commitment, Energy Commission staff conducts outreach efforts and activities to:

- Engage with disadvantaged and underrepresented groups throughout the state.
- Notify potential new applicants about the Energy Commission's funding opportunities.
- Assist applicants in understanding how to apply for funding from the Energy Commission's programs.
- Survey participants to measure progress in diversity outreach efforts.

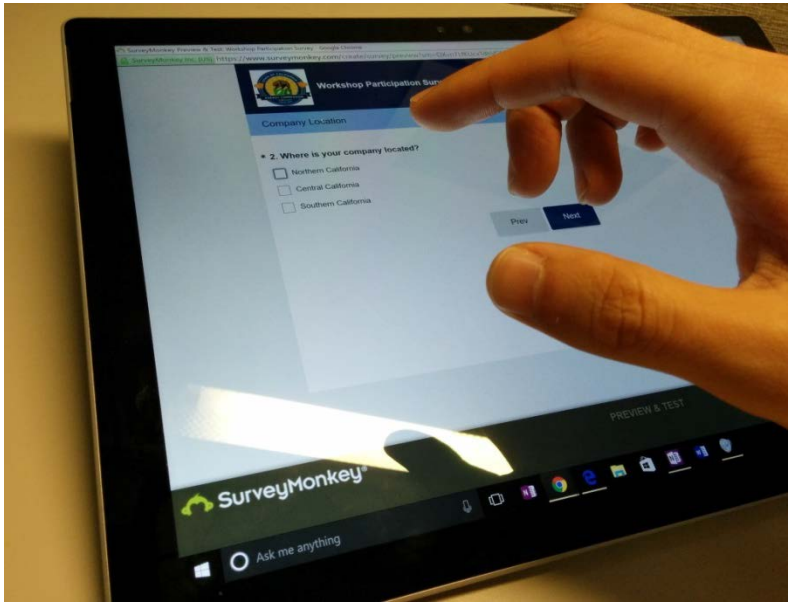
We Want to Hear From You!

1-Minute Survey

The information supplied will be used for public reporting purposes to display anonymous overall attendance of diverse groups.

- In person: iPads are being passed around the room
- WebEx: https://www.surveymonkey.com/r/CEC-10-17-2019

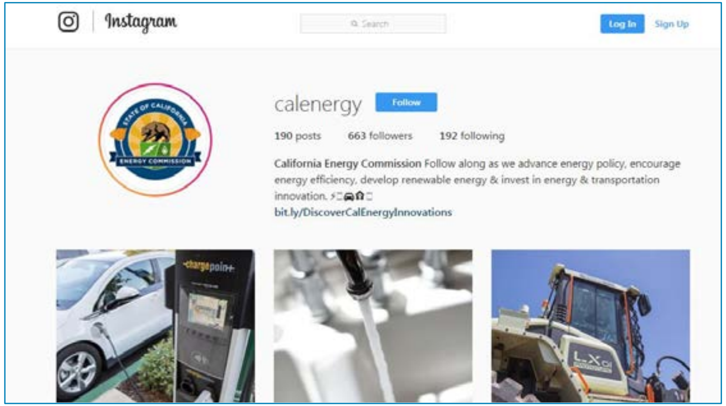
Thank you for your time!



Connect with Us

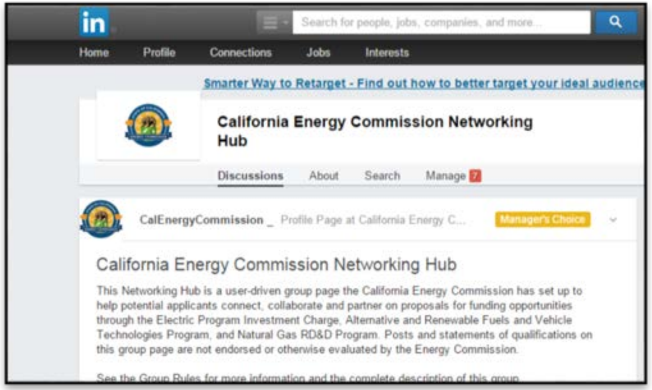
Tweets 7,729
Following 1,553
Followers 9,872
Likes 996
Lists 3
Tweets
Tweets & replies
Media
CA Energy Commission
@CalEnergy
The California Energy Commission is the state's primary energy policy and planning agency. bit.ly/DiscoverCalEne...
Sacramento, CA
energy.ca.gov
Joined July 2010
Tweet to CA Energy Commission
CA Energy Commission @CalEnergy · 28m
Today the Senate confirmed the appointment of #CalEnergy Commissioner Karen Douglas. Get to know her: ow.ly/5sI430kOZYn

Twitter



Instagram
Search
Log In
Sign Up
calenergy
Follow
190 posts
663 followers
192 following
California Energy Commission Follow along as we advance energy policy, encourage energy efficiency, develop renewable energy & invest in energy & transportation innovation.
bit.ly/DiscoverCalEnergyInnovations
chargepoint

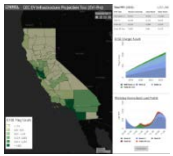
Instagram



Search for people, jobs, companies, and more...
Home
Profile
Connections
Jobs
Interests
Smarter Way to Retarget - Find out how to better target your ideal audience
California Energy Commission Networking Hub
Discussions
About
Search
Manage 7
CalEnergyCommission _ Profile Page at California Energy C...
Manager's Choice
California Energy Commission Networking Hub
This Networking Hub is a user-driven group page the California Energy Commission has set up to help potential applicants connect, collaborate and partner on proposals for funding opportunities through the Electric Program Investment Charge, Alternative and Renewable Fuels and Vehicle Technologies Program, and Natural Gas RD&D Program. Posts and statements of qualifications on this group page are not endorsed or otherwise evaluated by the Energy Commission.

LinkedIn

CEC Coordination to Accelerate Zero Emission Heavy-Duty Transportation

	Segment	Funding & Analytical Initiative
	Heavy-Duty Vehicle Technologies	Freight and Transit Demonstrations (Clean Transportation Program) **Fuel Cell Demonstrations in Rail and Marine (NG R&D)**
	Charging & H2 Fueling Equipment	Freight and Transit Infrastructure (Clean Transportation Program)
	Site Electric & Utility Infrastructure	Distributed Energy Resources for EV Charging (EPIC) Vehicle Grid Integration for PEVs (EPIC)
	System Modeling & Planning	Heavy Electric Vehicle Infrastructure Projections, HEVI-Pro EV-Ready Community Blueprints - Phase 2

Clean Transportation Program, Fuels & Transportation Division
EPIC Program, Energy Research & Development Division
NG R&D Program, Energy Research & Development Division

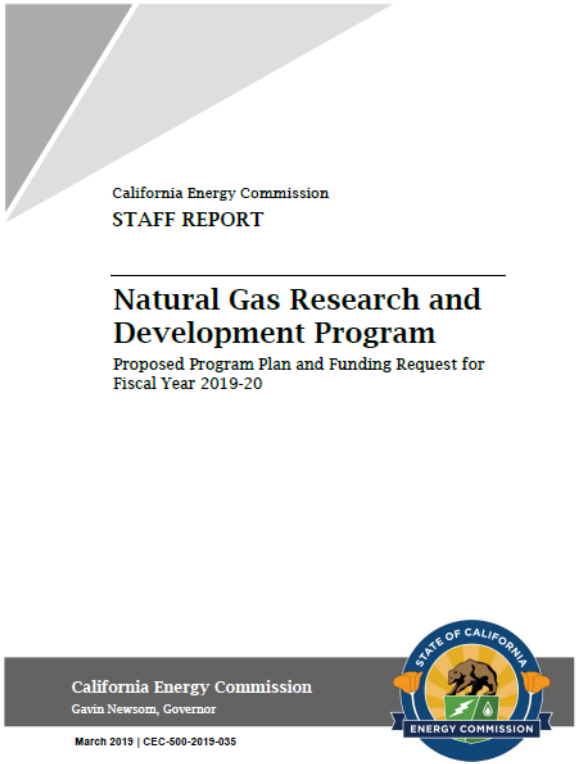
Why Are We Seeking Your Input?

- In early 2020, we anticipate releasing a Grant Funding Opportunity (GFO) to support up to $6.6M of fuel cell demonstration projects in rail and marine applications.
- We are seeking input from stakeholders and the general public to determine how to best facilitate successful demonstrations with measurable benefits.
- Ideally, projects funded under the upcoming GFO will spur technology advancement and future market adoption of fuel cell technologies in these difficult-to-decarbonize applications.

Input from today's workshop and the public comment session will help shape a future GFO.

Natural Gas Research & Development Program

- Annual budget plans of $24M/yr funded by a natural gas IOU ratepayer surcharge established by the CPUC.
- Goals for transportation research:
  - Advance transportation technologies that reduce air pollution and greenhouse gas emissions beyond applicable standards.
  - Benefit natural gas IOU ratepayers.
- Past research focused on natural gas vehicle technology such as advanced combustion, low NOx engines, and hybridization.



FY2019-20 Natural Gas R&D Program Budget

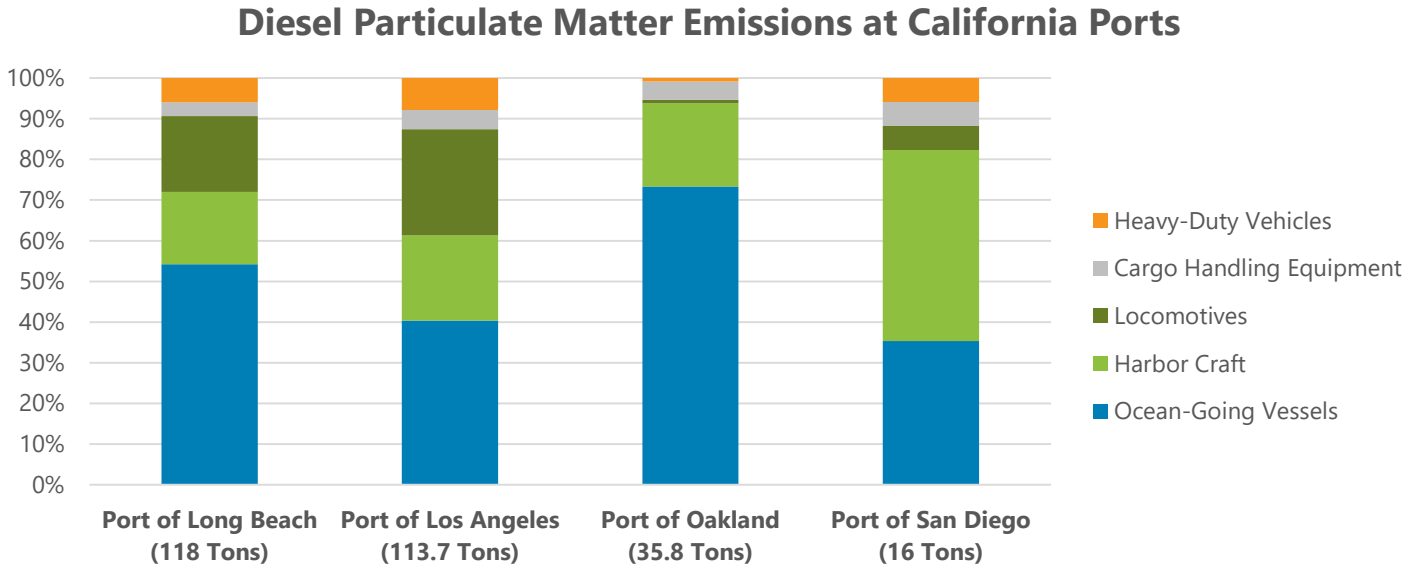
- FY2019-20 budget plan includes an initiative to demonstrate fuel cell technologies in rail and marine applications at ports.
- Expand portfolio to target difficult-to-decarbonize sectors and zero emission technologies.
- Build on past and ongoing projects.

BNSF 1205 Source: RR Picture Archives

Water Go Round Source: Golden Gate Zero Emission Marine

Air Quality Impacts of Locomotives and Commercial Harbor Craft

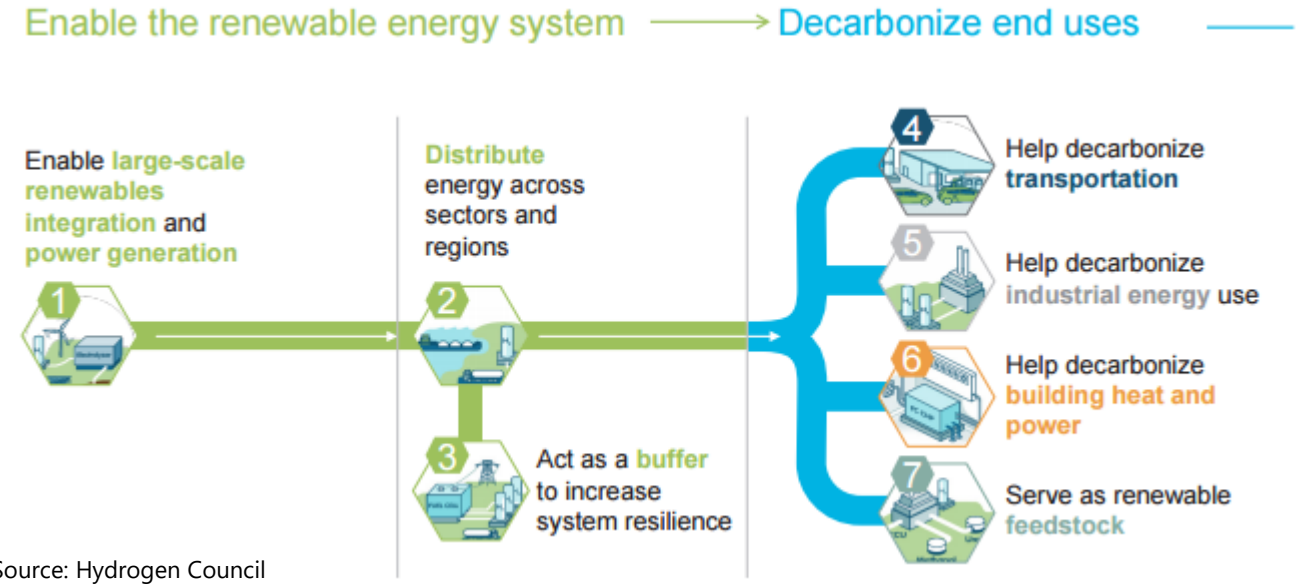
- Locomotives and commercial harbor craft are major emitters of diesel particulate matter and increase near-source cancer risk around ports.



Source: Port Emissions Inventories

Benefits of Enabling Renewable Hydrogen at Scale

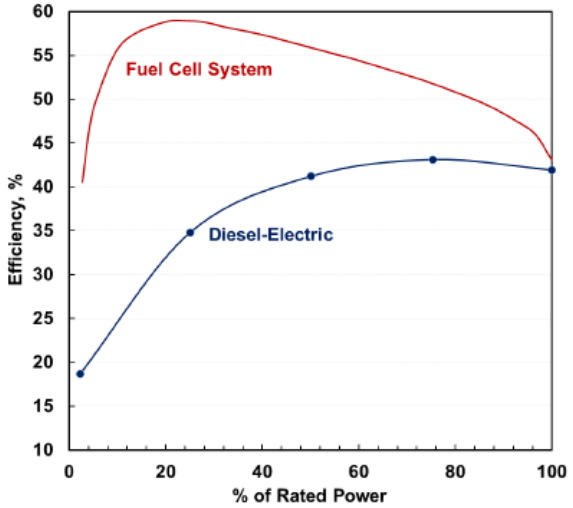
- Renewable hydrogen can help decarbonize challenging sectors and provide long term grid storage benefits but requires scale to lower costs.
- Ports have opportunities to leverage scale across multiple freight applications to reduce the cost of hydrogen.

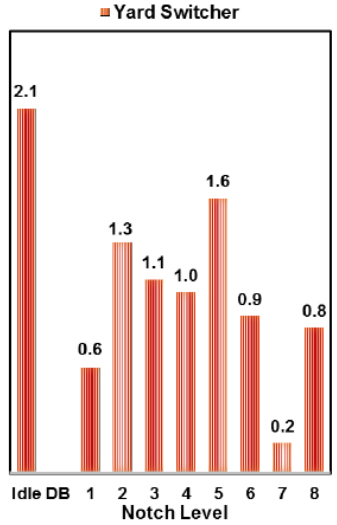


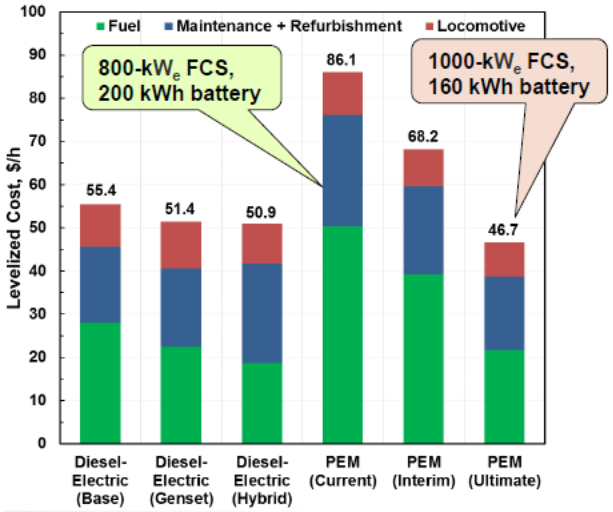
Source: Hydrogen Council

Total Cost of Ownership Projections – Locomotives

- Switchers operations include high idle and low notch loads. Fuel cells have significant low load efficiency advantages over diesel.
- Fuel cells can be >15% cheaper on a TCO basis than diesel for switcher locomotives.



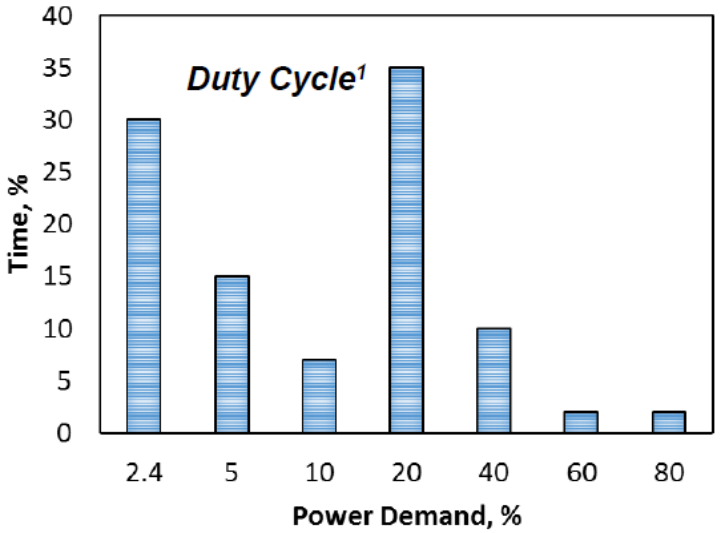


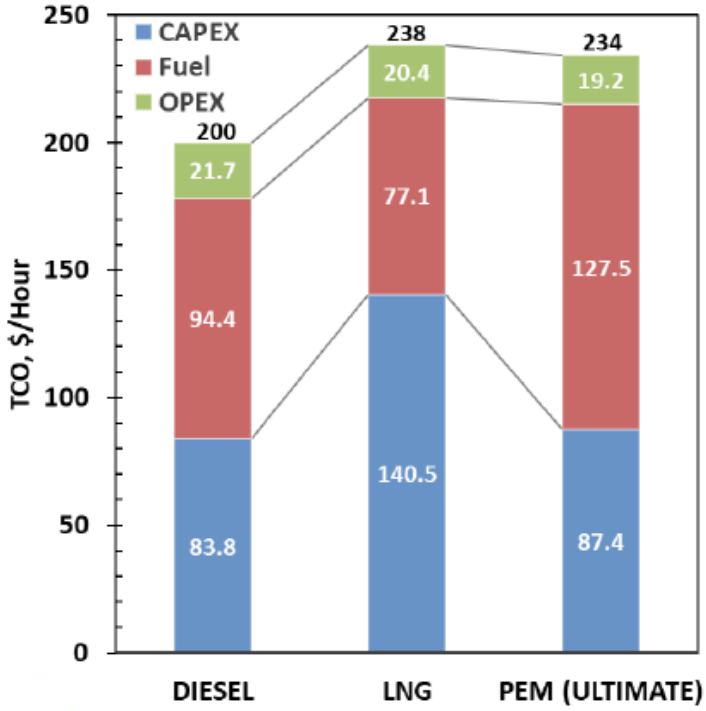


Source: Ahluwalia et al, "Total Cost of Ownership for Line Haul, Yard Switchers and Regional Passenger Locomotives – Preliminary Results"

Total Cost of Ownership Projections – Commercial Harbor Craft

- Tugboats with frequent low load and idling profiles can maximize benefits.
- Fuel cost is the primary TCO driver.





Source: Papadias et al, "Total Cost of Ownership (TCO) Analysis for Hydrogen Fuel Cells in Maritime Applications – Preliminary Results

California Market Potential

- Class I railroads: 400-500 intrastate locomotives, 129 are switchers
- Class III railroads: 135 switchers
- Commuter railroads: 130 locomotives
- Commercial harbor craft: 3,800 vessels

Source: California Air Resources Board Technology and Fuel Assessments

Solicitation Goals

- Design, build, and demonstrate a hydrogen fuel cell locomotive or commercial harbor craft at a California port.
- Ensure safe operation and demonstrate the ability to meet operational requirements.
- Collect data to evaluate technology performance in real world operation, validate potential benefits, and inform future regulations and deployment plans.

General Requirements May Include Some or All of the Following

- Fuel cell system must meet expected duty cycle and fleet operating requirements in terms of power, range/operating time, notch/transient response, operator experience.
- Demonstrate reliability, maintainability, and durability in terms of system uptime, maintenance intervals, issue response time, system useful life.
- Evaluate economics against the cleanest conventional diesel option in terms of operating cost, capital cost, and projected cost based on DOE targets.

General Requirements May Include Some or All of the Following

- Meet the refueling needs of the demonstration vehicles, including sufficient on-board storage capacity, fuel quality, fuel supply, and refueling time.
- Meet all safety requirements for design and operation, including risk assessments as mandated by industry codes and standards and other authorities.
- Procure a minimum of 33% renewable hydrogen.
- Provide a minimum of 20% match funds.
- Demonstration must be within a natural gas investor-owned utility territory (PG&E, SoCalGas, SDG&E).

Data Collection Requirements May Include Some or All of the Following

- **Demonstration:** 6 month minimum demonstration period
- **Vehicle/Vessel Operation:** usage rates, GPS data, load analysis, average speed, idling time
- **Vehicle/Vessel Performance:** productivity metrics, acceleration, ramp speed, peak conditions, fuel cell stack degradation
- **Fuel Consumption:** refueling time, distance traveled to refuel, refueling frequency, fuel efficiency

Data Collection Requirements May Include Some or All of the Following

- **Maintenance:** anticipated frequency of scheduled maintenance, repair documentation, time out of service
- **Safety:** description of accidents, incidents, near-misses related to the vehicle, vessel, or fueling infrastructure
- **Costs:** detailed O&M costs, including parts, fuel, and labor
- **User Experience:** qualitative feedback regarding uptime, ability to meet operational needs, O&M challenges, perceived safety, barriers

Preferred but not Required

- Include plan for post-project revenue service or continued data collection for the demonstration vehicle/vessel.
- Use fueling infrastructure to support multiple applications at the demonstration site such as cargo-handling equipment, drayage trucks, or light-duty cars.
- Procure 100% renewable hydrogen.

Discussion Questions

1. Should funding be limited to new builds or repowers? What are some specific benefits and challenges related to each deployment pathway?

Discussion Questions

2. Due to limited funding available, should certain applications be prioritized over others?

Discussion Questions

3. How should fueling infrastructure planning requirements be approached to ensure siting, accessibility, safety, throughput, and other considerations are correctly planned out?

Discussion Questions

4. How should renewable hydrogen procurement requirements be approached?

Discussion Questions

5. What specific performance metrics should be measured to compare against diesel and evaluate viability of fuel cell technologies?

Discussion Questions

6. What players and partnerships are needed to produce a strong project team?

Discussion Questions

7. What other considerations or requirements should be incorporated into the future GFO?

Questions? Comments?

Thank You!

Please submit your comments by October 24, 2019

- Submit electronically through the CEC's "Research Idea Exchange" docket: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=19-ERDD-01
- Submit by email to the Docket Unit at: docket@energy.ca.gov
- Submit paper copy to the Docket Unit: California Energy Commission; Docket Unit, MS-4; Re: Docket No. 19-ERDD-01; 1516 Ninth Street; Sacramento, CA 95814-5512

Peter Chen
E-mail: peter.chen@energy.ca.gov