Two Audio Options: Streaming Audio and Dial-In.

- Streaming Audio/Computer Speakers (Default)
- Dial-In: Use the Audio Panel (right side of screen) to see dial-in instructions. Call-in separately from your telephone.

- Ask questions using the Questions Panel on the right side of your screen.

- The recording of the webinar and the slides will be available after the event. Registrants will be notified by email.
Webinar Agenda and Speakers

- Welcome – Emanuel Wagner
- Overview of Workshop and Report Highlights – Cory Shumaker
- Role of Hydrogen in the Ports – Renee Moilanen
- Funding Opportunities – Chris Jenks
- Funding Opportunities – Leslie Goodbody
- Discussion/Q&A
Our Members Include:

- Hydrogen producers and distributors
- Automotive companies
- Public transit systems and suppliers
- Fuel cell, electrolyzer, compressor and storage manufacturers
- Fueling station developers, engineers and consultants
- Municipal, state and federal agencies
- Component suppliers
CHBC Advocacy

- Overall goal is inclusion of Hydrogen and Fuel Cells in transportation, energy and clean air decisions made in California.

CHBC Committees and Market Sector Action Groups (SAGs):

- Hydrogen Energy Storage and Renewable Hydrogen
- Heavy Duty Transportation, Goods Movement, and Clean Ports
- Public Transportation
- Communications and Business Expansion
- Infrastructure and Vehicle Deployment (under consideration)

Scheduled 2018 CHBC Events

- Hydrogen and Fuel Cell Policy Summit (April)
- Freight Workshop at ACT Expo (April 30)
- Public Transportation Briefing at APTA (May)
- Hydrogen + Fuel Cells NORTH AMERICA in partnership with CHBC and CaFCP at SPI (September)
• Two workshops, both well attended filling the venues
• Purpose:
  – Bring together key stakeholders in the ports industry, hydrogen and fuel cell industry, and State government agencies
  – Continue the conversation around accelerating the use of hydrogen and fuel cells in ports
    • Project updates
    • Technology updates
    • Funding updates
    • Show & Tell
Addressing the Shift of Energy in the Maritime Sector

- Thomas Cropper, President, CSUMA
- “The ocean is the driver of the world; 90% of trade moves across the oceans. Each week, $10 billion of goods moves through west coast ports”

Current Hydrogen and Fuel Cell Activities in Ports and Maritime

- Viking Cruise Lines announced it is developing a 20,000 kg/day hydrogen powered cruise ship.
- A liquid hydrogen tanker is able to transport 175,000 kg of H2.
- Many ports are looking at LNG; can be seen as a stepping stone towards cleaner technologies.
- Norway mandated all ferries must be zero emission by 2030.
Current Hydrogen and Fuel Cell Activities in Ports and Maritime (Con’t)

- European fuel cell maritime projects are increasing; FCH JU recently put out a call for two fuel cell passenger vessels.
- European ports such as Hamburg, Rotterdam, Amsterdam, Antwerp, Gothenburg are all looking to reduce emissions and are anticipating more stringent standards in the future.
  - Many are interested in Hydrogen
- Hydrogen projects are continuing in the California Ports
  - Recently announced tri-generation hydrogen production plant to go into Port of Long Beach to supply hydrogen for Toyota hydrogen truck and cars.
  - DOE ZECTII is ongoing with fuel cell Class 8 trucks in demonstration.
  - Pressure is mounting to go zero emission terminal operations by 2030.
• Voice of the Customer: Opportunities and Constraints for Hydrogen and Fuel Cells in Ports and Maritime Applications
  – Ports are a captive fleet
  – Hydrogen can be same work process as diesel
  – Port of Oakland is involved in a number of efforts to increase air quality by reducing diesel particulate matter.
    • Adopted Air Quality Improvement Plan in March 2008 to reduce cancer causing agents by 85% of 2005 levels by 2020.
  – Fuel cells on ships for cold ironing (shore-to-ship) needs to be considered
  – Port of West Sacramento is looking to use electric and zero emission vehicles and equipment wherever possible.
• Hydrogen and Fuel Cell Solutions for Ports and Maritime
  – Tri-generation systems and electrolyzers are good options for hydrogen production in ports.
  – Rail needs to be looked at more closely.
  – Hyster-Yale produces 25,000 electric vehicles a year and developed a 52 ton fuel cell electric hybrid top loader.
  – US Hybrid will be producing 12,000 fuel cell engines for China.
  – Fuel cells enable fast refueling and 24/7 operation, as well as more efficient and zero emission compared to CNG.
  – PowerCell has developed a 40 foot container housing 3MW of fuel cell power. Also has a fuel cell Class 8 truck and large forklift project which are ongoing.
Ports Workshop Discussion Topics

• Keynote – Safety Regulations, Codes and Standards for Hydrogen in the Ports and Maritime Environment
  – Building a hydrogen station to NFPA standards is less risky than a conventional gas system.

• Keynote – Opportunities and Barriers to Hydrogen Infrastructure in Ports
  – As part of ZECT II, Air Products will be refueling six drayage trucks at the Port of Long Beach; 240 kg/day by trucking multiple gas trailers filled with gaseous hydrogen.
  – With a wide variety of fuel cell applications available, the ports offer multiple customers for fueling stations.
• Government Programs and Funding Opportunities for Hydrogen Projects in Ports and Maritime
  – Large source of emissions are from ocean going vessels.
    • ARB is developing regulations to treat each vessel with same requirements.
  – CARB last year put out an Off-Road Advanced Technology Demonstration Project solicitation
  – Large amount of funds will be available in the 2017-2018 CARB Funding Plan for clean transportation incentives.
  – California Sustainable Freight Action plan was created to address numerous issues with emissions and freight efficiency throughout the State of California.
  – California passed SB1 into law on April 28, allocating $3 billion to improve trade corridors over the next decade.
• Audience Discussion Points
  – Stakeholders need to continue outreach and education efforts, encourage collaboration between policymakers and industry.
  – The industry needs to take advantage of funding opportunities, especially from the VW settlement.
  – The Bureau of Shipping has focused on LNG; other partners have been looking to hydrogen and fuel cells.
  – There is an opportunity with building ships or vehicles with electric drives that have a Genset or other generator, which fuel cells could eventually replace.
  – BMW is seeking a truck supplier as a platform to test fuel cells.
  – The business case for hydrogen production in the ports needs to be developed that addresses the permitting situation, as well as concerns from the Coast Guard.
Next Steps/Activities

- Workshop Report – Completed; Available online
- Summary of Workshop Report Webinar
- Freight Workshop – Scheduled for April 30\textsuperscript{th}, 2018 at the ACT Expo
- Distribution Center Workshop – Scheduled for May 3\textsuperscript{rd} at the ACT Expo
- Subsequent follow-up ports workshop – Fall 2018
Role of Hydrogen in the Ports

Renee Moilanen
Manager, Air Quality Practices
Port of Long Beach
Port of Long Beach
Advancing Zero Emissions

Renee Moilanen
Manager, Air Quality Practices

February 20, 2018
2017 Update Clean Air Action Plan

Zero Emissions Goal

Terminal Equipment by 2030, Trucks by 2035
Achieving this goal

Technology and Funding

Unprecedented Amount of Money in 2018
Our Team

- Environmental Planning
- Tenant Services and Operations
- Government Affairs
- Professional Grant Writers
What We Do

• Advocate for Funding
• Shape Funding Programs
• Build Competitive Projects
• Develop Partnerships
• Write Proposals
• Manage Grants
Funding Opportunities

- Demonstration of Advanced Technologies
- Deployment
- Infrastructure
- Energy
- System Efficiencies
Programs

South Coast AQMD Air Pollution Control Projects
ARB Near-Zero/Zero-Emissions Freight Facility
California Energy Commission AFRVTP
Off-Road Vouchers (ARB)
VW Settlement (ARB)
Proposition 1B (AQMD)
Carl Moyer
Diesel Emissions Reduction Act (EPA)
Targeted Air Shed Funding (EPA)
Ports Technology Advancement Program
SB 350 Transportation Electrification
Challenges

- Infrastructure
- Match funding
- Timing
Opportunities

• Technologies
• Leveraging
• Partnerships
What We’re Looking For

• “Wish Lists”
• Think Creatively
• Demonstration Partnerships
• Support Letters and Advocacy
• Education
Case Study: eRTGs

$8.8 \text{ million} - $3.4 \text{ million} = \$5.4 \text{ million} - \$4.86 \text{ million} = \$540,000 - \$470,000 = \$70,660
Funding Opportunities

Chris Jenks
Advanced Freight Technologies and Planning Unit
Fuels and Transportation Division
California Energy Commission
Advanced Freight and Fleet Technologies

Chris Jenks
Advanced Freight Technologies and Planning Unit
Fuels and Transportation Division
California Energy Commission

February 20, 2018
## Summary of MD-HD Vehicle Demonstrations

<table>
<thead>
<tr>
<th>Vehicle/Technology Type</th>
<th># of Vehicles</th>
<th>ARFVTP Funding (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium-Duty Hybrids, PHEVs and BEVs</td>
<td>166</td>
<td>$16.4</td>
</tr>
<tr>
<td>Heavy-Duty Hybrids, PHEVs and BEVs</td>
<td>78</td>
<td>$48.6</td>
</tr>
<tr>
<td>Electric Buses</td>
<td>35</td>
<td>$14.6</td>
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<tr>
<td>Natural Gas Trucks</td>
<td>51</td>
<td>$19.1</td>
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<tr>
<td>Fuel Cell Trucks and Buses</td>
<td>13</td>
<td>$14.5</td>
</tr>
<tr>
<td>Vehicle-to-Grid</td>
<td>6</td>
<td>$7.7</td>
</tr>
<tr>
<td>Off-Road Hybrids</td>
<td>2</td>
<td>$4.5</td>
</tr>
<tr>
<td>E85 Hybrids</td>
<td>1</td>
<td>$2.7</td>
</tr>
<tr>
<td>Intelligent Transportation Systems</td>
<td>110</td>
<td>$2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>462</strong></td>
<td><strong>$130.1</strong></td>
</tr>
</tbody>
</table>
Focus Areas

- MD-HD Vehicle Demonstrations
- Electric Truck Charging Standardization
- Grid Resiliency
- Clean Energy and Efficiency Measures
- Lighting Enhancements
Advanced Freight and Fleet Projects 2016-2018

- GFO-16-604 released November 2016
- Awarded $24.3 million for 3 projects
- Focused on demonstrating technologies at California Seaports
- 28 drayage trucks (20 Low NOx, 7 PHEV, 1 BEV), 15 BEV yard trucks, 3 BEV top handlers, and 9 electric RTGs
- Direct reduction of 3,900 MT CO$_2$e, 22 tons NOx, 0.4 tons PM$_{10}$ over term of projects.
- Released GFO-17-603 in December 2017
- $22 million with focus on zero-emission freight infrastructure

(Port of Long Beach)
# GFO-16-604 Project Summaries

<table>
<thead>
<tr>
<th>Recipient</th>
<th>Advanced Vehicles</th>
<th>Technology Vendors</th>
<th>Fleet Demonstrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port of Los Angeles</td>
<td>5 BEV (2 Top Handlers, 3 Yard Tractors)</td>
<td>• Taylor Machine Works, BYD</td>
<td>• Everport Terminal</td>
</tr>
<tr>
<td>Port of Long Beach</td>
<td>• 9 electric RTGs&lt;br&gt;• 12 BEV Yard Trucks&lt;br&gt;• 4 PHEV-LNG Drayage Trucks</td>
<td>• BYD&lt;br&gt;• Cavotec&lt;br&gt;• US Hybrid</td>
<td>• SSA Marine&lt;br&gt;• Long Beach Container Terminal&lt;br&gt;• Total Transportation Services</td>
</tr>
<tr>
<td>SCAQMD</td>
<td>• 20 Low NOx Drayage Trucks&lt;br&gt;• 3 PHEV-CNG Drayage Trucks&lt;br&gt;• 1 BEV Drayage Truck&lt;br&gt;• 1 BEV Top Handler</td>
<td>• Cummins Westport&lt;br&gt;• Efficient Drivetrains&lt;br&gt;• Hyster-Yale&lt;br&gt;• Wave</td>
<td>• APM Terminals&lt;br&gt;• Total Transportation Services&lt;br&gt;• Mayor Logistics&lt;br&gt;• Southern Counties Express&lt;br&gt;• Heavy Load Transfer&lt;br&gt;• Three Rivers Trucking</td>
</tr>
</tbody>
</table>
Hydrogenics FCEV Drayage Truck

Award: $2.7M; Match: $1.5M; Total: $4.2M

Description: Demonstrate Class 8 Fuel Cell drayage truck for 12 months at POLA/LB and along Alameda Corridor

Purpose: Collect performance data, validate the technical and market viability of the technology

Partners: Siemens Industry Inc. (hybrid drive technology); Actia Corporation (energy storage); Freightliner Trucks (technical assistance)

Status: Secured facility; design completed; acquired glider fuel cell support cradle assembly with thermal management system and test rig in front of DTNA glider chassis.
Questions

Chris Jenks
Air Pollution Specialist
California Energy Commission
(916) 654-4201
chris.jenks@energy.ca.gov
Leslie Goodbody
Engineer, Innovative Heavy Duty Strategies
Mobile Source Control Division
California Air Resources Board
Funding Opportunities for Hydrogen and Fuel Cells in the Ports

Leslie Goodbody, Air Resources Engineer
February 20, 2018
CARB Heavy-Duty Funding Portfolio

Today...

- Low Carbon Transportation
- Zero-Emission Warehouse Program
- Carl Moyer
- AB 617
- VW Mitigation Trust
Ongoing and Completed Projects in Ports

Green Omni Terminal - Port of Los Angeles (complete in 2020)

- $14.5 million award to the Los Angeles Harbor Dept.
- Demonstrate multiple battery electric technologies with supporting charging infrastructure
  - 4 Yard trucks
  - 2 Drayage trucks
  - 2 21-ton forklifts
  - Top handler
- At-berth vessel emission control system for CO₂, NOx, PM
- Rooftop solar to supplement power usage

For reports on completed port-related demonstration projects

- https://www.arb.ca.gov/msprog/aqip/demo.htm
Recent CARB funding for heavy-duty fuel cell technology

**Executed grant agreements:**

- Zero-Emission Bus Pilot Commercial Deployment Projects ($84M)
  - $35 million: 25 fuel cell transit buses, 2 new hydrogen stations and one upgrade
  - Demonstrate economies-of-scale cost reductions + higher throughput hydrogen refueling

**Solicitations closed with grant agreements pending**

- On-Road Advanced Technology Demonstration Projects ($17 M)
- Off-Road Advanced Technology Demonstration Projects ($17 M)

View Solicitations and lists of applicants

- [https://www.arb.ca.gov/msprog/aqip/solicitations.htm](https://www.arb.ca.gov/msprog/aqip/solicitations.htm)
FY 2017-18 Funding Plan for Clean Transportation Incentives

- $338M from Low Carbon Transportation and Air Quality Improvement Program
  - $188M Clean truck and bus vouchers (HVIP) (pg. I-77)
  - $40M Zero-Emission Off-Road Freight Voucher Project (pg. I-72)
  - $150M Zero- and Near Zero-Emission Freight Facilities Project (pg. I-67)

www.arb.ca.gov/msprog/aqip/fundplan/fundplan.htm

- FY 2018-19 Funding Plan - first workshop March 15
Clean Truck and Bus Vouchers (HVIP)

HVIP and Low NOx Engine Incentives

- FY 2017-18: $180M LCT funds for Clean Truck and Bus Vouchers (HVIP) plus $8M from AQIP exclusively for 12 liter low-NOx engines
  - Funds available on first-come, first-served basis with $35M reserved specifically for zero emission buses
  - $300,000 voucher for 40’ FCEB, with $100,000 enhancement for hydrogen infrastructure with 5 or more buses
  - $300,000 voucher for fuel cell electric trucks with similar infrastructure enhancement once they enter the market

HVIP to-date

- Over 3,100 vouchers issued for $89 million
- Eligible vehicles and current data available at CaliforniaHVIP.org

Next workgroup focusing on the charging and hydrogen fueling infrastructure enhancement, Feb. 27, arb.ca.gov/aqip
Zero-Emission Off-Road Freight Voucher Incentive Project

- $40 million from Low Carbon Transportation for zero-emission technologies
- Potential eligible equipment
  - Off-road terminal tractors
  - Large forklifts
  - TRUs, ground support equipment, and RTG cranes
- Voucher amounts off-set portion of incremental costs
- Will include enhancements for technology support costs such as infrastructure
- Next workgroup meeting/teleconference: February 21, 2018 in El Monte
  [www.arb.ca.gov/aqip](http://www.arb.ca.gov/aqip)
- Solicitation for statewide project administrator: Spring 2018
- Contact: David Eiges, [david.eiges@arb.ca.gov](mailto:david.eiges@arb.ca.gov), 626-575-6602
Zero- and Near Zero-Emission Freight Facilities Project (FY 2017-18)

- $150 million to demonstrate and deploy advanced technology, vehicles, equipment and system efficiencies at freight facilities
  - $100M from Low Carbon Transportation (AB 134) plus $50M from the Transportation Corridor Enhancement Account (SB 132)
- Supports warehouses, distribution centers, ports, freight airports and railyards
- Includes battery electric, fuel cell electric, and hybrid technologies (vehicles, equipment and infrastructure)
- Anticipated solicitation release in Spring 2018 following March workgroup
- Contact: Earl Landberg, Earl.Landberg@arb.ca.gov
Carl Moyer Funding for Hydrogen Infrastructure, Vehicles, and Equipment

- Carl Moyer program receives $69M annually to fund mobile sources and infrastructure
- Air districts determine project priority and select projects
  - On-road fuel cell vehicles
  - Off-road fuel cell equipment
  - Fueling infrastructure
- Additional Incentives Information:

  South Coast AQMD
  Mei Wang  Mwang@aqmd.gov  909-396-3257

  Bay Area AQMD
  Anthony Fournier  Afournier@baaqmd.gov  415-749-4961
Community Air Protection Program (Assembly Bill 617)

- Community-focused framework to reduce exposure in communities most impacted by air pollution
- Aligns with and builds on existing CARB programs
  - Community emissions reduction programs
  - Community-level air monitoring and enhanced reporting
  - Accelerate reductions at industrial facilities, including ports

For Concept Paper and Draft Process and Criteria for 2018 Community Selections, go to: ww2.arb.ca.gov/our-work/programs/community-air-protection-program-ab617

FY 2017-18 Funding: $250 million in clean technology incentives to support community focused immediate reductions
Future Funding - VW Environmental Mitigation Trust

$423 million for NOx mitigation (Consent Decree Appendix D)

- Discussion Document recommends a suite of measures for the Beneficiary Mitigation Plan to fully mitigate excess NOx emissions and fund zero-emission transformation in the heavy-duty sector
  - $130M for zero-emission transit, shuttle and school buses
  - $90M for zero-emission Class 8 freight and port drayage trucks
  - $70M for zero-emission freight and marine equipment
  - $60M for combustion-based freight and marine equipment when zero-emission is unavailable
  - $10M for charging/fueling infrastructure for light-duty zero-emission vehicles
  - $63M reserve for administrative costs
- Six workshops statewide in late February/early March to share Discussion Document and get stakeholder input
- Present proposed Beneficiary Mitigation Plan to CARB Board late spring 2018
Get involved...

Zero- and Near Zero-Emission Freight Facilities Project:  
Earl.Landberg@arb.ca.gov, 916-323-1384  
- Join the workgroup email list - Third workgroup teleconference in March 2018  
- Join the Team Building List - email company info and description or products/services  
- Solicitation release early Spring 2018, www.arb.ca.gov/aqip

Off-Road Freight Vouchers: David Eiges, david.eiges@arb.ca.gov, 626-575-6602  
- Next workgroup meeting, tomorrow, February 21, 2018, www.arb.ca.gov/aqip

AB 617 - contact: Melissa.Niederreiter@arb.ca.gov, 916-323-6576  
- Participate in February 2018 public workshop  
- https://www.arb.ca.gov/msprog/cap/capmtgs.htm

VW Mitigation Trust: Lisa.Williams@arb.ca.gov, 916-324-7582  
- Comment on Draft Discussion Document - via docket or mititrust@arb.ca.gov  
- Participate at a public workshop: Feb. 26 & 28, March 1, 5, 7 & 8  
- www.arb.ca.gov/msprog/vw_info/vsi/vw-mititrust/vw-mititrust.htm
Leslie Goodbody
Air Resources Engineer
Innovative Heavy Duty Strategies Section
Mobile Source Control Division
(916) 323-2961
Leslie.Goodbody@arb.ca.gov
Ask questions using the Questions Panel on the right side of your screen.

The webinar slides and recording will be made available after today. Please fill out survey upon leaving.
Thank you for attending today’s webinar and remember to fill out attendee survey. Slides and Recording will be made available within a few days.

For more information, contact:
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Ewagner@CaliforniaHydrogen.org
310-455-6095 x360
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www.CaliforniaHydrogen.org