SAN PEDRO BAY PORTS

CLEAN AIR ACTION PLAN

Status Update on Current Technology Demonstrations
October 19, 2021

Questions or comments? Chat us or submit via caap@cleanairactionplan.org

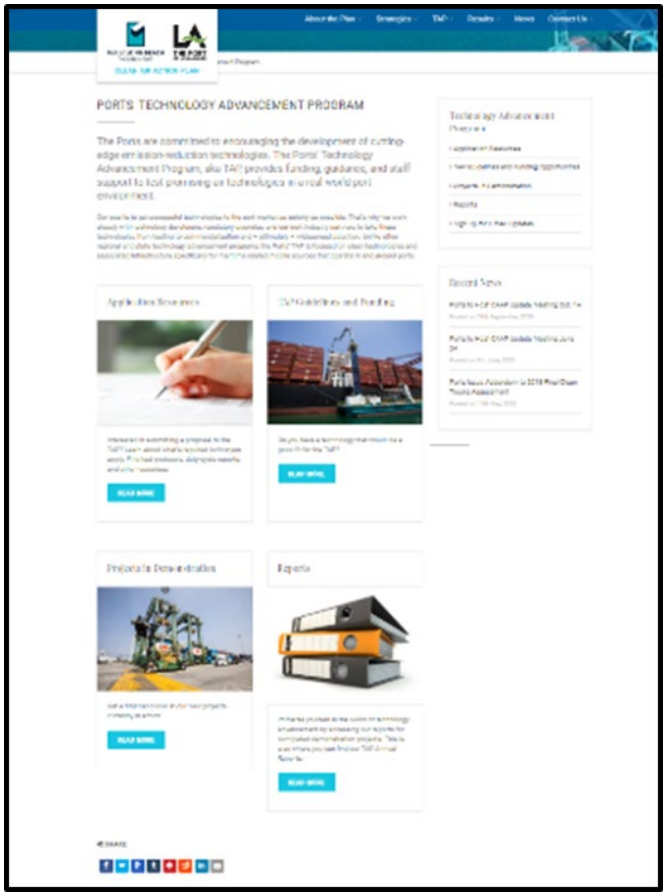
Rose Szoke, Port of Long Beach
Jacob Goldberg, Port of Los Angeles

Overview

- Ports' Technology Advancement Program (TAP) Updates
- Status of Ports' Grant-Funded Deployment and Demonstrations
- Project Challenges and Successes
- Ongoing COVID-19 Impacts

TAP: Concept Paper/Proposal Status

- TAP Open *Request for Information*
- Since January 2021, the TAP has received a total of six new project concepts.



PASHA LNG/Diesel Dual-Fuel OGV Demonstrations

- Project demonstrations in partnership with PASHA Hawaii, LLC
- Two separate projects
  - 2 new build vessels
  - 1 repowered vessel
- 1 new build slated for delivery December 2021

SCAQMD OGV Water-in-Fuel Demonstration

- Project partners include SCAQMD, MAN Energy Solutions, and MSC.
- Demonstration of water-in-fuel retrofit technology on a main engine
- *MSC Anzu* expected to be commissioned by the end of the year

Nett Technologies Harbor Craft BlueMAX™ Demonstration

- Project partners include Nett Technologies and Pacific Tugboat
- Demonstration of the BlueMAX™ NOVA 320e retrofit emission control system on a tug boat
- System was installed and commissioned in July 2021
- Collection of durability hours underway

Ports Grant-Funded Demonstrations and Deployments

- Ports have been awarded a combined **$144 M** to support the advancement of technology.
- This includes a total of **27 near-ZE** and **107 ZE** equipment, heavy-duty trucks, ships and harbor craft.

Ports Grant-Funded Demonstrations and Deployments

Since the 2017 CAAP Update, the Ports have supported the commissioning and deployment of the following combined units:

- 2 Tier 3 ships
- 4 near-zero electric trucks
- 5 eRTG cranes
- 5 battery-electric top handlers
- 12 zero-emission trucks
- 13 battery-electric yard tractors
- 20 near-zero natural gas yard tractors

Project Challenges

- Issues with ZE port equipment unable to hold a charge or unable to complete the required number of shifts at terminals.
- ZE trucks are experiencing power loss, stalling demonstration progress.
- Infrastructure hurdles remain
  - Permitting
  - Timelines
  - Unforeseen Costs

Project Successes

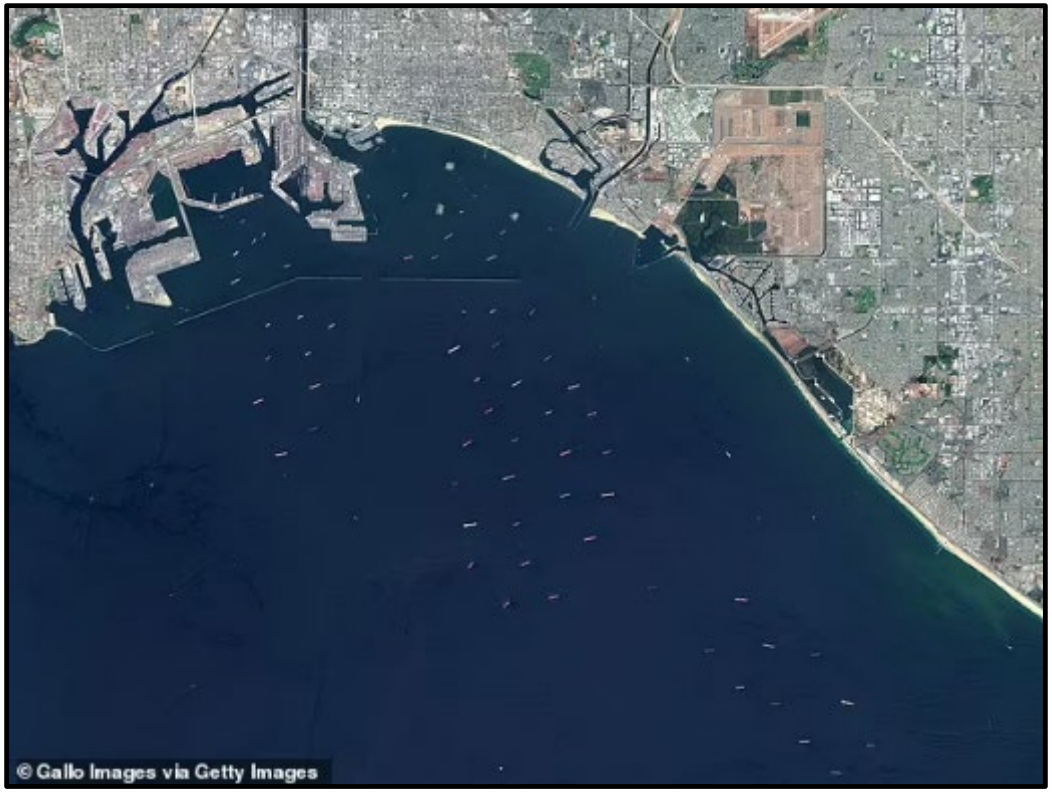
- POLA:
  - Shore to Store Project has deployed all 10 hydrogen drayage trucks
  - Broke ground on wireless charging infrastructure for ZE yard tractors at WBCT
- POLB:
  - Completed the CARB C-Port Project with all demonstration units currently performing revenue service at SSA and LBCT
  - All four LNG plug-in hybrid electric trucks have been delivered to TTSI for drayage service
  - Six grid-powered eRTGs have been commissioned at SSA

Completed Grant-Funded Demonstrations

- POLA has completed the following demonstrations to-date:
  - 2 Taylor/BYD battery-electric top handers (Everport)
  - 5 BYD battery-electric yard tractors (Everport)
  - 20 Capacity near-zero natural gas yard tractors (Everport)
- POLB has completed the following demonstrations to-date:
  - 1 Kalmar/TransPower battery-electric yard tractor (LBCT)
  - 3 Taylor/BYD battery-electric top handlers (SSA, LBCT)
  - 6 BYD battery-electric yard tractors (ITS)
  - 1 BYD battery-electric yard tractor with Cavotec smart-charging (ITS)

Ongoing COVID-19 Impacts

- Travel restrictions
- Permit approvals taking longer than normal
- High cost of commodities
- Long lead times for parts



Contacts/Information

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- Rose Szoke, Port of Long Beach: rose.szoke@polb.com

- www.cleanairactionplan.org
- www.polb.com/zeroemissions
- https://www.portoflosangeles.org/environment/air-quality/zero-emissions-technologies

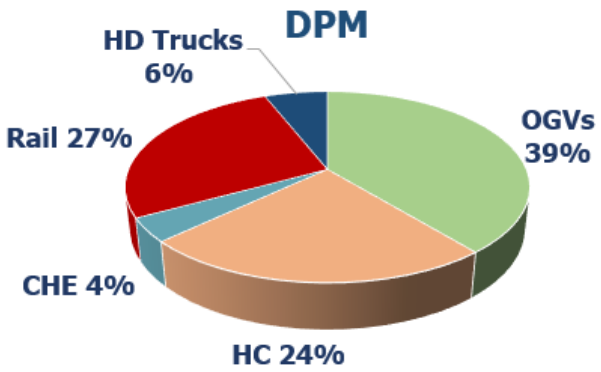

Thank you!

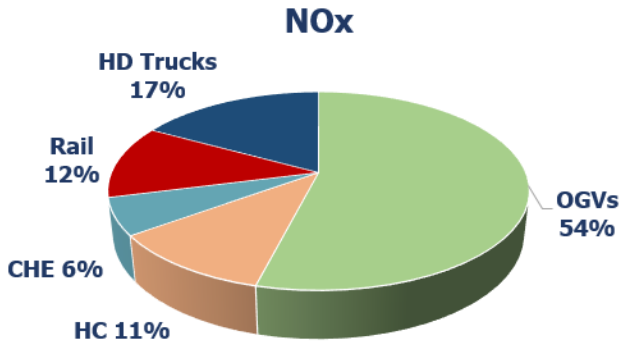
Status Update on CAAP Ocean-Going Vessel Measures & Efforts

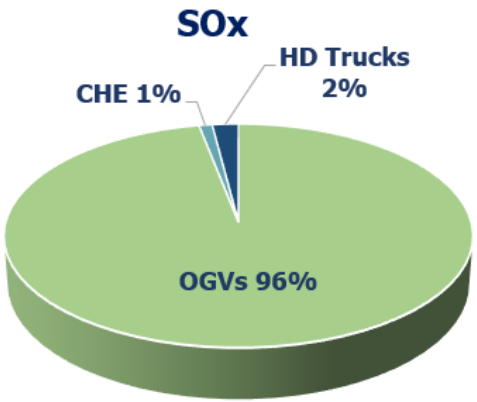
October 19, 2021

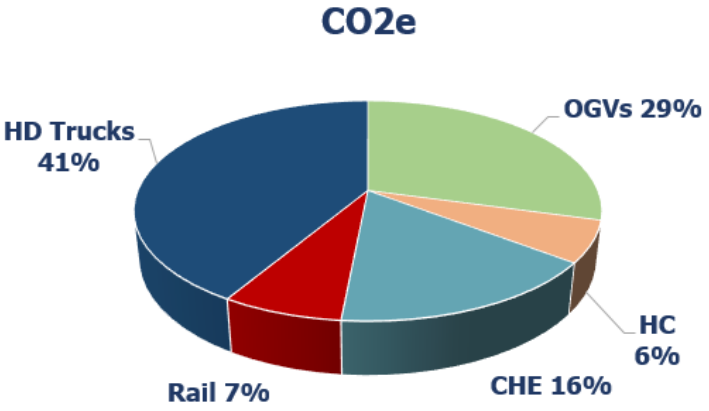
Morgan Caswell, Port of Long Beach
Teresa Pisano, Port of Los Angeles

OGV Emissions in 2019









2019 OGV Emissions Reductions

Diesel Particulate Matter

DOWN

90%

Nitrogen Oxides

DOWN

44%

Sulfur Oxides

DOWN

97%

Greenhouse Gases

DOWN

29%

UP **20%** TEUs

*Compared to 2005 Levels

Container Throughput & Vessel Call Comparison

	2005 vs. 2019
Container Throughput (TEUs)	↑ 20%
Containers (TEUs) per call	↑ 72%
Containership Arrivals	↓ 30%

Near-Term OGV Strategies

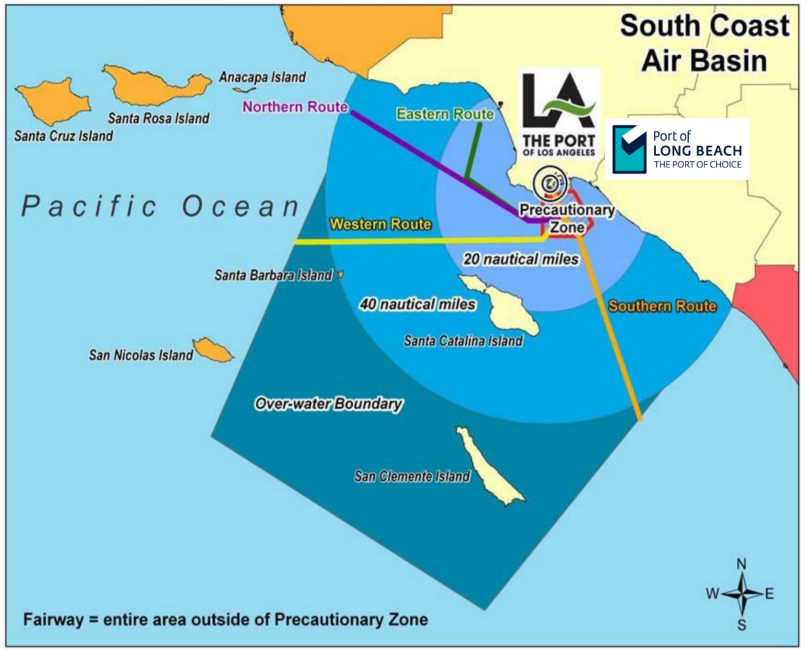
- Vessel Speed Reduction (VSR) Programs
- Ship Incentive Programs
- Technology Advancement Program (TAP) Demonstrations
- Vessels At Berth

For more details: https://cleanairactionplan.org/

Vessel Speed Reduction Programs

❖ **Objective:** reduce emissions from OGVs by lowering speeds as vessels approach or depart the Ports.

- ≤ 12 knots at 20nm or 40 nm from Point Fermin
- ≥ 90% fleet compliance earns rebate on dockage fees
  - 40nm
  - 20nm
- 96% participation within 20nm and 92% participation within 40nm in 2020



Ship Incentive Programs

❖ **Objective:** reduce emissions from OGVs through per-call incentives to attract cleaner ships.

Environmental Ship Index

- Participation in IAPH ESI
  - Score 40-49: $750/call
  - Score ≥50: $2,500/call
- IMO Tier III: $5,000/call

Green Ship Incentive Program

- Participation in IAPH ESI
  - Score 25-47: $600/call
  - Score 48-53: $3,000/call
  - Score ≥ 54: $6,000/call
- IMO Tier III: $3,000/call

Ocean-Going Vessel Demonstrations

- **Technology Advancement Program**
  - SCAQMD Water-in-Fuel Demonstration
  - Pasha LNG/Diesel Dual-Fuel Demonstration
- **Grant-funded**
  - Port of Long Beach START project

Vessels at Berth

- CARB Ocean-Going Vessels At Berth Regulation
  - Board approved in August 2020
  - Expands requirements for regulated fleets and includes new vessel categories, including RoRo and tanker vessels
  - Requires submission of Terminal and Port Plans by December 1, 2021
- Efforts Underway
  - Ongoing engagement with terminal operators and other stakeholders regarding Terminal Plan/Port Plan development
  - Draft plans are underway

Next Steps

- Continue evaluation of vessel incentive programs
- Support Terminal Plans and develop Port Plans to comply with the CARB At Berth Regulation
- OGV demonstration projects


Thank you!

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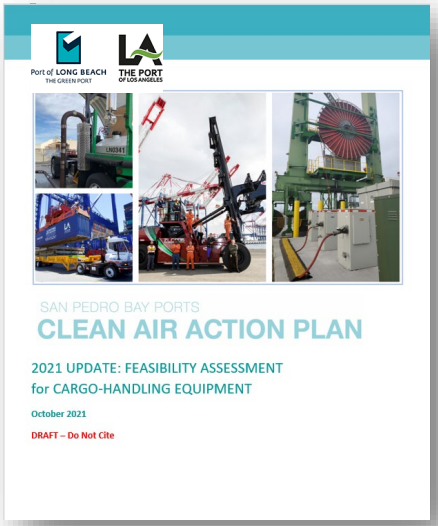


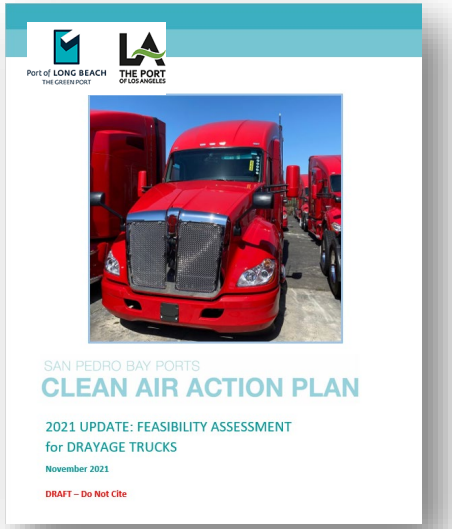
Port of LONG BEACH
THE GREEN PORT

THE PORT OF LOS ANGELES

Status Update:

2021 FEASIBILITY ASSESSMENTS for CARGO-HANDLING EQUIPMENT and DRAYAGE TRUCKS

October 2021



Presented at the CAAP Stakeholder Implementation Meeting

Patrick Couch / Jon Leonard
Gladstein, Neandross & Associates

October 19, 2021

GLADSTEIN, NEANDROSS & ASSOCIATES

TETRA TECH

Feasibility Assessment: Structure

- 2021 Assessments **build upon and update** original (2018) Feasibility Assessments
- Continue to follow Ports' November 2017 "Framework" document
- Emerging **ZE** and **NZE** fuel-technology platforms are evaluated according to the following five basic parameters:
  1. Technical Viability
  2. Commercial Availability
  3. Operational Feasibility
  4. Availability of Infrastructure and Fuel
  5. Economic Workability

Feasibility Assessment: Structure (continued)

- **Breadth of Application** – Capability for widespread deployment
- **Timeframe** - 2021 to 2024
- **Fuel-Technology Platforms**
  1) Advanced diesel combustion
  2) Natural gas combustion
  3) Other combustion (e.g., propane)
  4) Hybrid-electric platforms (may include combustion)
  5) Pure battery-electric (or grid-electric) systems
  6) Hydrogen fuel cell
- **Sources of Information Used**

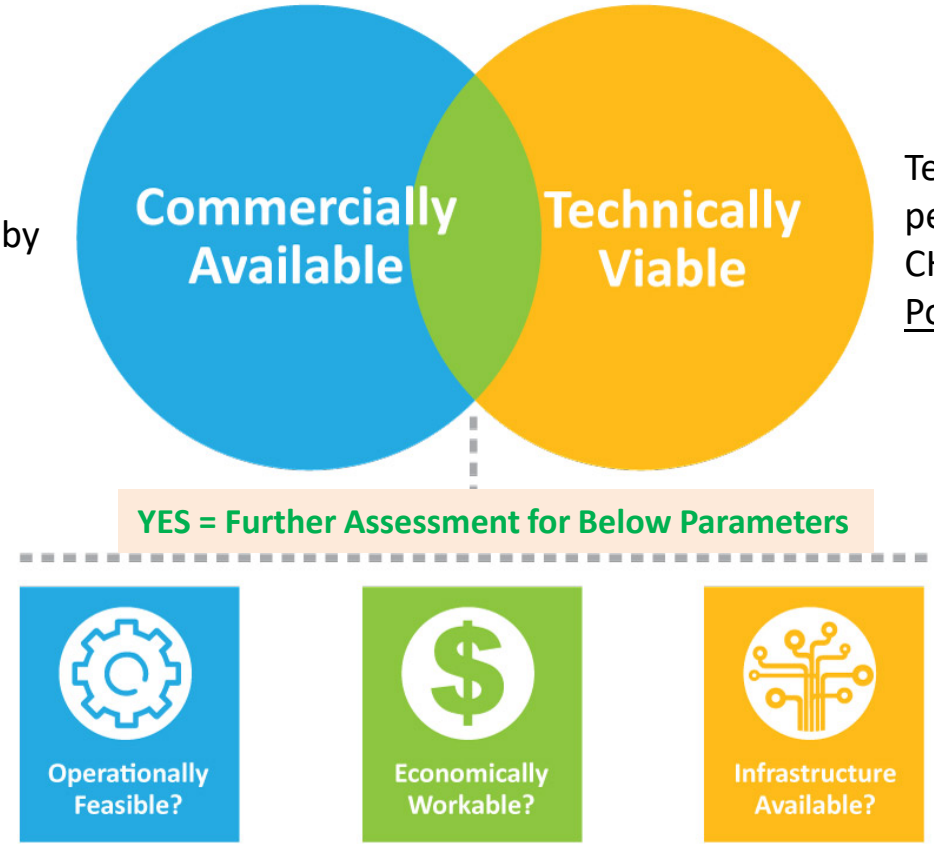
✓Technical reports, papers and literature resources

✓Key agencies (ARB, CEC, AQMD, Ports)

✓Surveys

Basic Screening Methodology:

Currently available for commercial sale by capable OEM(s)?



Technically capable of performing service (drayage or CHE) specifically at the SPB Ports?

Overall Status / Schedule
(Both 2021 Assessments)

- **Completed:** extensive info gathering / interviews with dozens of stakeholders to **capture verifiable updates**
  - ✓ Manufacturers and Technology Partners (CHE and Class 8 Drayage Truck)
  - ✓ End Users (MTOs and Drayage Fleets, Trade Associations, etc.)
  - ✓ Fuel / Energy / Infrastructure Providers
  - ✓ Regulators (CARB, SCAQMD, etc.)
  - ✓ Public Information and Literature
- **Completed:** documentation of important advancements and milestones since 2018
- **Status:** both 2021 Assessment updates (CHE, Drayage) in writing stages
- **Release Plan:** on track to distribute both drafts in late 2021 for public review
  - ✓ CHE Assessment released first
  - ✓ Drayage Assessment will follow

New for 2021 Feasibility Assessment Updates:
"Pie" Charts Clearly ID Key Areas of Progress Since 2018

Illustrative Example Only

2021 Updates:

- Emphasis *on major progress for overall feasibility* of **ZE** platforms
- Pie charts from 2018 Assessments are being updated
- **Blue pie wedges** clearly ID progress from 2018
- Same method for four feasibility parameters:
  - ✓ Commercial Availability
  - ✓ Operational Feasibility
  - ✓ Infrastructure Availability
  - ✓ Economic Workability
- Tech Readiness (TRL rating) doesn't use pie chart system (progress described in narrative)

"Commercial Availability" Criteria	Base Considerations for Assessing "Commercial Availability"	Truck or CHE Platform: Achievement of Criteria in 2021 by Type of ZE or NZE Fuel-Technology Platform				
		Type 1	Type 2	Type 3	Type 4	Type 5
Production and Sales with Major OEM Involvement	Production and full certification by either a major CHE OEM, or by a proven technology provider that has partnered with the major OEM.					
Proven Network / Capabilities for Sales, Service, Parts and Warranty	Demonstrated existing (or near-term planned) network of sufficient dealerships to sell, service, warranty and provide parts for all commercially deployed CHE of this type					
Sufficient Means and Timeline for Production	Demonstrated capability to manufacture sufficient numbers of CHE (suitable for SPBP MTOs) within timeline to meet existing or expected demand.					
Existence of Current and/or Near-Term Equipment Orders	Demonstrated backlog of orders, or credible expression of interest from prospective customers to submit near-term orders.					

Legend: Commercial Availability (2021)

Source of Ratings: based on OEM survey responses, OEM product information, various government sources, and consultant's site visits to San Pedro Bay Ports Marine Terminal Operators.

2021 **CHE** Assessment Update

- 4 CHE types (diesel / ~90% of Ports inventory):
  - ❖ Yard Tractors
  - ❖ RTG Cranes (RTG)
  - ❖ Top Handlers
  - ❖ Large-Capacity Forklifts

Yard Tractors

- **ZE Battery Electric**: emerging from pre-commercial into early commercial products
- **ZE H2 Fuel Cell**: proof-of-concept demos underway by OEMs with tech partners
- **NZE Natural Gas ICE**: multiple OEMs offer commercial units as option (special order)

RTG Cranes

- **ZE Grid-Electric**: multiple deployments of commercial conversions underway
- **NZE Diesel Hybrid**: dozens of deployments; OEMs have further improved emissions

Top Handlers and Large-Capacity Forklifts

- **ZE Battery-Electric**: pre- and early commercial demonstrations underway
- **ZE H2 Fuel Cell**: proof-of-concept development by OEMs (with tech partners)

ZE battery-electric yard tractor

ZE H2 fuel cell yard tractor

ZE grid-electric rubber-tired gantry crane

ZE battery-electric top handler

ZE H2 battery-electric large-capacity forklift

2021 Drayage Truck Assessment Update

Key development since '18: OEM advancement of ZE platforms

ZE Battery-Electric Trucks:

- Multiple Class 8 OEMs will initiate small-volume manufacturing in 2022
- Demonstrations continue; completions are very important
  - Initial demos: promising results, some challenges emerged
  - Larger demos: underway or in planning
- Ports, CARB, CEC and SCAQMD launching 36-month "JETSI" program ("at scale")
  - 2 leading Class 8 truck OEMs
  - 100 battery-electric trucks
  - 2 major drayage fleets

ZE Hydrogen Fuel Cell Trucks:

- OEM advancements
- At least 10 pre-commercial units in demo

NZE Natural Gas Trucks:

- Fully commercial options, multiple OEMs

ZE battery-electric Class 8 trucks

ZE fuel cell Class 8 trucks

NZE natural gas Class 8 truck

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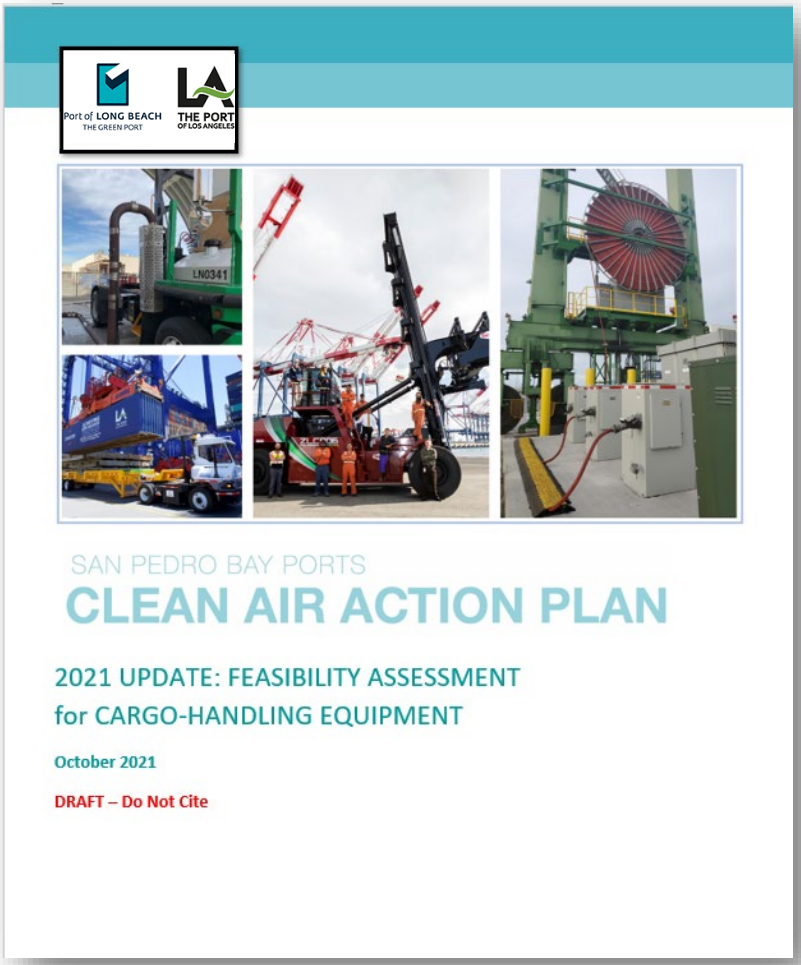
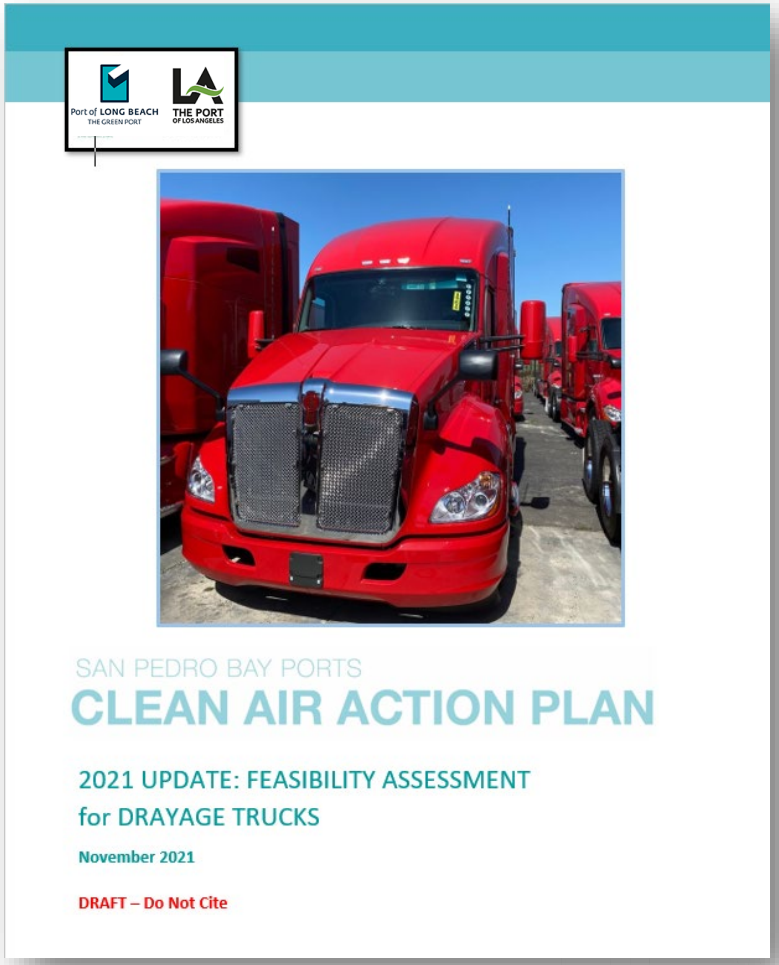
Thank You!





Clean Truck Fund Rate

Tariff Considerations and Proposed Incentive Program

CAAP Stakeholder Update Meeting
October 19, 2021

Clean Trucks Program

CAAP Goal of 100% Zero Emission Trucks by 2035

Objectives:

- Reduce emissions to improve community health, meet criteria pollutant and greenhouse gas reduction goals
- Minimize economic impacts and disruption
- Utilize Port's authority within our jurisdiction

Joint Port Trucks Today*

- 19,994 trucks are in the Port Drayage Truck Registry (PDTR)
- 9,384 2014+ trucks registered in the PDTR and make 48% of moves
- 70% of trucks in the PDTR have engines meeting 2010 EPA standards
- 30% of trucks in the PDTR are engine year 2007-2009
- 911 LNG/CNG trucks are in the PDTR and perform 5% of moves
- 193 trucks with the Cummins natural gas fueled 0.02g/bhp-hr NOx engines are in the PDTR
- 28 Zero Emission (battery-electric) trucks in the PDTR

* Snapshot from August 2021

CTF Rate as described in the 2017 CAAP Update

"Beginning in 2020, a Clean Truck Fund (CTF) Rate will be charged to the beneficial cargo owners that move loaded containers in and out of port terminals with trucks that do not have CARB-certified low NOx engines or better." **Contingent on:**

- Truck Feasibility Assessment, including evaluation of availability of trucks – ***Completed April 2019, Amended May 2020***
- Clean Truck Rate Economic Study – ***Completed February 2020***
- CARB low NOx manufacturing standard – ***Adopted August 2020***
- Establishment of rate collection mechanism – ***Estimated completion March 2022***

Approach for Developing the CTF Rate

- 2017 CAAP Update Discussions
- Stakeholder input on CTP Concept, including Rate
- Special Studies
- Joint Board approval of CTF Rate Resolution
- Continued Stakeholder Input
- Board Direction on Exemptions
- Public Workshops and Meetings
- Board Consideration of Tariff and Incentive Priorities

Proposed Amendment to Tariff

- Starting April 1, 2022, charge $10 per loaded TEU or $20 per loaded FEU
  - Charged to BCOs for loaded containers hauled by truck
  - Zero emission trucks exempt
  - Exemption for low NOx trucks through end of 2027 (POLA) and through the end of their useful life (POLB), if put into Ports service and added to the Port Drayage Truck Registry (PDTR) by end of 2022
- Potential to generate approximately $90 million per year initially (both ports combined)

How will the CTF Rate funds be used?

- 2017 CAAP Update commitment to use the funding for truck initiatives

- Small amount to cover administrative expenses

Proposed Incentive Approach

- Ports will develop incentive programs (e.g. grants and/or lease subsidies) and spending priorities with input from stakeholders and direction from their Boards
- Consistent funding amounts as other agency grants (e.g. HVIP, Prop 1B, etc.)
- Must be in Port Drayage Truck Registry (PDTR)
- Ports will explore trade down replacement option
- Priority selection of replacement trucks that will achieve the greatest emission reductions, for example:
  - History of more frequent calls
  - Replacement of oldest, dirtiest trucks (i.e. MY2007 – 2009)

POLB Proposed Funding Priorities

- Prioritize early emission reductions
  - Allow funding from program launch through end of 2023 to provide up to 90% of funds to Low NOx trucks and at least 10% for ZE trucks
- Board to review ongoing priorities
  - Anticipate transition by 2024 to focus on incentives for ZE trucks
  - Future prioritization review to include consideration of Truck Feasibility Assessment, incentive demand and allocations, and review of regulatory requirements

POLA Proposed Funding Priorities

- 100% of net revenues from CTF Rate will be used in support of ZE trucks
- Annual review of rate efficacy and spending plan

CTF Rate Next Steps

- Following Board action, stakeholder outreach related to launch of CTF Rate and Incentives
- Secure third-party administration of the incentive funds and finalize program details
- Finalize Rate Collection Mechanism
- Begin collection of the CTF Rate on 4/1/22 and launch incentive program
- Regular reporting to Board to monitor progress and evaluate the CTF Rate and Incentive Program


Thank you!