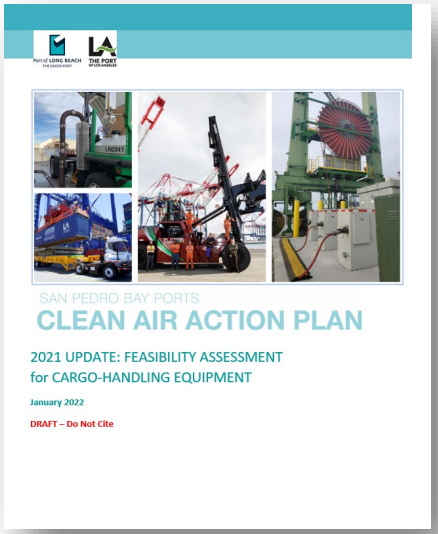
SAN PEDRO BAY PORTS

CLEAN AIR ACTION PLAN



Port of LONG BEACH
THE GREEN PORT

THE PORT OF LOS ANGELES

UPDATE:

2021 FEASIBILITY ASSESSMENT for Drayage Trucks

October 2022

Patrick Couch
Gladstein, Neandross & Associates

October 12, 2022

GLADSTEIN, NEANDROSS & ASSOCIATES

TETRA TECH

Feasibility Assessment: Structure

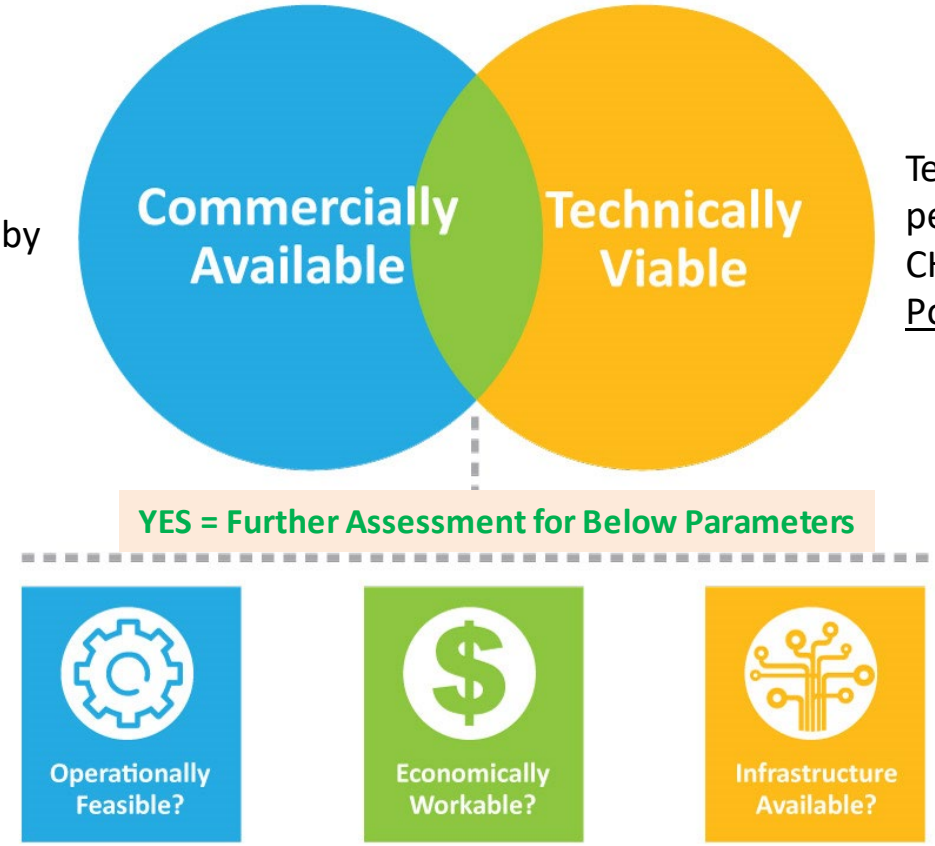
- 2021 Assessment **builds upon and updates** original (2018) Feasibility Assessment
- Continue to follow Ports' November 2017 "Framework" document
- Emerging **ZE** and **NZE** fuel-technology platforms are evaluated according to the following five basic parameters:
  1. Technical Viability
  2. Commercial 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?

TRL does not, by itself, determine feasibility

2021 Drayage Truck Assessment Update

Key development since '18: OEM advancement of ZE platforms

ZE Battery-Electric Trucks:

- Seven (7) Class 8 OEMs offer commercial platforms with increasing production in 2022
- Demonstrations continue; completions are very important
  - Initial demos: promising results, some challenges emerged
  - Larger demos: underway or in planning
- 2022 NACFE Run on Less demonstrations largely support Assessment's operational assumptions for BE trucks.

ZE Hydrogen Fuel Cell Trucks:

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

NZE Natural Gas Trucks:

- Fully commercial options, multiple OEMs
- Primary remaining challenge is modest incremental TCO to baseline

ZE battery-electric Class 8 trucks

ZE fuel cell Class 8 trucks

NZE natural gas Class 8 truck

2021 **Drayage Truck** Assessment Update

Drayage Truck Progress Since 2018

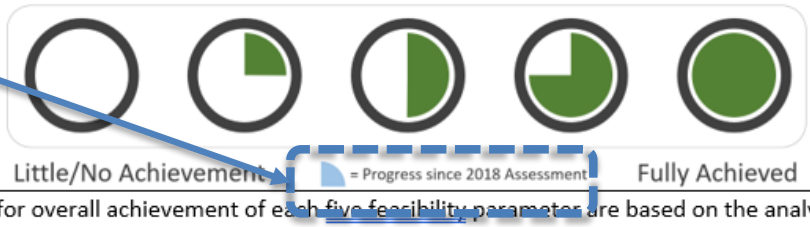
Preliminary Results

2021 Updates:

- Progress toward *overall feasibility*
- Battery-electric trucks TRL 7-8. Anticipated TRL 9 by 2024 for short range drayage.
- NZE Natural Gas likely to be considered sufficiently feasible to remove from future assessments
- **Blue pie wedges** identify progress from 2018
- Update of NZE term to Low Emission (LE) for consistency with ACT/Low NOx Omnibus

Feasibility Parameter / Criteria	Overall Achievement* of Criteria in 2021 (Commercially Available / Technically Viable Truck Platforms)	
	ZE Battery-Electric	LE NG ICE
Commercial Availability		
Technical Viability	TRL 7 to 8 (moving to 9) (for short-range drayage)	TRL 9
Operational Feasibility		
Infrastructure Availability		
Economic Workability		

Legend: Achievement of Each Noted Parameter / Criteria **(2021)**



*These ratings for overall achievement of each five feasibility parameter are based on the analysis of several criteria within that parameter. Because each criterion is important for the success of a given fuel-technology platform in drayage, the overall achievement ratings are based on the lowest criterion score for each feasibility parameter.

2021 **DRAYAGE** Assessment Update

Operational Feasibility Detail

Preliminary Results

2021 Updates:

- NGVs considered to "fully achieve" Operational Feasibility for most drayage applications.
- BE drayage truck range has increased significantly since the 2018 Assessment
- BE charging rates of 150-250 kW are an improvement over the 2018 Assessment
- Availability of BE Class 8 products from major OEMs (Daimler, Volvo, PACCAR) and support by major local dealerships (VVG, TEC, Rush)

Operational Feasibility Criteria/Parameter	Base Considerations for Drayage Platforms to Achieve Operational Feasibility	Achievement of Criteria for Remaining Drayage Truck Platforms	
		ZE Battery-Electric	LE NG ICE
Basic Performance	Demonstrated capability to meet drayage company needs for basic performance parameters including power, torque, gradeability, operation of accessories, etc.		
Range	Demonstrated capability to achieve per-shift and daily range requirements found in San Pedro Bay drayage.		
Speed and Frequency of Fueling/Charging	Demonstrated capability to meet drayage company needs for speed and frequency to refuel / recharge such that revenue operation is not significantly reduced relative to diesel baseline.		
Driver Comfort, Safety, and Fueling Logistics	Proven ability to satisfy typical drayage trucking company's needs for comfort, safety and refueling procedures.		
Availability of Replacement Parts and Support for Maintenance/Training	Verifiable existence of and timely access (equivalent to baseline diesel) to all replacement parts needed to conduct scheduled and unscheduled maintenance procedures.		
	Verifiable existence of maintenance procedure guidelines and manuals, including OEM-provided training courses upon purchase and deployment of new trucks.		

Legend: Operational Feasibility **(2021)**

Little/No Achievement = Progress since 2018 Assessment Fully Achieved

Source: Based on Drayage Truck Operator Survey responses, footnoted studies, OEM product information, and consultant's industry knowledge.

2021 **DRAYAGE** Assessment Update

Infrastructure Availability Detail

Preliminary Results

2021 Updates:

- Improved harmonization around the CCS-1 standard for BE trucks. MCS evolving new capability but represents a new standard.
- Recognized ability of NG infrastructure to build out at pace with NGV deployments.

Infrastructure Criteria/Parameter	Base Considerations for Assessing Infrastructure Availability	Achievement of Criteria for Remaining Drayage Truck Platforms	
		ZE Battery-Electric	LE NG ICE
Dwell Time at Station	Fueling/Charging can be accommodated within typical work breaks, lunches, other downtime compatible with trucking company schedules and operational needs.		
Station Location and Footprint	Fleets have existing onsite access to fueling infrastructure, or can be fueled/charged conveniently and affordably off site, at public or private stations. New infrastructure can be installed without extensive redesign, reconfiguration or operational disruptions and there is sufficient electrical or natural gas capacity at the site.		
Infrastructure Buildout	Infrastructure can be constructed at a pace consistent with fleet adoption and able to meet fleet fueling/charging requirements by the end of the assessment period.		
Existence of/Compatibility with Standards	A sufficient body of codes and standards exist from appropriate organizations that enables safe and effective refueling/recharging. The refueling/recharging station technology has already been installed at other trucking companies in the U.S., with sufficient time to assess performance and safety.		

Legend: **Infrastructure Availability (2021)**

Source: based on preliminary OEM survey responses, OEM product information, various government sources, and Tetra Tech team's industry knowledge.

2021 **DRAYAGE** Assessment Update

Economic Workability Detail

Preliminary Results

2021 Updates:

- BE drayage truck costs have not decreased, although capability (range) has increased.
- Base case for determining ratings remains a "no purchase incentives" case
- No changes "pie" ratings since 2018 Assessment

Economic-Related Criteria/Issue	Base Considerations for Assessing General Economic Workability	Achievement of Criteria for Remaining Drayage Truck Platforms	
		ZE Battery-Electric	LE NG ICE
Incremental Vehicle Cost	The upfront capital cost for the new technology is affordable to end users, compared to the diesel baseline.		
Fuel and Other Operational Costs	The cost of fuel/energy for the new technology is affordable, on an energy-equivalent basis (taking into account vehicle efficiency). Demand charges/TOU charges (if any) are understood and affordable. Net operational costs help provide an overall attractive cost of ownership.		
Infrastructure Capital and Operational Costs	Infrastructure-related capital and operational costs (if any) are affordable for end users.		
Potential Economic or Workforce Impacts to Make Transition	There are no known major negative economic and/or workforce impacts that could potentially result from transitioning to the new equipment.		
Existence and Sustainability of Financing to Improve Cost of Ownership	Financing mechanisms, including incentives, are in place to help end users with incremental vehicle costs and/or new infrastructure-related costs, and are likely remain available over the next several years.		

Legend: Economic Workability **(2021)**

Source: based on preliminary OEM survey responses, OEM product information, various government sources, and Tetra Tech team's industry knowledge.

2021 **Drayage** Assessment Public Comments

Public Comments Received

- Written comments from: SCAQMD, LACI, Impact Project, Hyzon and Air Products
- Topics receiving multiple comments:
  - Modify / augment assessment with focus on policy roadmap that will help accelerate ZE drayage truck deployments (per CAAP / regional / state goals)
  - Remove low-emission truck platforms from future Assessments (CARB regulated out of operation, stranded assets, etc.)
  - Focus future assessments solely on ZE truck architectures, and restructure to a comparative analysis (BETs and H2 FCTs)
  - Update Assessment (out-of-date) to reflect important 2022 OEM advancements with ZE architectures (especially BETs)
  - Augment / revise Assessment's analysis to:
    - Accentuate that ZE trucks are already "feasible" for certain drayage applications; highlight that short-range BETs already have achieved overall feasibility to meet a significant subset of existing SPBP drayage applications
    - Remove existing focus on whether ZE trucks can immediately serve as 1:1 replacements for diesel trucks

2021 **Drayage** Assessment Public Comments (**cont'd**)

- Areas of significant debate amongst public comments received:
  - Inclusion of grants and overall TCO analysis
  - Role of / efficacy of hydrogen fuel cell trucks
    - Include a "full feasibility analysis" for H2 FC trucks, given growing OEM interest and activities
    - Highlight advantages of FC trucks in areas where BETs are challenged
    - De-emphasis of H2 FC trucks and reductions in Feasibility Ratings

Overall Status / Next Steps
(2021 Drayage Assessment)

- **Completed:** extensive info gathering / interviews with dozens of stakeholders to **capture verifiable updates**
  - ✓ Information gathering with stakeholders
    - ✓ Manufacturers and Technology Partners
    - ✓ End Users (Drayage Fleets, Trade Associations, etc.)
    - ✓ Fuel / Energy / Infrastructure Providers
    - ✓ Regulators (CARB, SCAQMD, etc.)
    - ✓ Public Information and Literature
  - ✓ First full draft
  - ✓ Third party review of draft
  - ✓ Released for Public comment
- **Next Steps:** Review public comment and prepare final release

SAN PEDRO BAY PORTS

CLEAN AIR ACTION PLAN

Thank You!

SAN PEDRO BAY PORTS

CLEAN AIR ACTION PLAN

Update on Clean Truck Program Implementation

Leela Rao – Port of Long Beach
Environmental Specialist

Amber Coluso – Port of Los Angeles
Air Quality Environmental Specialist

CAAP Stakeholder Implementation
October 12, 2022

Joint Port Trucks Today*

- 23,078 trucks are in the Port Drayage Truck Registry (PDTR)
- 11,538 2014+ trucks registered in the PDTR and make 63% of moves
- 80% of trucks in the PDTR have engines meeting 2010 EPA standards
- 20% of trucks in the PDTR are engine year 2007-2009
- 854 LNG/CNG trucks are in the PDTR and perform 5% of moves
- 390 trucks with the Cummins natural gas fueled 0.02g/bhp-hr NOx engines are in the PDTR
- 38 Zero Emission (35 battery-electric, 3 Hydrogen Fuel Cell) trucks in the PDTR

* Snapshot from August 2022

Clean Truck Fund Rate

- Boards of Harbor Commissioners approved the Clean Truck Fund (CTF) Rate in November 2021.
- Collection began at both Ports on April 1, 2022
- Charge $10 per loaded TEU or $20 per loaded FEU
  - Charged to BCOs or their specified agents for loaded containers hauled by truck
  - Zero-emission trucks are exempt
  - Port-specific exemptions for low NOx trucks

Current CTF Rate Status

- Collection mechanism did not cause any major delays to port operations
- Approximately $3-4 million collected by each port monthly
- Ports have not heard of any incidents of the rate being passed along to drivers
- Drivers are encouraged to contact the Ports with any comments or concerns
  - By email at : caap@cleanairactionplan.org
  - By phone at : (866) 721-5686.

How will the CTF Rate funds be used?

- Potential to generate approximately $90 million per year initially (both Ports combined)
  - About $19M from POLB and $19M from POLA April-August
- 2017 CAAP Update commitment to use the funding for truck initiatives
- Small amount to cover administrative expenses
- Both Ports received approval of their spending plans from respective Boards on March 24

CTF Rate Revenue Spending Priorities

- Both Ports prioritizing zero emission truck vouchers in Year 1
- Smaller portion of Year 1 funds to go to early truck deployment projects
- POLB to also fund zero emission infrastructure with a portion of Year 1 funds
- POLA is funding some zero emission infrastructure through the early truck deployment projects
- Year 2+ spending priorities to be taken for Boards' consideration in 2023

ZE Truck Voucher Incentive Program

- On September 12, 2022, POLA released an initial $5 million for vouchers through the CARB Hybrid and Zero Emission Truck and Bus Voucher Incentive Project (HVIP)
  - $150,000 per truck for currently listed HVIP approved ZE trucks
  - Potential for up to $300,000 per truck for more expensive technology advancements or to match any changes to HVIP funding
  - Truck purchasers can find a participating dealership at the HVIP website: **https://californiahvip.org/**
- Currently no vouchers issued on POLA funds; CARB has ~$20M in HVIP funds remaining as well
- Both Ports to issue a larger second round of vouchers in the future

POLA Early ZE Truck Deployment

- POLA released a RFP in late 2021 for 10 or more ZE trucks and associated infrastructure to be deployed before the end of 2022
- POLA plans to award 3 of the proposals for a total of $9 million pending future Board approval later this fall
- Total of 42 trucks

POLB Public Charging Infrastructure

- Completed the Public Truck Charging and Fueling Assessment in September 2021
- Issued a Request for Information (RFI) in February 2022 to obtain information on potential development of the “Tier 1” sites identified in the Assessment
  - Received 17 responses, indicating significant interest from the private sector to build public truck charging facilities
  - A summary of the findings can be found on our website at polb.com/zeroemissions
  - The Port is exploring issuance of RFP(s) for two sites as a next step

POLB EVITP Policy

- POLB Board will consider adopting a new policy in Q4 2022 that will require zero-emission vehicle infrastructure projects funded by POLB to use Electric Vehicle Infrastructure Training Program (EVITP) approved contractors
  - Expected to be effective January 1, 2023
  - Will apply to CTF Rate dollars and TAP funds
  - Shall not apply to projects for ZE vehicles only, infrastructure maintenance, or funding administered through a third party

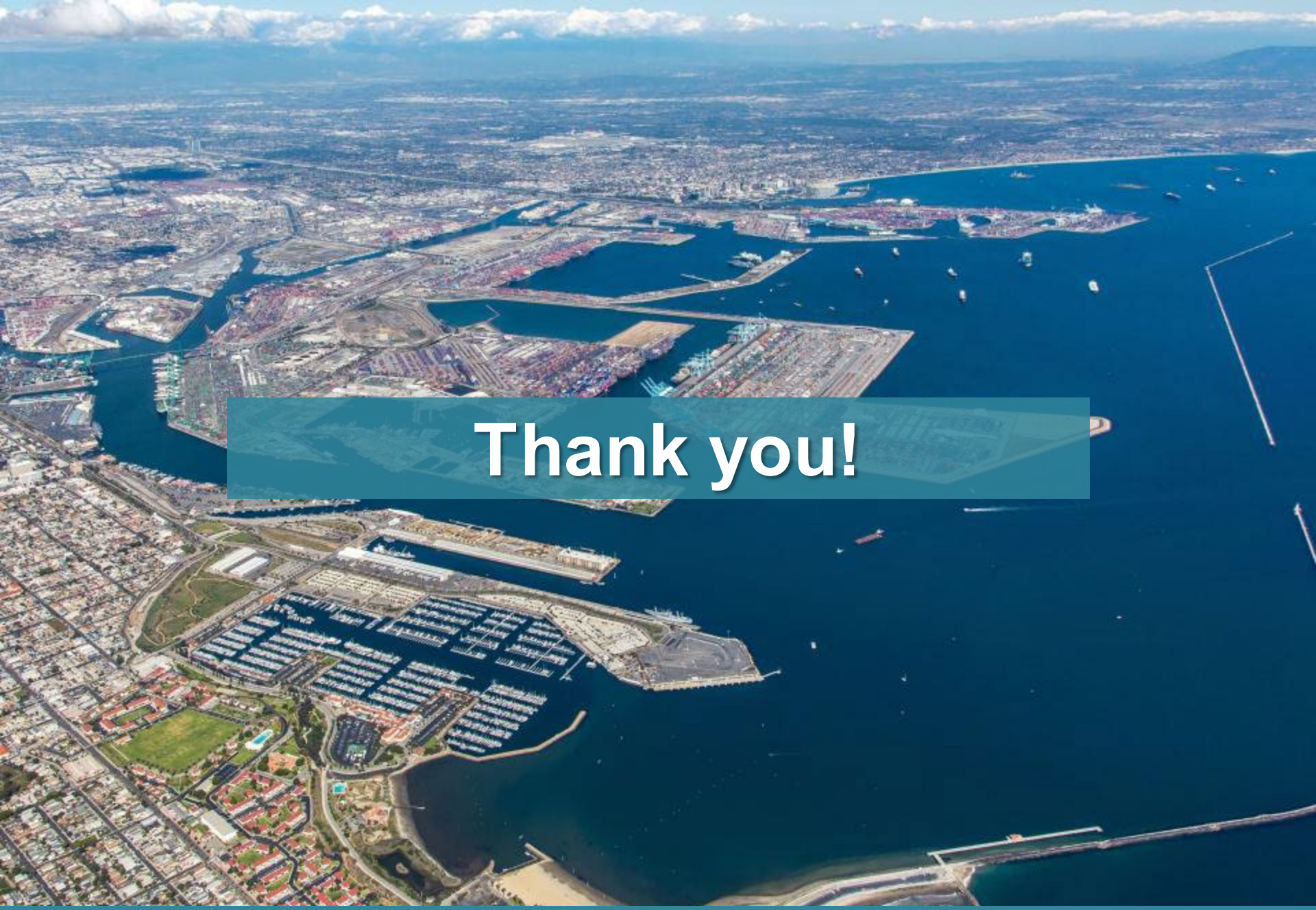
CARB Truck Regulations

- Truck and Bus (adopted December 2008)
  - January 1, 2023 - All in use diesel trucks/buses in California must meet EPA 2010 engine emission standards or cleaner
  - Manufacturer Delay Compliance Extension was made available for truck owners who obtained a purchase order for a new truck by September 1, 2022
- Heavy Duty Vehicle Inspection & Maintenance final regulation order posted August 22, 2022
- Advanced Clean Fleet - CARB Board hearing for adoption scheduled for October 27, 2022

  - Written comments to CARB due by October 17, 2022

Next Steps

- Both Ports to closely monitor implementation of CTF Rate and spending plan roll-out
  - Evaluate if any near-term adjustments needed
- Public engagement and input into longer term (e.g., 3-year) spending plan
- In early 2023, seek Board consideration of funding priorities for year 2


Thank you!

2021 San Pedro Bay Ports Air Emissions Inventory Results

Christine Batikian
Port of Los Angeles

Background

- Annual activity-based
  - 2005 – 2021
- Source categories
  - Ships, harbor craft, cargo handling equipment, trucks, trains
- Pollutants/ Greenhouse gases
  - PM_{10}, $PM_{2.5}$, DPM, NOx, SOx, CO, HC, CO_2e (CO_2, CH_4, N_2O)
- Annually coordinated with & reviewed by EPA, CARB, & South Coast AQMD

2021 Snapshot

Peak disruption to the supply chain, largely due to COVID-19, resulted in:

- Increased cargo throughput
- Large number of vessels at anchorage
- Longer stays at berth and at anchorage
- Increased usage activity of CHE, harbor craft, and trucks

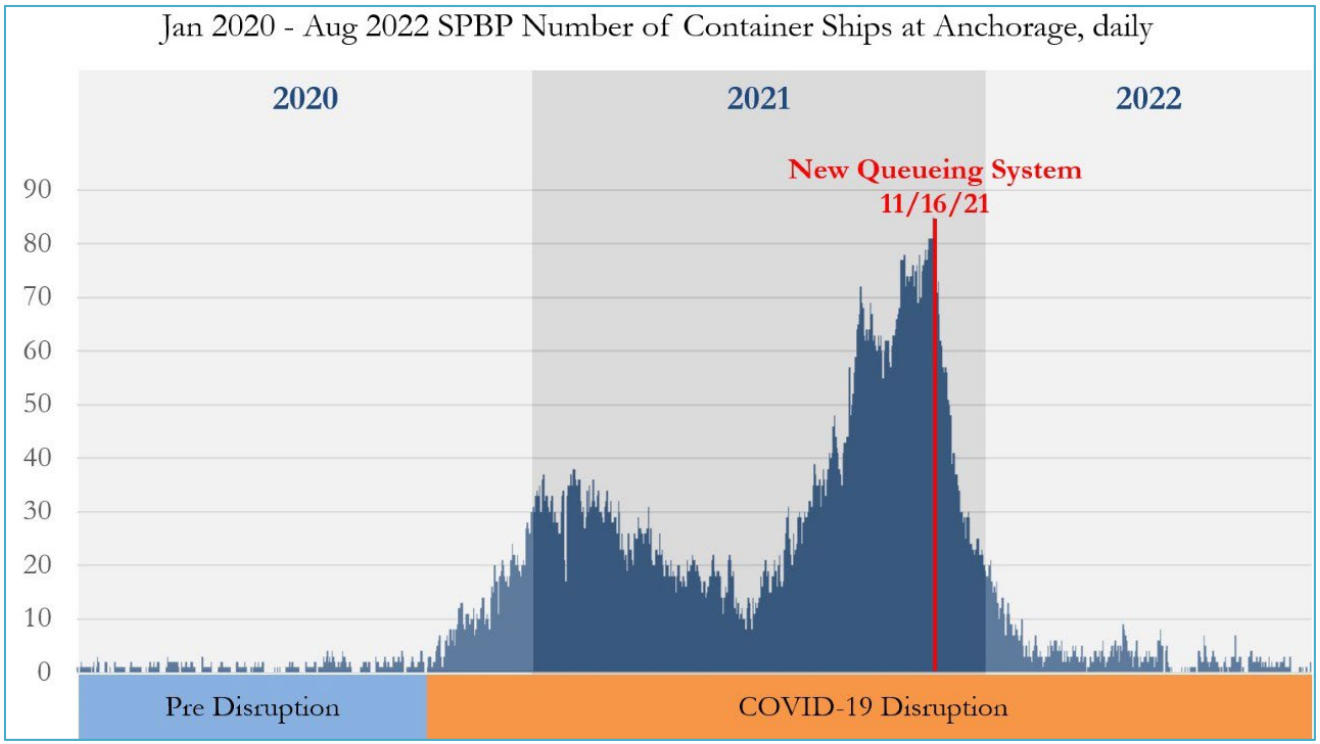
- Other factors affecting 2021 emissions include:
  - Energy Emergency Alert impacting shore power
  - Improved emissions efficiency due to larger ships visiting

2021 Ship Emissions Explained

- Overall ship emissions were significantly higher in 2021
  - Ships, particularly container vessels, accounted for the majority of DPM and NOx emissions
- Higher emissions at berth
  - Increased visits from vessels that were not shore power equipped
  - Longer stays at berth than usual, with larger ships calling, and fewer gangs working the ships
  - Energy Emergency Alert requesting ships to unplug
- Higher emissions at anchorage
  - Supply chain congestion led to significantly more container ships at anchor
  - Anchorage calls from container ships were **~146% higher** in 2021 vs. 2020

Anchorage Analysis

- Implementation of Pacific Maritime Management Services (PacMMS) – new vessel queuing system



Container Throughput & Vessel Call Comparison

	2005 vs. 2021	2020 vs. 2021
Container Throughput (TEUs)	↑ 41%	↑ 16%
Containers (TEUs) per call	↑ 116%	↑ 23%
Containership Arrivals	↓ 35%	↓ 6%

SPBP 2021 Air Emissions vs. 2020

UP **50%**
Diesel Particulate Matter

UP **44%**
Nitrogen Oxides

UP **75%**
Sulfur Oxides

UP **37%**
Greenhouse Gases

UP **16%**
TEUs

*Compared to 2020 Levels
**GHG emissions (CO_2e) are reported in metric tons per year; all other pollutants are shown in tons per year.

SPBP 2021 Air Emissions vs. 2005

Diesel Particulate Matter

DOWN

86%

2023 Goal ✓ 77%

Nitrogen Oxides

DOWN

46%

2023 Goal ✗ 59%

Sulfur Oxides

DOWN

95%

2023 Goal ✓ 93%

Greenhouse Gases

UP

22%

TEUs

UP

41%

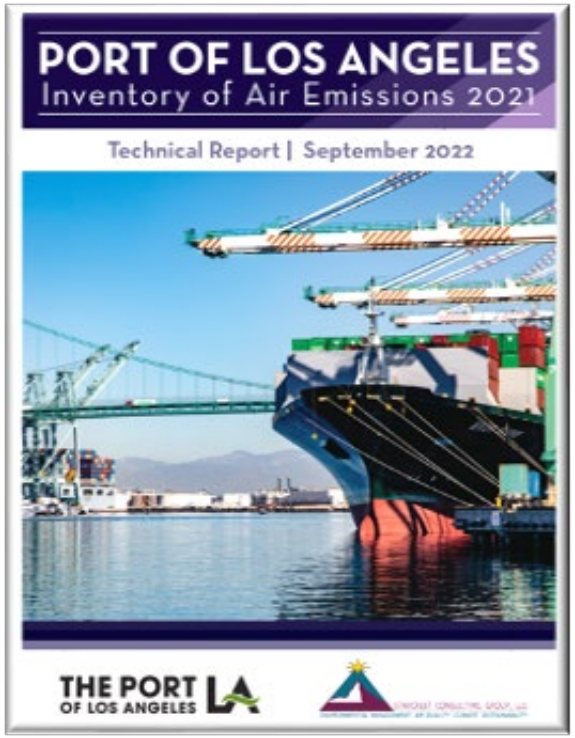
*Compared to 2005 Levels

**GHG emissions (CO_2e) are reported in metric tons per year; all other pollutants are shown in tons per year.

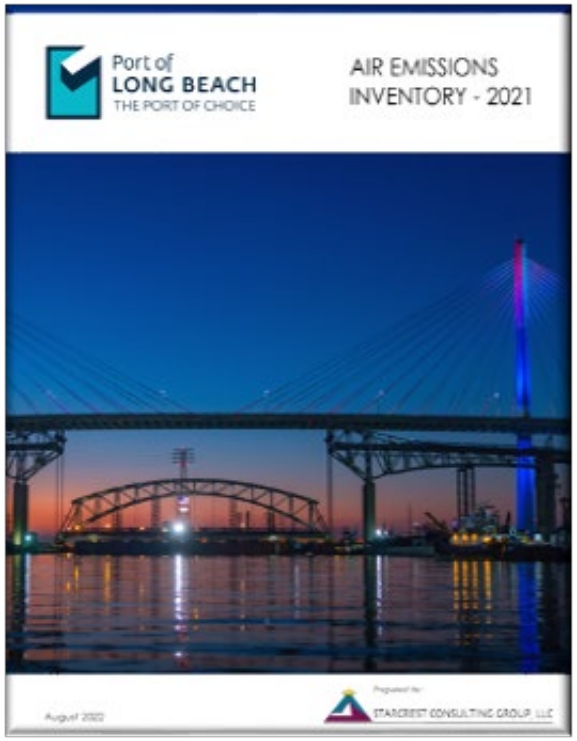
Moving Forward

- State and Federal Regulations
- Technology Advancement
- Green Shipping Corridor
- Ship Incentive Programs
- Clean Truck Fund Rate

2021 Air Emissions Inventories



https://www.portoflosangeles.org/environment/air-quality/air-emissions-inventory



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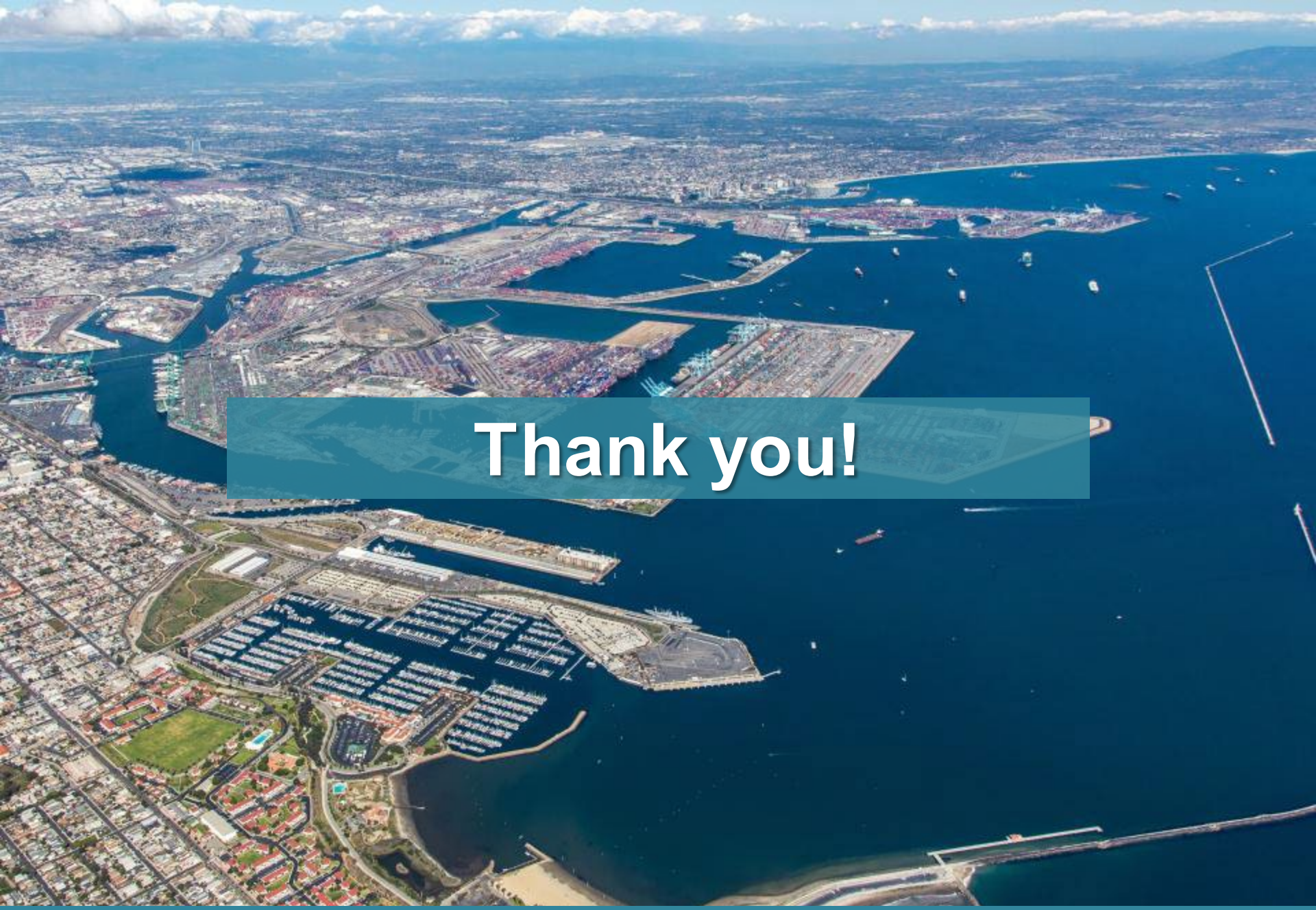
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Los Angeles – Shanghai Green Shipping Corridor Partnership

Implementation Plan

Need and Ambition

Worldwide Need for **Action**

Why Create a Green Shipping Corridor?

Scope of the Green Shipping Corridor


© SMTC


© POLA

Worldwide Need for **Action**

Climate crisis is a worldwide phenomenon that demands urgency, seriousness and collective action.

Addressing emissions from shipping and goods movement is necessary to meet global climate goals.

LA – SH Green Shipping Corridor is responding to this challenge, by bringing together key actors to slash emissions on one of the world's busiest cargo routes.

Why Create a Green Shipping Corridor?

Realize actual emissions reductions for maritime goods movement between Shanghai and the Los Angeles and Long Beach Ports.

Showcase cutting edge goods movement technologies, fuels, and best management practices.

Serve as a model for decarbonizing the movement of goods over large-scale supply chains of all kinds.

Catalyze technological, economic and **policy** efforts to establish low and zero Well to Wake GHG emission vessel operations and supporting infrastructure.

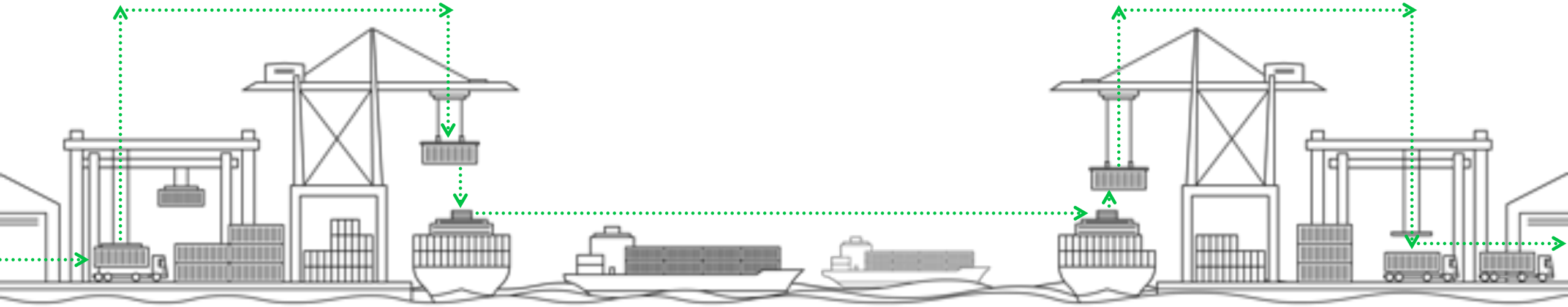
Scope of the Green Shipping Corridor

The participants of this Green Shipping Corridor have committed to reduce greenhouse gas and other pollutants starting from:

The incoming gate of the departure terminal including ship loading activities;	Transit along the shipping route to the arrival terminal;	Unloading of the ship and movement to the outgoing gate of the arrival terminal.

Shanghai

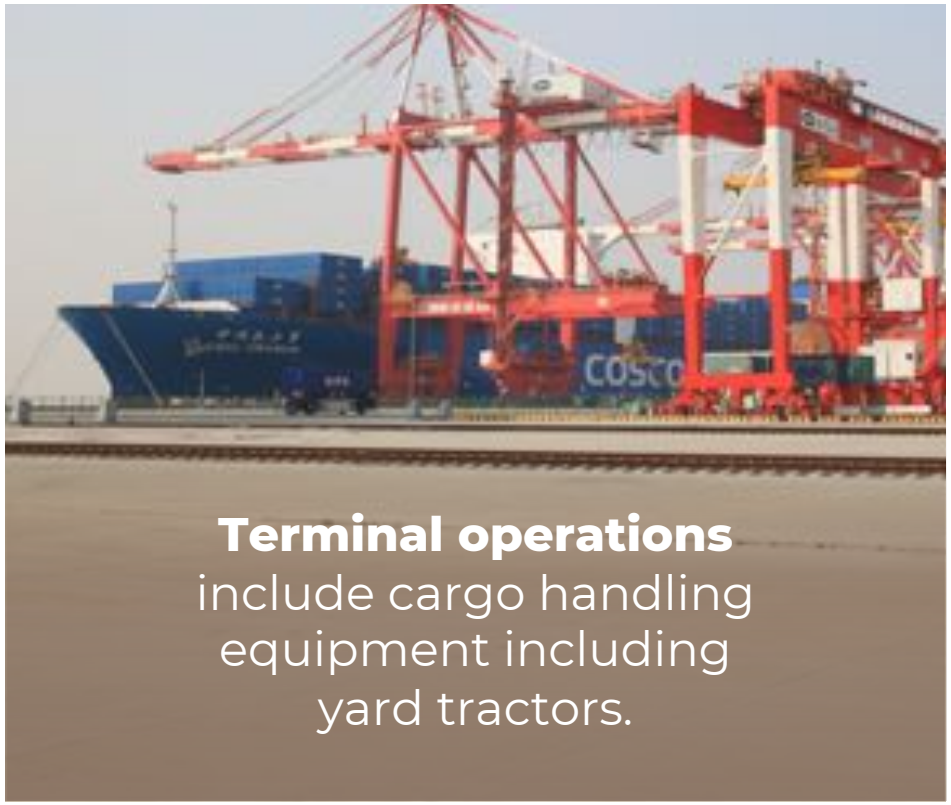
Los Angeles/Long Beach



Gate	Yard	Quayside	Crossing	Quayside	Yard	Gate

Scope of the Green Shipping Corridor (cont.)

Includes **container terminals in POLA / POLB and Shanghai** involved in moving cargo on Green Shipping Corridor.



Terminal operations include cargo handling equipment including yard tractors.

Who is involved?

Partners

Voluntary **Collaboration**

How Do We Work Together?

© POLA

Partners

Project Leadership

THE PORT OF LOS ANGELES

SHANGHAI MUNICIPAL TRANSPORTATION COMMISSION 上海市交通委员会

C40 CITIES

Core Partners

The City of Shanghai logo needs to be supplied

CITY OF LOS ANGELES FOUNDED 1781

Port of LONG BEACH THE PORT OF CHOICE

CCS CHINA CLASSIFICATION SOCIETY 中国船级社

CMA CGM

COSCO SHIPPING 中国远洋海运集团有限公司 CHINA COSCO SHIPPING CORPORATION LIMITED

Shipping Decarbonization Initiative aspen institute

MTCC ASIA Maritime Technology Cooperation Centre

ONE OCEAN NETWORK EXPRESS

MAERSK

SIPG

SHANGHAI MARITIME UNIVERSITY 上海海事大学 1909

Project Collaborators

amazon

IKEA

GLOBAL MARITIME FORUM

Voluntary **Collaboration**

Collaboration and action by our partners – including key maritime stakeholders for this critical trade route and others worldwide - acknowledges the critical importance of the climate crisis.

Ports, Carriers, Cargo Owners working together voluntarily allows them to encourage each other, share best practices, and combine resources.

Worldwide sustainability planning and **action** that fully considers the legal and political environment of countries, and includes coordination with the world's largest cities is necessary to combat the climate crisis.

How Do We Work Together?

Provide Input to Implementation Plan and
Identify Achievable Interim and Long-term Goals

Ports

Carrier

Cargo Owners

Knowledge Partners

Combined Partnership Group

- Define Green Shipping Corridor Goals
- Lead Stakeholder Engagement
- Consider Addition of new Partners
- Develop and approve Implementation Plan
- Ongoing Corridor Program Administration and Development
- International Collaboration and Knowledge Exchange

External Stakeholders

Dialog with Lead Partners to identify challenges, opportunities, and constraints for implementation

Implementation

Key Definitions

Goals & **Objectives**

Partners' **Plans**

Key Definitions

Green Shipping Corridor (GSC) - A shipping route between two major port hubs on which Zero Lifecycle Carbon Ships and other GHG and air pollutant emissions reduction programs are deployed, measured, and supported through public and private actions and policies.

Well to Wake (WTW) Emissions - Includes emissions related to every stage in the lifecycle of a fuel — from its production until it is used to fuel a ship.

Well to Tank (WTT) Emissions - Includes emissions related to production, storage and delivery of fuel to a ship.

Tank to Wake (TTW) Emissions - Includes emissions related to fuel use aboard ship. Excludes Pilot Fuels.

Key Definitions

Baseline Year (2019) - Last year prior to the pandemic.

Carbon Dioxide Equivalent (CO_2e) - A measure used to compare emissions from various greenhouse gases (GHGs) and other substances based on their global warming potential (GWP).

Conventional Bunker Fuels - An IMO compliant fossil fuel used for ship propulsion including HFO, MGO, MDO, or blends.

Key Definitions (cont.)

Reduced Lifecycle Carbon Fuels - Any fuel or blend that reduces CO_2e emissions on a WTW basis when compared to Conventional Bunker Fuel.

Zero Lifecycle Carbon Fuels - Any fuel or blend that result in zero CO_2e emissions from WTW basis.

Zero Carbon Fuels - Any fuel that has no carbon molecules.

Key Definitions (cont.)

Baseline Ship - The operational characteristics of a ship or sister / surrogate during the Baseline Year. Includes fuels and operating parameters.

Reduced Lifecycle Carbon Emission Ship - A ship having lower WTW CO_2e emissions compared to a Baseline Ship operating on Conventional Bunker Fuels.

Zero Lifecycle Carbon Emission Ship - A ship having zero WTW CO_2e emissions.

Zero Carbon Fueled Ship - A ship that only operates on Zero Carbon Fuels on a tank to wake (TTW) basis. Pilot fuels excluded.

Goals and **Objectives**

Carrier Partners commit to:

Work together to phase in Reduced Lifecycle Carbon Emission Ships through the 2020s, including:

Develop and improve technical and operational efficiency for all participating shipping lines using this corridor.

Evaluate and implement operational and technical optimization strategies to reduce emissions and carbon intensity of ships and fleets.

Begin deploying ships capable of running on Reduced or Zero Lifecycle Carbon Fuels in the corridor by 2025.

Use Reduced Lifecycle Carbon Fuels when feasible, with increasing percentages of Zero Lifecycle Carbon Fuels over time.

Demonstrate the feasibility of deploying the world's first Zero Carbon Fueled Ship(s), by or before 2030.[1]

Begin transitioning the entire fleet on the corridor to Zero Lifecycle Carbon Emission Ships, including Zero Carbon Fueled Ships, in the years beyond 2030

Demonstrate the feasibility of deploying the world's first Zero Carbon Fueled Ship(s), **by or before 2030**.

1 – with preference to minimizing well-to-tank (WTT) carbon emissions of the Zero Carbon Fuels

Goals and **Objectives** (cont.)

Port Partners commit to:

- Facilitate and support investment in and development of marine fueling infrastructure and supply by relevant stakeholders for reduced and Zero Lifecycle Carbon Emission Ship current and future deployments by or before 2025.
- Continue to reduce air pollutant and carbon emissions from terminal operations.
- Work to align current incentive programs to support the deployment of cleaner ships/fuels on the GSC.

Cargo Owner Partners commit to:

- Contract with carriers to use Zero Lifecycle Carbon Emission Ship services, with increasing percentages of Zero Lifecycle Carbon Fuels over time.
- Support policy measures that will enable zero-carbon solutions to become cost competitive.

All Partners commit to:

- Establish and communicate tangible carbon (CO_2e) reduction goals.
- Establish new or adjusted goals over time.
- Develop metrics to track decarbonization progress.
- Report on progress and identify steps for further improvement.

Partners' Decarbonization Activities

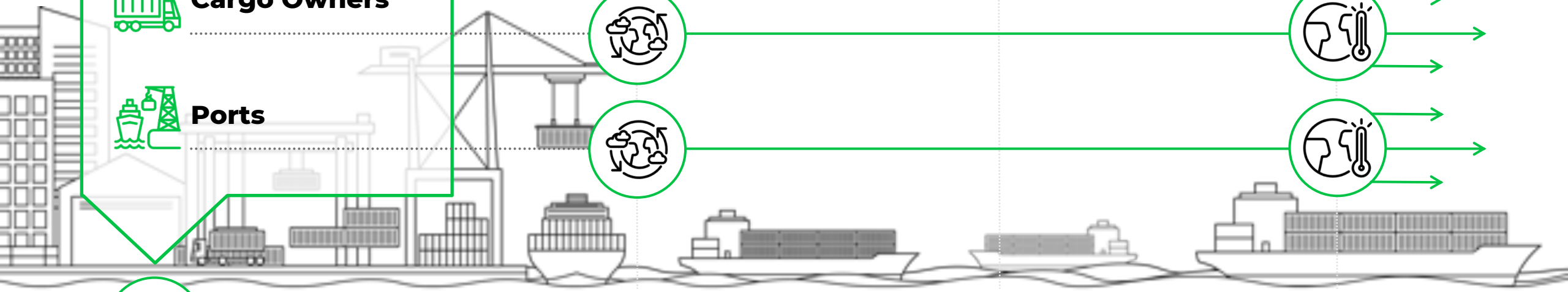
Cities

Carriers

Cargo Owners

Ports

Climate change goals



Corridor Partnership

2025
Reduced carbon operations

2030
Demonstrate zero carbon vessels

2050
Fully decarbonized corridor

Upcoming Partnership Activities

Future Partnership Organization

Protocol/Metrics for Decarbonization Tracking

Fuels, **Equipment** & **Infrastructure**

Future Partnership Organization

Initial expression to the world of the existence of this effort

 **Website**

 **MOU**

 **Other organizational structure**

As the **Partnership moves from planning to implementation**, consideration will need to be given to how the Partnership organizes itself going forward.

It is **expected** that an organization will be needed to provide:

- Oversight for corridor implementation and operation.
- Coordination for communication and reporting.
- Supporting resources.
- Website development and maintenance.

Protocol/Metrics for Decarbonization Tracking

The Partnership has made a commitment to track progress of the GSC

A Partnership working group will be established to consider how to utilize a number of tools to track progress including:

- Annual emissions inventories (Los Angeles and Long Beach Ports, SMTC, IMO, etc.).
- New or modified inventories as necessary, including operational performance potentially measured in both total emissions & intensity basis.
- Deployment metrics including IMO metrics like EEDI, EEXI, & CCI.

Details of monitoring & reporting to be developed over the course of the next year

Fuels, Equipment, & Infrastructure

Ongoing Partnership activities include:

Fuel Demand/Supply Assessment

- Zero Lifecycle Carbon Fuel adoption timeline.
- How much fuel is needed and where to fuel vessels?
- Fueling logistics and operations safety.
- Fuel costs.
- Fueling infrastructure need.

Zero Emissions Equipment Deployment

- Port and terminal commitment to zero lifecycle emissions operations.

Infrastructure Development

- Timeline and need.
- Ports prioritize permitting and environmental review.

Fuels, **Equipment**, & **Infrastructure** (cont.)

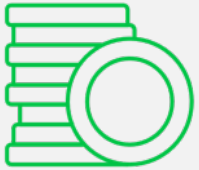
Ongoing Partnership activities include:

Technology Advancement

- Partnership review/support of potential goal advancing technologies.

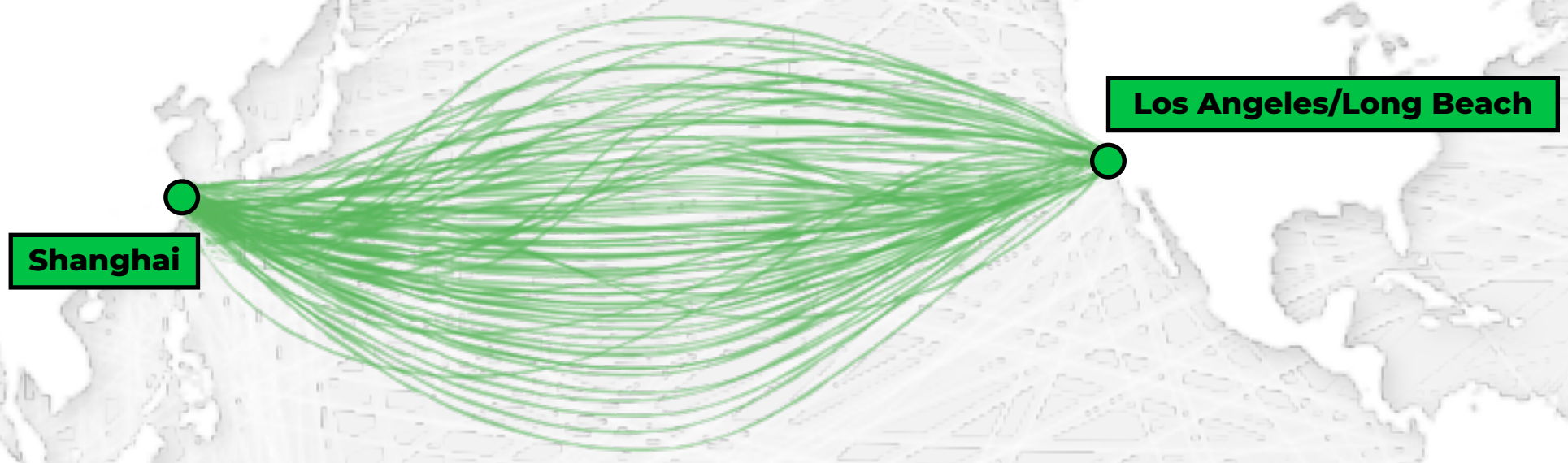
Green Shipping Policy Advocacy

- Coordination with international organizations and governments in the development of policy to encourage green shipping.



Investment Opportunities

- Advance and enable investment opportunities for infrastructure and technologies.
- Coordination with multilateral financing institutions and private sector investors.



<<Reference link to the detailed implementation plan>>