DOCKETED	
Docket Number:	22-IEPR-05
Project Title:	Emerging Topics
TN #:	243614
Document Title:	Presentation - Current Use of Hydrogen and Near-Term Opportunities – MDHDMarine Applications Port of Los Angeles
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Organization:	Port of Los Angeles
Submitter Role:	Public Agency
Submission Date:	6/20/2022 2:41:37 PM
Docketed Date:	6/20/2022

Current Use of Hydrogen and Near-Term Opportunities – MD/HD/Marine Applications Port of Los Angeles

THE PORT OF LOS ANGELES

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Director, Commercial and
Waterfront Real Estate

May 5, 2022

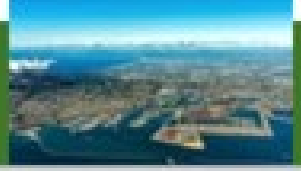
Clean Air Action Plan

- Planning document that outlines a series of strategies and goals for reducing air emissions from Port operations

- Primary Carbon Reduction goals:
  - All terminal equipment to be zero emissions by 2030

  - All on-road trucks to be zero emissions by 2035

  - Reduce GHG emissions to 40% and 80% below 1990 levels by 2030 and 2050, respectively



Emissions Reductions (2005-2020)

Diesel Particulate Matter

DOWN

89%

2023 Goal ✓ 77%

Nitrogen Oxides

DOWN

64%

2023 Goal ✓ 59%

Sulfur Oxides

DOWN

98%

2023 Goal ✓ 93%

Greenhouse Gases

DOWN

12%

UP **23%**

TEUs

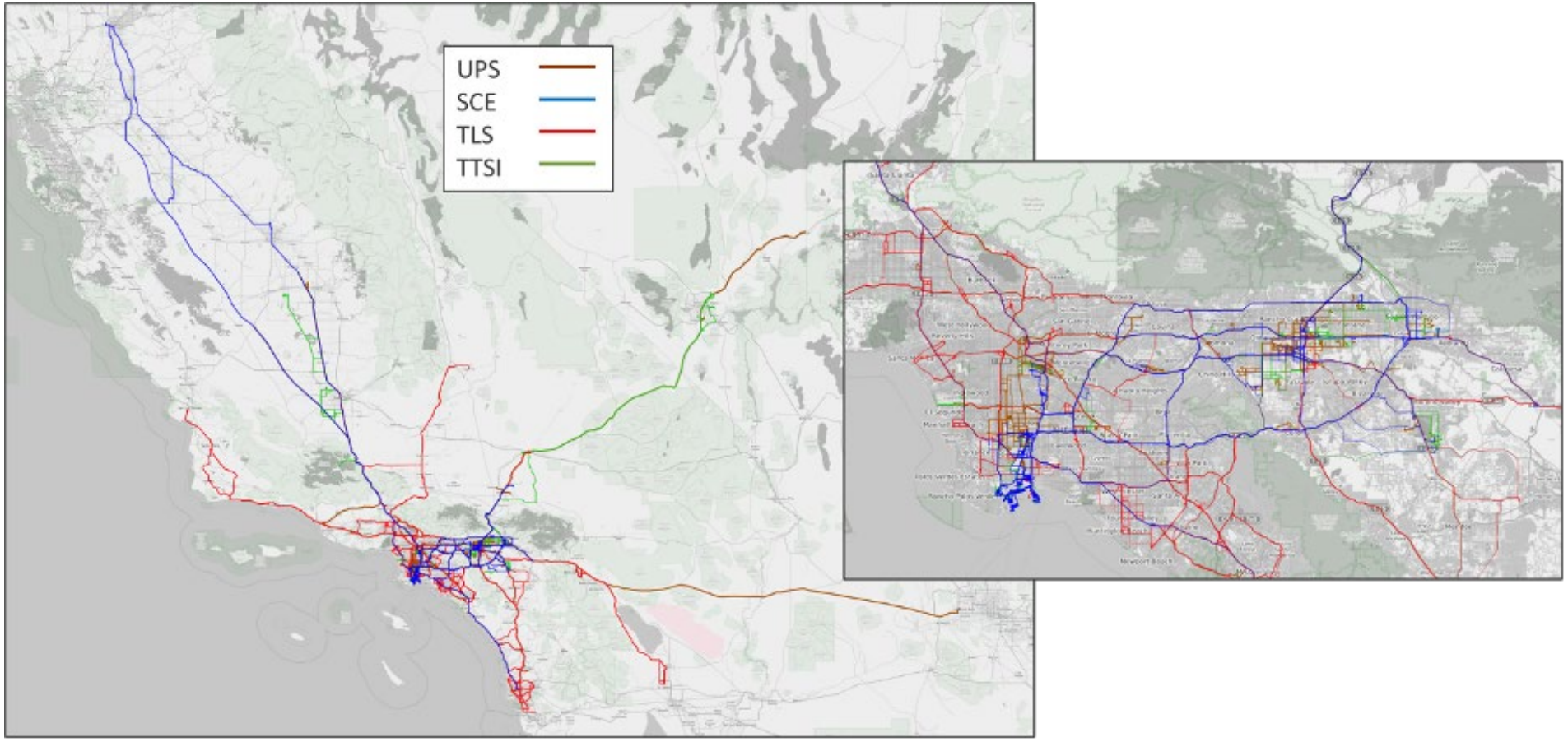
Decarbonizing the Port

- Summary of Mobile Emissions Source Categories (2020):
  - Ocean Going Vessels
    - 1,533 Arrivals; remain at berth 3-5 days
  - Heavy Duty Trucks
    - 18,048 registered for operation at POLA (December 2020)
  - Cargo Handling Equipment
    - 1915 operating equipment
      - Includes 966 Yard Tractors and 196 Top Handlers
  - Locomotives
    - 24 Switching Locomotive on-dock
  - Harbor Craft
    - 206 unique work vessels (tug, ferry, fishing)

Benefits of Hydrogen Technology

- Potential capability for Long Haul freight movement (potentially up to 400 miles)for trucks and longer duty cycles for Cargo Handling Equipment
- Hydrogen offers a comparable driver experience compared to diesel for all equipment types (fueling time and range)
- Fueling infrastructure efficient at large scale
- Vehicle weight comparable to standard options

Drayage Baseline Operational Data



Shore to Store Grant Project

- "Zero and Near Zero Emissions Freight Facilities" (ZANZEFF)
- $205 Million awarded to various projects in California
- Harbor Department received an award for $41,122,260
- Project focuses on connecting freight hubs throughout Southern California

Shore to Store Project (Cont.)

- 10 Hydrogen Fuel Cell Class 8 Trucks

- 2 Heavy Duty Hydrogen Fueling Stations
  - 1 near-port station in Wilmington
  - 1 Inland Empire station in Ontario

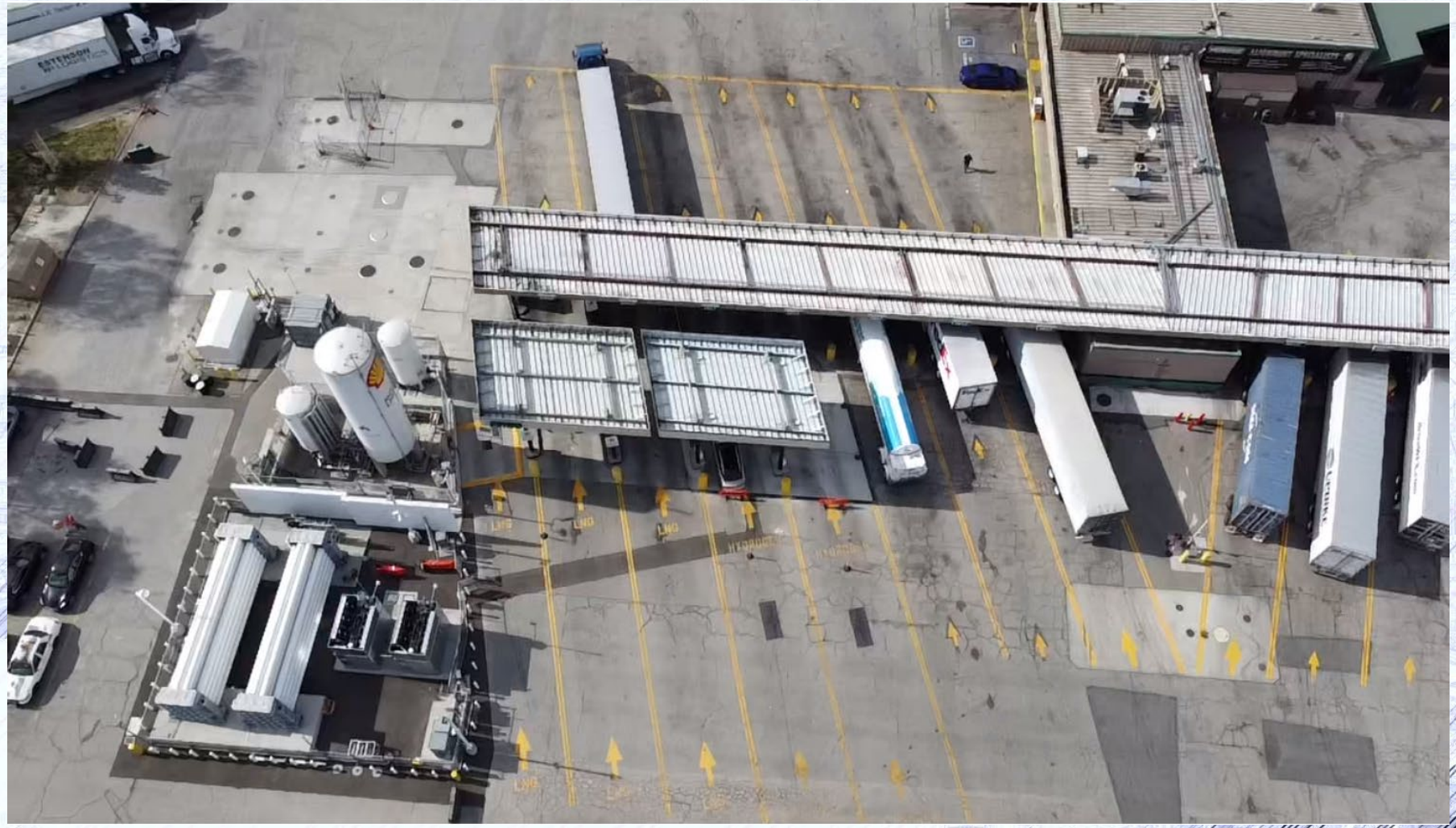
- Key Partners:

- $42 million in cost share across public and private partners

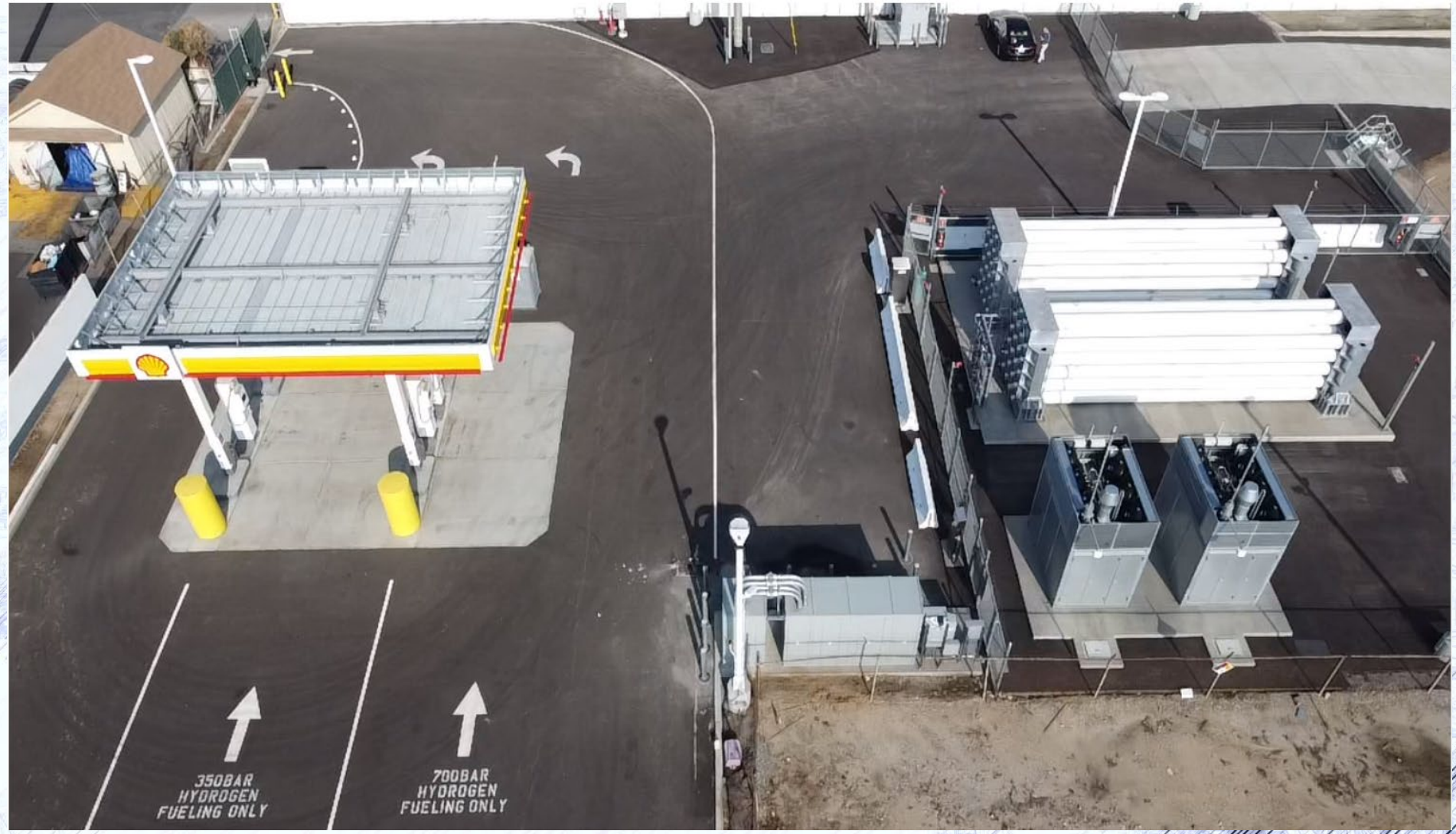
Kenworth Toyota Trucks

Station Sites

Ontario



Wilmington


350BAR
HYDROGEN
FUELING ONLY
700BAR
HYDROGEN
FUELING ONLY

Demonstration Update

- 10 truck fleet have recorded over 30,000 miles in-service
- Overall excellent feedback from drivers and operators
  - Minor issues have arisen and been resolved on a routine basis, such as valve failures, software bugs, etc.
- Test run to Port of Hueneme (140mi round trip) planned for August
- Stations – Ontario station fully operational, Wilmington online this summer
  - Various issues with station reliability, part and software failures consistently have station operating a 50% capacity

Other Projects

- Yard Tractor Demonstration – GTI
  - TraPac Terminal, 2 Yard Tractor demo this summer
- Fenix Marine Services Top Handler Demonstration
  - 1 top handler, hydrogen fuel cell used as a range-extender
  - Demo this summer
- YTI Cargo Handling Equipment Demonstration
  - Sponsored by Japanese Energy Development Administration
  - Yard Tractor, Top Handler, and RTG deployment
- HyZET Design Project – CEC Funded Grant
  - Awarded to CALSTART, working with Crowley to design/scope a hydrogen tug boat

Looking Forward

- Demonstrations of the Port's freight moving equipment (ships, trucks, cargo handling equipment, locomotives and harbor craft) provide opportunity to prove the technology's viability in the heavy-duty sector
- Need to bring overall costs down for freight moving equipment and H2
- H2 Hub opportunity can be leveraged to partner public and private organizations to develop necessary infrastructure network
- Creating large scale open market green hydrogen generation, storage and distribution network to and within market area is critical to expedited implementation

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THANK YOU