



Proposition of Hydrogen in Drayage Application



Sustainability

At TTSI, we are committed to leaving as small a footprint as possible on our precious environment. That's why we are committed to several ecological goals designed to drastically reduce our operational emissions and subsequent environmental pollution.

Our goal is to operate a zero emission fleet that services our customers while being a steward to the environment.





The Beginning Pre-Clean Air Action Plan (CAAP)



Prior to the implementation of the CAAP, trucks that transported containers in and out of the port complex were much older trucks with little to no emission standards





CLEAN TRUCK PROGRAM

Ban Schedule

October 1, 2008:	All pre-1989 trucks are banned from entering the Port
January 1, 2010:	1989-1993 trucks will be banned in addition to 1994-2003 trucks that have not been retrofitted
January 1, 2012:	All trucks that do not meet the 2007 Federal Clean Truck Emissions Standards will be banned from the Port



2007 CAAP Announcement

LB News | 08.03.07 | publishers@lbpost.com

Coalition Funds Green Trucks

Long Beach Mayor Bob Foster and LA Mayor Antonio Villaraigosa were on hand to support the Clean Trucks Program to address the impact of diesel-related emissions on the surrounding communities by 2012.

The program places truck drivers into environmentally friendly vehicles by providing them with financial support which allows them to remain as independent owner operators.

The program will fund 100 "clean" trucks into service over the next 12 months.

The retail store, Target, has partnered with Total Transportation Services, Inc (TTSI) and NYK Logistics and identified an innovative solution which meets both industry and independent owner/operator needs.

This group, along with other beneficial cargo owners and trucking companies, has also formed a coalition for the sole purpose of developing and implementing solutions to address the issues of truck emissions. The Coalition for Responsible Transportation will use the framework from TTSI, NYK and Target as a starting point for encouraging discussions and partnership as companies identify possible solutions.



TTSI announced during the press conference that it would convert its entire fleet to comply with the provisions of the CAAP



TTSI's CAAP

- By January 2008, TTSI leased and purchased 106 clean diesel trucks

- May 22, 2008, TTSI takes delivery of the first 8 Clean LNG Trucks



TTSI TAKES DELIVERY OF FIRST 8 CLEAN LNG TRUCKS
May 22, 2008



From Right: Greg Roche, Shaunt Hartounian & Peter Grace of Clean Energy, Scott Newton - NYK Logistics, Kayle Schreiber - TARGET, Vic La Rosa - TTSI, Rick Crawford - NYK Logistics, Russ Schmitz, Inland Kenworth and Kelly Mills - Westport Fuel Systems.



TTSI's CAAP

- By July 2011, TTSI had purchased 49 LNG Trucks





TTSI's CAAP

July 11, 2011, TTSI takes possession of the 1st Class 8 Hydrogen Fuel Cell Truck





TTSI's CAAP

In 2015, TTSI begins to demonstrate the capabilities of total electric trucks in the drayage operation





LNG/CNG Technology





Battery Electricity





Clean Air Action Plan II (CAAP2)

Clean Trucks Program

Original	New Proposed
<ul style="list-style-type: none">• 2018: Fee on trucks 10 years old or older• 2020: Trucks must be MY 2010+• 2023: New trucks entering service must be NZE (contingent on establishment of NZE engine standard)• 2035: Trucks to be zero emissions	<ul style="list-style-type: none">• 2018: New trucks entering service must be MY 2014+• 2023: New trucks entering service must be NZE; Initiate rate structure with exemptions for NZE and ZE trucks (contingent on establishment of NZE engine standard)• 2035: Goal for all trucks to be ZE; modify rate structure to exempt only ZE trucks



Drayage Operations

Largest Port Complex in US – Long Beach & Los Angeles





Port Truck Data

Engine Year	Trucks ⁴	Percent Trucks		Moves ⁵	Percent Moves		Moves per Truck ⁶	Active Trucks ⁷	
<=1988	0	0.00%	0.00%	0	0.00%	0.00%	0.0	0	0
1989-2006	0	0.00%	0.00%	0	0.00%	0.00%	0.0	0	0
2007	1,929	11.23%	100%	17,431	10.60%	100.00%	12.5	1,397	12,855
2008	3,024	17.60%		28,425	17.28%		12.4	2,297	
2009	3,698	21.52%		37,183	22.61%		13.3	2,793	
2010	1,272	7.40%		12,691	7.72%		13.4	945	
2011	1,909	11.11%		18,631	11.33%		12.7	1,468	
2012	1,449	8.43%		13,215	8.04%		12.3	1,072	
2013	1,064	6.19%		8,968	5.45%		11.7	766	
2014	839	4.88%		7,066	4.30%		11.8	597	
2015	907	5.28%		8,964	5.45%		13.0	687	
2016	667	3.88%		8,324	5.06%		16.3	510	
2017	288	1.68%		2,396	1.46%		11.0	217	
2018	132	0.77%		1,126	0.68%		10.9	103	
2019	5	0.03%		44	0.03%		14.7	3	
Typos/Blanks	0	0.00%	0.00%	0	0.00%	0.00%	0.0	0	0
Total	17,183	100.00%		164,464	100.00%		-	12,855	

Source: Port of Los Angeles (Tetra Tech)– April 2018



Port Truck Data

Total Gate Moves by Fleet Size					
Fleet Size	LMCs	Total Fleet Size ⁸	Total Moves	Avg. Number of Moves per Fleet Size ⁹	Avg. Number of Trucks per LMC ¹⁰
<=20	624	5,205	43,993	8.45	8.34
21-99	226	9,544	79,238	8.30	42.23
>=100	25	4,653	39,311	8.45	186.12
Total	875	19,402	162,542	8.38	22.17

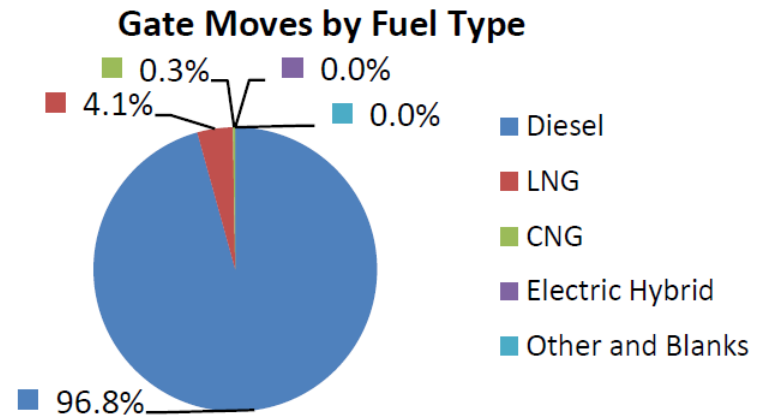
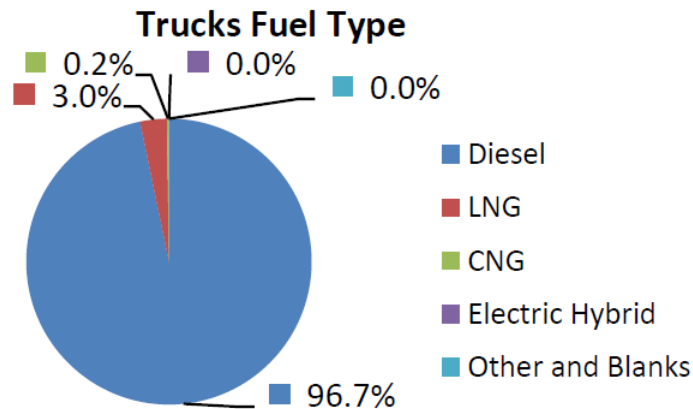
<p>Distribution of LMC's Truck Fleet Size</p> <p>71% <=20 26% 21-99 3% >=100</p>	<p>Fleet Size Distribution</p> <p>27% <=20 49% 21-99 24% >=100</p>	<p>Total Moves per Truck Fleet Size</p> <p>27% <=20 49% 21-99 24% >=100</p>
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Source: Port of Los Angeles (Tetra Tech)– April 2018



Port Truck Data

Truck Fuel Type Summary				
Fuel Type	Trucks	Percent Trucks	Moves	Percent Moves
Diesel	16,622	96.7%	157,315	96.8%
LNG	522	3.0%	6,677	4.1%
CNG	35	0.2%	429	0.3%
Electric Hybrid	0	0.0%	0	0.0%
Other and Blanks	1	0.0%	0	0.0%
Total	17,183	-	162,542	-

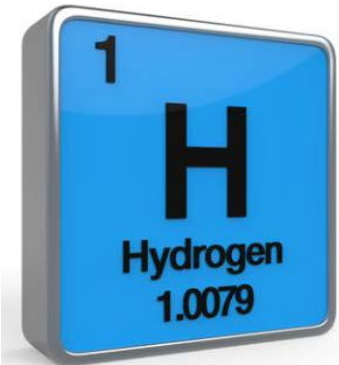


Source: Port of Los Angeles (Tetra Tech)– April 2018



Why Hydrogen?

- **Offers several benefits over diesel and natural gas**
 - Cheaper operating cost per mile/more efficient than Diesel
 - ZERO Greenhouse Gas Emissions
 - No noise pollution
 - No idling
 - Substantial increase of torque
 - Domestic and secure energy source
 - Renewable and non-depleting
 - Can be made from a wide variety of resources
- **OEM show interest in this technology**
- **State and federal support available**





Fuel Price Comparison

■ As of 07/19/2018 in Southern CA:

- Hydrogen \$9.99 (Per kilogram*)
- Diesel \$3.66 (US/Gallon)
- Natural Gas \$3.81 (US/Gallon)

*per Air Products (03/06/2017)

** Hydrogen Price at SCAQMD - \$13.99/Kilogram



Cost of Ownership

Vehicle Metrics	Fuel Type		
	Diesel	LNG/CNG	Hydrogen*
Initial Vehicle Cost	\$140,000	\$204,000	\$270,000
Tax Credit for Qualified Alternative Fuel Vehicle	\$0	\$0	\$0
Funding (Grant/Subsidy) Incentive Programs	\$0	\$100,000	\$200,000
Initial Net Vehicle Costs	\$140,000	\$104,000	\$70,000
Service Life Fueling Costs	\$292,800	\$270,933	\$256,428
Service Life Maintenance Costs	\$49,920	\$49,920	\$30,720
Salvage Value	(\$20,000)	(\$20,000)	\$0
Total Ownership Cost	\$362,720	\$340,853	\$287,148

Assumptions

Vehicle Service Life (Years)	8	8	8
Miles/Year	48,000	48,000	48,000
Fuel Cost (Per gallon Diesel, LNG, H2)	\$3.66	\$3.81	\$4.54
MPG or MPP (H2) (50/50 Duty Cycle)	4.8	5.4	6.8
Maintenance Cost per Year	\$6,240	\$6,240	\$3,840

* Based on data from Vision Motors

↑ ↑
Costs to increase due to stricter
air emission standards

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Costs to decrease due to
technology advancement

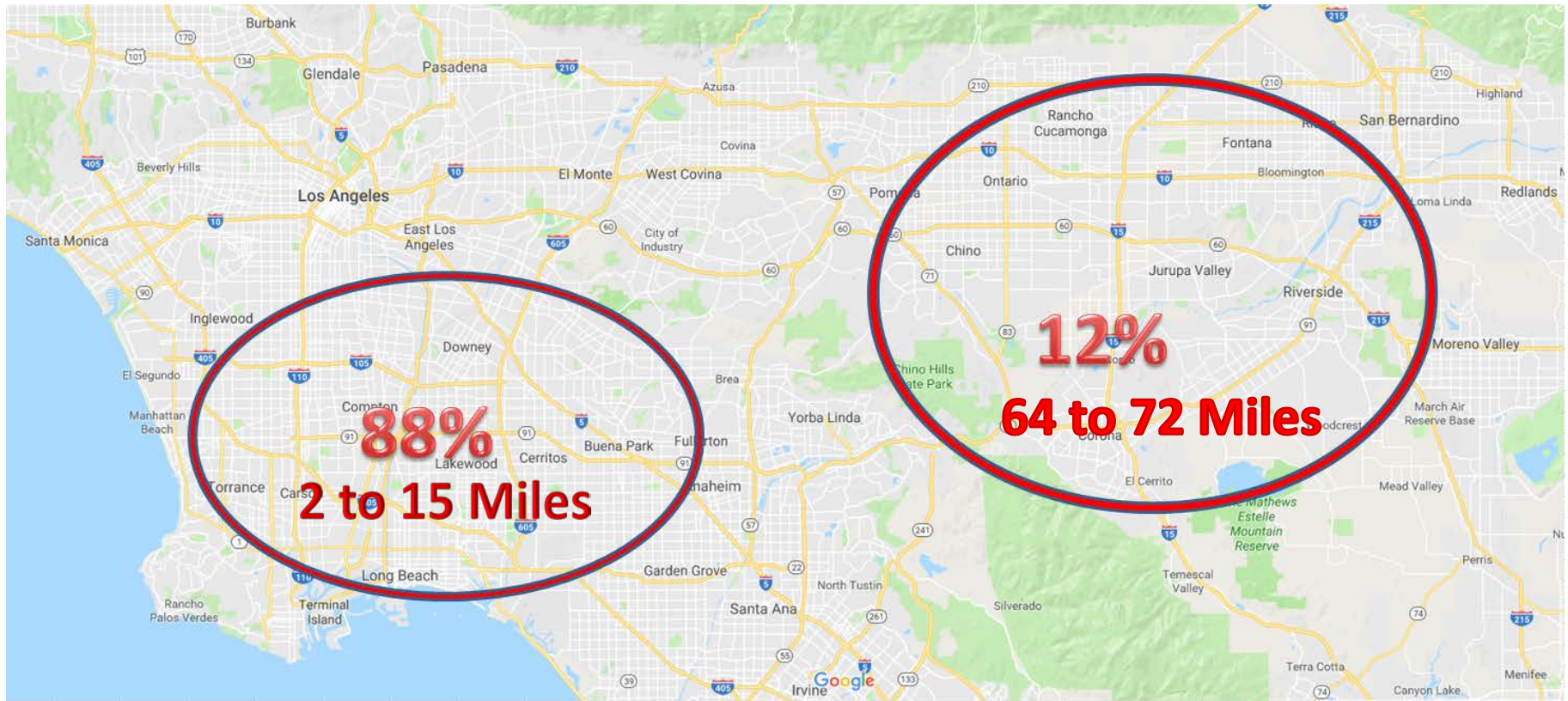


Hydrogen Solution

- **Weekly Operation Ports of LA & LB:**
 - 4 – Day of two 8 Hour Shifts
 - 2 - Days of one 8 Hours Shift
- **Operational Needs:**
 - Class 8 Zero Emission Trucks
 - Power to transport 36 to 39K loads
 - Able to travel 6% Grade at minimal 30 to 35 MPH
 - Minimal fueling time
 - Available fueling



Drayage Operations



Southern CA Basin



Hydrogen Fuel Cell

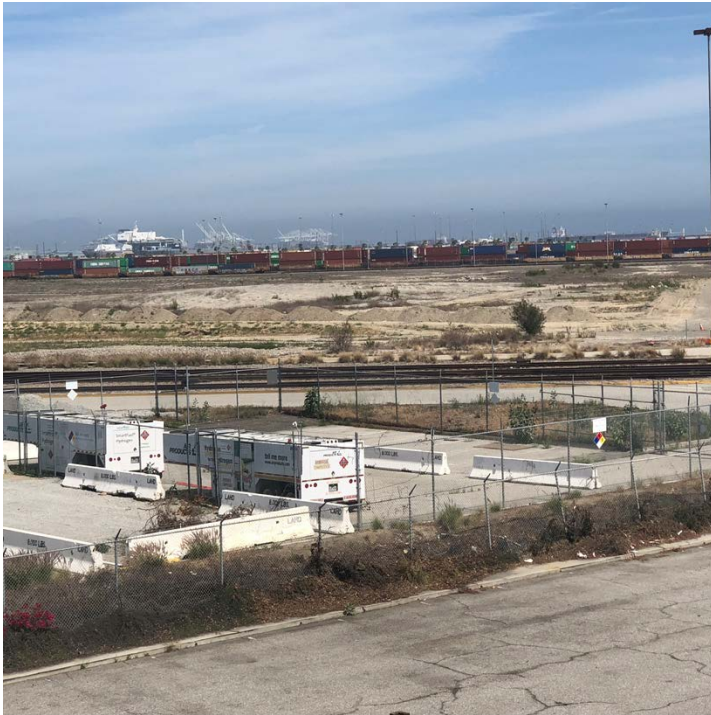




Hydrogen Fueling Station

Hydrogen Fueling Equipment

- Footprint – 45' X 82'
- 2 HF-150 Hydrogen Fueler, self contained
- Each at 150 kg (63,450 SCF) of compressed, gaseous hydrogen [not liquid, cryogenic hydrogen]
- 5,076 psig (350 bar)
- Fill time ~ 20 to 25 minutes
- Permitted on-site capacity – 500kgs
- Air Products Facility <5 miles from site
- Requires no utilities



Partners

- Center for Transportation and Environment (CTE)
- S CA Air Quality Management District (SCAQMD)
- Air Products
- Port of Los Angeles & Port of Long Beach



Harbor Performance Enhancement Center (HPEC)



KEYNOTES

- ① EXISTING CUSTOMS HOUSE - HISTORICAL BUILDING
- ② ADMINISTRATION BUILDING (EXISTING STRUCTURE)
- ③ CELL PHONE HOLDING YARD / BOBTAILS
- ④ TERMINAL ACCESS
- ⑤ PROPOSED GRADE SEPARATION
- ⑥ ENTRY / EXIT GATE (4 LANES EACH DIRECTION)
- ⑦ SECURITY BOOTH
- ⑧ WHEELED CONTAINER STORAGE, TYP
- ⑨ CHASSIS POOL (FLEXIBLE)
- ⑩ POTENTIAL SECONDARY AISLE

LEGEND

- CONTAINER TERMINAL SUPPORT FACILITIES BOUNDARY - 120 ACRES
- FUTURE PROPOSED LIQUID BULK AREA - PORT MASTER PLAN - 55 ACRES
- WHEELED STORAGE (DRY) 3,551 SLOTS
- CHASSIS POOL (FLEXIBLE)
- GATE FACILITY
- PROPOSED GRADE SEPARATION
- ENTRY TRAFFIC FLOW
- EXIT TRAFFIC FLOW



For more information on TTSI, please
visit our website at: www.tts-i.com

Thank You

STAYING
A STEP
AHEAD
& Leaving
Small Footprints

