

Zero Emission Cargo Transport I (ZECT I)



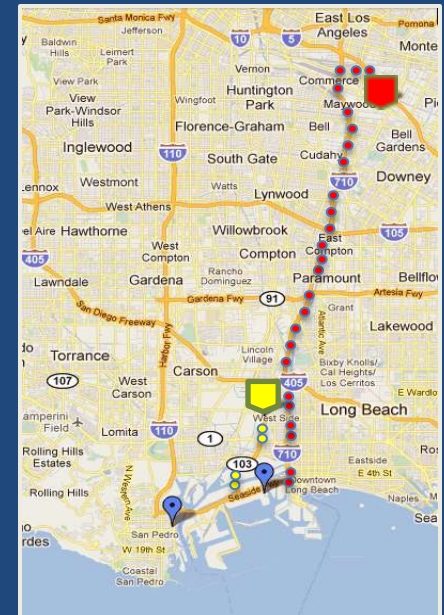
September 3, 2015
Clean Fuels Advisory Group Meeting



Brian Choe
Technology Advancement Office

Background

- \$4.2M DOE grant recognized in 10/12
- Four contractors selected to develop zero emission drayage trucks
- Demonstrate in revenue drayage service with fleet partners
- Promote and accelerate market acceptance
- Initial scope revised from 13 to 11 demonstration trucks



Project Re-scope

- TransPower
 - Four BETs (70-100 miles in operating range)
 - Two CNG PHETs added (150-200 miles with 30-40 AER miles)
- US Hybrid
 - Two BETs (100 miles)
 - Three LNG PHETs added (150-200 miles with 30-40 AER miles)
- Out of Project
 - Balqon withdrew
 - Vision Motors out of business



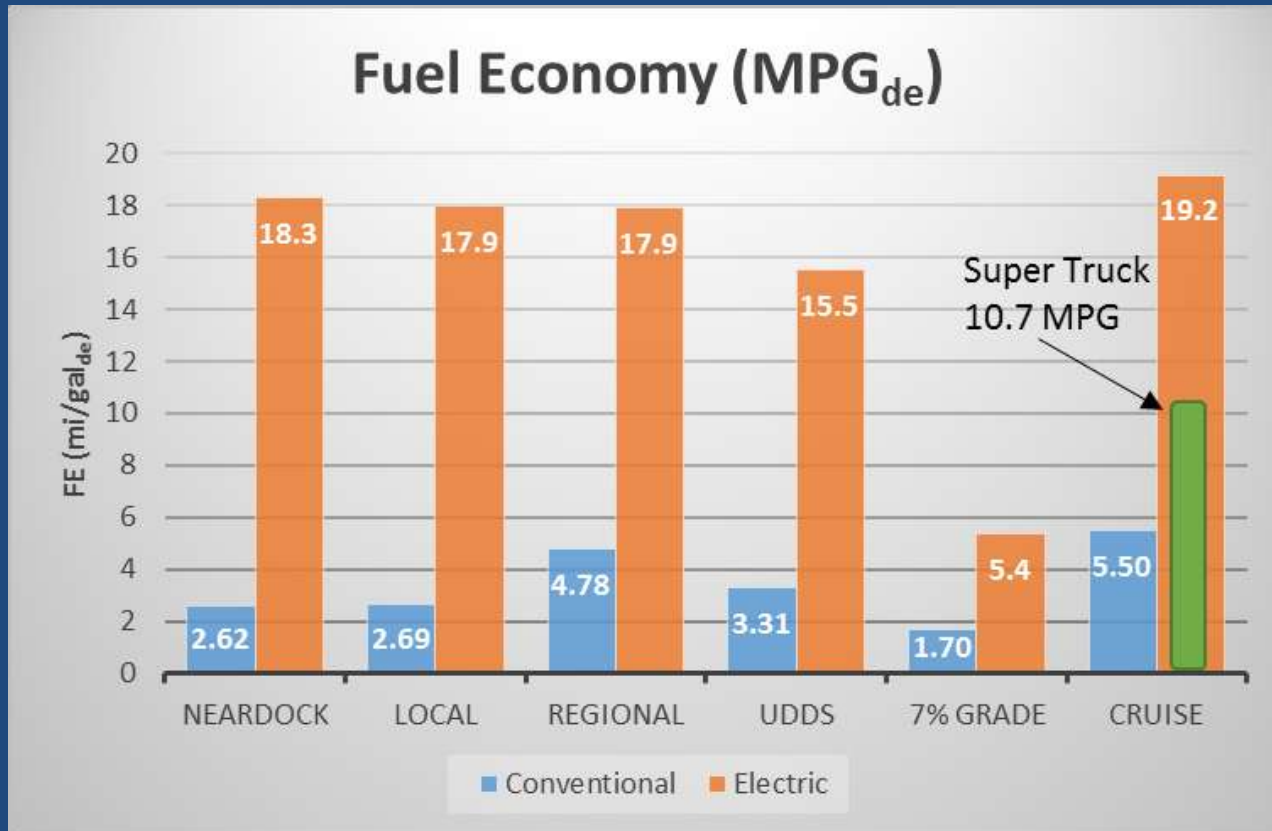
Project Status

TransPower - BETs

- All four trucks completed (three currently in demonstration)
- EDD-2
 - Deployed with TTSI since 1/15
 - Over 4,500 cumulated miles
 - Operating 2-3 days/wk
 - 3.8 hrs & 40 miles/day
 - Chassis dyno testing @UCR
 - DTP, UDDS, 7% Grade
 - 72,000 lbs GCWR
 - Reliable operation (full to 20% SOC)
 - 2.06 – 2.1 kWh/mi (DTP)
 - 7 kWh/mi for 7% grade



Chassis Dyno Test EDD-2



Courtesy of UCR CE-CERT

NREL

Data Collection & Analysis

EDD2

- 1/15 through 6/15
- 42 days of operation
- 1,860 miles traveled
- Predominant local operations



Baseline Trucks

- 10/14 through 1/15
- Two diesel trucks
- Mack 2013 – 12.8L
- 149 days of operation
- 22,660 miles traveled



Data Analysis

Median Daily Use

	EDD2	Baseline
Operation Time	3.8 hrs	7.9 hrs
Idle Time	1.6 hrs	2.6 hrs
Distance	39.8 miles	124 miles
Average Speed	11.5 mph	16.5 mph
Fuel Consumption	1.9 kWh/mi (19.8 MPGde)	6.2 mpg
Ending SOC	65%	
Kinetic Intensity	1.3	0.7



Project Status

TransPower -BETs (continued)

- EDD-3
 - Deployed with TTSI in 4/15
 - Limited drayage miles due to alternating use between EDD-2 & EDD-3
 - Not enough trained drivers
 - Insufficient demand by contract drivers
 - Moved to Cal Cartage in 8/15
- EDD-4
 - 700 test miles since 1/15
 - Deployed with NRT in 8/15
- EDD-1 at Poway HQ, scheduled for battery and BMS upgrade in 4th Qtr 2015



Project Status

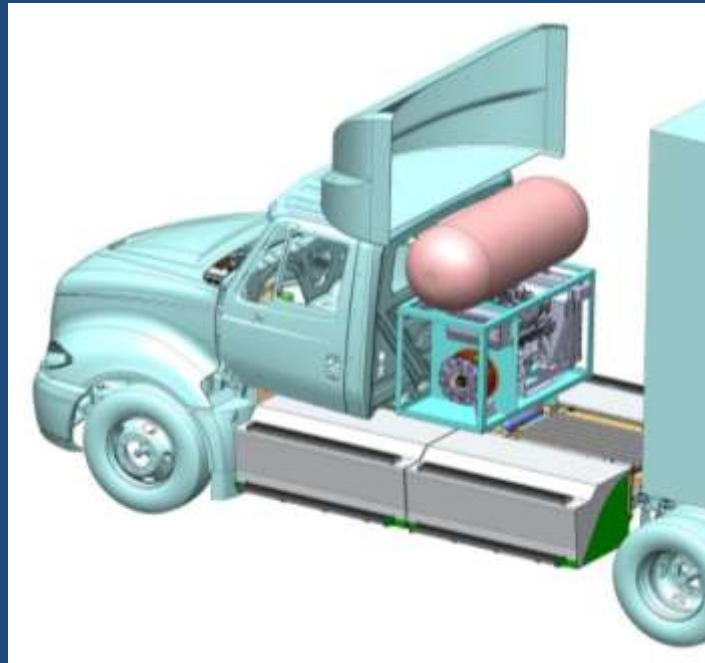
US Hybrid - BETs

- First truck completion - 9/15
- Chassis dyno testing - 9/15
- On-board charger integration - 11/15
- Second truck completion - 12/15



Rescope Projects

NG Hybrid Electric Trucks



Selection Criteria

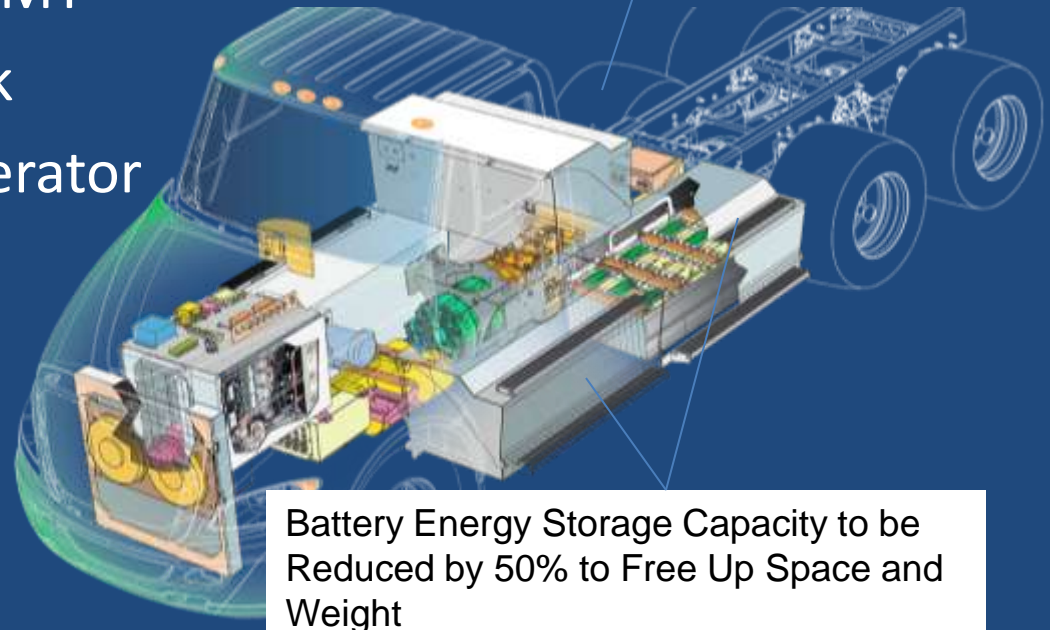
- All-electric operation capability
- Related project experience
- Secured matching cost share
- Commercial viability



TransPower CNG PHET

- Two CNG PHETs
- Based on ElecTruck drive system
- 300 kW motor with AMT
- 107 kWh battery pack
- 3.7L CNG engine generator
- 30-40 AER miles
- 150-200 total miles

Battery Enclosure Behind Cab to be Replaced with CNG Engine, Generator, and Fuel System



Battery Energy Storage Capacity to be Reduced by 50% to Free Up Space and Weight

US Hybrid LNG PHET

- Three LNG PHETs
- Convert LNG trucks with 8.9L ISLG engine
- Utilize parallel hybrid electric drive system developed for Autocar LNG trucks (refuse haulers)
- 240 kW motor with AMT
- 80 kWh battery pack
- 30-40 AER miles
- 150-200 total miles



NG PHETs

Estimated Project Costs

	TransPower	US Hybrid
DOE	\$958,120	\$925,000
CEC	\$900,000	\$450,000
SCAQMD	\$195,326	\$22,896
OEM/TTSI	\$50,000	\$598,779
Total	\$2,103,446	\$1,996,675

NG PHETs

Project Timeline

1st Quarter after Contract Execution

- Complete system design
- Order long-lead components

2nd Quarter

- Complete first truck

3rd Quarter

- Deploy first truck for demonstration
- Complete second & third trucks

4th Quarter

- Deploy second & third trucks



Questions & Discussion

