Global, National Goals on Emissions

EXAMPLES

- GHG avg reduction/year = - 4.2%
- NOx avg reduction/year = - 15.7%
- PM avg reduction/year = - 18.5%
- Fuel econ avg increase/year = + 4.9%
Convergence of Enablers/Drivers

Increasing Efficiency

High efficiency, extremely low emission, low carbon solutions

Emission Reductions
climate and criteria

Electrification of Systems

Automation/Connected Tech
Port of Long Beach, Middle Harbor

- Automated Electric AGVs

Port of LA, TraPac Terminal

- Automated Electric Straddle Carriers

Port of Savannah

- Electric Gantries
- Rubber Tire Gantries (RTG)

43 Truck ZE Drayage Demo
California ARB/Air Districts – 4 OEMs – 5 Ports

Kenworth
- NG-REEV

BYD
- BEV

Volvo
- PHEV

Peterbilt
- BEV; NG-REEV
Renewable Natural Gas (RNG)

Renewable Diesel – Important Pathway
43 Truck ZE Drayage Demo
California – Ports – Air Districts - OEMs

- BYD, Kenworth, Peterbilt, Volvo
- Partners BAE, Transpower, most state air districts
- BEV, PHEV, NG-REEV technologies
- CALSTART helped recruit, design, organize program
Conceptual: Corridor Transformation

- LE/UL/ZE Picks & Lifts
- LE/UL Loaders, CCE
- LE/UL/ZE HD Urban Delivery
- LE/UL/ZE HD Drayage
- LE/UL/ZE Regional Cargo Delivery
- LE/UL/ZE HD Urban Delivery
- UL/ZE MD Delivery
- LE/UL Vocational Trucks
- UL/ZE Shuttle Buses

Beachhead Port Low & ULEmissions & Electrification

- UL/ZE Hostler
- UL/ZE AGVs
- UL/ZE CHE

UL/ZE Urban Transit

- Facility Truck Automation
- Beachhead Warehouse Distribution Cntrs
- ZE Forklift
- UL/ZE Hostler
- UL/ZE TRUs