

The Case for Truck Electrification in the U.S.

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Outline







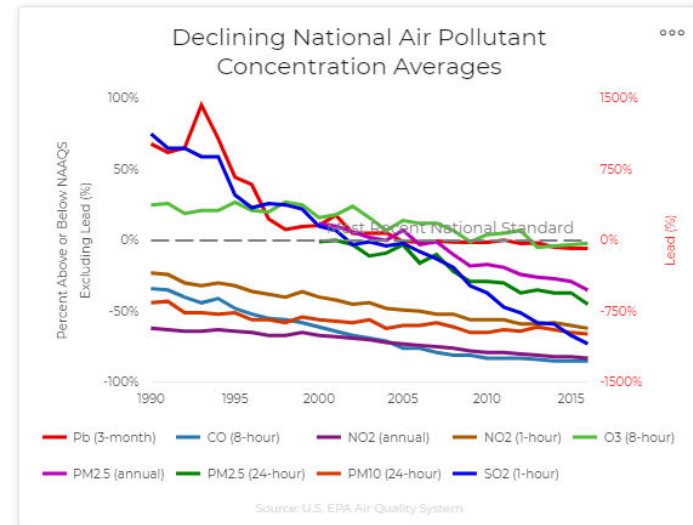
-  Context: air pollution, fossil fuel, interventions
-  Policy review: global, federal, state policies
-  Industry transition: heavy-duty zero emission technology offerings
-  Closing thoughts

Air pollution & health effects



IN THE UNITED STATES, BETWEEN 1970 AND 2016 COMBINED EMISSIONS OF SIX COMMON POLLUTANTS DROPPED BY 73%

-  Higher rates of mortality
-  Chronic and acute respiratory illnesses
-  Emergency room visits
-  Lost work days

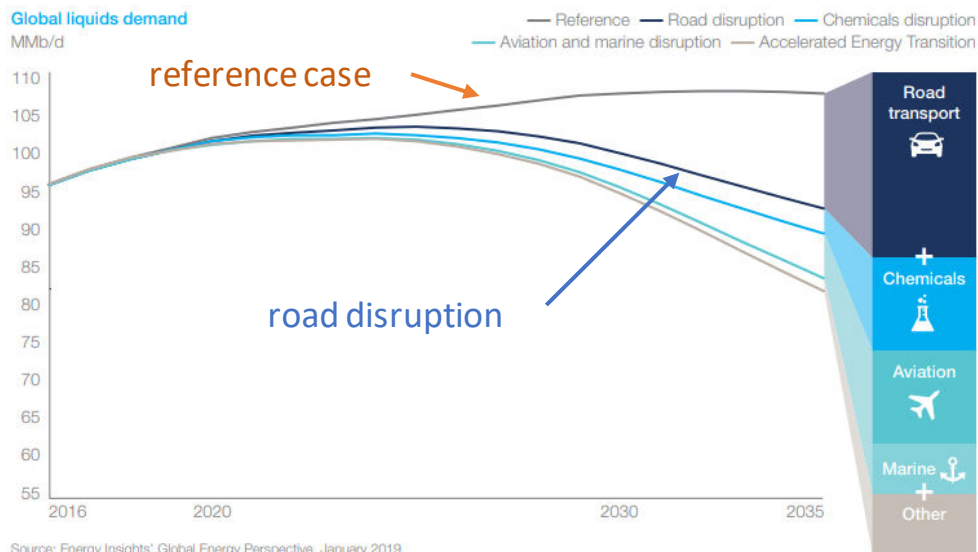


Source: U.S. EPA [Our Nation's Air](#)

Transportation, oil consumption, GHG emissions

DESPITE PROGRESS ON HD-TRUCK EFFICIENCY, OIL DEMAND CONTINUES TO GROW

- Transportation represents ~70% of all U.S. petroleum consumption
- 30% of GHG emissions
- Fuel economy/emissions standards slow energy demand, GHG growth
- Road transport disruption (ie: battery, fuel cell, technology advancements) could dramatically reduce energy demand, emissions growth)



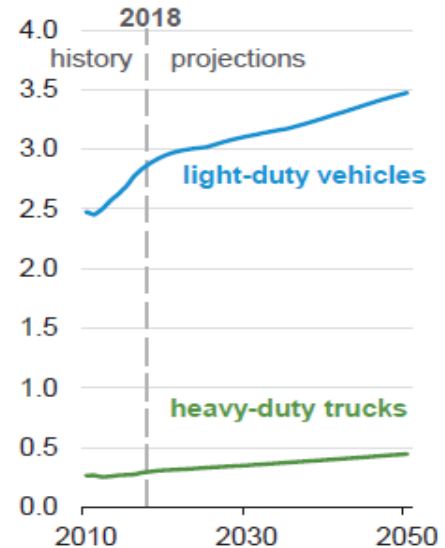
Source: McKinsey Energy Insights, Global Energy Perspective

Freight transport projections

- Truck miles increase 52% from 397 billion miles to 601 billion miles
- Carbon intensity of freight transport remains high based on continued reliance on petroleum-based energy
- E-commerce likely to increase truck miles (esp. regional and last-mile)
- Globally, more significant increases




Source: 2019 American Energy Outlook

Vehicle travel (Reference case)
trillion vehicle miles



Air Quality Standards and Policy



-  EPA integrates vehicle/fuel standards enabling technologically feasible, cost-effective emissions reductions
 - Ultra-low sulfur diesel, helps meet criteria pollutant standards
-  Greenhouse Gas Emissions and Fuel Economy Standards
 - Phase 1: 270 million metric ton reduction in carbon pollution
 - Phase 2: 1.1 billion metric ton reduction in carbon pollution
-  Cleaner Trucks Initiative
 - Will achieve further NO_x reductions, help offset climate impacts

Government Policy, Incentives, Funding



Advanced Technology Credits



Test Exemptions



Grants and Rebates Funding
Clean Diesel National Grants
Volkswagen Partial Clean Air Act Settlements


Freight miles, tonnage, energy use, emissions



HOW FREIGHT MOVES: LONG HAUL, REGIONAL HAUL, SHORT HAUL

 Long haul and Regional Haul account for largest share of miles, tonnage, energy use and emissions



 Short haul, including last mile account for less, but growing (e-commerce) mileage, emissions



Where do electric trucks make sense?



PARITY BETWEEN COST AND PERFORMANCE

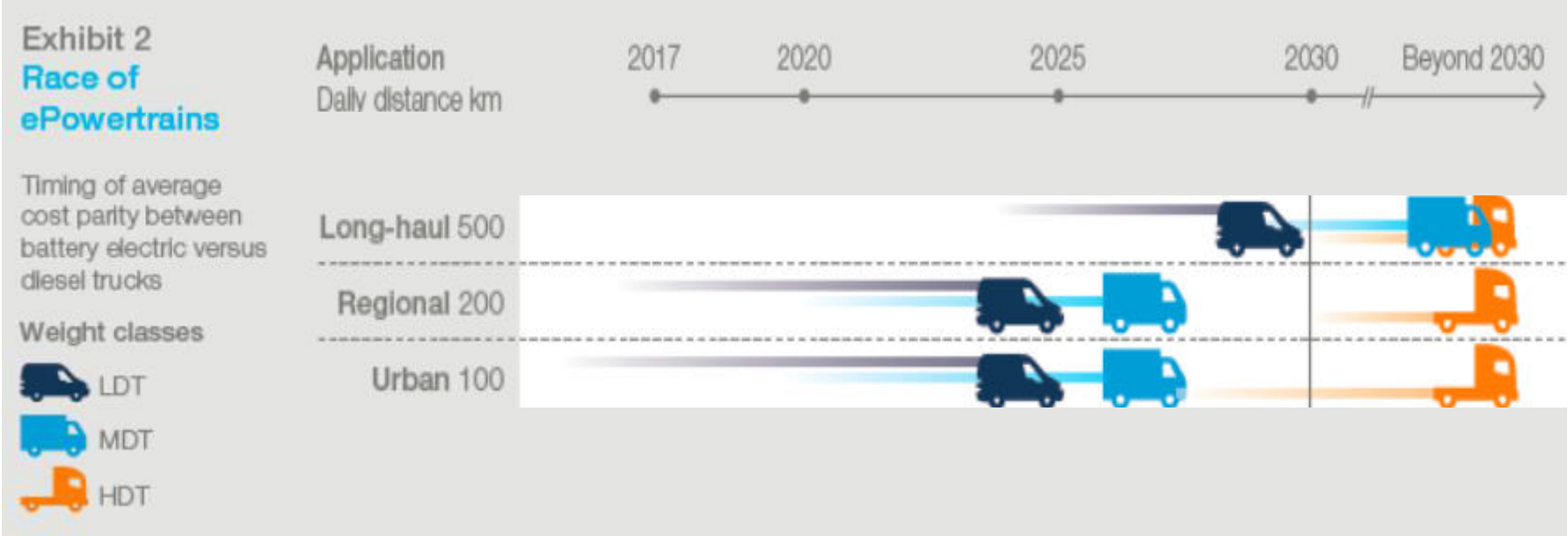
Performance

- Tare Weight
- Range, refill time
- Service Life
- Safety

Cost

- Initial Cost
- Fuel
- Maintenance
- Residual Value

Total cost of ownership, parity to diesel vehicles achieved



Source: McKinsey Energy Insights, Center for Future Mobility

ALMOST 300 TRUCKS AND BUSES CERTIFIED



- Class 8 (other than vocational tractors)
 - ~ 200 Battery-electric, Hydrogen-electric and Trackless Electric Trolley powered heavy-duty Urban Transit Buses; Dray; Coach
 - ~ 10 School Buses, ~ 10 Coach Buses, 10 < Refuse, recycling, other utility

Manufacturers

- BYD Motors, Blue Bird Body, Daimler Truck North America, GILLIG, Green Power Motor, Lion Bus, New Flyer of America, Volvo



EPA Certified Electric Trucks, Buses



Class 6-7 (other than vocational tractors)

- Electric city bus; School Bus service, pick up and delivery; Shuttle Bus, Medium-duty transit bus; cab-chassis platform with configurable body

Manufacturers

- An Yuan Bus Manufacture, BYD Motors, Blue Bird Body, Daimler Trucks North America, Distinctive Service, Thor Trucks



EPA Certified Electric Trucks, Buses



Class 2b-5 (vocational vehicles)

- Pickup and Delivery, Short Haul, Service Utility, Repair, Maintenance Service; Urban cabover, Logistics Van and Cutaway; Panel van; High-urban Final Mile delivery of products and parcel; Shuttle Van for high-urban passenger, special needs and para-transit, passengers for institutions with smaller capacity needs; Shuttle Delivery applications

Manufacturers

BYD Motors, Chanje Energy, Daimler Trucks North America, GreenPower Motor, +Lion Bus, Mitsubishi Fuso Truck of America, Thor Trucks



Diesel Emission Reduction Grants



Electric	Hybrid	Vehicle Type
	53	Short Haul
	2	Long Haul
	26	Refuse Hauler
36	10	school bus
26	17	Transit Bus
174		Agricultural Equipment & Pumps

Electric	Hybrid	Vehicle Type
385	10	Airport GSE
7		Cranes
1	6	Ferry/Tug Boat
9	7	Nonroad Port
41	1	Terminal Tractor
58	16	TRUs

Industry Transition

Large Manufacturers



Start-ups



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