



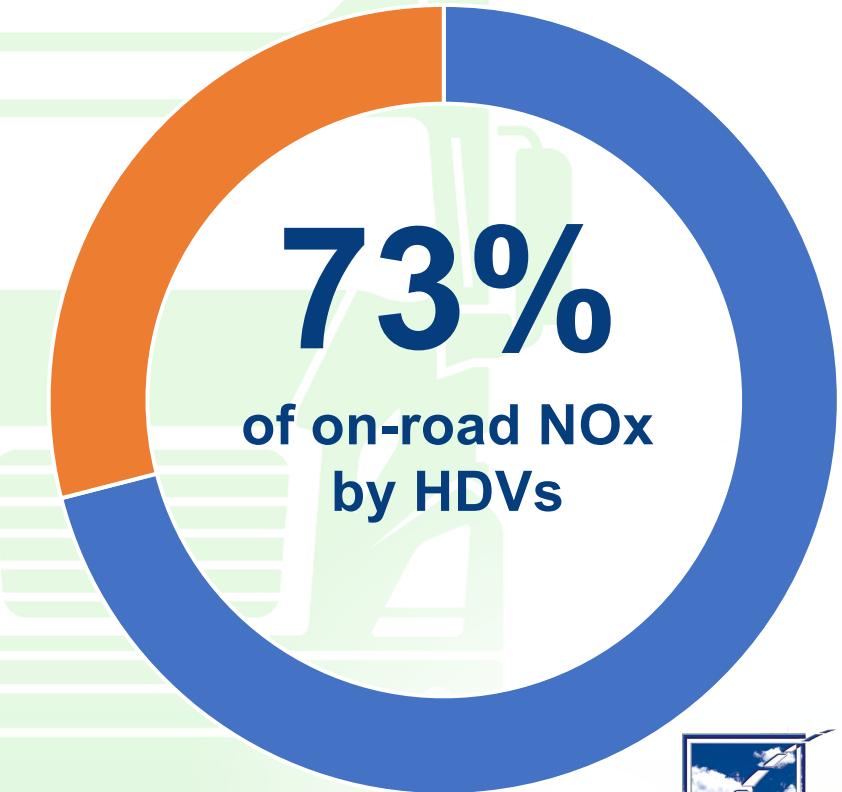
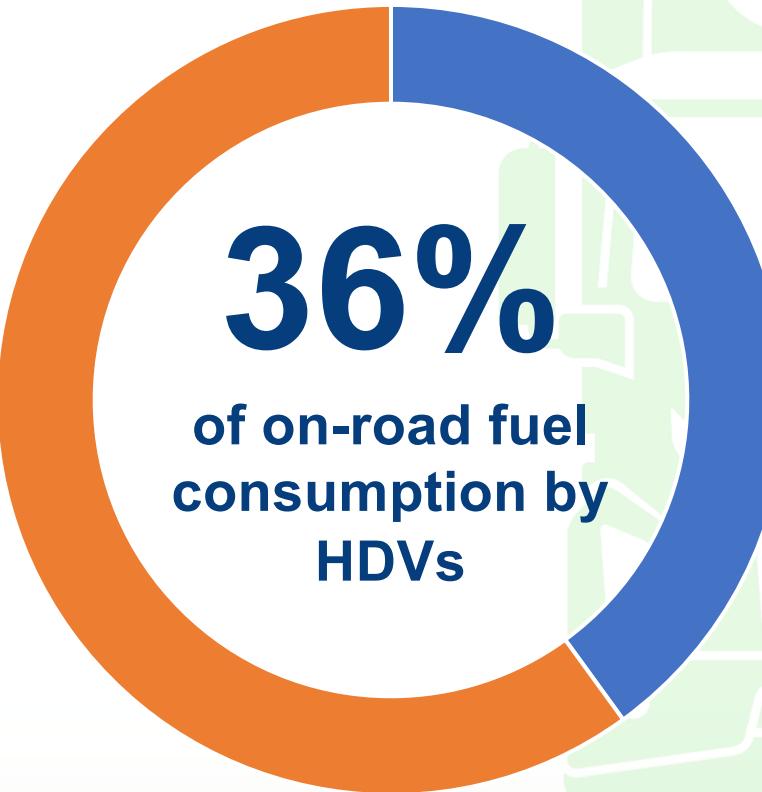
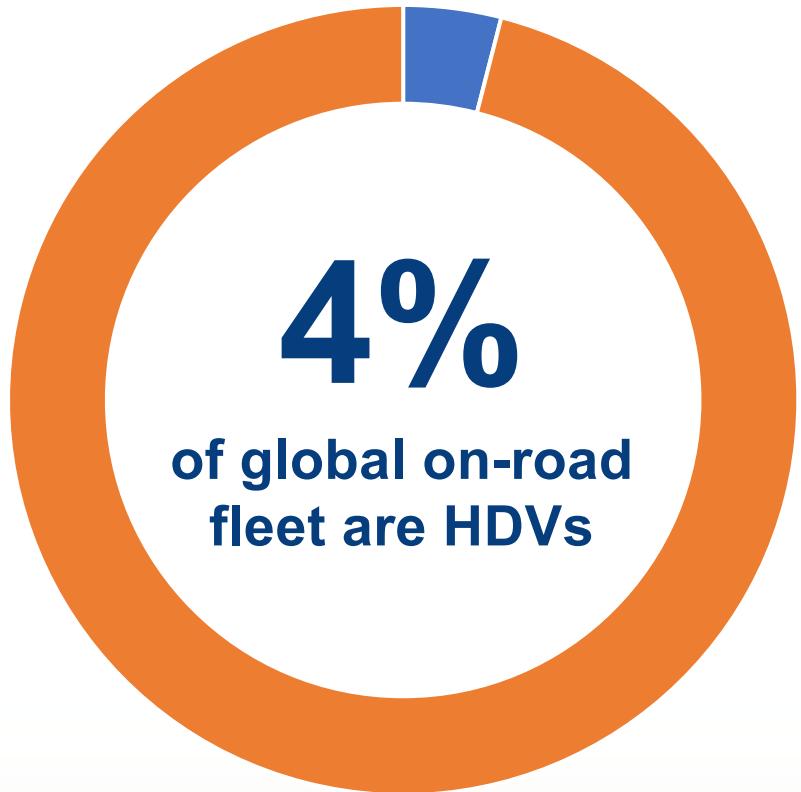
THE ZERO-EMISSION FREIGHT REVOLUTION: CALIFORNIA CASE STUDIES

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 EVS35
OSL2022

Over 300 Members

WHY ZERO EMISSION FREIGHT: DISPROPORTIONATE EMISSIONS



ICCT (2020): Roadmap model

CALIFORNIA'S APPROACH TO MARKET TRANSFORMATION

Regulations

Advanced Clean Trucks

Mandates OEMs to sell increasing percentage of ZE Class 2b-8 vehicles

Advanced Clean Fleets

Would mandate fleets to purchase increasing percentage of ZE Class 2b-8 vehicles (expected to pass in 2022)

Incentives

Low Carbon Fuel Standard

Generates credits for low-carbon fuel producers and EV charger owners



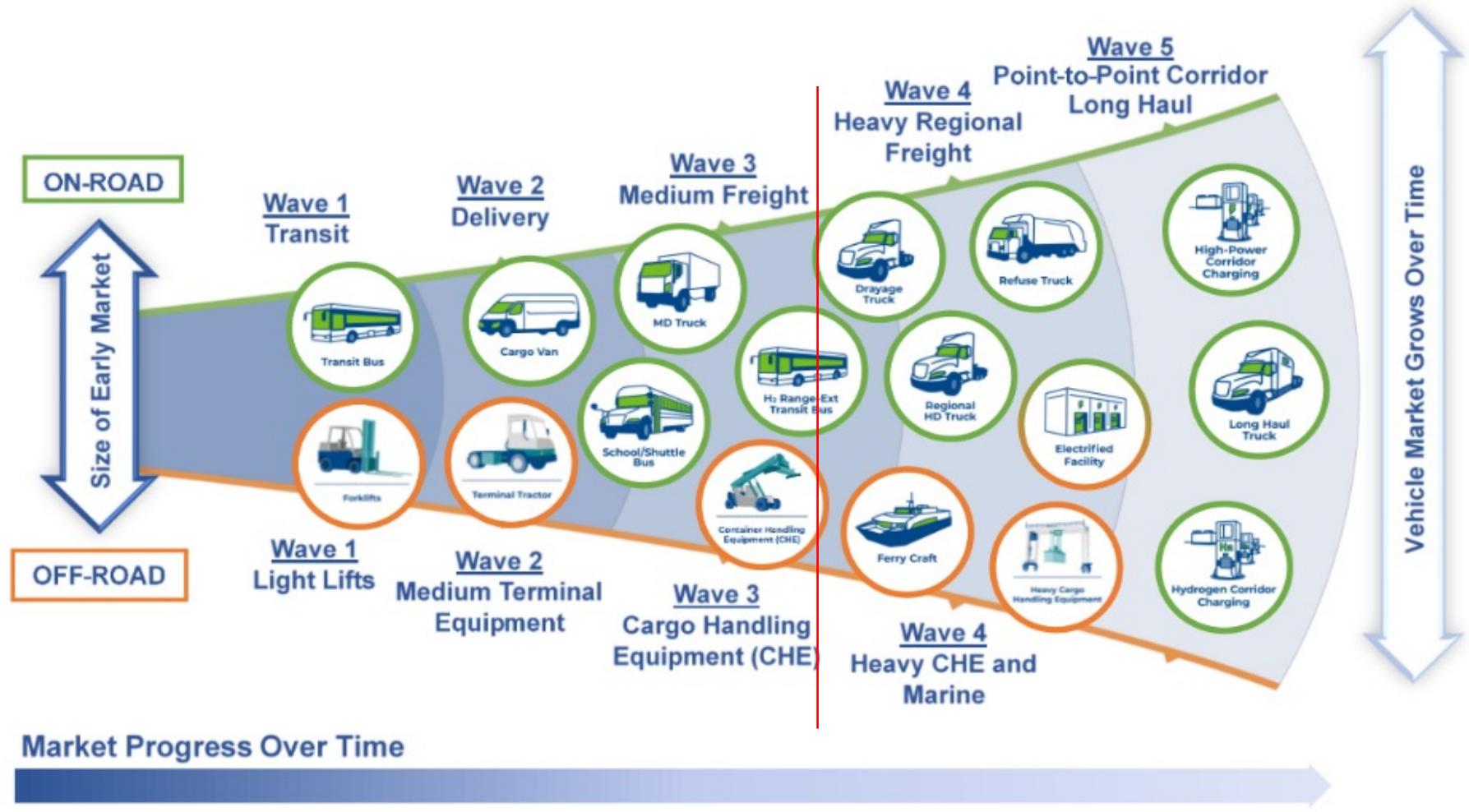
Point-of-sale incentives for clean trucks and buses



Point-of-sale incentives for clean off-road equipment



BEACHHEAD MODEL: TARGET THE EASIEST TO ELECTRIFY SECTORS



PROJECTS AND FLEETS

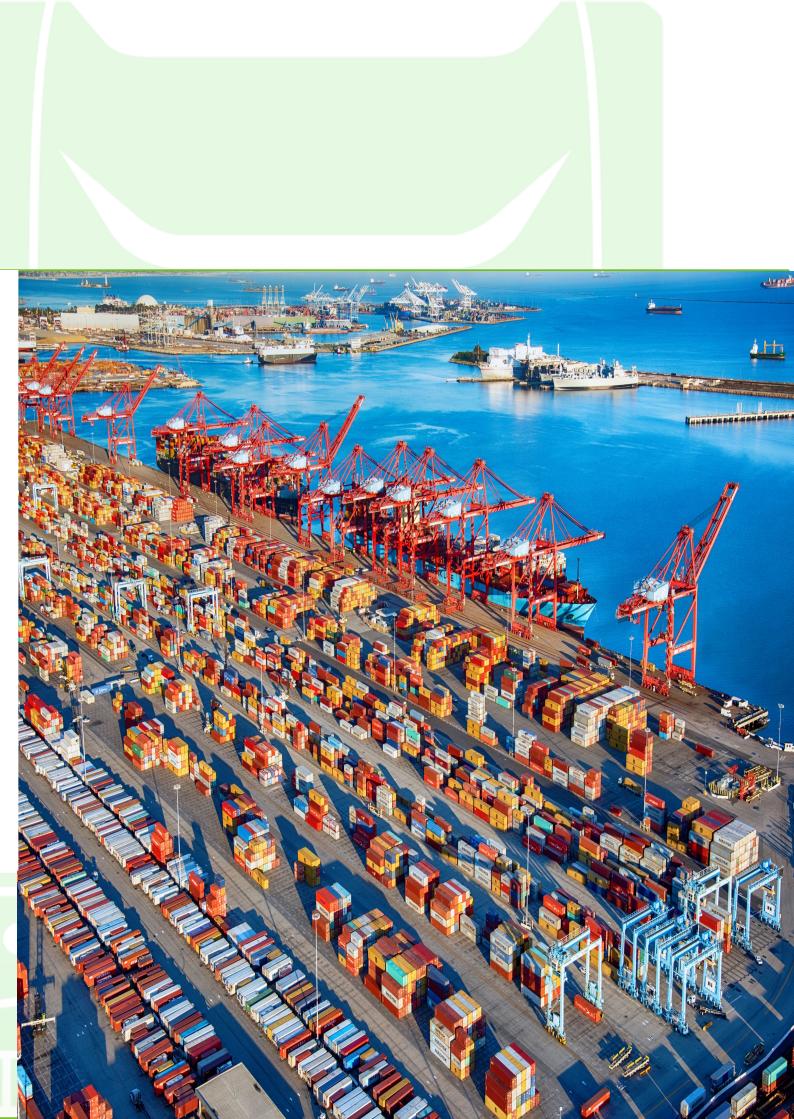
Volvo LIGHTS (\$90M)

- DHE & NFI
- Ports of LA / LB
- Drayage + warehousing operations



Project 2 (\$30M)

- Central Valley
- Manufacturing, warehousing + delivery



VEHICLES DEPLOYED

CONVERSION

Yard Tractor



Orange EV

T-Series Pure Electric Terminal Truck

2



Kalmar Ottawa

T2E 4x2 Terminal Tractor

2



BYD

8Y (Off-Road)

3

Class 6



Peterbilt

Peterbilt Model 220 Battery Electric Truck

6

8,846 – 11,793 kg

Class 7



Volvo

Volvo VNRe Battery Electric Truck

1

11,794 – 14,969 kg

Class 8



Volvo

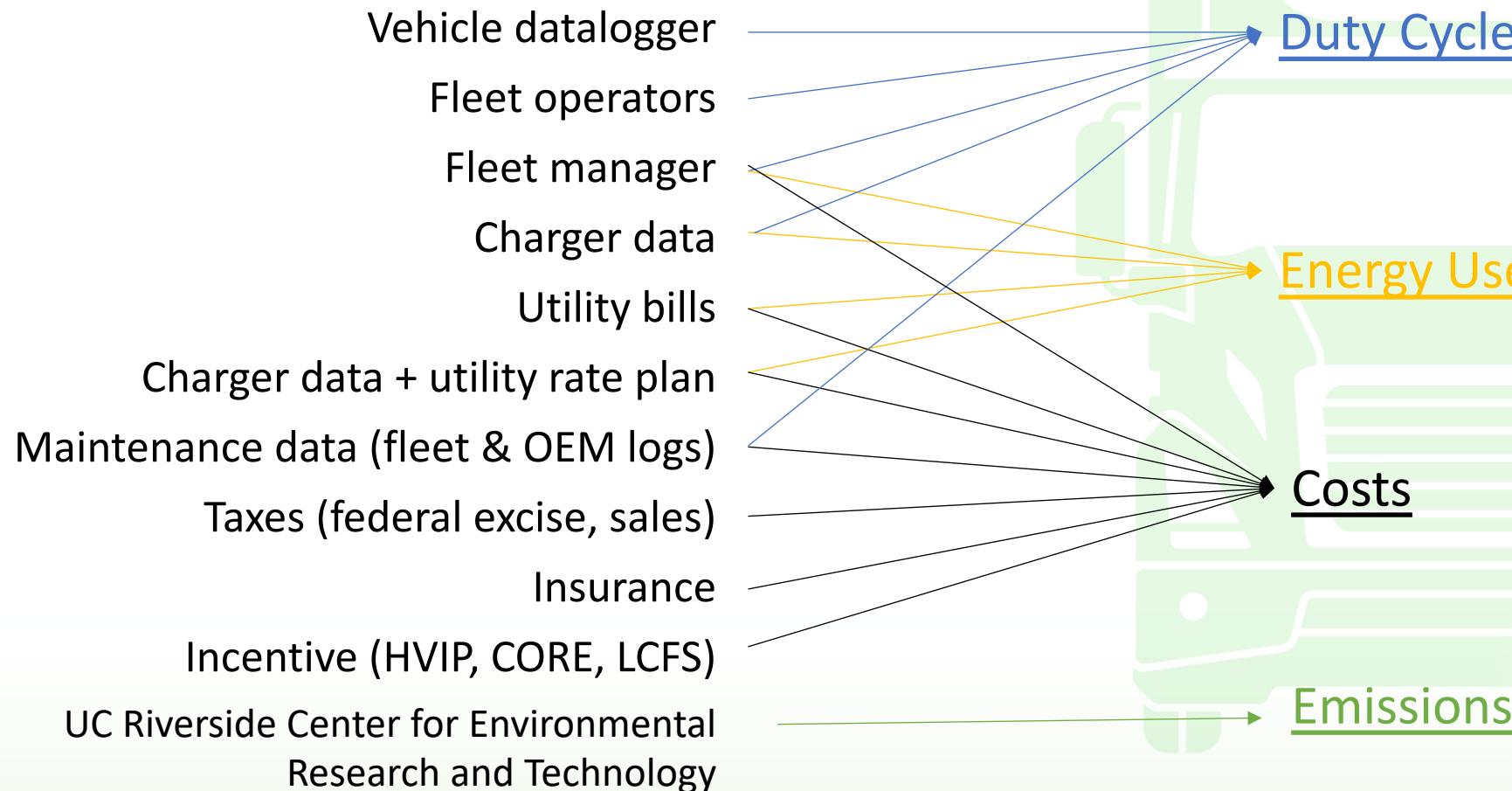
Volvo VNRe Battery Electric Truck

4



> 14,969 kg

DATA COLLECTION



E-YARD TRACTOR: 5X MORE EFFICIENT

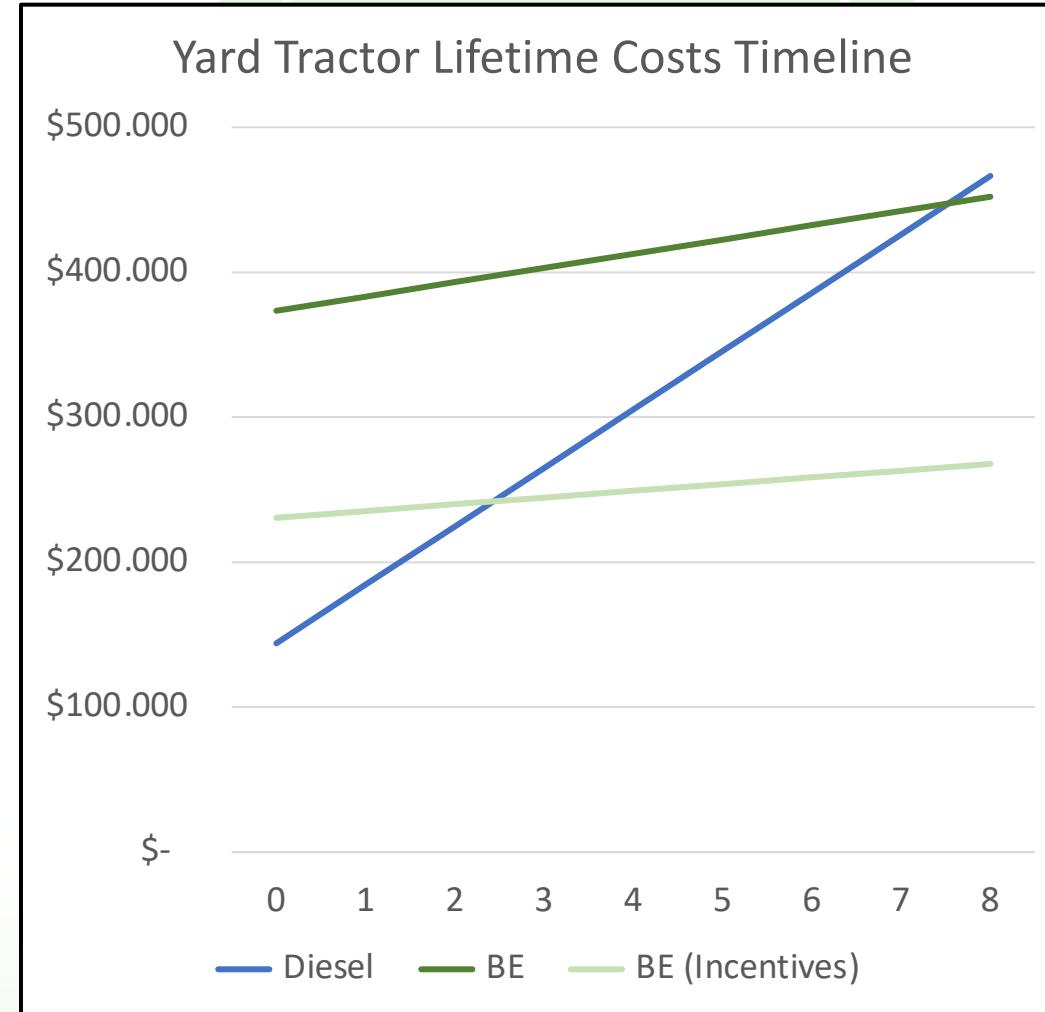
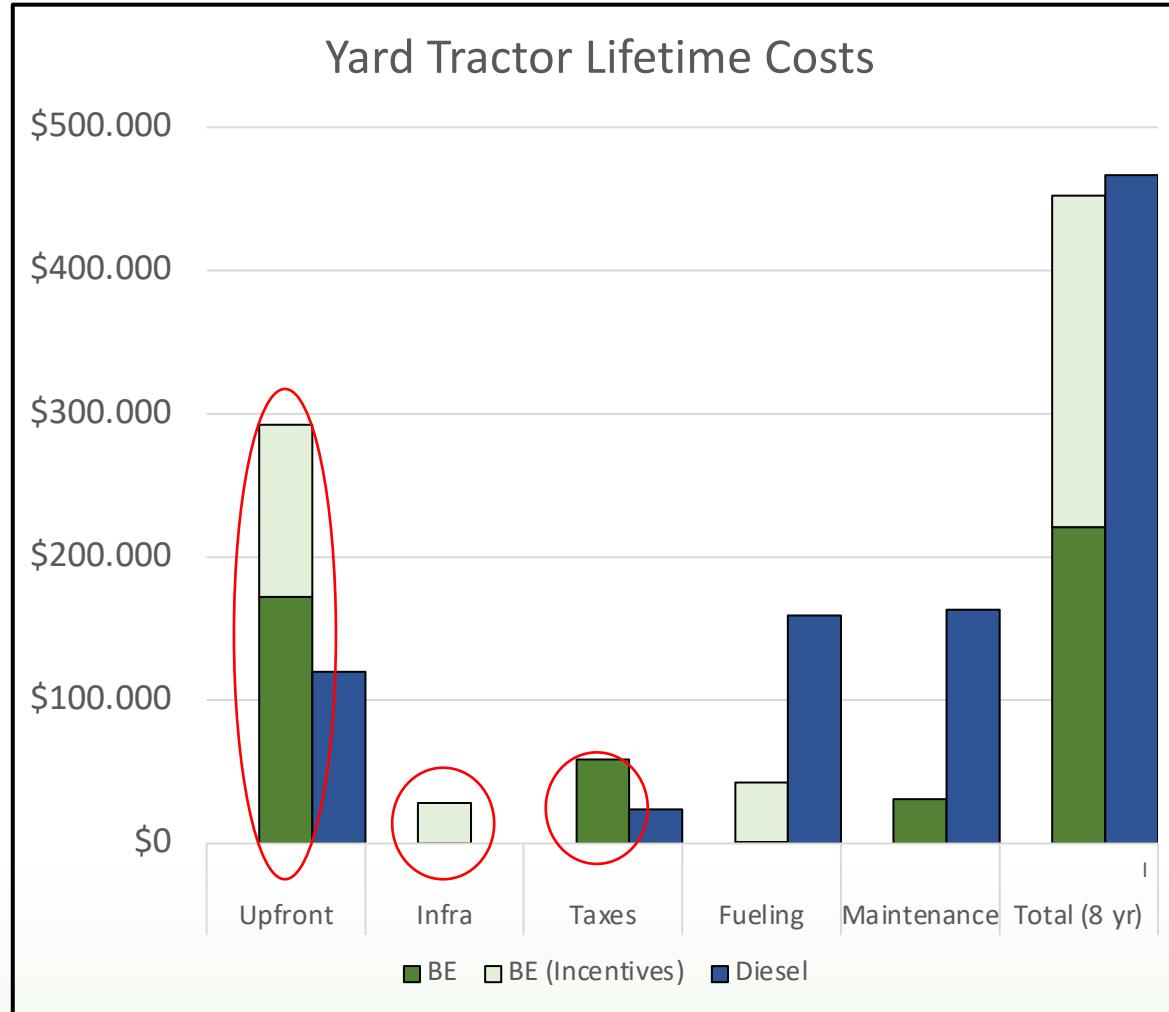
Same Duty Cycle as Diesel



More Energy Efficiency



E-YARD TRACTOR: BETTER TOTAL COST OF OWNERSHIP



E-YARD TRACTOR: LOWER EMISSIONS & LIFETIME COSTS

Emissions

- 1 yard tractor = 6.6 cars



Summary

- Meet duty cycle
- Cheaper lifetime costs than diesel
- Major climate and pollution benefits



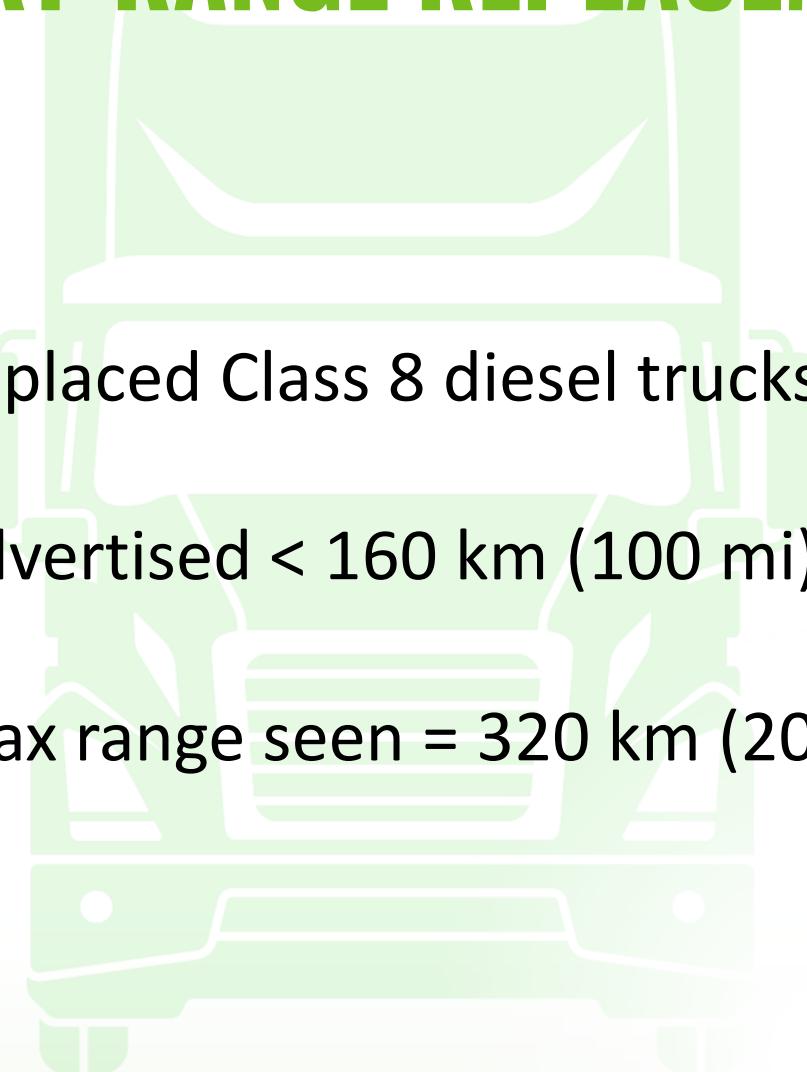
CLASS 6 E-TRUCKS: GREAT SHORT-RANGE REPLACEMENT



Peterbilt

**Peterbilt Model 220 Battery
Electric Truck**

- Replaced Class 8 diesel trucks
- Advertised < 160 km (100 mi)
- Max range seen = 320 km (200 mi)



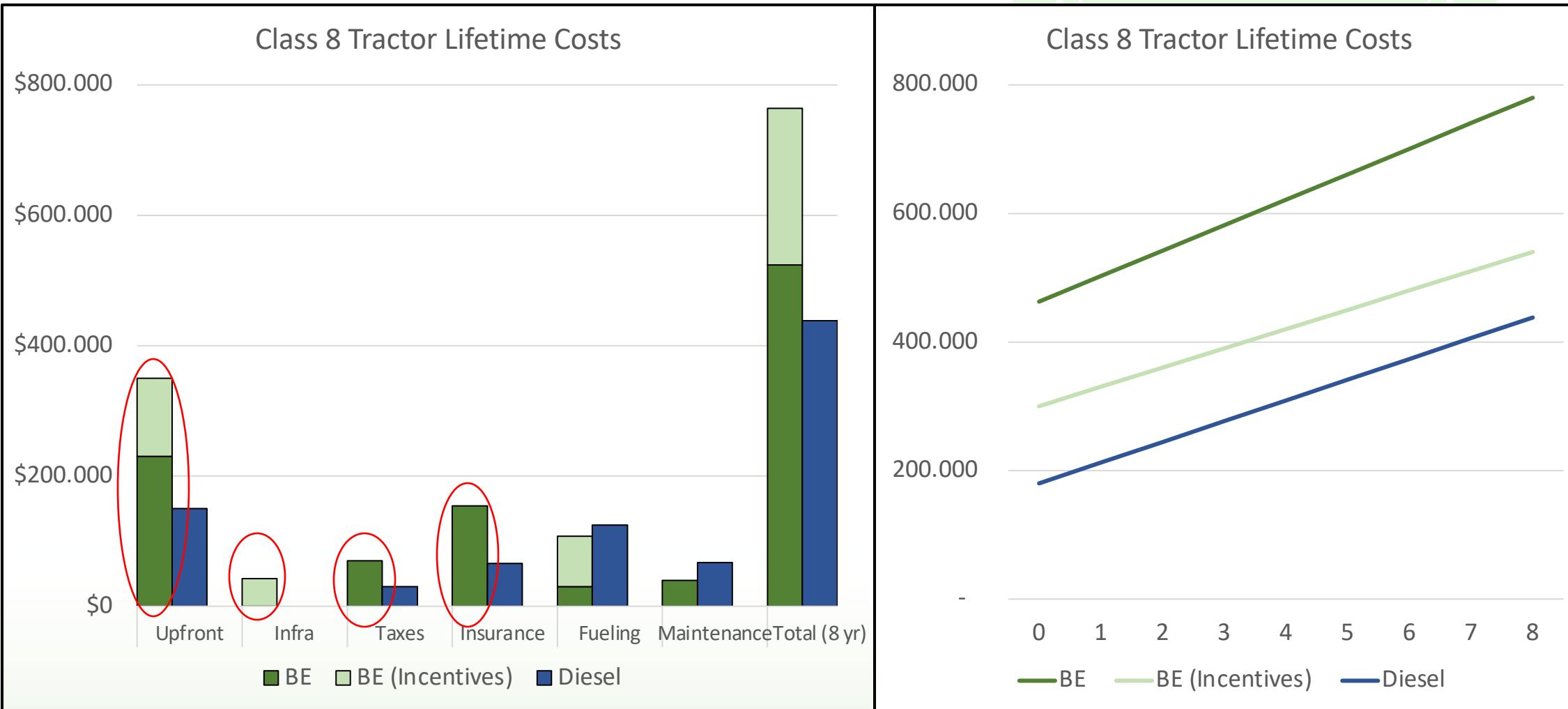
CLASS 7-8 TRUCKS: MORE ENERGY EFFICIENT, LESS RANGE



- EVs 3x more energy efficient
- Class 7 EV range limited to 160 km per day (100 mi). 50-60% of DHE's nationwide
- Class 8 EV range limited to <240 km per day (150 mi) and 1 shift per day



CLASS 7-8 TRUCKS – SEVERAL BARRIERS TO A LOWER TCO



CLASS 7-8 TRUCK – HUGE EMISSIONS SAVINGS

Class 7

(24,000 km, 15,000 mi)



= 5.2 cars

A horizontal row of 5.2 black car icons, with the last icon partially cut off on the right.

Volvo

Volvo VNRe Battery Electric Truck

Class 8

(161,000 km, 100,000 mi)



36 cars

A grid of 36 black car icons, arranged in 6 rows and 6 columns.

Volvo
Volvo VNRe Battery Electric Truck

At Port of Los Angeles, HD trucks make up:

- 44% of CO₂
- 18% of NO_x



CONCLUSION

| | Yard Tractor | Class 6 | Class 7 | Class 8 |
|------------------------|---|---|---|---|
| Vehicle |  |  |  |  |
| Range | = Diesel | < 160 km < 100 mi | < 160 km < 100 mi | < 240 – 350 km < 150-220 mi |
| Cheaper Lifetime Costs |  | ? |  |  |



THANK YOU



CO-AUTHORS

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