Zane McDonald
Lead Hydrogen & Alternative Transportation Analyst

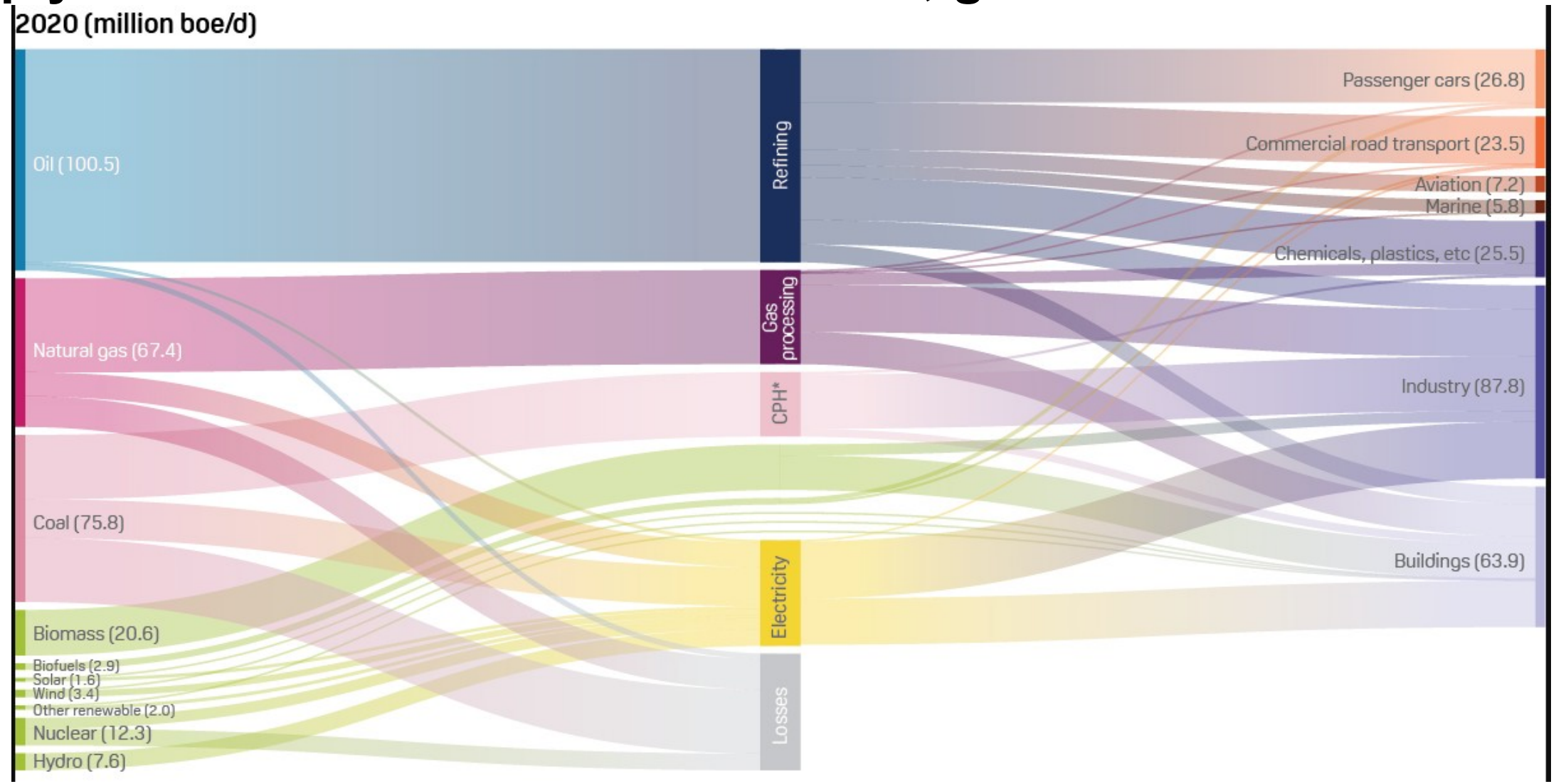
Heavy Duty Trucking

Are Alternative Fuels in Mirror Closer Than They Appear?

June 17th, 2020

S&P Global
Platts

Energy Transitions: as of 2020 around 80% of total energy supply comes from three fossil fuels: oil, gas and coal

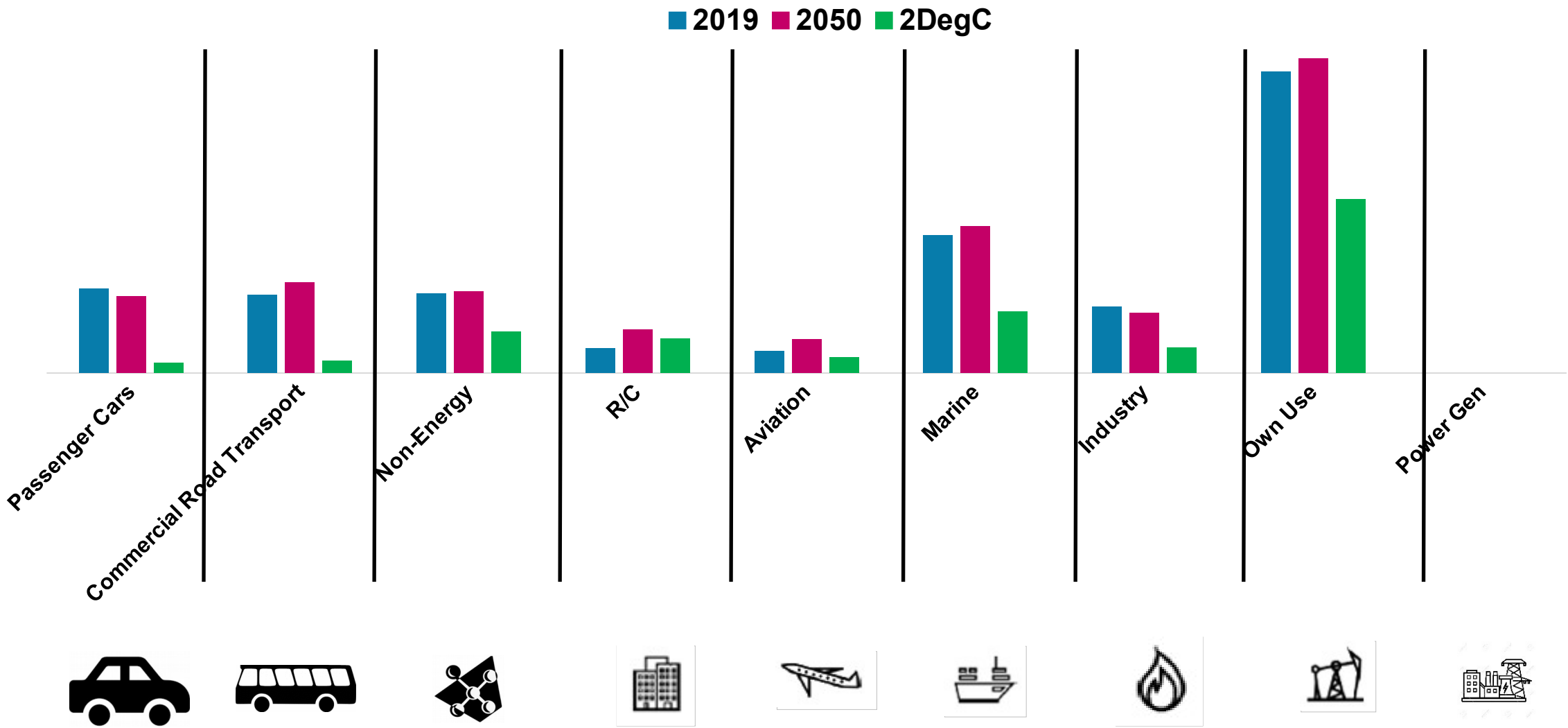


S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *World Energy Demand Model*

Required CO_2 emission reductions for 2 Degrees Scenario

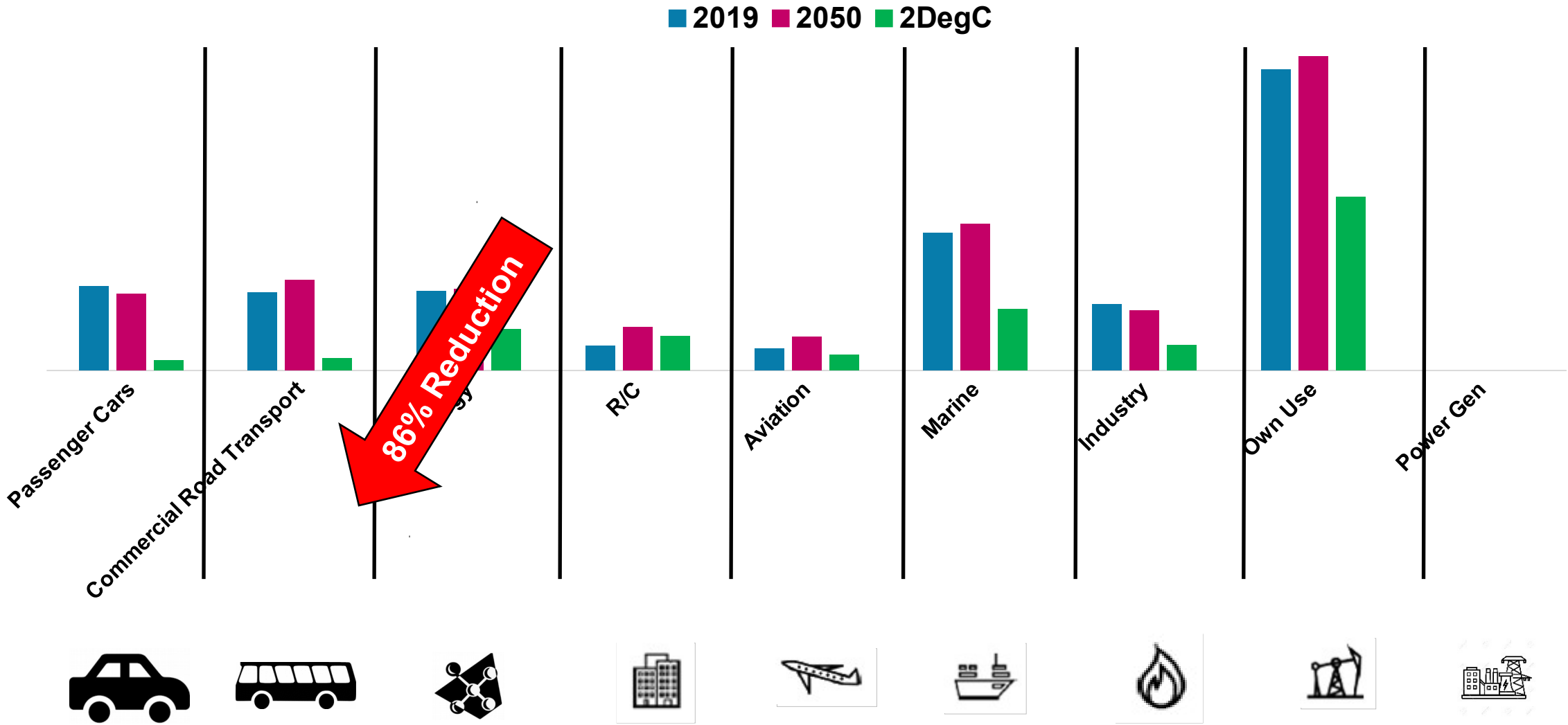
Some sectors are easier than others



Source: Platts Analytics **Scenario Planning Service:** *World Energy Demand Model*

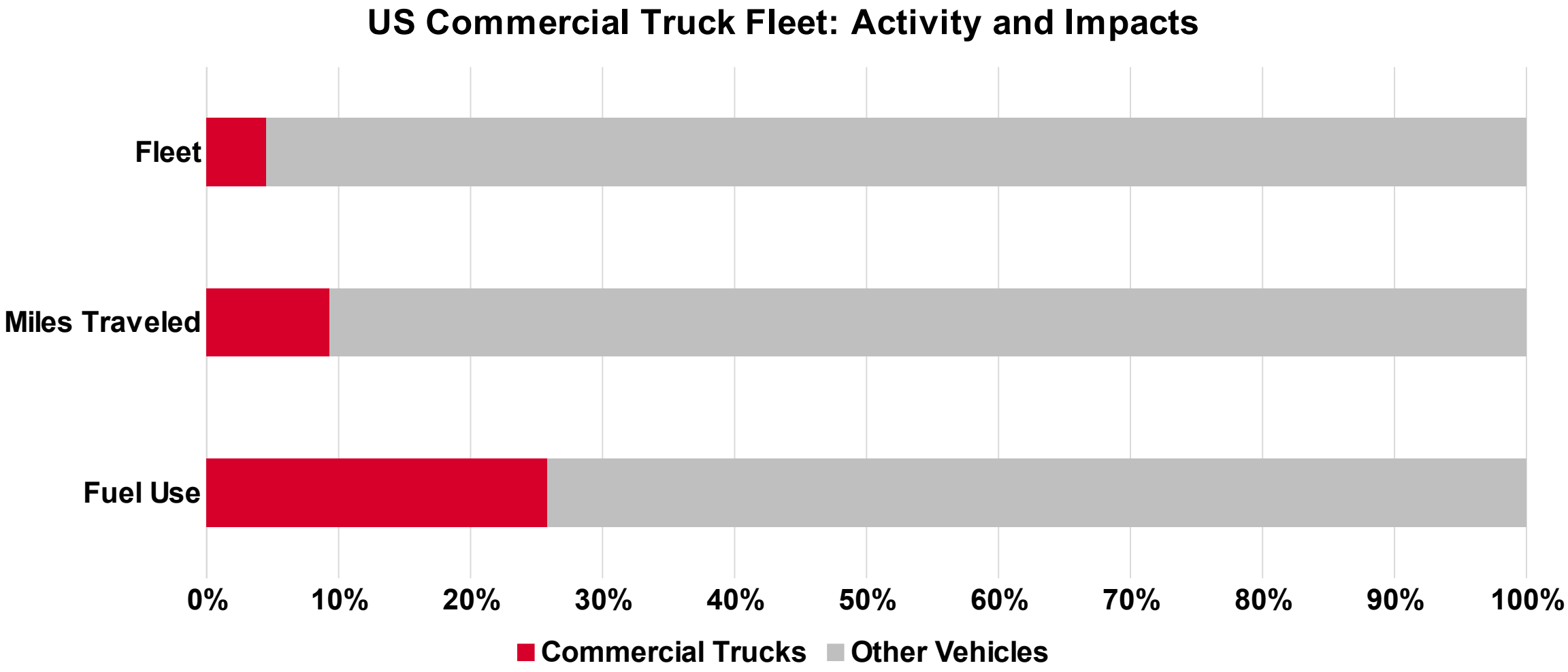
Required CO_2 emission reductions for 2 Degrees Scenario

Some sectors are easier than others



Source: Platts Analytics **Scenario Planning Service:** *World Energy Demand Model*

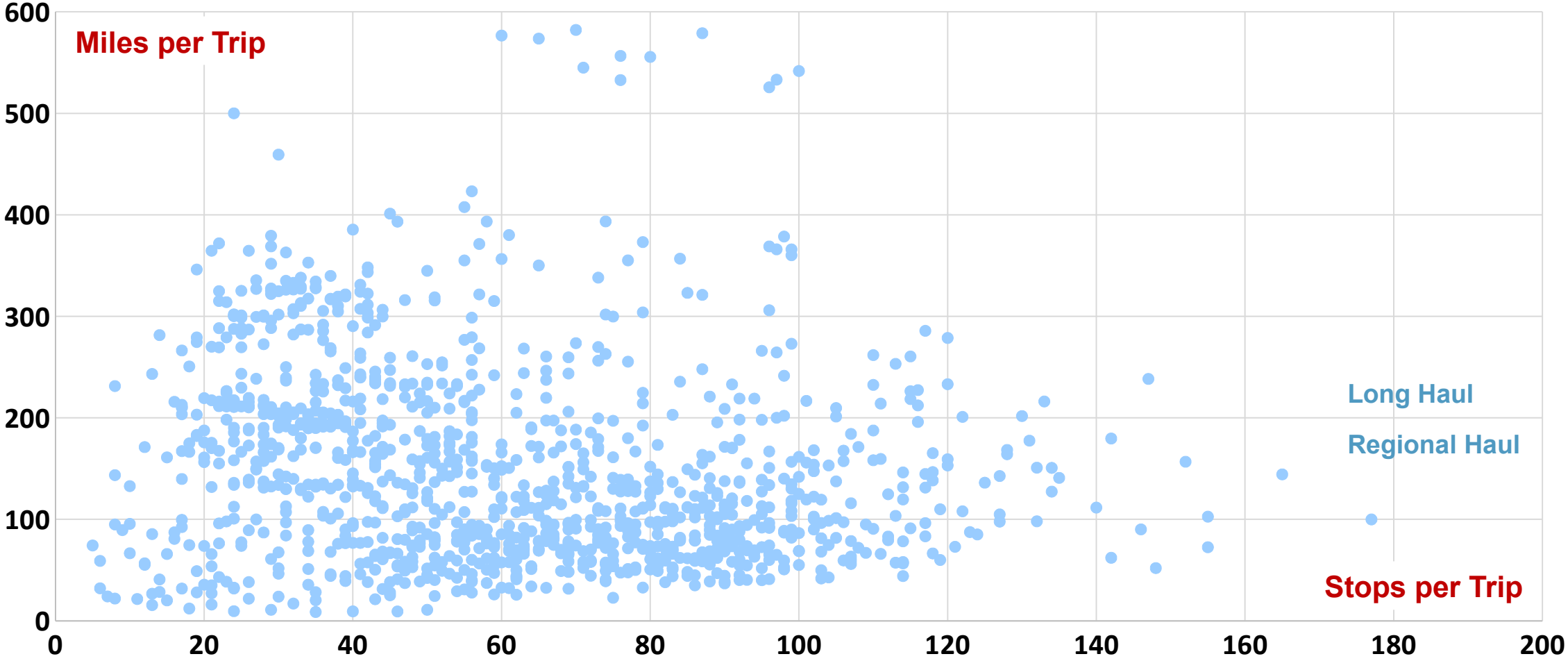
Commercial trucks have an outsized impact on US fuel use



S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

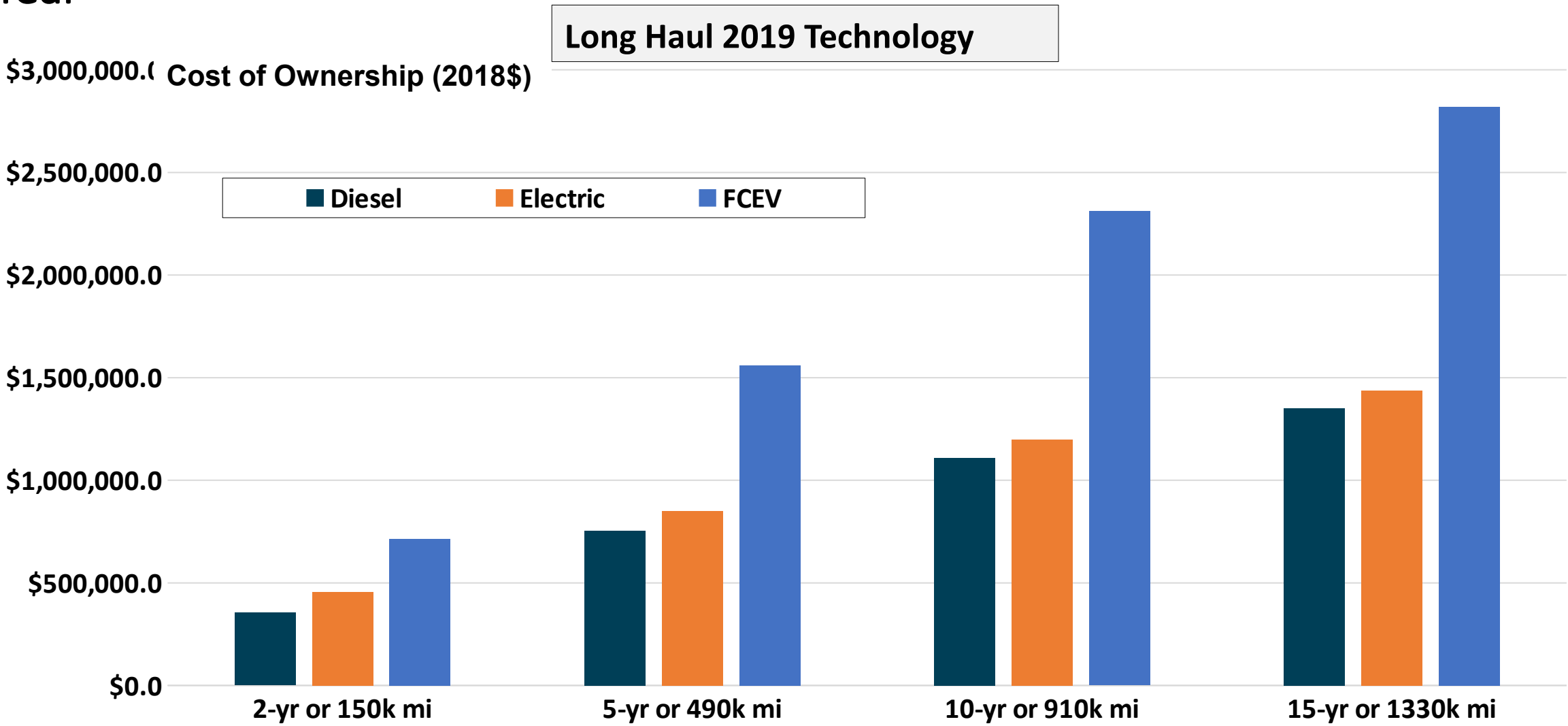
Class 8 Semi Trucks Have A Wide Spectrum of Duty Cycles, Ranging in both Trip Length and Stoppage



S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

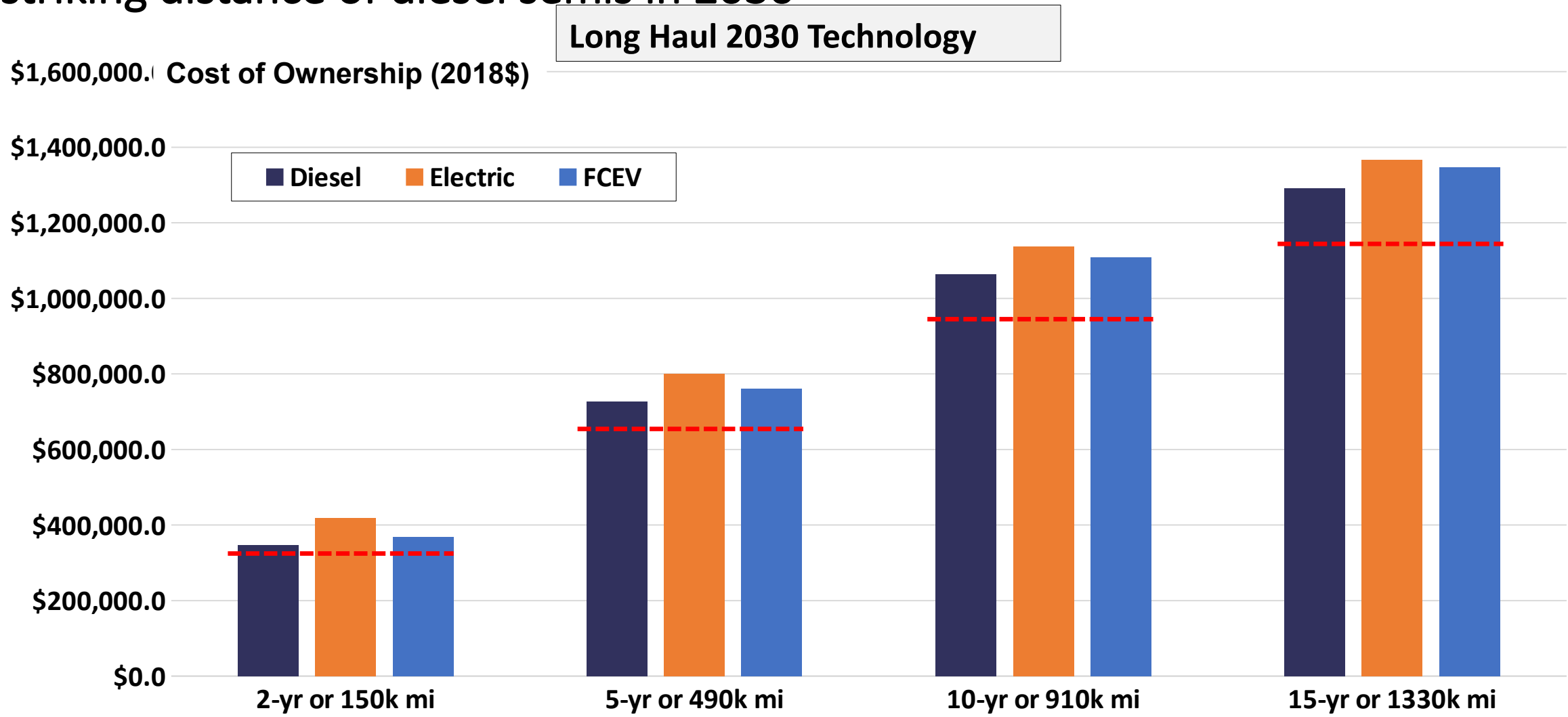
Long Haul Semi Truck (2019) Cost of Ownership Assuming 85,000 Miles per Year



S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

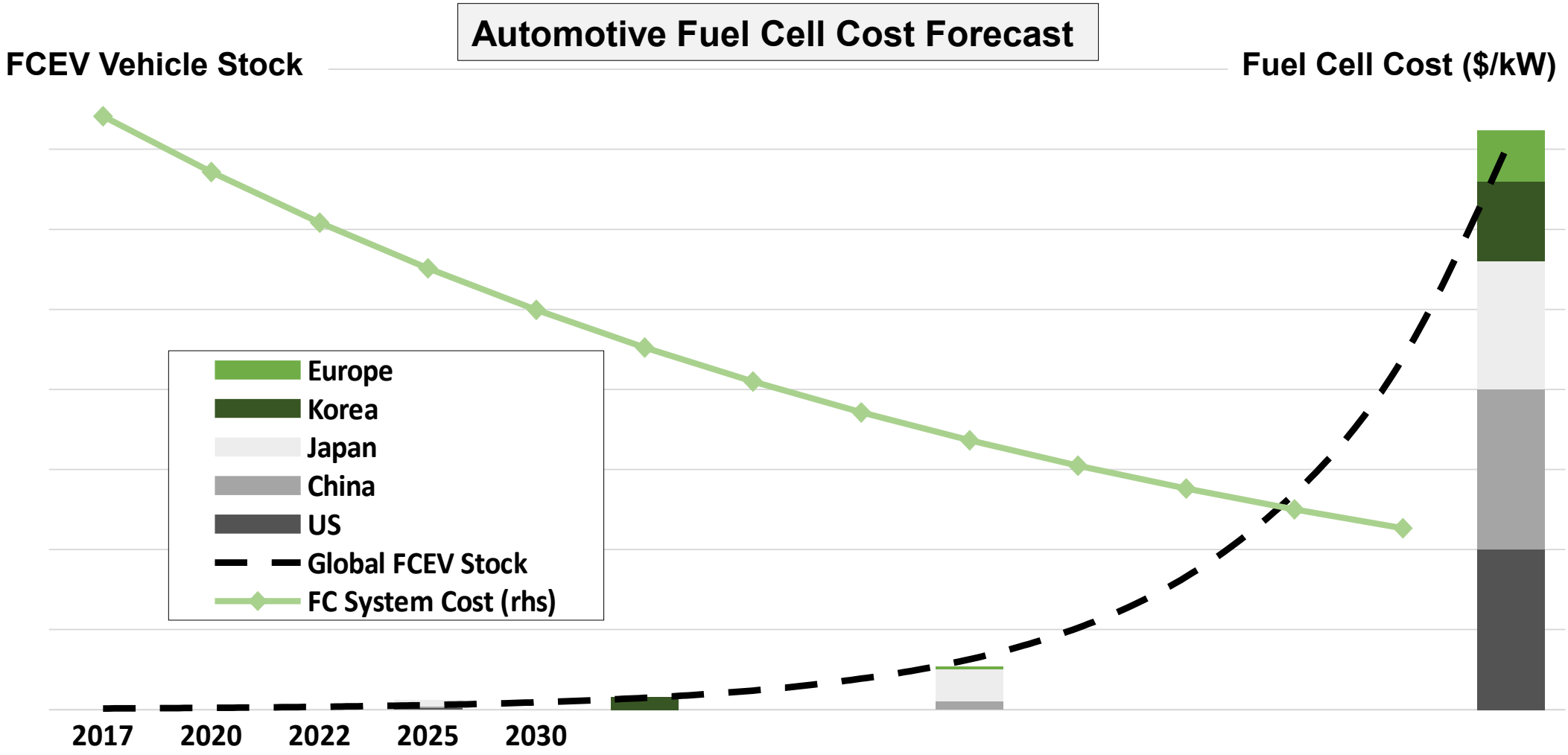
Long haul semi truck total cost of ownership shows hydrogen well within striking distance of diesel semis in 2030



S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

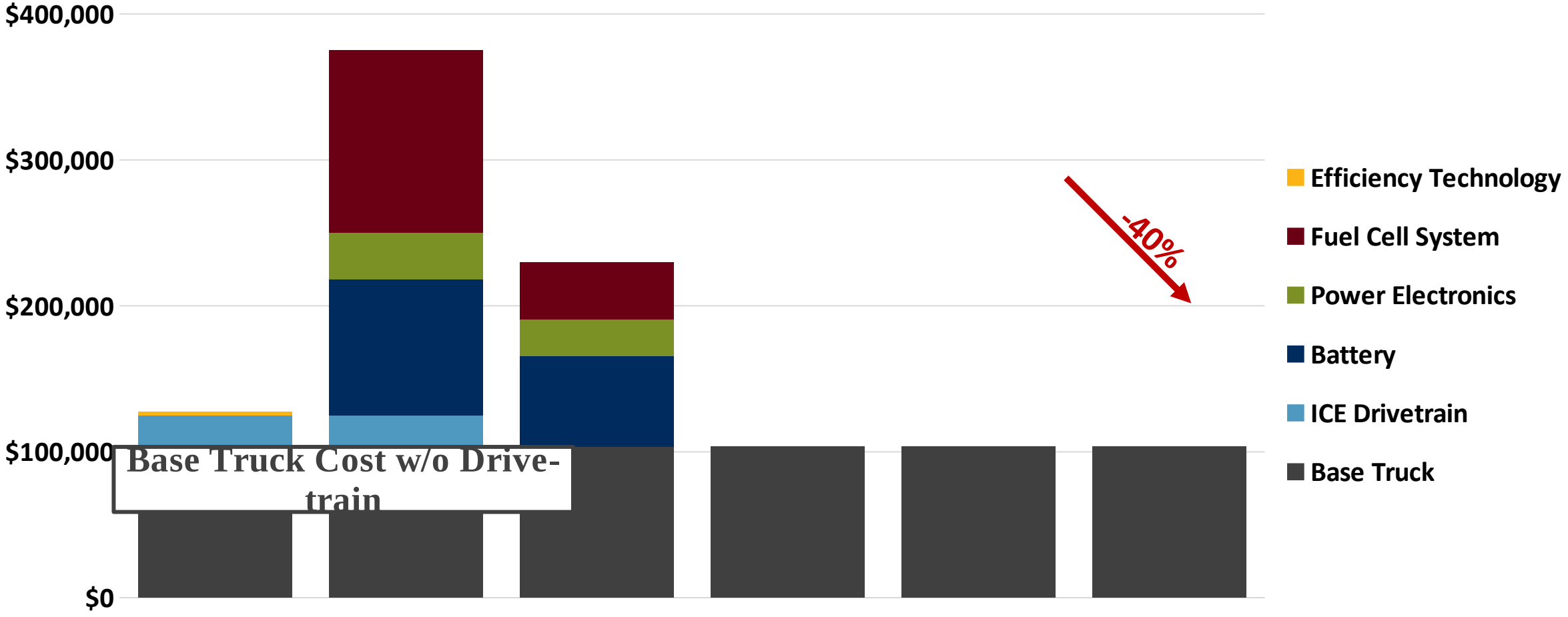
Fuel cell costs can be expected to decline significantly with economies of scale if country level commitments are realized



S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

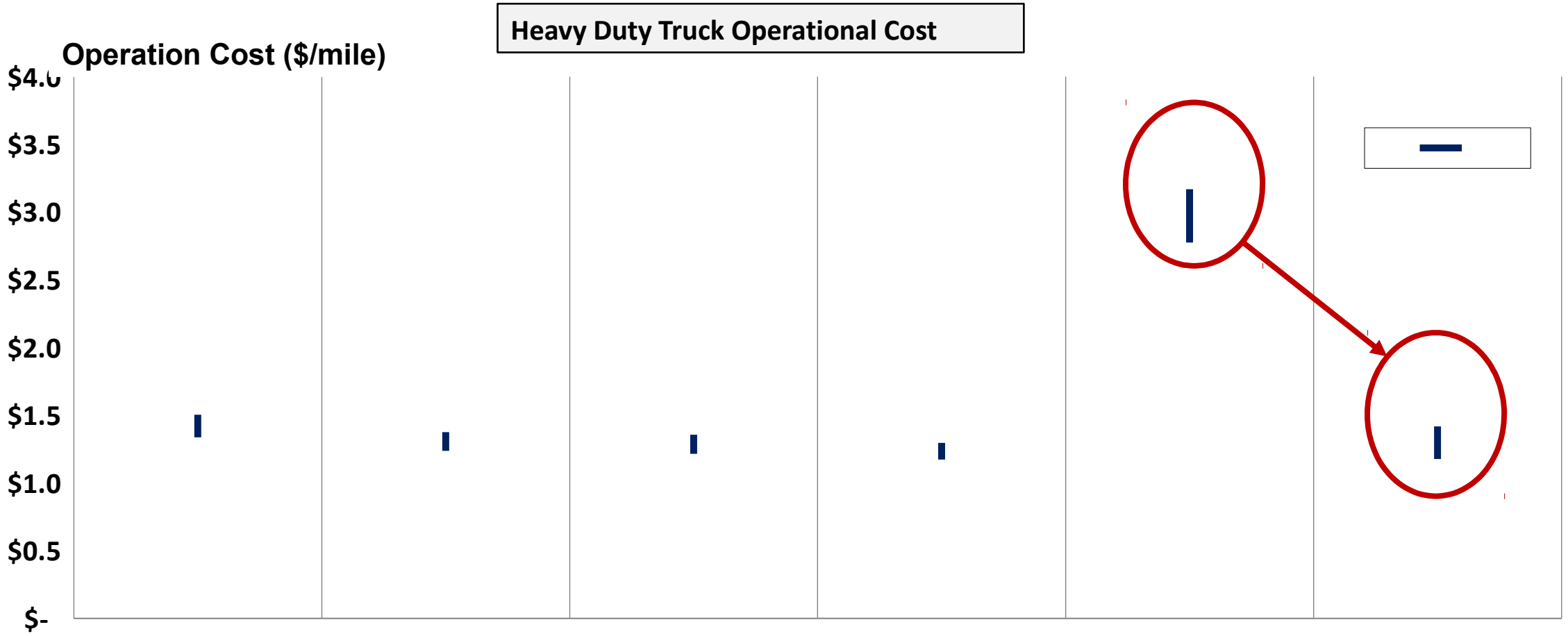
Scale in automotive fuel cell production would put significant downward pressure on hydrogen semi truck purchase cost



S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

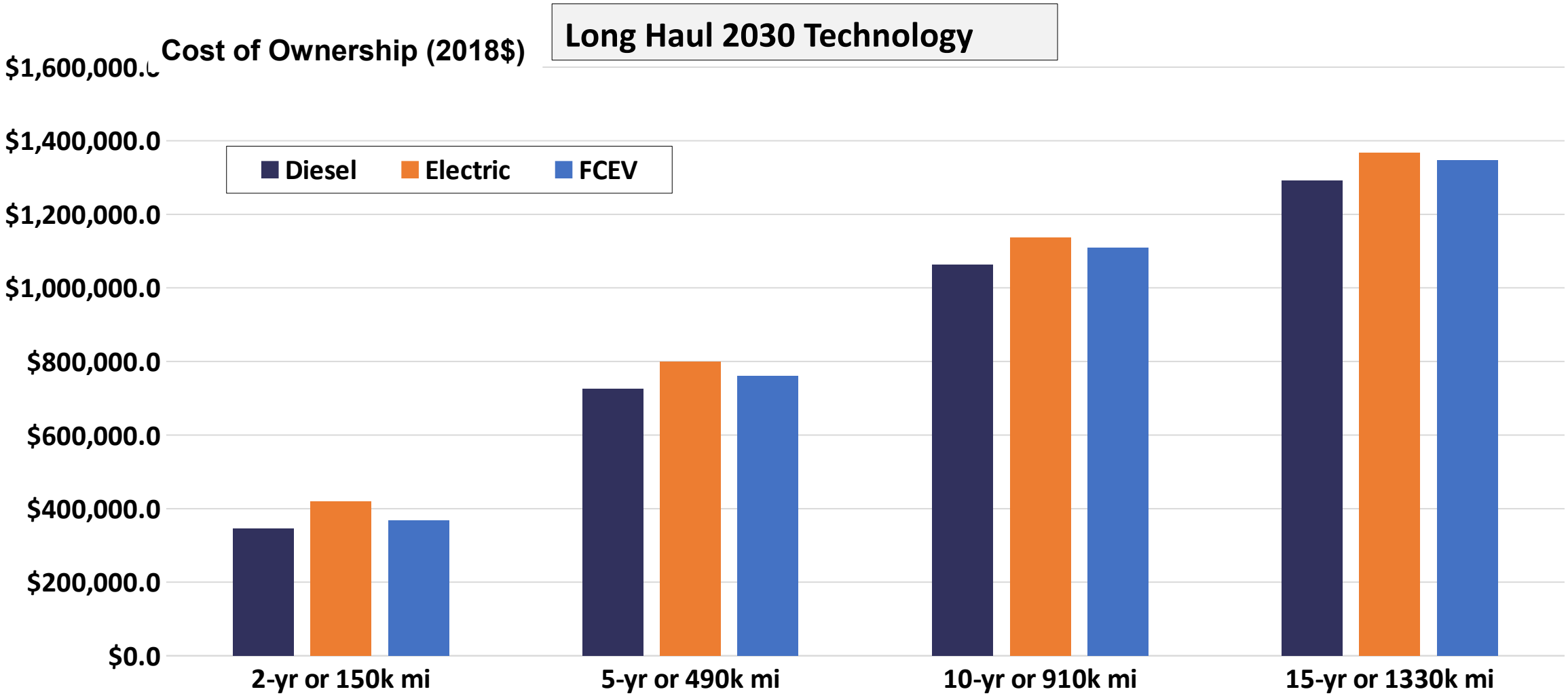
Operational costs have outsized impact on economics of fuel switching in high-mileage heavy duty trucking



S&P Global
Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

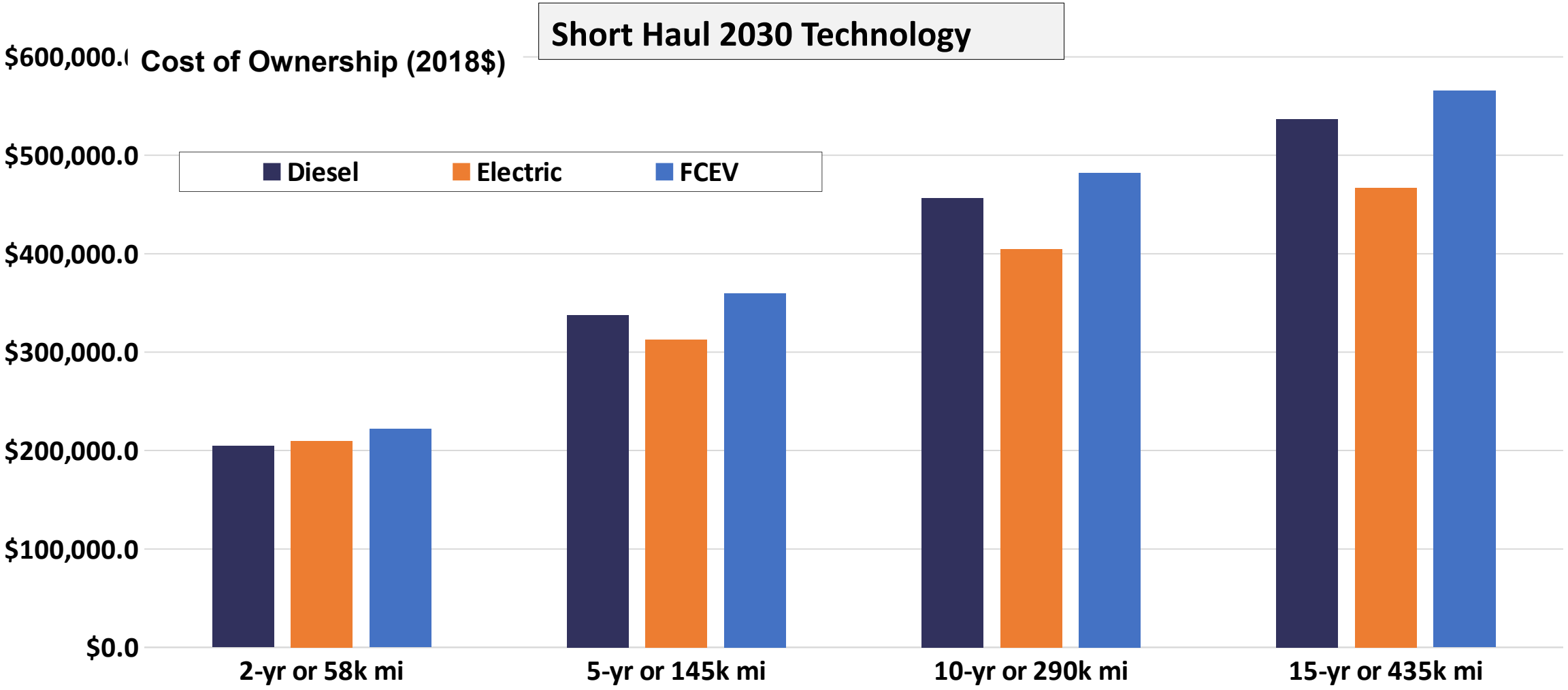
Long haul semi truck total cost of ownership shows hydrogen well within striking distance of diesel semis in 2030



S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

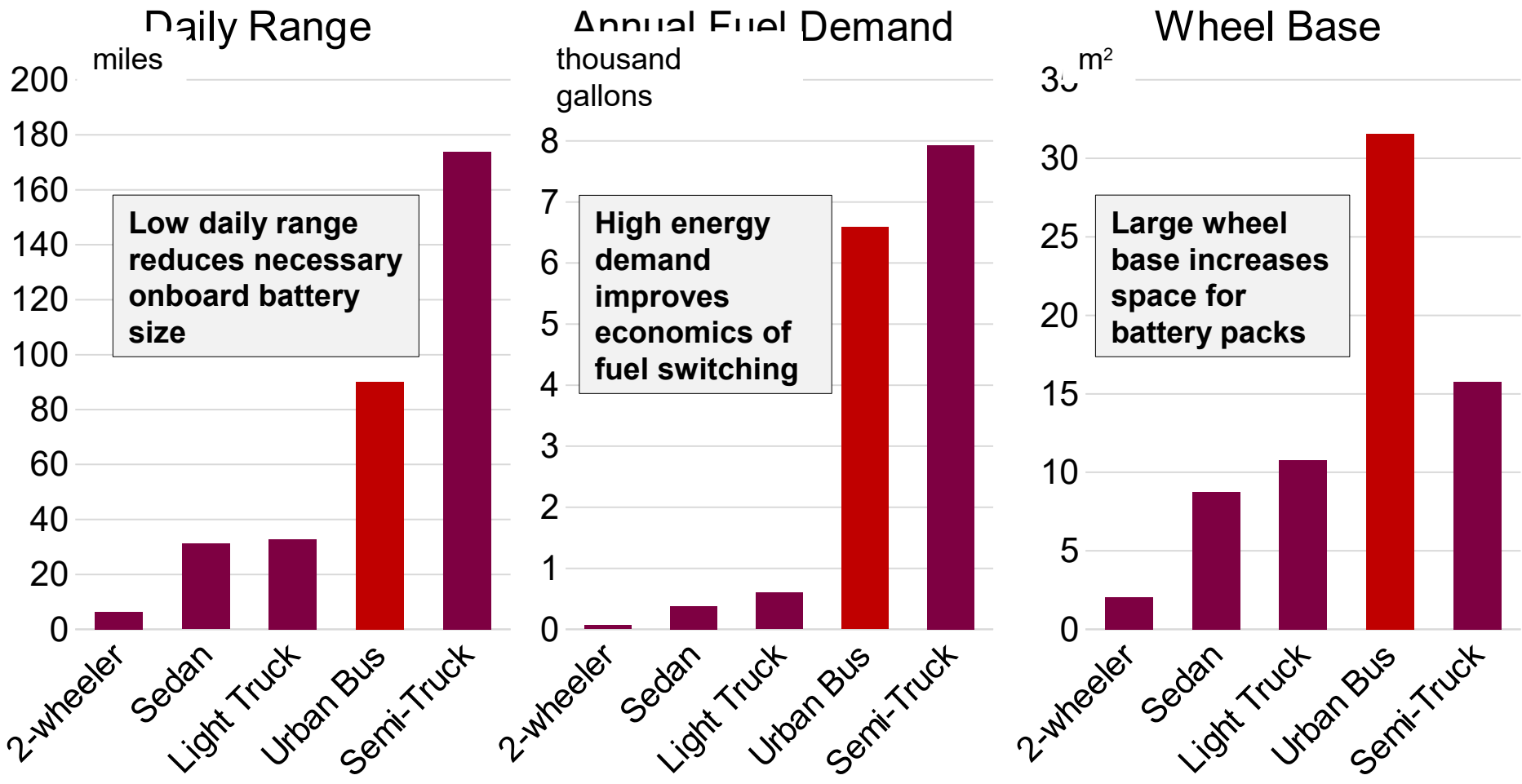
Reduced range requirements of regional short-haul semis deemphasize necessary on-board battery capacity



S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

Why buses? Low Range, High Energy Demand, and Large Wheel Base Make Urban Buses an Ideal Candidate for Electrification



- **Fixed and predictable routes**
- **Return to recharging facilities overnight**
- **Target for subsidy/gov't financing**
- **Start-stop usage ideal for regenerative braking and idling**
- **Provides highest benefits to air quality due to proximity to population**

S&P Global Platts

Source: Platts Analytics **Scenario Planning Service:** *Semi Trucks and U.S. Diesel Demand*

Conclusion

Fuel Cell Electric Truck

- Light weight fuel is suitable for long haul application
- High vehicle purchase price and mediocre fuel economy are barriers to shortterm adoption
- Cost reductions in H_2 fuel from:
  - Development of cross-commodity hydrogen markets
  - Investment in multi-access H_2 transportation infrastructure

Battery Electric Truck

- Extremely high fuel economy reduces operating costs
- Battery costs have shown significant declines, reducing purchase price premium vs diesel
- Battery weight remains key barrier, tipping economics towards short haul applications