Heavy Duty Trucking
Are Alternative Fuels in Mirror Closer Than They Appear?

June 17th, 2020
Energy Transitions: as of 2020 around 80% of total energy supply comes from three fossil fuels: oil, gas and coal

Source: Platts Analytics Scenario Planning Service: World Energy Demand Model
Required CO₂ 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

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

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

Cost of Ownership (2018$)

Source: Platts Analytics Scenarios 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.

**Automotive Fuel Cell Cost Forecast**

- **FCEV Vehicle Stock**
- **Fuel Cell Cost ($/kW)**

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.

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

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.

Cost of Ownership (2018$)

Long Haul 2030 Technology

- Diesel
- Electric
- FCEV

2-yr or 150k mi:
- Diesel: $0.0
- Electric: $200,000.0
- FCEV: $400,000.0

5-yr or 490k mi:
- Diesel: $600,000.0
- Electric: $800,000.0
- FCEV: $1,000,000.0

10-yr or 910k mi:
- Diesel: $1,200,000.0
- Electric: $1,400,000.0
- FCEV: $1,600,000.0

15-yr or 1330k mi:
- Diesel: $1,400,000.0
- Electric: $1,600,000.0
- FCEV: $1,800,000.0

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.

Cost of Ownership (2018$)

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

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 short term adoption

- Cost reductions in H₂ fuel from:
  - Development of cross-commodity hydrogen markets
  - Investment in multi-access H₂ 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