

# Decarbonizing Long-Haul Trucking

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# North American Council for Freight Efficiency



- Unbiased, fuel agnostic, non-profit
- Mission to double freight efficiency
- All stakeholders
- Scale available technologies, guide emerging change and Run on Less demonstrations.

[www.NACFE.org](http://www.NACFE.org)  
[www.RunOnLess.com](http://www.RunOnLess.com)



# Fleet Decision Making

- There are a complex number of factors driving fleets to decarbonize.
- Actions
  - Burn less diesel through efficiency
  - Go to zero
  - Consider alternatives



# Run on Less - “Best of the Best”

2017



2019



2021



2023



**Long Haul**  
7 Fleets  
10.1 MPG



**Regional Haul**  
10 Fleets  
8.3 MPG



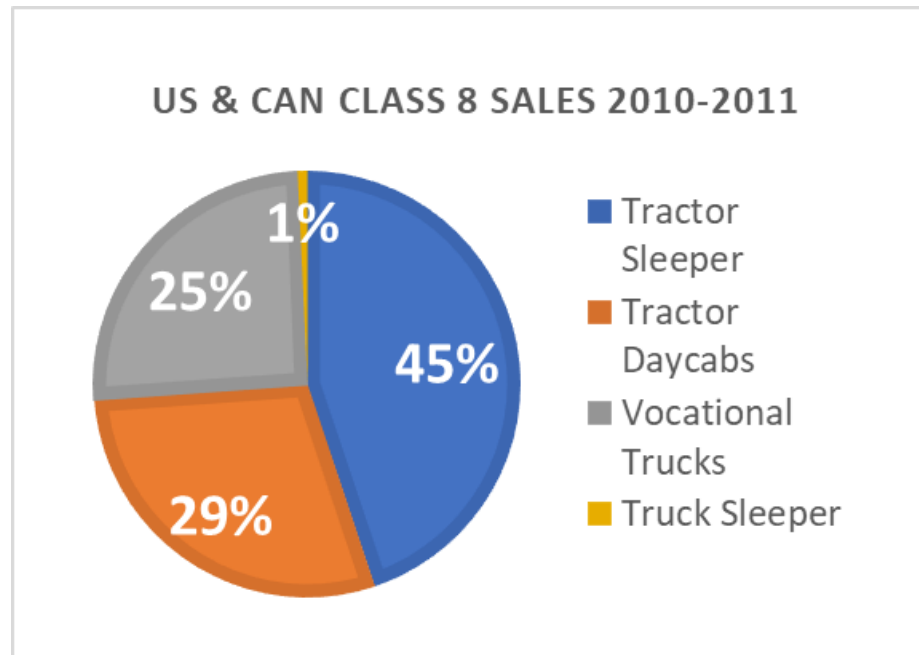
**All BEVs**  
13 Fleets  
New metrics!



**BEV Depots**  
8 Depots  
Infrastructure

[www.runonless.com](http://www.runonless.com)

# Class 8 Truck Data



Source: ACT Research, 2022

- Average annual Sales US & CAN are 234,000 per year
- Sleepers are long-haul
- But many Regional Haul drive long distances before returning to base
- Daycabs
  - 40% of Class 8 Tractors
  - US – 30% of total
  - CAN – 19% of total
  - Trending up year over year

# Long Regional Haul

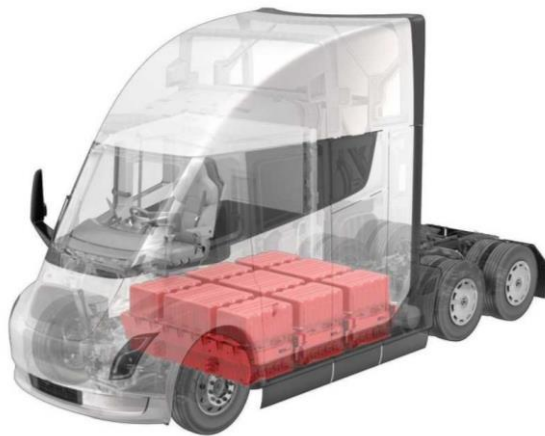


- Regional Haul defined as return to base daily
- Driver hours of service limits this to 300 miles (480 km) per day.
- “Dedicated fast turn” growth
- E-Commerce and new technologies is driving more of this “hub and spoke” or “pony expressing” of freight.
- Regional Haul good for driver attraction and retention and electrification

<https://nacfe.org/research/run-on-less-regional/>

# Long Regional Haul: Tesla Semi

- Dec 2, 2022, Tesla PepsiCo Delivery in Reno and Jan 18, 2023, Frito-Lay Modesto Events
  - Real-world 500-mile (800 km), 81k GVW on a single charge
  - “Everything smaller than I thought”
- Looking forward to more data.



<https://www.fleetowner.com/perspectives/ideaxchange/article/21255865/with-tesla-semi-the-500mile-run-is-a-new-benchmark>



# Decarbonizing: Options Abound





# Hydrogen Electric Truck Guidance



Making Sense  
of Heavy-Duty  
Hydrogen Fuel  
Cell Tractors

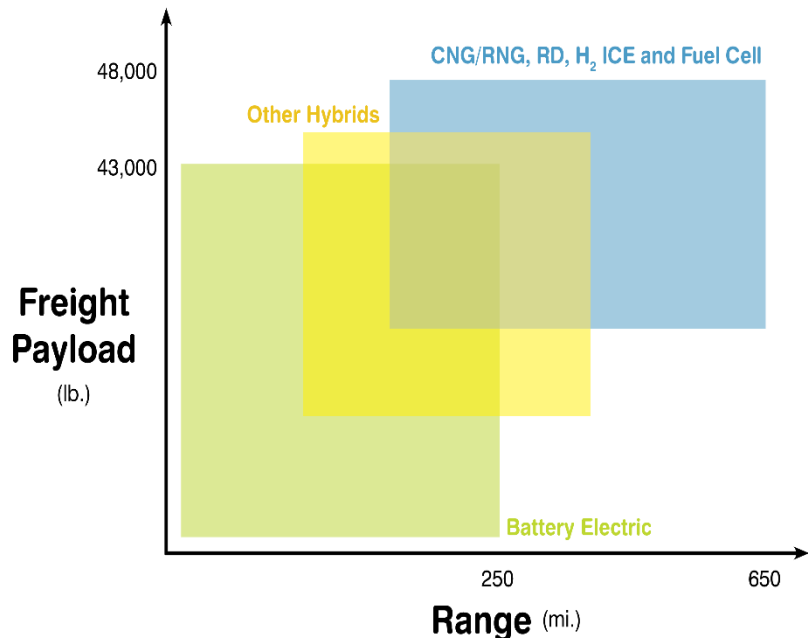
Dec 2020



Hydrogen  
Trucks: Long-  
Hauls Future?

Apr 2023

## Optimum Duty Cycle Sweet Spot



<https://nacfe.org/research/electric-trucks/>

## PRESENT

- Technology immature
- Many unknowns & challenges



## "MESSY MIDDLE"

- Many optimization solutions
- Growing infrastructure
- Multi-fuel choices
- Innovation & maturation
- Facts replacing estimates
- Learning curves



## FUTURE 2050

- Fast charging
- Hydrogen everywhere
- Long-life, low-cost batteries
- Acceptable weights & costs

- Legacy Diesels
- Natural Gas

- Diesel Advancements
- Natural Gas
- Hybrids
- Hydrogen ICE

- Battery Electric
- Hydrogen Fuel Cells
- Renewable Natural Gas & Diesel
- More

- CBEV & HFCEV from Clean Energy

# Framework for Powertrain Decision Making

**Start Here**

Start with battery electric trucks. If they meet your needs and the cost and timing is right, this can be the simplest path forward.

If BEVs don't work, the next consideration might be hydrogen fuel cell vehicles, given another zero-emissions pathway with probably a better solution for long haul.

**BEV**

- Financial Benefit ✓
  - Sustainability ✓
  - Availability ✓
- No to any of these

**Choose BEV**

**H<sub>2</sub>FC**

- Financial Benefit ✓
  - Sustainability ✓
  - Availability ✓
- No to any of these

**Choose H<sub>2</sub>FC**

Natural gas, hybrids, renewable fuels and hydrogen internal combustion engines are options that fleets might deploy if their strategies to decarbonize cannot be supported in a timely manner by zero-emissions solutions.

**Natural Gas**

- Financial Benefit ✓
  - Sustainability ✓
  - Availability ✓
- No to any of these

**Choose Natural Gas**

**Renewables/ Hybrids**

- Financial Benefit ✓
  - Sustainability ✓
  - Availability ✓
- No to any of these

**Choose Renewables/ Hybrids**

**H<sub>2</sub> ICE**

- Financial Benefit ✓
  - Sustainability ✓
  - Availability ✓
- No to any of these

**Choose H<sub>2</sub> ICE**


In some cases, it may make sense to stay with a diesel strategy working to make the equipment and operations as efficient as possible, leading to a later decision to move to zero-emission vehicles.

**Diesel**

- Financial Benefit ✓
- Sustainability ✓
- Availability ✓

**Choose Diesel**

**Thank You!**  
**Let's Stay Connected**

**LinkedIn**  NACFE (& Spanish: NACFE LATAM)

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 @NACFE\_Freight & @RunOnLess

 NACFE

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