Business & Technology Advisory

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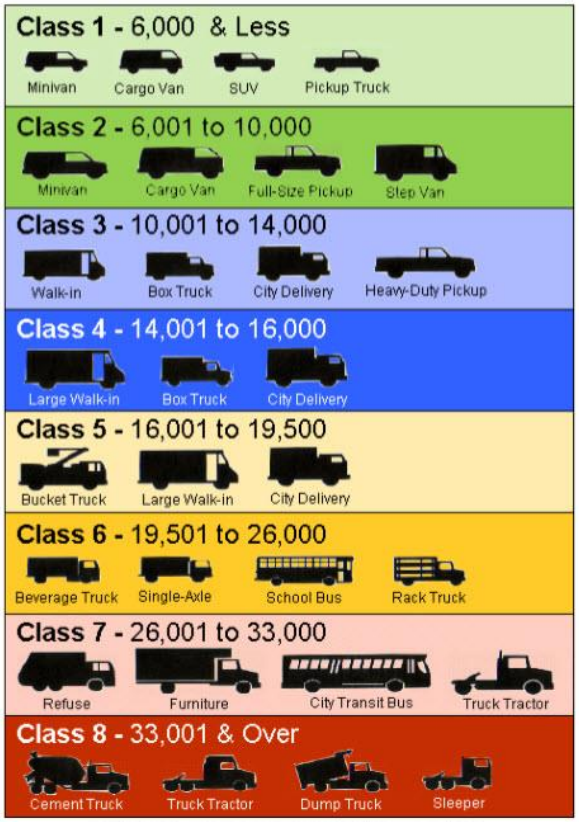
Viable Fuel Alternatives to Class 7/8 Diesel Trucks

Key Findings

- There are multiple alternatives to diesel fuel for heavy duty trucking.
- There is no clear cut "better" fuel.
- By co-op staff engaging early with fleet owners, they can better understand their choices and the advantages that electric trucks can provide.

What has changed?

Battery electric vehicles for commercial applications are here today and are a growing alternative to traditional gasoline, diesel, alternative fuel, and hybrid powertrains. Opinions vary on whether this technology is a viable alternative to traditional powertrains; they are considered a threat by some and a promise by others. While considerable capital is being invested as a result of Commercial Battery Electric Vehicles (CBEVs), information is rife with biases and vested interests.



In their Guidance Report: *Viable Class 7/8 Electric, Hybrid and Alternative Fuel Tractors*, The North American Council for Freight Efficiency examines several alternative fuels and provides guidance on the advantages and disadvantages of each.

NRECA is a member of The North American Council for Freight Efficiency (NACFE). NACFE works to drive the development and adoption of efficiency enhancing, environmentally beneficial, and cost-effective technologies, services, and methodologies in the North American freight industry. An unbiased and fuel agnostic organization, NACFE communicates the benefits, challenges, and payback of such actions, summarizing the confidence fleets should have in adoption. The Council is an effort for fleets, manufacturers, vehicle builders, and other government and nongovernmental organizations coming together to improve North American goods movements.

NACFE reports are made available for the use of electric co-op staff. Co-op staff can share this report with interested members.

What is the impact on cooperatives?

Co-op staff can use the information contained within the full report to gain an understanding of the alternatives to diesel for class 7/8 trucks. This information can be used to start conversations with commercial customers within the service territory, who are looking for honest and impartial information. Co-op staff can share this report with their commercial members.

What do cooperatives need to know or do about it?

Electric powertrain comparison to diesel powertrains is not a simple yes/no choice. The same is true for other competing technologies. What is known is that many fleet operators and government officials are looking for cleaner alternatives to traditional diesel. This report examines the following fuel sources:

- Commercial battery electric (CBEV)
- Fuel cell hybrid electric vehicle (FCEV)
- Compressed natural gas (CNG)
- Renewable natural gas (RNG)
- Liquefied natural gas (LNG)
- Propane (LPG)
- Hybrid diesel electric (HDE)
- Renewable diesel (RD)

The current field experience of each fuel source, impacts to infrastructure, efficiency of the fuel, and issues surrounding each fuel are reviewed. The report compares the fuels today and 10 years out.

NACFE found no clear winners or losers in alternative fuels. Instead, each alternative will play a part as vehicles become more specialized for their duty cycles. Decisions will also be influenced by factors that include regional or local energy availability and operational requirements, such as day or night operations; dual driver operations; slip seat driver operations; and regional, local, or long haul. Class 7/8 tractors, however, have operational sweet spots where these alternative fuel technologies currently make more sense. Sweet spots are defined as the best application of the technology for various duty cycles (see Figure 1).

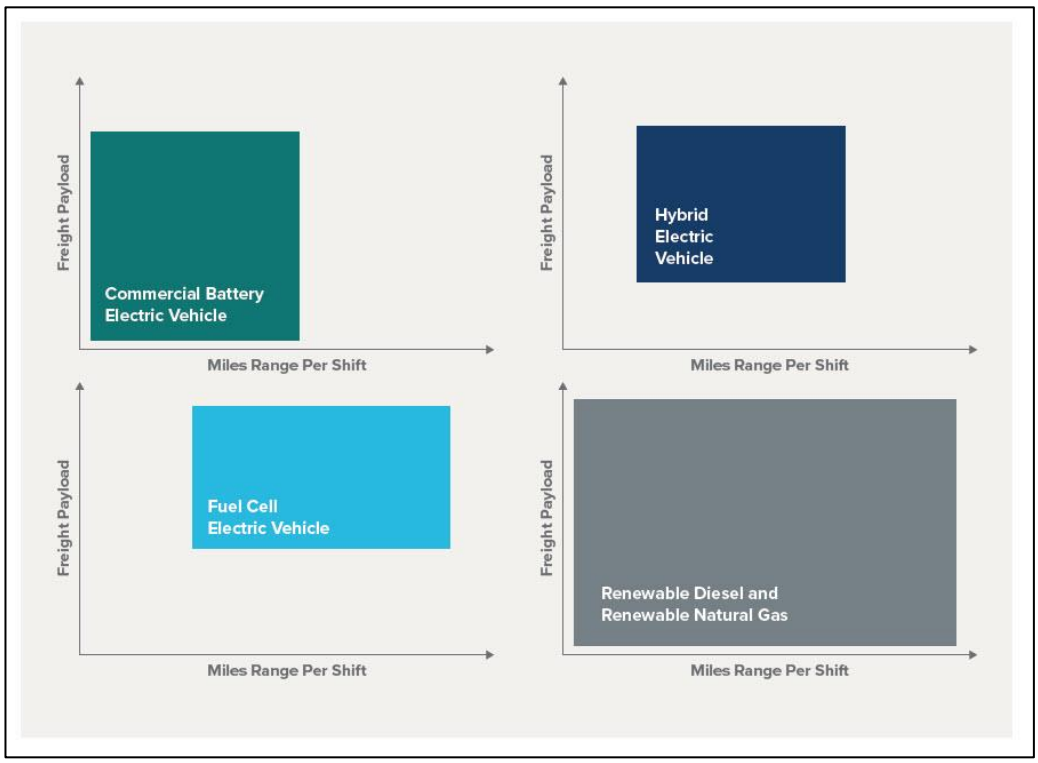


Figure 1: Technological Sweet Spots (Source: NACFE)

NRECA America's Electric Cooperatives

In its first Guidance Report, *Electric Trucks — Where They Make Sense*, NACFE identified 22 parity factors related to comparing battery electric vehicles to current diesel or gasoline vehicles. Expanding that comparison for the alternative fuel powertrains described in this report is shown in Figure 2. This table shows the parity estimates of 2030 production Class 7/8 North American tractors versus diesel tractors in 2020, providing specific detail on the 22 factors that influence where the technology's sweet spots lie.

		Production Class 7/8 North American Tractor — 2030							
		Renewable Diesel	FCEV	CBEV	CNG/RNG	LNG	Propane	Diesal Hybrid	Other Hybrids
WEIGHT	Tare Weight	Parity	Parity	Parity			Parity	Parity	
	Typical Freight Weight	Parity	Parity		Parity	Parity	Parity	Parity	Parity
	Max Freight Weight	Parity	Parity	Parity				Parity	
COST	Initial Cost	Parity							
	Net After All Factors	Parity	Parity		Parity	Parity		Parity	
	Operating Cost				Parity	Parity	Parity		Parity
	Residual Value Used Market	Parity		Parity			Parity	Parity	
	Residual Value Salvage/ Repurposing	Parity	Parity	Parity	Parity	Parity	Parity	Parity	
MAINTENANCE EFFORT	Service Center	Parity		Parity				Parity	
	Remote Diagnostics	Parity	Parity	Parity	Parity	Parity	Parity	Parity	Parity
	Breakdown Recovery	Parity		Parity	Parity	Parity	Parity	Parity	Parity
VEHICLE LIFE	10-Year Service Life	Parity		Parity	Parity	Parity	Parity	Parity	Parity
	Max Life Before Obsolete	Parity			Parity	Parity	Parity		
RANGE	Typical Daily Range	Parity	Parity	Parity	Parity	Parity	Parity	Parity	Parity
	Max Daily Range	Parity	Parity	Parity				Parity	
"FUEL" AVAILABILITY	Yard "Fueling"	Parity	Parity	Parity	Parity	Parity	Parity	Parity	Parity
	Truck Stop "Fueling"	Parity					Parity	Parity	Parity
	"Fuel" Pump	Parity	Parity	Parity	Parity	Parity	Parity	Parity	Parity
	"Refill" Time	Parity	Parity					Parity	Parity
GENERAL	Overall Technology Maturity	Parity			Parity	Parity	Parity	Parity	Parity
	Safety	Parity		Parity	Parity	Parity	Parity	Parity	Parity
	Environment GHG & Particulates	Parity							

Key: Comparison to 'Equivalent' Diesel Baseline: Worse Parity Better

Figure 2: Alternative Fuel Powertrain Parity (Source NACFE)

At the end of the day, actual tractors in use on actual routes with real drivers hauling real freight will quickly replace the often inappropriate extrapolations from automotive experience and bus experience. This real data will also allow factual information to replace optimistic or biased marketing claims or biased competitive conjecture. Co-ops with customers using electric class 7/8 tractors are encouraged to share the experiences with NRECA and NACFE for use in case studies.

NACFE concludes there are six major findings supported by the research for this report.

- North American freight movement is becoming more predictable with dedicated routes enabled by e-commerce and other technologies, offering better duty cycles for alternative powertrains.
- Each alternative fuel powertrain offers benefits in the short term compared to current diesel, and may have enough duty cycle scale to offer total cost of ownership (TCO) and emission savings.
- CBEVs and Fuel Cell trucks will be capable of lower TCO in the 2030 timeframe.
- Vehicle specifications will be more optimized for the duty cycle and technology of the first user, limiting the applicability of the equipment for second or third users.
- There will be a "messy middle" until commercial batteries and fuel cells alone power these trucks, as alternatives offer significant improvements over the diesel and gasoline baselines (see Figure 3).

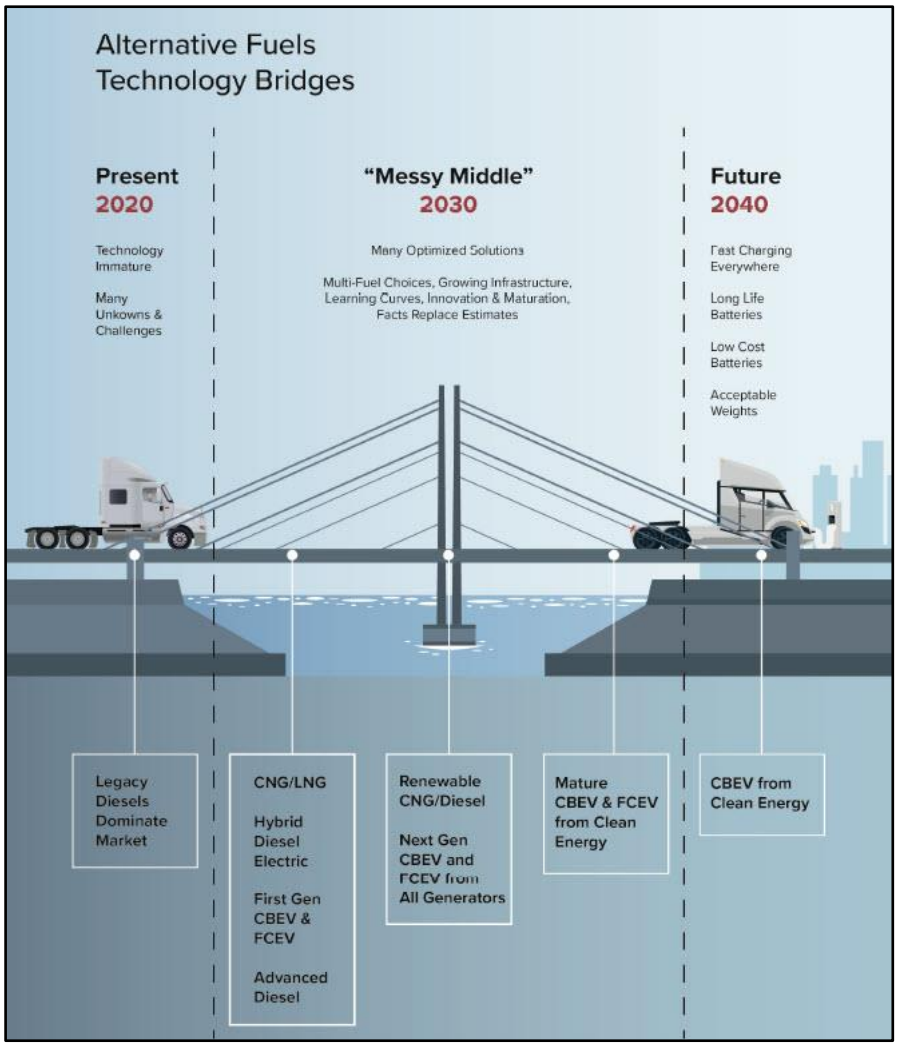


Figure 3: Alternative Fuels Technology Bridge Source: NACFE

- A future zero-emission freight world will only have electric based vehicles (CBEV, FCEV, or catenary electric) powered well-to-wheel from truly renewable sources such as hydro, solar and wind.

NRECA America's Electric Cooperatives

NRECA is working with and closely monitoring the Innovation Fleet of Daimler Trucks North America (DTNA). DTNA manufactures trucks and buses under the Freightliner, Western Star and Thomas Built Buses badges. DTNA is conducting a pilot with Penske and NFI of several eCascadia and eM2 trucks (https://freightliner.com/e-mobility/). See Figure 4. According to Daimler, NFI's 10 eCascadias are running regular drayage routes back and forth to the Ports of Los Angeles and Long Beach. On a typical day, NFI has five trucks charging and five running routes. The Penske fleet of eCascadias and eM2s are hauling goods for various customers and putting in full workdays. Overall, they have covered over 70,000 miles, with good uptime statistics. Daimler hopes to share cost and performance information as more data is collected and analyzed.

Figure 4: Picture of Penske Electric Trucks
Image courtesy of: Rustam Kocher, DTNA EMG Utility Concierge

The full NACFE report, *Viable Class 7/8 Electric, Hybrid and Alternative Fuel Tractors*, is available here.

Additional Resources

- Electric Trucks Where They Make Sense (2018)
- Medium-Duty Electric Trucks Cost Of Ownership (2018)
- Amping Up: Charging Infrastructure for Electric Trucks (March 2019)
- NRECA Website: Market Potential for Commercial Electric Trucking

Contact for Questions

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NRECA America's Electric Cooperatives