Do Alternative Fuels Have their Greatest Impact with Hybrids?

A SUSTAINABLE TRANSPORTATION ENERGY FUTURE

The ATRI[1] bar graph depicted represents the 10-year million-mile lifecycle of a Sleeper Cab Freight Truck, showing the lifetime carbon footprint using various technologies as displayed on each bar for the approach used to power the truck. The benchmarks added alongside the bars demonstrate a significant decrease in the carbon footprint, achieved by selecting alternative fuel mix B-20 and combining it with progressive hybrid technology for higher MPG in the coming years (seen in the ongoing benchmarks). Starting with 10 MPG Hybrids[2], as would be possible with the Compound Electric Hybrid at t20e.net, and so able to bypass costly and time-consuming infrastructure changes. Other alternative fuels and mixes could be used in place of B-20 for even greater results.

ZERO EMISSIONS MUST ADDRESS TWO WORLDS...

The first world is all about zero tailpipe output for clean city air.

The second world is about the lowest possible carbon footprint over a million-mile lifecycle (cradle to grave).

NOW THE BEST OF BOTH WORLDS IS SHOWN HERE WITH HYBRIDS & B-20!

First, semi-trucks can enter and exit cities with zero tailpipe output, up to 75 miles multiple times in one trip (with Compound Electric Hybrid technology as a NZEV).

Second, higher MPG hybrids using alternative fuel mixes can achieve a lower carbon footprint lifecycle than BEVs now and in the projected future.

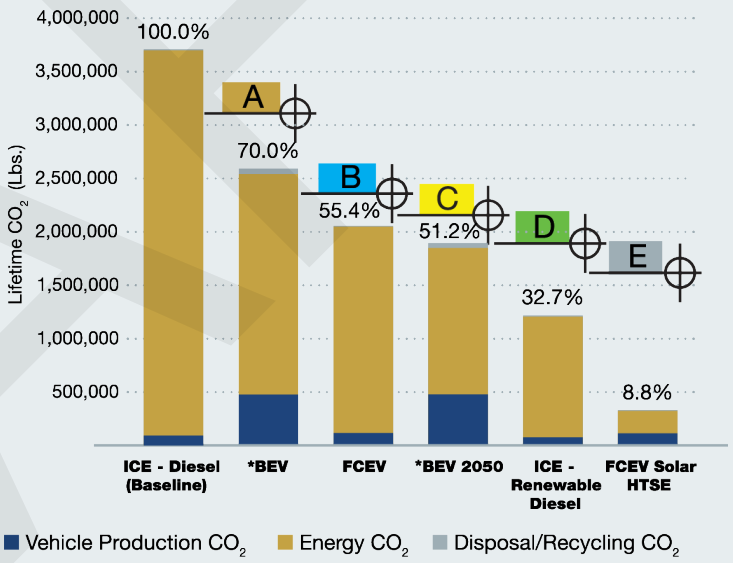
This combination also enables a 2,800+mile range with no required infrastructure changes, as demonstrated at t20e.net.

ADDTIONALLY:

As fuel distributors use mixes of bio diesel and renewable diesel (e.g., 20% BD and 15% RD), they will eliminate 35% of the petroleum diesel and reduce each bar's Hybrid-Benchmark another 8% lower for carbon footprint compared to the baseline, —all without incurring costs for infrastructure changes. As enabled by these newer PHEV long-haul freight trucks.

Lifecycle Assessment of Leading Technologies for Freight Trucks: ATRI[1] Carbon Footprint Bar Graph

Now Including B-20 Diesel + Hybrid: Benchmarks Shown Below on the Bar Graph



****BENCHMARK KEY**

A = 87% w/only B-20 @ 7.2mpg
B = 63% B-20 & HYBRID @ 10mpg
C = 57% B-20 & HYBRID @ 11mpg
D = 52% B-20 & HYBRID @ 12mpg
E = 48% B-20 & HYBRID @ 13mpg

** The carbon footprint represented by this bar may increase due to insufficient data on battery degradation for Battery Electric Semi-Trucks. (e.g., State of Health, SOH). Data extrapolated from electric cars indicates a decline of over 20%, possibly reaching 25% in SOH for battery range after 200,000 miles. Degradation is further exacerbated by fast charging. This is akin to a fuel tank shrinking by 25%, thus reducing the EV 500 mile range. Original batteries are intentionally oversized to mitigate some of this degradation, adding to weight & cost. Moreover, if batteries need to be replaced more than once over a million-mile lifecycle, this will significantly increase the carbon footprint and double the total cost of the truck. Currently, 55% of the $450,000 price for a Battery Electric Truck is attributed to batteries. Links: Battery University: Battery Aging in an Electric Vehicle, Geotab: EV Battery Health, NimbleFins: Real-Life Tesla Battery Deterioration Study.*

*** The Benchmark %'s listed include CO_2 lbs. attributable to the impact from the battery lifecycles in these Long Range PHEV Hybrids.*

1. https://truckingresearch.org/wp-content/uploads/2022/05/ATRI-Environmental-Impacts-of-Zero-Emission-Trucks-Exec-Summary-5-2022.pdf

>> Sign up for the full report paper at: https://truckingresearch.org/2022/05/understanding-the-co2-impacts-of-zero-emission-trucks

2. https://truckingresearch.org/sustainable-vehicle-practices-2/ "HYBRID ELECTRIC... UPS has also deployed nearly 400 hybrid electric vehicles that have improved fuel economy by 35 percent compared to the trucks that were replaced..." https://www.nacfe.org/wp-content/uploads/edd-free-downloads-cache/AFFS-2022-Report-FINAL-1.pdf "The US Department of Energy (DOE) helped fund four SuperTruck 1 teams to build prototype tractors ... Four teams created equipment that reported fuel economy in the 10 to 12.5 MPG range..." https://news.navistar.com/2023-06-20-Navistar-Reveals-International-R-SuperTruck-II-Results-with-Improved-Fuel-and-Freight-Efficiency,-Goals-for-Hybridization "...International SuperTruck II demonstrates 16 miles per gallon (MPG) fuel efficiency through hybridization..."