

HD REGIONAL HAUL TRACTORS



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Market Segment & Fleet Profile Fact Sheet



Operational Characteristics

| | |
|--------------------|---------------------------|
| Duty Cycle | Return to Base |
| Use Case | Regional Haul |
| Average Range | Less than 300 miles / day |
| Routes | Fixed |
| Fueling | Centralized, at night |
| Miles per Gallon | 7.23 |
| Replacement Cycle | 6.8 years |
| Average Age | 5.1 years |
| Axle Configuration | 6X4 |

Definition

Heavy-duty tractors have a gross vehicle weight rating (GVWR) of 80,000 lbs. and are able to pull a wide range of trailer types and sizes. The most common cab type in North America is the conventional, where the engine is in front of the steering wheel giving the truck a “nose.” The cabover (cab over engine) design can still be found in older model tractors, although it is starting to make a comeback in some of the new heavy-duty electric vehicle (HDEV) prototypes. These tractors also come in day cabs or with sleeper cabs depending on the duty cycle requirement. Class 8 tractors can pull a wide variety of trailers, the most recognized being dry vans, refrigerated, and flatbed trailers and depending on the size of the fuel tanks, can drive up to 1,200 miles before refueling. While Class 8 heavy-duty trucks can haul up to 50,000 lbs., trailers also can cube-out (constrained by size) before they weigh-out (constrained by weight) e.g., hauling bulky items like TVs, patio furniture, kayaks, etc.

Diesel vs. Electric Comparison

| Diesel | Type | Electric |
|-------------|---------------------------|-------------|
| 80,000 | GCW | 82,000 |
| 152” – 256” | Wheelbase | 166” |
| 400 – 565 | Horsepower | 360 - 536 |
| up to 2050 | Torque (lbs-ft) | up to 4050 |
| 40,000 | Est. Payload | Unavailable |
| \$123,000 | Avg. Purchase Price (USD) | Unavailable |

Market Summary

There are several duty cycles for Class 8 tractors, like regional haul, drayage, beverage delivery, and long haul, with each one presenting its own unique challenges. Currently, there are an estimated 656,294 regional haul Class 8 tractors in the US and Canada. This estimate does not include vocational trucks, off-highway tractors, or long-haul tractors.

Run on Less – Electric highlighted four Class 8 tractors: the BYD 8TT operated by Anheuser-Busch to make beverage deliveries around Modesto, CA; the Freightliner eCascadia Penske is using to haul freight from Temecula, CA to San Diego, CA; the Peterbilt 579EV Biagi Brothers is running to shuttle loads between Napa, CA and Sonoma, CA; and the Volvo VNR NFI uses on routes between Chino, CA to the Port of Long Beach.

Collectively, the duty cycles and use cases for the Run on Less – Electric heavy-duty tractors are highly representative of return-to-base, single-shift operations within this market segment. Furthermore, the duty cycle of the beverage segment, represented by the BYD 8TT at Anheuser-Busch, is optimal for electric trucks, with the HDEVs capable of doing the same amount of work as their diesel counterparts.

The challenge with regional haul tractors is the opportunity for dynamic (unpredictable) routing, longer routes, more wait time, and drivers not returning to base each day. As this segment transitions into the long-haul end of the spectrum, these opportunities are amplified and make electrification dependent, at minimum, on regional charging infrastructure.

As a result, NACFE considers this segment to be 70% electrifiable.

Run On Less – Electric Findings & Metrics

There are many locations with noise ordinances which limit the time of day a business can receive deliveries, usually because the docks are near a residential neighborhood. Electric trucks are extremely quiet and have the potential to mitigate the need for future delivery restrictions which would improve fleet efficiency in these locations.

The number of power accessories, like lift gates which are used to raise and lower heavy pallets into the trailers in some cases cycling up and down 10 to 12 times per day, must be factored into the electrification solution to ensure there is enough battery capacity to support functional requirements.

Significant quarterly cash flow can be accrued if fleets in California are able to participate in the Low Carbon Fuel Standard (LCFS) program. The LCFS program includes all electric vehicles at a facility, both on road and off and can

help offset cost and improve the overall TCO of the electric vehicles.

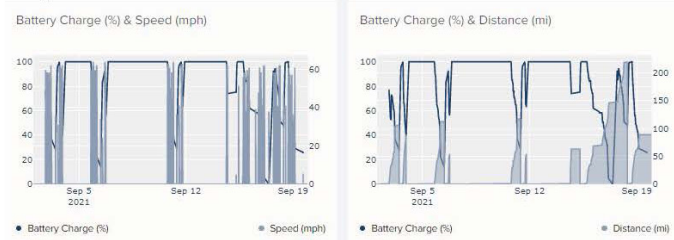
Identifying the curb weight of the HDEVs, especially those still in the prototype phase, is challenging. Current estimates indicate the HDEVs are going to be approximately 3,000 – 5,000 lbs. heavier than the traditional diesel tractors. For fleets running heavy loads, this could result in having to reduce the amount of freight on a trailer to ensure they do not exceed the GVWR limit, thus impacting their overall efficiency.

Fleets are very intentional about the routes for which they are using the Class 8 electric tractors. Decreased weight and increased range continue to be areas of focus for the OEMs as they work to meet the operational requirements for regional haul tractors.

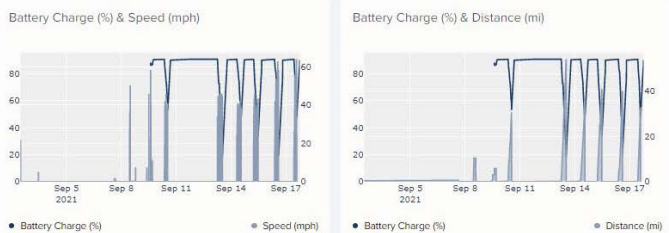
BYD 8TT



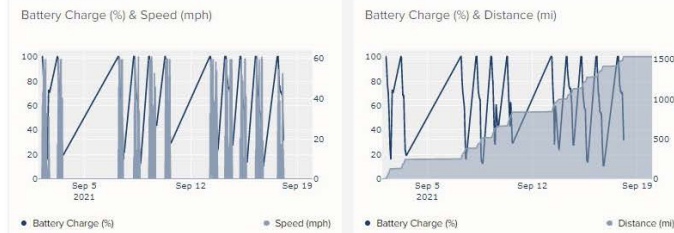
Freightliner eCascadia



Peterbilt 579EV



Volvo VNR



To view the BYD metrics in more detail, click [here](#).

To view the Freightliner metrics in more detail, click [here](#).

To view the Peterbilt metrics in more detail, click [here](#).

To view the Volvo metrics in more detail, click [here](#).

If 70% of the Class 8 regional haul tractors in the US and Canada were electrified, it would require approximately 39,624 gWh of electricity for charging and result in the avoidance of 28,764,526 MT CO₂e* annually.

* Carbon dioxide equivalent, used in GHG reporting to bundle greenhouse gases into a single number.



Anheuser-Busch – BYD 8TT



Penske – Freightliner eCascadia



Biagi Bros. – Peterbilt 579EV



NFI Logistics – Volvo VNR

| | BYD 8TT | Freightliner eCascadia | Peterbilt 579EV | Volvo VNR |
|--------------------------|---------------------------|------------------------|-----------------------------|------------------------|
| ROL-E Site | Los Angeles, CA | Temecula, CA | Napa, CA | Chino, CA |
| Fleet | Anheuser-Busch | Penske | Biagi Brothers | NFI |
| Service Territory | Inland Empire | San Diego | Sonoma, CA | Port of LA/Long Beach |
| Facility Details | 200,000 sq. ft. facility | Not available | 350,000 sq. ft. warehouse | 8 warehouse complex |
| Weather – Temp Range | 57 – 100 degrees F | 59 – 94 degrees F | 53 – 96 degrees F | 60 – 101 degrees F |
| Duty Cycle Requirement | Less than 100 miles / day | 100 miles / day | 120 - 150 miles / day | 300 miles / day |
| Battery Capacity | 435 kWh | 440 kWh | 396 kWh | 396 kWh |
| Battery Range | 150 – 200 miles | 175 miles | 150 miles | 175 miles |
| Battery Chemistry | LFP | LFP | LFP | LFP |
| Charging Rate | 40 kW | 150 kW | 150 kW | 150 kW |
| Battery Charger | J1772 | CCS1 | CCS1 | CCS1 / CCS2 |
| Total Miles | 304 | 902 | 253 | 1533 |
| Estimated Moves | 47 | 78 | 48 | 28 |
| % of Speed <40 mph | 71.1% | 27% | 92% | 44% |
| % of Speed >50+ mph | 15% | 58% | 0.5% | 37% |
| Charging Opportunity | Overnight | Overnight | Overnight | Overnight |
| Charger Location(s) | On yard | On yard | On yard | On yard |
| Charging Port on Tractor | Passenger-side behind cab | Driver-side behind cab | Driver-side rear of tractor | Driver-side below door |
| Parking to Charge | Nose-in | Nose-in | Nose-in | Nose-in |
| Days in Operation | 11 | 12 | 8 | 12 |