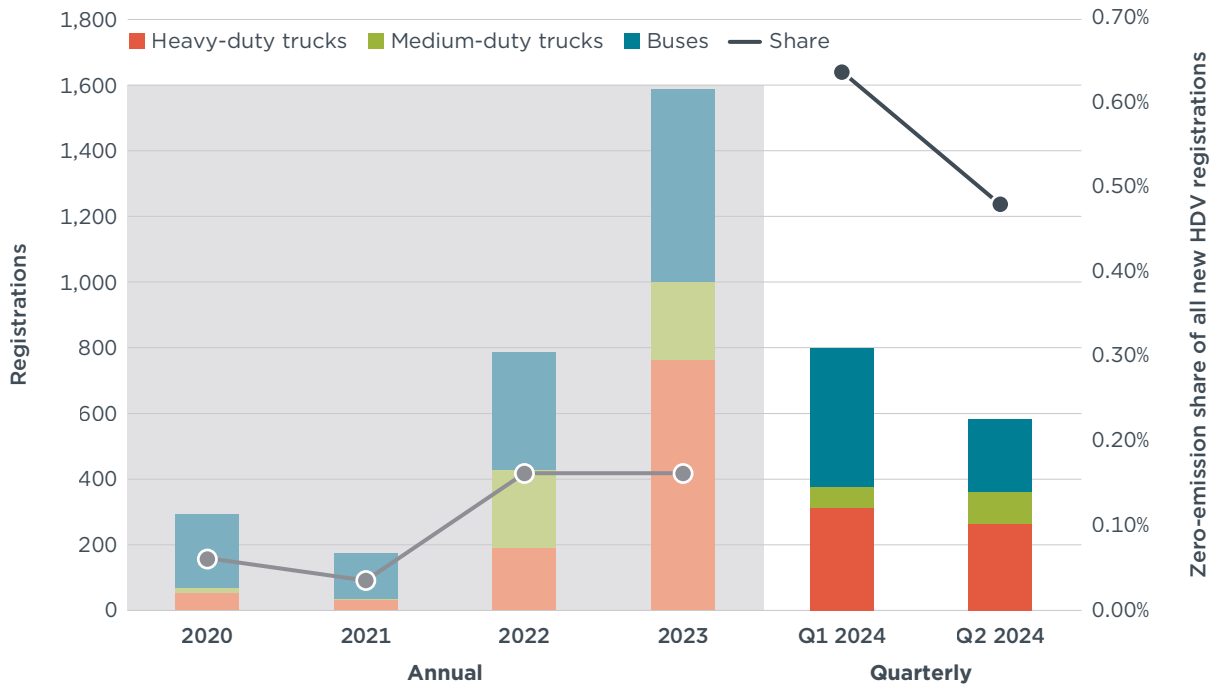


RACE TO ZERO

ZERO-EMISSION BUS AND TRUCK MARKET IN THE UNITED STATES (JANUARY-JUNE 2024)

YIHAO XIE

FIGURE 1
Number and share of new zero-emission heavy-duty vehicle registrations in the United States



OVERVIEW

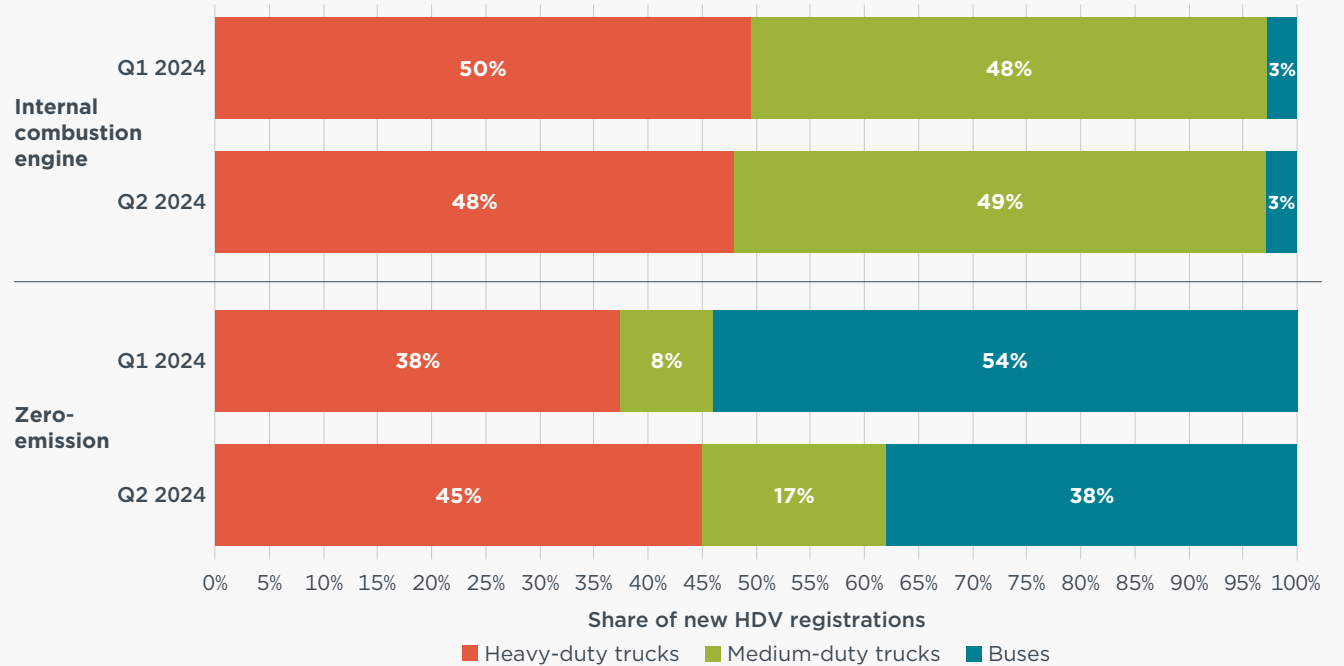
Approximately 120,000 new heavy-duty vehicles (HDVs) were registered in the United States in the first half of 2024. Of these, 1,381 (0.56%) were zero-emission vehicles (ZEVs). There were more zero-emission HDV registrations in the first quarter of 2024 (800) than in the second quarter (581).

Zero-emission vehicles accounted for 0.64% of total HDV registrations in Q1 and 0.48% of HDV registrations in Q2, increases of 113% and 60%, respectively, from the 0.30% share for all of 2023. Additionally, new zero-emission bus registrations in Q1 achieved a double-digit share of the bus market for the first time. If trends continue through the end of the year, 2024 will surpass 2023 in both total registrations and market share for zero-emission HDVs.

Medium- and heavy-duty trucks dominated the internal combustion engine (ICE) HDV market, with more than 97% of total registrations in both quarters. Trucks made up 46% of all new zero-emission HDV registrations in Q1 and 62% in Q2. Buses accounted for just over 54% of zero-emission registrations in Q1, and 38% in Q2. This pattern in quarterly bus sales is consistent with previous years and reflects seasonality in the relatively small zero-emission HDV market. More than 99% of zero-emission HDVs registered in Q1 and Q2 2024 were battery electric, with a small number powered by hydrogen fuel-cell electric powertrains.

FIGURE 2

New heavy-duty vehicle registrations in the United States in Q1 and Q2 2024 by vehicle type and powertrain



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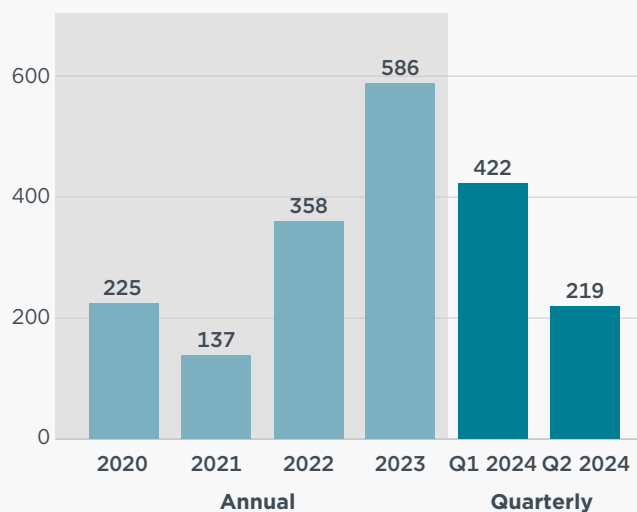
BUSES

In the first quarter of 2024, zero-emission buses represented nearly 11% of all bus registrations in the United States—the first time zero-emission technology has surpassed 10% market penetration in any HDV segment. New registrations of zero-emission buses totaled 422 in the first quarter and 219 in the second quarter; the 641 buses registered in the first half of 2024 were more than were registered in all of 2023.

Traton and Daimler are the largest manufacturer groups for both ICE and zero-emission buses in the United States. Together, they accounted for more than 90% of the ICE market and close to 90% of the zero-emission market for buses in Q1 and Q2 2024. Most zero-emission bus registrations were battery-electric school buses manufactured by Traton subsidiary International Motors (formerly Navistar) and Daimler subsidiary Thomas Built Buses. Lion Electric, which manufactures only battery electric buses, ranked third for zero-emission bus registrations in both quarters, although with fewer than half the registrations of either Traton or Daimler.

FIGURE 3

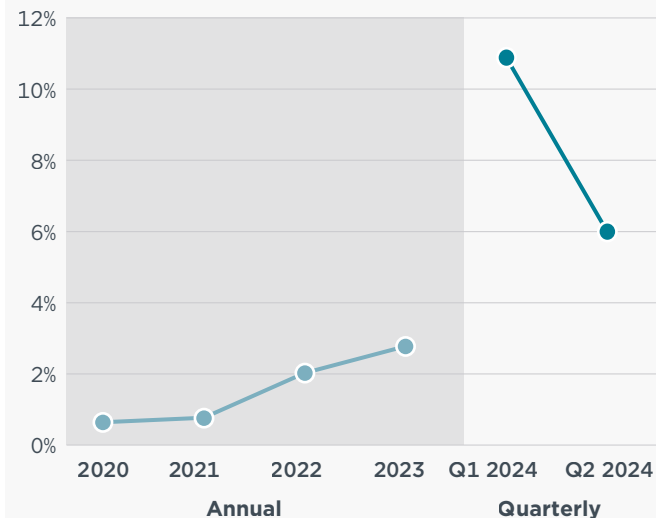
Number of new zero-emission bus registrations in the United States



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FIGURE 4

Share of zero-emission vehicles in new bus registrations in the United States



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TABLE 1

Share of new internal combustion engine and zero-emission bus registrations in the United States by manufacturer group

	Daimler	Traton	Lion Electric	Others
Q1 2024				
ICE market share	51%	45%	0%	4%
Zero-emission market share	36%	49%	15%	0%
Q2 2024				
ICE market share	58%	40%	0%	2%
Zero-emission market share	26%	67%	7%	0%

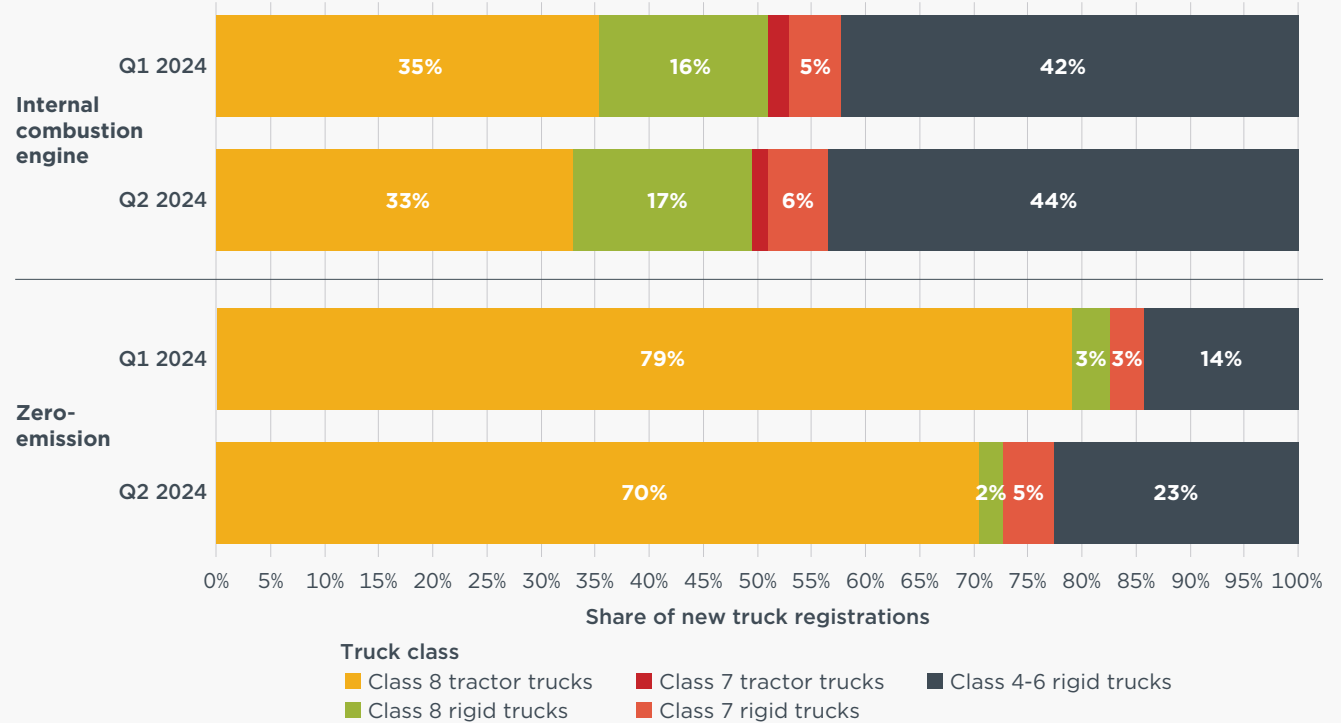
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TRUCKS

The composition of truck classes in both the ICE and zero-emission markets remained largely unchanged from Q1 to Q2 2024. This composition is also consistent with the breakdown of truck classes in 2022 and 2023. In the ICE market, Class 4-6 rigid trucks were the most popular truck segment, with over 40% of total registrations in both quarters, followed by Class 8 tractor trucks and Class 8 rigid trucks. In the zero-emission truck market, Class 8 tractor trucks accounted for more than 70% of all registrations in the first half of the year. The high share of Class 8 tractor trucks corresponds to manufacturers' deployment of battery electric drayage truck models in the market. Meanwhile, the share of Class 4-6 rigid trucks in the zero-emission truck market grew over the first half of the year, from 14% in Q1 to 23% in Q2. Class 7 and 8 rigid trucks together accounted for around 22% of ICE truck registrations but only about 7% of zero-emission truck registrations in both quarters.

FIGURE 5

New medium- and heavy-duty truck registrations in the United States by vehicle class and powertrain



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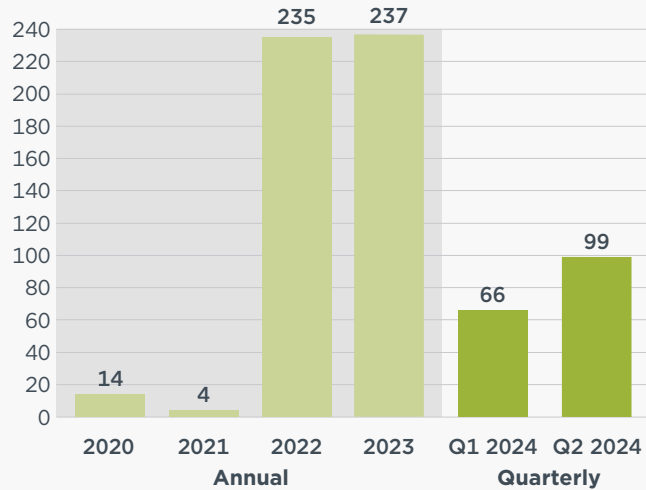
MEDIUM-DUTY TRUCKS

There were 66 zero-emission medium-duty trucks registered in the first quarter of 2024 and 99 registered in the second quarter. This represented 0.11% and 0.17%, respectively, of the approximately 59,000 total medium-duty truck registrations in each quarter. While still low, these shares surpassed 2022 and 2023 levels.

The medium-duty truck market shows a high degree of fragmentation in terms of manufacturer market share. No manufacturer accounted for more than 50% of the ICE vehicle market, and multiple legacy and dedicated zero-emission manufacturers are active in the zero-emission market. In the first quarter of 2024, Daimler, Traton, Paccar, and BYD were the largest zero-emission medium-duty truck manufacturers. In the second quarter, Daimler's share accounted for almost 80% of zero-emission registrations. Ford, Isuzu, General Motors, and Stellantis did not record any zero-emission medium-duty truck registrations during the first half of 2024. Unlike other HDV segments where diesel is the dominant fuel in ICE vehicles, this segment included some gasoline-powered vehicles sold by Ford, Isuzu, and other manufacturers.

FIGURE 6

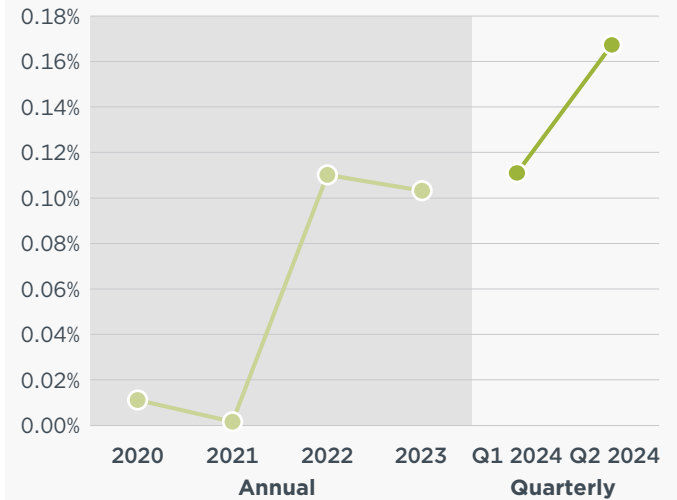
Number of new zero-emission medium-duty truck registrations in the United States



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FIGURE 7

Share of zero-emission vehicles in new medium-duty truck registrations in the United States



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TABLE 2

Share of new medium-duty internal combustion engine and zero-emission truck registrations in the United States by manufacturer group

Manufacturer group	Ford	Daimler	Isuzu	Traton	General Motors	Stellantis	Paccar	BYD	Others
Q1 2024									
ICE market share	39%	16%	10%	10%	8%	7%	4%	0%	5%
Zero-emission market share	0%	20%	0%	12%	0%	0%	15%	15%	38%
Q2 2024									
ICE market share	40%	17%	10%	10%	8%	6%	4%	0%	5%
Zero-emission market share	0%	79%	0%	9%	0%	0%	8%	0%	4%

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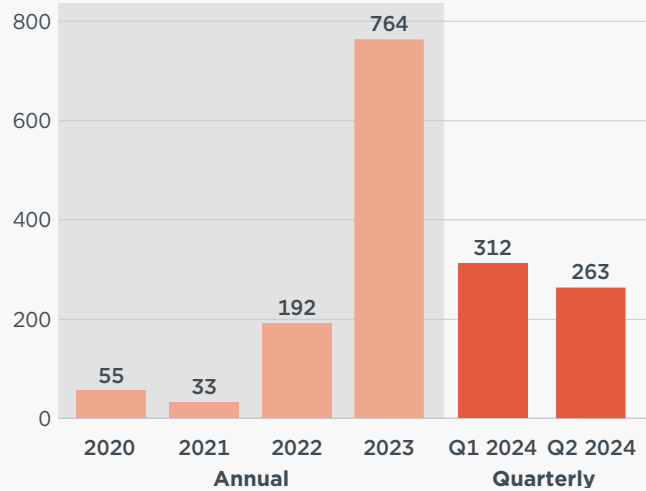
HEAVY-DUTY TRUCKS

Almost 62,000 heavy-duty trucks were registered in the first quarter of 2024 and about 58,000 were registered in the second quarter, making up roughly half the total HDV market. There were 312 zero-emission heavy-duty trucks registered in Q1 and 263 in Q2, accounting for 0.50% and 0.45% of total heavy-duty truck registrations, respectively. The shares for both quarters were higher than the latest full-year data from 2023.

Legacy manufacturer groups Daimler, Paccar, Volvo Truck, and Traton are the largest ICE manufacturers; these groups accounted for more than 95% of the market in both Q1 and Q2. Daimler, Paccar, and Volvo Truck also dominated the zero-emission market, collectively representing about three quarters of zero-emission heavy truck registrations in the first half of 2024. Volvo had the most zero-emission heavy truck registrations in Q1 by a wide margin, while Daimler recorded the most in Q2. Dedicated zero-emission manufacturers BYD, Tesla, and Nikola accounted for single-digit market shares in the zero-emission market. Nikola's registrations were of hydrogen fuel-cell and battery electric vehicles, while registrations of BYD and Tesla trucks were exclusively battery electric vehicles. Because of data limitations, no manufacturer information was available for 18% of zero-emission registrations in Q1 and 14% in Q2.

FIGURE 8

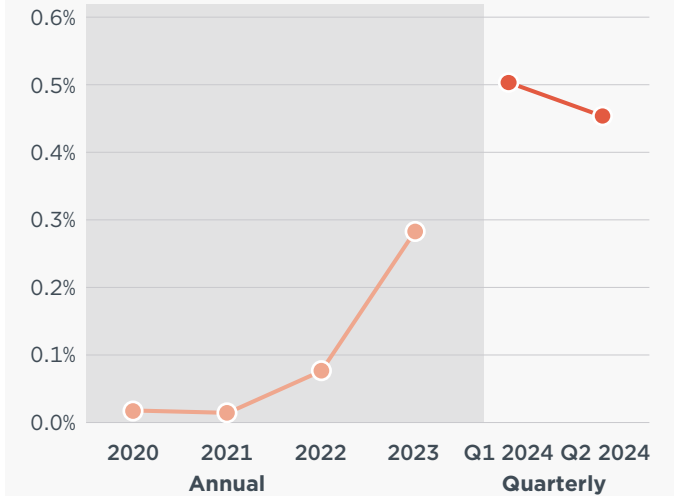
Number of new zero-emission heavy-duty truck registrations in the United States



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FIGURE 9

Share of zero-emission vehicles in new heavy-duty truck registrations in the United States



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TABLE 3

Share of new internal combustion engine and zero-emission heavy-duty truck registrations in the United States by manufacturer group

Manufacturer group	Daimler	Paccar	Volvo Trucks	Traton	Nikola	BYD	Tesla	Others
Q1 2024								
ICE market share	38%	33%	15%	10%	0%	0%	0%	4%
Zero-emission market share	22%	13%	38%	0%	8%	2%	0%	18%
Q2 2024								
ICE market share	36%	34%	17%	9%	0%	0%	0%	4%
Zero-emission market share	41%	3%	32%	0%	2%	3%	6%	14%

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DEFINITIONS AND DATA SOURCES

Zero-emission vehicles: Any vehicle with a propulsion system that produces zero combustion emissions, such as a dedicated battery electric, fuel-cell electric, or other motor that is not driven by combustion.

Heavy-duty vehicles: All vehicles with a gross vehicle weight rating above 14,001 lb, which corresponds to Classes 4–8 in the National Highway Administration’s vehicle class definitions.

Buses: All Class 4–8 buses and coaches.

Heavy-duty trucks: Class 8 trucks with a gross vehicle weight rating greater than 33,000 lb.

Medium-duty trucks and vans: Class 4–7 trucks and vans with a gross vehicle weight rating of 14,001–33,000 lb.

DATA SOURCES

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Truck class	Gross vehicle weight rating (lb)	Gross vehicle weight rating (kg)	Classification in this Market Spotlight
4	14,001–16,000	6,350–7,257	Medium-duty trucks
5	16,001–19,500	7,258–8,845	
6	19,501–26,000	8,846–11,793	
7	26,001–33,000	11,794–14,968	
8	33,001+	14,968+	Heavy-duty trucks



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