

Leading cities for new energy commercial vehicles in China

Yidan Chu and Wenxin Ye

Addressing emissions from commercial vehicles is a crucial part of efforts in China to decrease air pollutants and achieve national carbon-reduction goals. Commercial vehicles are defined as buses and goods vehicles, such as trucks and utility vehicles, that are mostly used for business purposes.¹ In 2022, commercial vehicles accounted for more than 90% of nitrogen oxide (NO_x) emissions and more than 60% of particulate matter (PM) emissions from all motor vehicles in China.² The latest data show that commercial vehicles make up 12% of China's vehicle population but are responsible for 55% of carbon emissions from vehicle tailpipes.³

The Chinese government has announced a target to reduce the carbon dioxide (CO₂) intensity—the emissions per unit of gross domestic product—of the transportation sector by 5% by the end of 2025, compared with the 2020 level.⁴ Fleet electrification is one effective way to reduce emissions from commercial vehicles, and Chinese cities are at the forefront in deploying new energy technologies. These new energy technologies include battery electric vehicles (BEVs), also known in China as pure electric vehicles; plug-in hybrid electric vehicles (PHEVs); and hydrogen fuel-cell electric vehicles (FCEVs). This brief looks at the electrification progress being made in China, particularly in the top city markets for new energy commercial vehicles (NECVs), in 2023. All analysis is based on Gasgoo's registration data of commercial vehicles produced domestically in China.⁵

- 1 In China, the definition of commercial vehicles refers to all motor vehicles with four wheels or more that are not passenger cars. Passenger cars are defined as motor vehicles with four wheels that carry people, have no more than nine seats, and have a maximum designed gross vehicle weight of less than or equal to 3,500 kg.
- 2 Ministry of Ecology and Environment of China, "中国移动源环境管理年报 [China Mobile Source Environmental Management Annual Report]" (November 17, 2023), https://www.mee.gov.cn/hjzl/sthjzk/ydyhjgl/202312/t20231207_1058460.shtml.
- 3 China Society of Automotive Engineers, 商用车碳中和技术路线图1.0 [Commercial Vehicle Carbon Neutrality Technology Roadmap 1.0] (Mechanical Industry Press, 2024), Foreword.
- 4 The State Council of China, "2024–2025年节能降碳行动方案 [2024–2025 Energy Conservation and Carbon Reduction Action Plan]" (May 29, 2024), http://www.scio.gov.cn/zd gz/jj/202405/t20240530_850086.html.
- 5 Registrations of new vehicles, a proxy for sales, was obtained from Gasgoo, *Retail Data of Commercial Vehicles Produced in China*, accessed July 20, 2024, <https://auto.gasgoo.com/>.

Acknowledgments: Thanks to Hongyang Cui, Liuhanzi Yang, and Chang Shen for their constructive comments on an earlier version of this paper.

www.theicct.org

communications@theicct.org

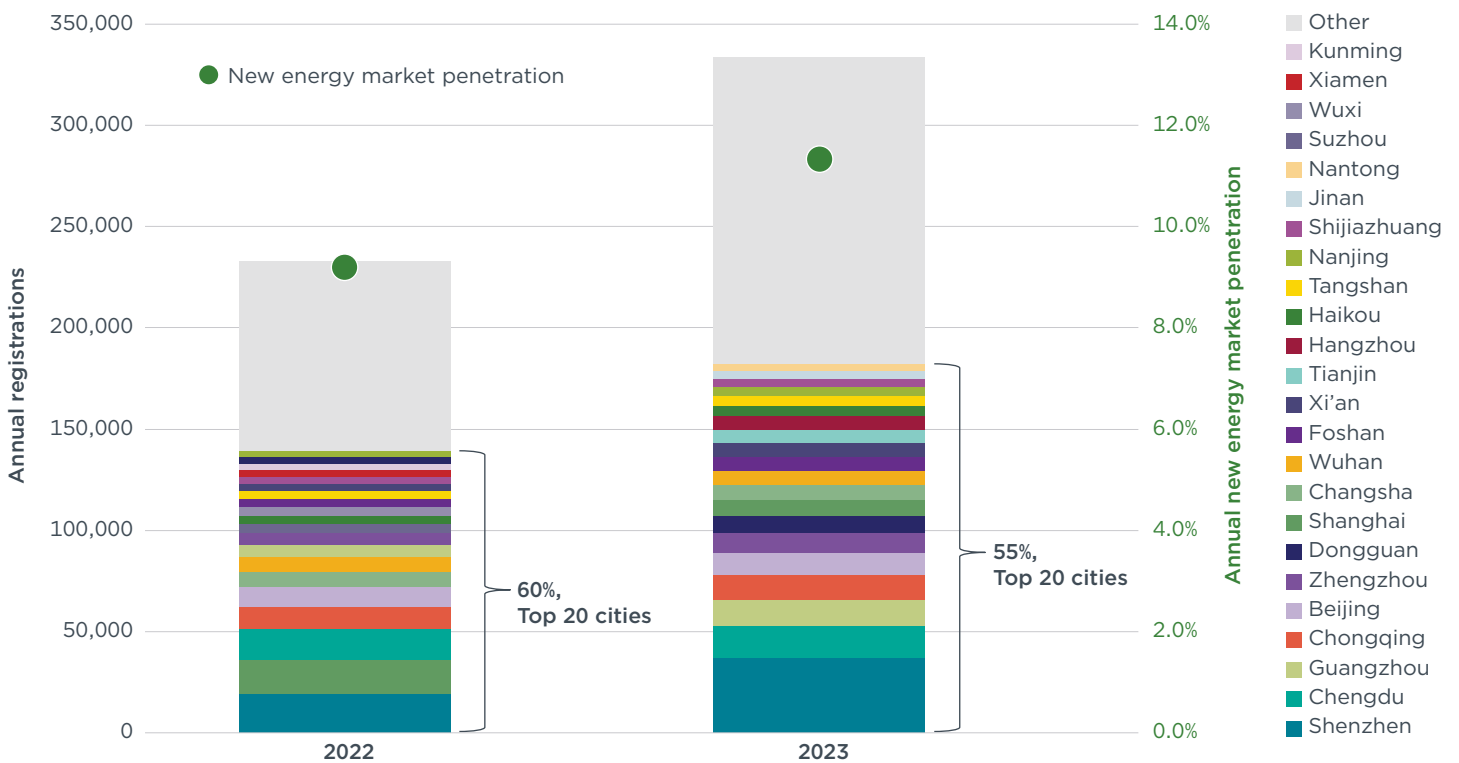
[@theicct.org](https://twitter.com/theicct.org)

icct
THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION

OVERALL TRENDS

Both sales and market penetration of NECVs grew substantially in 2023, with the top-performing city markets making significant contributions to this growth. Registrations of new NECVs in China increased by 43%, from about 234,000 NECVs in 2022 to more than 333,000 in 2023. NECV penetration also increased to 11.3% of the entire commercial vehicle market, up from 9.2% in 2022 (Figure 1). The cities of Shenzhen, Chengdu, Guangzhou, Chongqing, Beijing, and 15 others led the 2023 NECV market in China with the highest numbers of new registrations, which closely approximates to new vehicle sales. The 20 leading cities together represented 55% of all NECV sales in 2023, down from 60% in 2022. This decrease in the share of NECV registrations implies that more cities in China are deploying NECVs.

Figure 1
Top 20 cities for registrations and market penetration of new energy commercial vehicles in 2022 and 2023



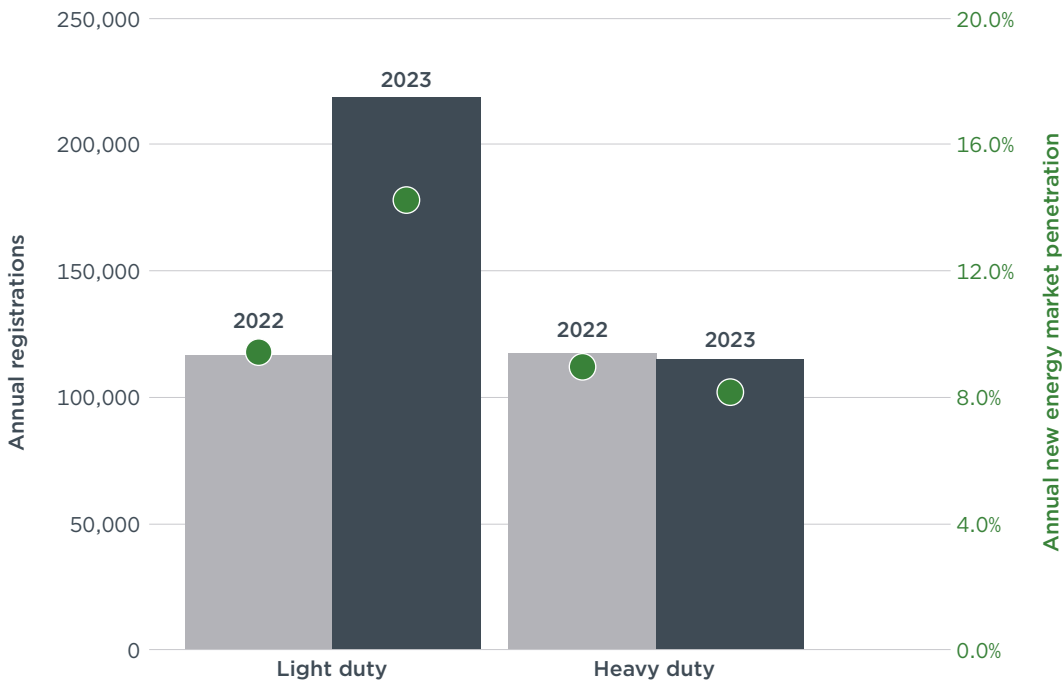
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

The light-duty segment accounted for most of the NECV sales growth in 2023, as well as the largest share of NEVC registrations (Figure 2). Registrations of light-duty NECVs increased 87% from 2022 to 2023, while registrations of heavy-duty NECVs decreased 2%.⁶ The NECV light-duty segment also reached a remarkably high level of penetration in the entire commercial vehicle market at 14.2% in 2023. This is up from 1.0% in 2020, 4.4% in 2021, and 9.4% in 2022. The market penetration of the NECV heavy-duty segment, however, regressed slightly, from 8.9% in 2022 to 8.2% in 2023.

⁶ The light-duty segment here refers to commercial vehicles with a gross vehicle weight of 3.5 tonnes or below, while the heavy-duty segment refers to commercial vehicles with a gross vehicle weight above 3.5 tonnes.

Figure 2

Registrations and market penetration of new energy commercial vehicles by weight class in 2022 and 2023



THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

Looking at NECV registrations by major vehicle categories provides another perspective on market trends. More than 200,000 new energy urban logistics vehicles were registered in 2023, a 64% increase from 2022, making this category the largest contributor to NECV growth (Figure 3).⁷ There is wide variation in the gross vehicle weight (GVW) of urban logistics vehicles, but most products registered in 2023 in this category were concentrated in the light-duty segment. This partially explains why the light-duty segment contributed more to overall NECV market performance in 2023, as shown in Figure 2. Urban logistics vehicles also had the highest market penetration, at 37.1%, among all the major commercial vehicle categories in 2023, followed by buses (17.1%) and dump trucks (11.2%). Roughly 36,000 new energy buses were registered in 2023, a 32% decrease from 2022. About 7,000 new energy dump trucks were registered in 2023, an 8% increase from the previous year.

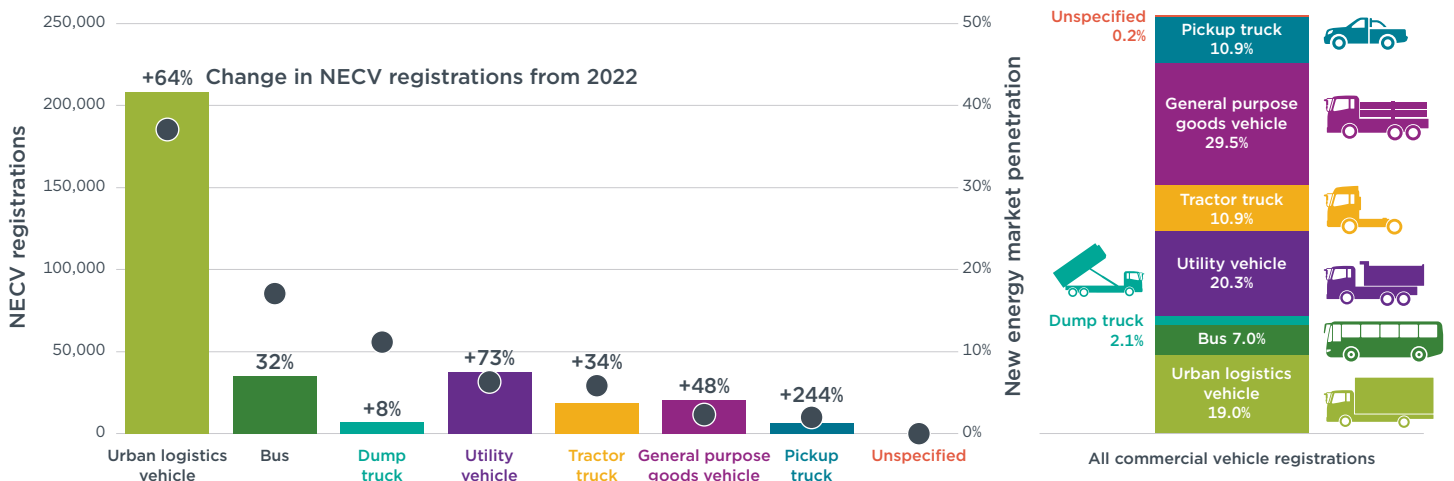
The left panel of Figure 3 ranks the major vehicle categories by their new energy market penetration rate in 2023 from left to right. New energy utility vehicles, tractor trucks, general purpose goods vehicles, and pickup trucks showed substantive growth in the number of registrations in 2023, even as their corresponding penetration rate in the commercial vehicle market stayed below 7%.⁸ However, these four categories accounted for 71.6% of commercial vehicle registrations of all fuel types in 2023 (right panel). Thus, the low sales numbers of new energy vehicles in these categories brought down the overall market penetration rate for NECVs in 2023.

⁷ The technical requirements for the classification of urban logistics distribution vehicles is based on Ministry of Transport, “Standard No.:GB/T 29912-2013,” accessed October 10, 2024, <https://openstd.samr.gov.cn/bzgk/gb/newGbInfo?hcno=D7259E2788711739EC79B2EF59B174A6>.

⁸ Utility vehicles, also called special purpose vehicles in China, refer to a set of functional vehicles such as refrigerated trucks, post office vehicles, engineering trucks, and sanitation vehicles. General purpose goods vehicles, in the Chinese context, are open- or closed-structure vehicles used to transport cargo.

Figure 3

Registrations by major vehicle categories in 2023 for new energy commercial vehicles (left) and commercial vehicles of all fuel types (right)



THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://theicct.org)

FRONT RUNNERS IN COMMERCIAL VEHICLE ELECTRIFICATION

This section analyzes the three commercial vehicle categories with the highest penetration rate for new energy vehicles: urban logistics vehicles, buses, and dump trucks. For each category, we first provide the national-level electrification background and then select the cities with the highest number of new energy deployments for further market and policy analysis.

New energy urban logistics vehicles

National overview

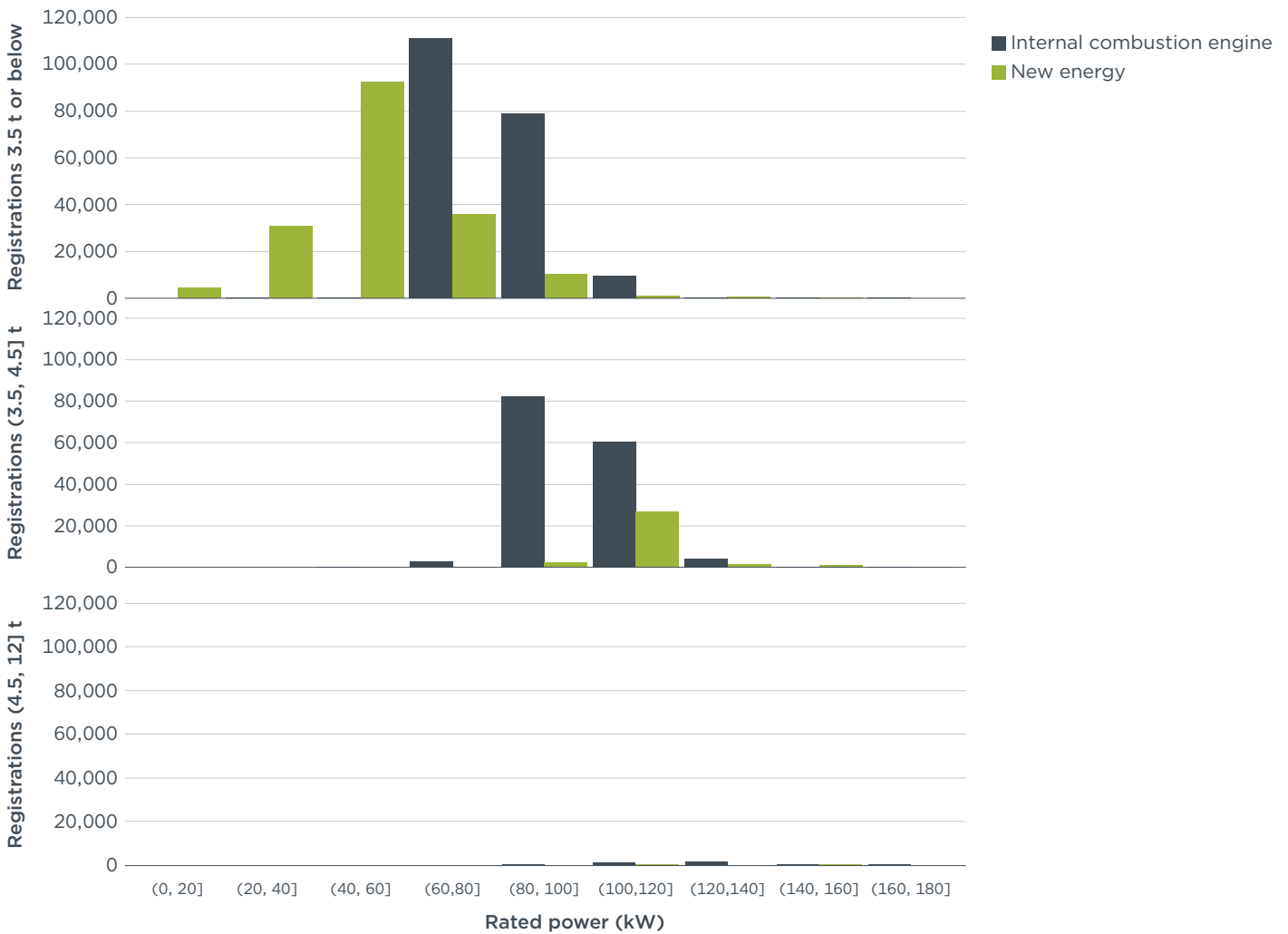
Of all the major commercial vehicle categories, urban logistics vehicles had the highest new energy penetration rate in 2023 at 37.1%, which is 7.1 percentage points higher than in 2022.⁹ New energy models with lighter GVW and lower-rated power were the most popular. As Figure 4 shows, most new energy urban logistics vehicles registered in 2023 have a GVW of 3.5 tonnes or less and rated power ranging from 20 kW to 80 kW. Internal combustion engine (ICE) vehicles in the same GVW grouping have rated power of 60–120 kW. This difference in rated power could result in ICE urban logistics vehicles performing better in real-world situations—such as being able to haul heavier loads and requiring fewer trips to accomplish the same amount of work—than their new energy counterparts. Although there were fewer new energy urban logistics vehicles registered in the 3.5–4.5 t range of GVW, operation costs do not seem to be a barrier preventing new energy deployment in this weight group.¹⁰ There were no new energy deployments of urban logistics vehicles above 4.5 t.

⁹ Yidan Chu, Hui He, and Zhixin Cui, *Leading New Energy Vehicle Cities in China: The 2022 Market* (International Council on Clean Transportation, 2024), <https://theicct.org/publication/ev-china-city-markets-2022-update-mar24/>.

¹⁰ “想买辆新能源轻卡跑物流，真的省钱吗 [I Want to Buy a New Energy Light Truck for Logistics. Is it Really Saving Money?].” *Yoojia*, May 2, 2024, <https://www.yoojia.com/ask/17-14422703870456730673.html>.

Figure 4

Registrations of urban logistics vehicles by gross vehicle weight and rated power in 2023



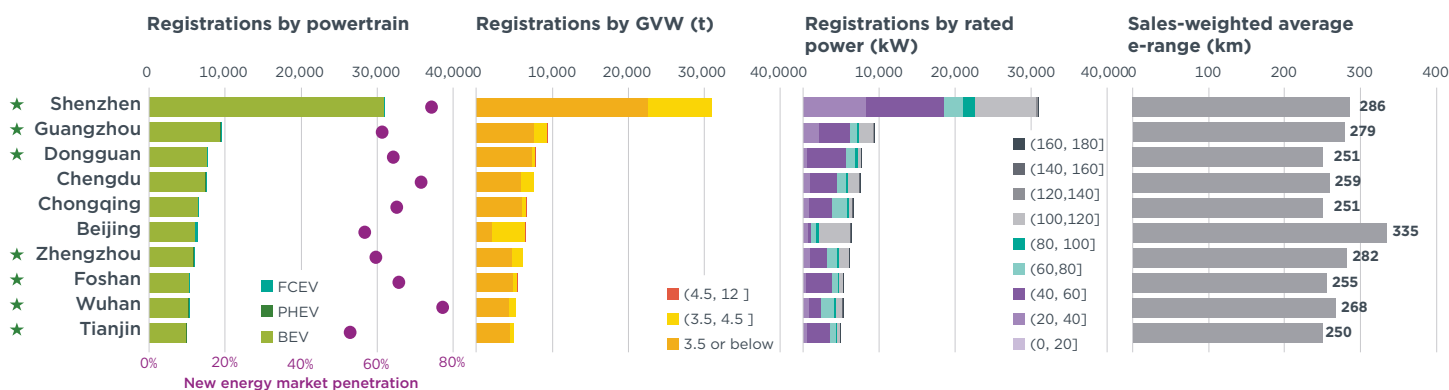
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

Leading cities

Many cities proactively deployed new energy urban logistics vehicles in 2023, with pure electric, lighter, and lower-rated power models being the most popular. Figure 5 lists the 10 cities with the most new energy urban logistics vehicles registered in 2023, from the highest to the lowest, and displays the market performance and technical features of these vehicles. These top-performing cities collectively deployed 43% of all new energy urban logistics vehicles registered in 2023, with an average new energy penetration rate in these cities of 67%. As shown in the left panel, Shenzhen led by a wide margin with more than 30,000 registrations, but the other top 10 cities also stood out for remarkably high new energy penetration—all exceeding 50%. Most of the new energy urban logistics vehicles deployed in these top cities had a GVW of 3.5 t or below and rated power of 80 kW or below. The average type-approval electric range of these vehicles was about 300 km.

Figure 5

Characteristics of new energy urban logistics vehicles in the top 10 cities for registrations in 2023



★ Green Freight Demonstration cities

Notes: BEV = Battery electric vehicle, PHEV = Plug-in hybrid vehicle, FCEV = fuel-cell electric vehicle

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION THEICT.ORG

The market performance and characteristics of new energy urban logistics vehicles deployed in these leading cities were largely driven by China’s national Green Freight Demonstration program and by municipal efforts. The goal of the Green Freight program is to establish efficient, low-carbon, and smart urban freight-distribution systems in and between cities in China; one of the key elements of this program is deploying new energy urban logistics vehicles.¹¹ Many cities applied to join the program after its launch in 2017, and seventy-one cities have been enlisted as formal demonstration cities since 2021.¹² Demonstration cities all need to have clear plans and goals to increase the deployment of new energy urban logistics vehicles, along with the policies and measures needed to achieve these goals. For example, Shenzhen aims to have 113,000 new energy urban logistics vehicles in service by 2025, while Chengdu aims to have 80% of all urban logistics vehicles on the road be new energy by the same year.¹³ These two cities also offer road access privileges to new energy urban logistics vehicles.¹⁴ Seven of the top 10 cities for new energy urban logistics vehicles are formal Green Freight Demonstration cities: Shenzhen, Guangzhou, Chengdu, Zhengzhou, Foshan, Wuhan, and Tianjin.

Three of the top 10 cities were not Green Freight Demonstration cities in 2023, but they still took measures to promote new energy urban logistics vehicles. Dongguan—which

11 Ministry of Transport, “三部门联合启动城市绿色货运配送示范工程 [Three Departments Jointly Launched the Green Freight Delivery Demonstration Program]” (December 27, 2017), http://www.gov.cn/xinwen/2017-12/27/content_5250767.htm.

12 Ministry of Transport, “首批16个‘绿色货运配送示范城市’出炉 [Name List of the 16 Pilot Cities for Green Freight Demonstration Program Released]” (August 12, 2021), http://www.gov.cn/xinwen/2021-08/12/content_5630889.htm. Note: Cities that submitted their application do not necessarily become formal demonstration cities, as there was a screening process.

13 Shenzhen Development and Reform Commission, “深圳市新能源汽车推广应用工作方案 (2021-2025年) [Work Plan for the Promotion and Application of New Energy Vehicles in Shenzhen (2021-2025)]” (March 31, 2021), https://fgw.sz.gov.cn/zwgk/zcjcjd/zc/content/post_8667568.html; Chengdu Municipal People’s Government, “成都市人民政府办公厅关于成都市促进新能源汽车产业发展的实施意见 [Implementation Opinions of the General Office of Chengdu Municipal People’s Government on Promoting the Development of New Energy Automobile Industry in Chengdu]” (March 10, 2023), <https://www.chengdu.gov.cn/gkml/cdsrmzfbgt/qtwj/1646400540776624128.shtml>.

14 Public Security Bureau of Shenzhen Municipality, “关于对新能源纯电动物流车继续实施通行优惠政策的通告 [Notice on the Continued Implementation of Preferential Road Access Policies for Pure Electric Logistics Vehicles]” (June 25, 2023), https://ga.sz.gov.cn/ZWGK/QT/GSGG/content/post_10666425.html?utm_source=chatgpt.com; Chengdu Municipal People’s Government, “成都市人民政府办公厅关于成都市促进新能源汽车产业发展的实施意见 [Implementation Opinions of the General Office of Chengdu Municipal People’s Government on Promoting the Development of New Energy Automobile Industry in Chengdu]” (March 10, 2023), <https://www.chengdu.gov.cn/gkml/cdsrmzfbgt/qtwj/1646400540776624128.shtml>.

is in the same province as Shenzhen and Guangzhou—is following their examples by setting deployment goals and providing urban-entry passes only to pure electric and fuel-cell electric urban logistics vehicles; an exception allows urban-entry passes for ICE refrigerated trucks, possibly because of their higher energy-consumption needs.¹⁵

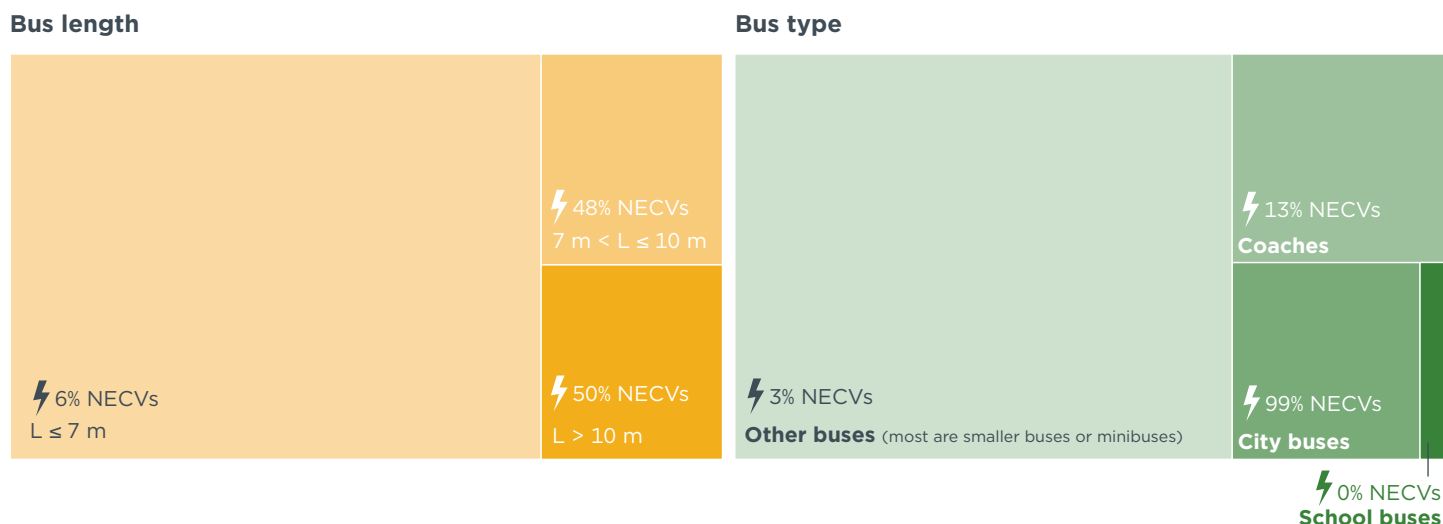
New energy buses

National overview

Buses had the second-highest new energy penetration rate of commercial vehicle groups at 17.1% in 2023, which is 8.1 percentage points lower than in 2022. However, the new energy penetration rates of different bus subcategories varied greatly. As shown on the left side of Figure 6, buses with a length of 7 meters or less accounted for the majority of models registered in 2023 but had the lowest new energy penetration rate. The right side of Figure 6 presents the same bus registration data, but by major bus types. City buses in China almost achieved almost 100% electrification in 2023, but the new energy penetration rates for other bus types lagged behind. These non-city buses were the majority of all buses registered in 2023.

Figure 6

Registrations for buses of all fuel types by vehicle length and major application type in 2023



Note: The rectangular areas in the figure represent the proportional values of all bus registrations by length and by application type.

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

Leading cities

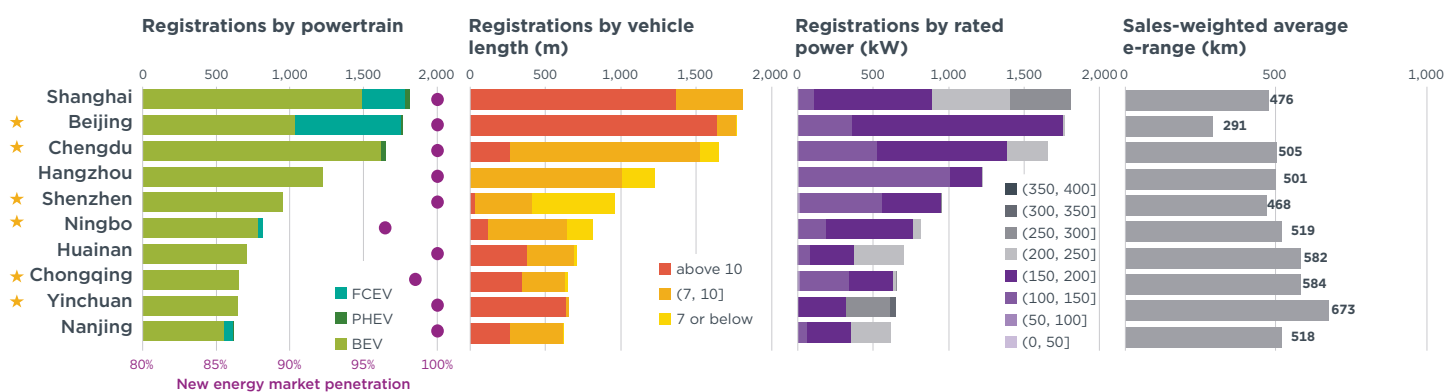
Many cities achieved a 100% electrification rate for new city buses deployed in 2023. Figure 7 lists the 10 cities with the highest number of registrations of new energy city buses in 2023 along with the market penetration rate and technical characteristics. These top-performing cities collectively deployed 41% of all new energy city buses in China in 2023, with an average new energy penetration rate of 99.6%. Most of the new energy city buses deployed in these cities were longer than 7 meters and had a power

15 Dongguan Municipal Transportation Bureau, “东莞市交通运输领域设备设施更新工作方案 [Dongguan City Transportation Equipment and Facility Update Work Plan]” (May 8, 2024), https://www.dg.gov.cn/ztzllm/tddgmsbgxhyjh/xz/wj/sjzcx/content/post_4201285.html; Dongguan Public Security Bureau, “东莞市公安局城市配送车辆通行证管理办法 [Dongguan Public Security Bureau: Administrative Measures for Urban Delivery Vehicle Pass Management]” (February 14, 2023), https://www.gd.gov.cn/zwgk/wjk/zcfgk/content/post_4094489.html.

rating of up to 200 kW. The average type-approval electric range of these vehicles was about 500 km.

This remarkable electrification rate of city buses was largely driven by the central government and various municipal policy efforts. The national Transportation Development Plan for 2021 to 2025 set a target for cities with a population of 1 million or more: At least 80% of all buses acquired to replace existing buses or to expand the bus fleet must be new energy vehicles.¹⁶ All 10 top-performing cities meet this population criteria. China's central government also launched the Full Vehicle Electrification in the Public Sector national pilot program in 2023.¹⁷ Cities were encouraged to apply for national pilot status and to electrify their public sector vehicles, including city buses. Pilot cities under this program need to meet new energy vehicle targets, based on how the cities are classified, within the program timeframe of 2023 through 2025. The target for large cities such as Beijing and Shanghai is to deploy 100,000 new energy public vehicles over the three years.¹⁸ The central government did not provide a financial incentive to the pilot cities but, according to the related policy, the central government might introduce supportive policies to these cities and prioritize allocating subsidies to them for future investment. Six of the leading cities listed in Figure 7 enlisted as formal national pilot cities.¹⁹

Figure 7
Characteristics of new energy city buses in the top 10 cities for registrations in 2023



★ Pilot cities in Full Vehicle Electrification in the Public Sector program

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

New energy coaches registered in the top-performing cities varied greatly in their market penetration and technical characteristics (Figure 8). These 10 cities collectively deployed 45% of the national total for new energy coaches in 2023, with an average new energy penetration rate of 30%. The new energy penetration rate ranged from

16 State Council, “国务院关于印发“十四五”现代综合交通运输体系发展规划的通知 [Notice of the State Council on Issuing the 14th Five-Year Plan for the Development of a Modern Comprehensive Transportation System]” (January 18, 2022), https://www.gov.cn/zhengce/content/2022-01/18/content_5669049.htm.

17 Public sector vehicles in this policy includes city buses, taxis, postal vehicles, sanitary vehicles, urban logistics vehicles, and other types of vehicles. Ministry of Industry and Information Technology, “关于开展公共领域车辆全面电动化先行区试点工作的通知 [Notice by the Ministry of Industry and Information Technology and Seven Other Departments on Organizing Pilot Work for Fully Electrified Public Sector Vehicles in Pioneer Zones]” (January 30, 2023), https://www.gov.cn/zhengce/zhengceku/2023-02/03/content_5739955.htm.

18 Ministry of Industry and Information Technology, “公共领域车辆全面电动化试点城市新能源汽车推广数量参考目标 [Reference Targets for New Energy Vehicle Promotion in Pilot Cities for Fully Electrified Public Sector Vehicles],” accessed July 20, 2024, <https://www.gov.cn/zhengce/zhengceku/2023-02/03/5739955/files/d7b71c27e174b60bd00500df7169681.pdf>.

19 Xinxin Zhang, Xing Huang, and Dandan Zhao, “15个城市获批试点，公共领域车辆全面电动化提速为新能源汽车发展助力 [15 Cities Approved as Pilots: Accelerating Full Electrification of Public Sector Vehicles to Boost New Energy Vehicle Development],” *Xinhua News Agency*, November 16, 2023, https://www.gov.cn/lianbo/bumen/202311/content_6915659.htm.

9.9% in Guangzhou to 95.6% in Yongzhou. While most of these leading cities deployed pure electric models, several cities also deployed fuel-cell models, including Beijing, Shenzhen, Shanghai, and Guangzhou. Most of the models deployed were 7 m or longer in length and had a power rating of up to 250 kW. The average type-approval electric range ranged from roughly 360 km to nearly 550 km.

The market performance and characteristics of new energy coaches in the leading cities were largely driven by varied local efforts and by the national Fuel Cell Vehicle Demonstration program.²⁰ This program, which was launched in 2020 and lasts for 4 years, aims to establish fuel cell vehicle industries, boost new fuel cell vehicle technologies and the application of these technologies, explore effective operational business models, and improve the relevant policies and standards. Cities selected for the demonstration program will receive financial awards from the central government. As part of its short-term planning, Beijing aimed to lift the percentage of new energy models deployed in its intercity bus fleet, including commuter and tourism buses, between 2020 and 2025.²¹ Beijing also initiated local pilot projects to promote fuel-cell electric fleets, particularly those used for passenger transport. The city supported the deployment and operation of fuel cell buses to be used for sightseeing and tourism and by universities and companies offering commuter transportation for employees. Beijing has offered financial awards for deploying these large buses—typically more than 10 meters in length—ranging from ¥990,000 to ¥1,260,000 depending on vehicle rated power and after 4-year mileage requirements are met.²² Another example is Shenzhen, which had already achieved 100% electrification in its city bus fleet in 2017. The city set new goals to electrify its coach fleet by, in particular, deploying fuel cell coaches on its intercity coach routes.²³ In addition, Shenzhen also offered per-vehicle subsidies of ¥20,000–¥50,000 for new energy tourism buses purchased in 2023.²⁴

Five of the 10 leading cities listed in Figure 8 are also national demonstration cities for fuel cell vehicle applications: Beijing, Shenzhen, Shanghai, Zhuhai, and Guangzhou. These five cities were identified as deploying fuel cell buses in their jurisdictions during the pilot period from 2021 to 2025.²⁵

20 Ministry of Finance, Ministry of Industry of Information Technology, Ministry of Science and Technology, National Development and Reform Commission, and National Energy Administration, “关于开展燃料电池汽车示范应用的通知 [Notice on the launch of demonstration program of fuel cell vehicles]” (September 16, 2020), https://www.gov.cn/zhengce/zhengceku/2020-09/21/content_5545221.htm.

21 Beijing Municipal Transportation Commission, “北京市贯彻《道路旅客运输及客运站管理规定》的实施意见 [Beijing’s implementation guidelines for the regulations on road passenger transport and passenger station management]” (December 28, 2020), https://jtjw.beijing.gov.cn/xxgk/flfg/zcfg/202206/t20220609_2733427.html.

22 Beijing Municipal Bureau of Economy and Information Technology, “关于开展2022-2023年度北京市燃料电池汽车示范应用项目申报的通知 [Notice on the Application for the 2022-2023 Beijing Fuel Cell Vehicle Demonstration Projects]” (April 12, 2023), https://www.beijing.gov.cn/zhengce/zhengcefagui/202304/t20230418_3058192.html; Beijing Municipal Bureau of Economy and Information Technology, “关于开展2023-2025年度北京市燃料电池汽车示范应用项目申报的通知 [Notice on the Application for the 2023-2025 Beijing Fuel Cell Vehicle Demonstration Projects]” (April 16, 2023), https://jxj.beijing.gov.cn/jxdt/tzgg/202404/t20240416_3619890.html.

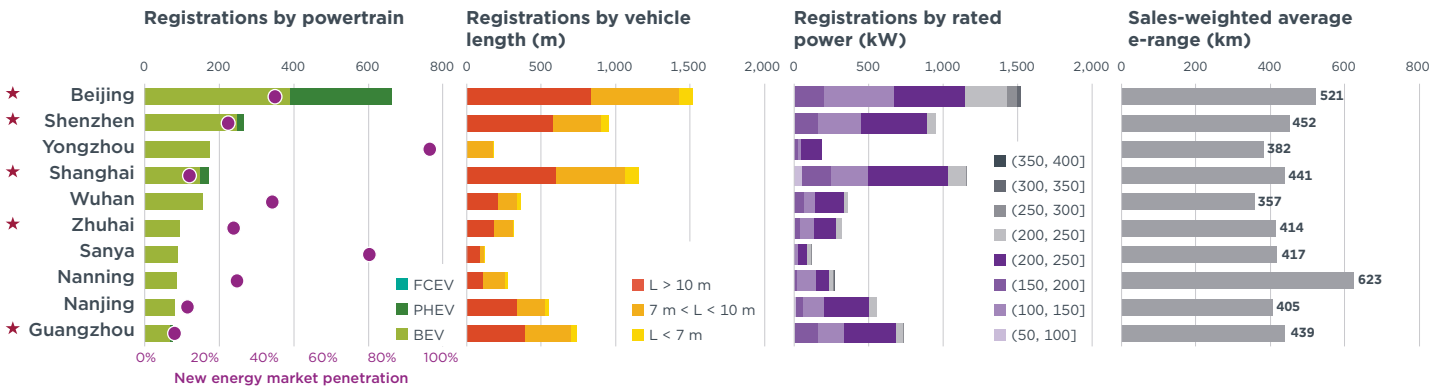
23 Shenzhen Municipal Bureau of Industry and Information Technology, “深圳市加快打造‘新一代世界一流汽车城’三年行动计划（2023—2025年） [Shenzhen Three-Year Action Plan (2023-2025) to Accelerate the Development of a ‘Next-Generation World-Class Automobile City]” (August 3, 2023), https://www.sz.gov.cn/cn/xxgk/zfxxgj/zcfg/content/post_10764131.html; Shenzhen Municipal Transportation Bureau, “深圳市综合交通‘十四五’规划 [Shenzhen Comprehensive Transportation 14th Five-Year Plan]” (February 23, 2022), https://jtys.sz.gov.cn/gkmlpt/content/9/9585/mpost_9585397.html#1493; “公交车和出租车全面电动化 深圳巴士集团将建百座超级充电站 [Full Electrification of Buses and Taxis: Shenzhen Bus Group to Build 100 Supercharging Stations],” *Shenzhen Evening News*, October 30, 2023, https://www.sznews.com/news/content/2023-10/30/content_30559030.htm.

24 Shenzhen Municipal Bureau of Transportation, “深圳市新能源旅游客车消费补贴申领实施细则（2023年度） [Implementation details for applying for consumer subsidies for new energy tourist buses in Shenzhen (2023)]” (February 21, 2024), https://jtys.sz.gov.cn/zwgk/xxgkml/zcfgjdd/gfxwjcx/content/post_11152229.html.

25 “‘3+2’氢燃料电池汽车示范城市群格局形成 氢燃料电池汽车产业再次站上风口 [The ‘3+2’ Hydrogen Fuel Cell Vehicle Demonstration Urban Cluster Takes Shape, Boosting the Hydrogen Fuel Cell Vehicle Industry to the Forefront Again],” *China Auto News*, February 7, 2022, http://www.caam.org.cn/search/con_5235405.html.

Figure 8

Characteristics of new energy coaches in the top 10 cities for registrations in 2023



★ Fuel Cell Vehicle Demonstration cities

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION THEICT.ORG

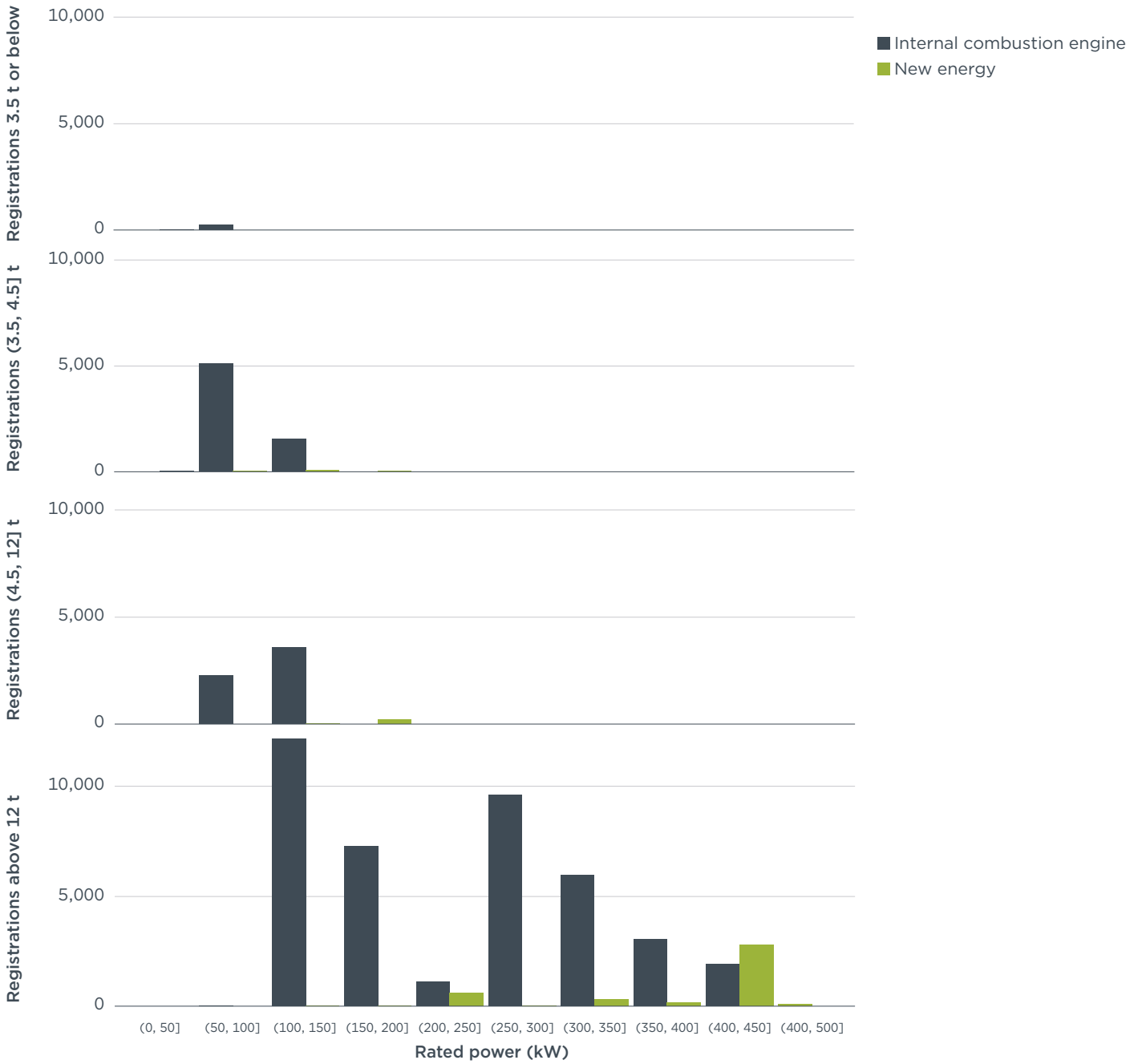
New energy dump trucks

National overview

Dump trucks had the third-highest new energy penetration rate of commercial vehicle groups at 11.2% in 2023, 5.4 percentage points higher than in 2022. New energy models with a higher GVW and rated power were most popular. As Figure 9 shows, new energy dump trucks registered in 2023 were mostly models with a GVW above 12 t and with rated power ranging from 350 kW to 450 kW. This is the same or higher rated power than most ICE dump trucks. This implies that these new energy products could do the same amount of work as their ICE counterparts.

Figure 9

Registrations of dump trucks by gross vehicle weight and rated power in 2023



THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION THEICCT.ORG

Leading cities

The 10 cities with the highest number of new energy dump truck registrations in 2023 collectively deployed 46% of the national total of all registrations, with an average market penetration rate of 28%. This is a shift from 2022, when the top 10 cities registered 56% of all new energy dump trucks, with an average penetration rate of 17%.²⁶ As shown in Figure 10, Chengdu held a wide lead in terms of both annual registrations (more than 1,000) and market penetration (71%). While most of those leading cities deployed pure electric models, several cities also deployed fuel cell models, including Zhengzhou, Shanghai, and Jinan. Most new energy dump trucks deployed in these top cities had a GVW of more than 12 t and rated power above 300 kW. The average electric range of the new energy dump trucks in the top-performing cities mostly ranged from 200 km to 300 km. Trucks in Zhengzhou, however, had an exceptionally high average electric range of 474 km; Zhengzhou has a larger share of fuel-cell electric dump trucks, which have higher ranges than battery electric trucks.

The market performance and characteristics of new energy dump trucks in these leading cities resulted from multiple national policies and programs and local efforts. Eight of the 10 leading cities were under the purview of China's Ultra-low Emission Campaign on Heavy Industries.²⁷ This campaign sets requirements for companies in high-polluting industries to use low-emission tools, including new energy trucks, to transport bulk products such as coal. Companies that fail to meet the requirements must pause production during times of heavy air pollution. Five of the top-performing cities are also formal pilot cities for China's Full Vehicle Electrification in the Public Sector program; these cities included the electrification of heavy-duty trucks in their local implementation plans.²⁸ The city of Chengdu set a 100% electrification target by 2025 for trucks used to transport cement and construction waste within urban areas, with most of these vehicles being dump trucks.²⁹ To meet this target, Chengdu has offered road-access privileges for new energy trucks, which allows them to enter urban centers; free parking for the first 2 hours; and an award of ¥200,000 to ¥300,000 for qualified trucks.³⁰ The city of Rizhao in Shandong province deployed new energy dump trucks produced by a local manufacturer in the city's port. This action furthered the city's goals of building an exemplary smart and green port while also providing a market for its NECV manufacturer.³¹

26 Yidan Chu, Hui He, and Zhixin Cui, *Leading New Energy Vehicle Cities in China: The 2022 Market* (International Council on Clean Transportation, 2024), <https://theicct.org/publication/ev-china-city-markets-2022-update-mar24/>.

27 Shiyue Mao, Liuhanzi Yang, and Felipe Rodriguez, *The Ultra-low Emission Campaign on Heavy Industries in China* (International Council on Clean Transportation, 2024), <https://theicct.org/publication/the-ultra-low-emission-campaign-on-heavy-industries-in-china-dec24/>.

28 Ministry of Industry and Information Technology, “关于组织开展公共领域车辆全面电动化先行区试点工作的通知 [Notice by the Ministry of Industry and Information Technology and seven other departments on organizing pilot work for fully electrified public sector vehicles in pioneer zones]” (January 30, 2023), https://www.gov.cn/zhengce/zhengceku/2023-02/03/content_5739955.htm.

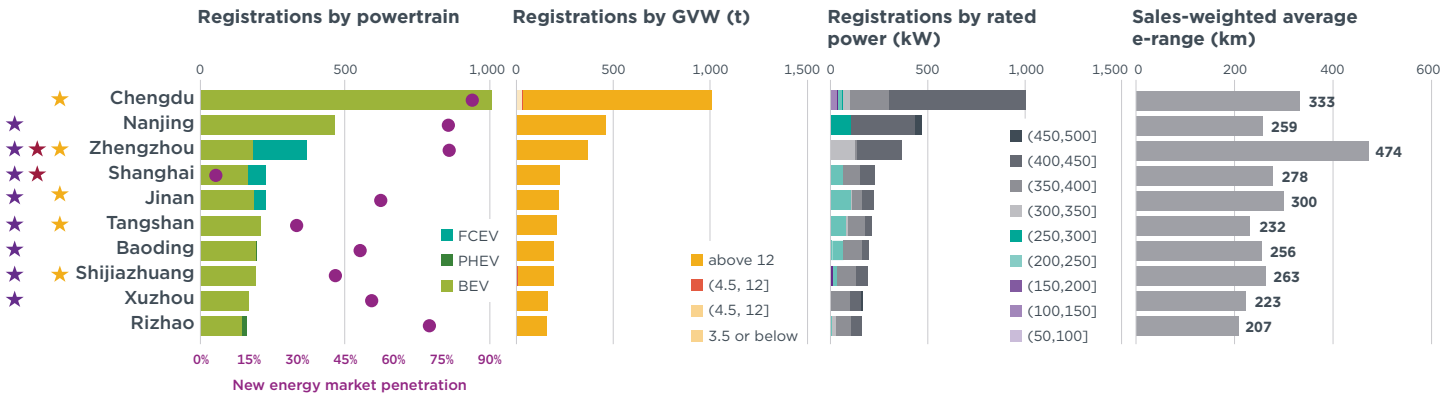
29 Chengdu Municipal People's Government, “成都市人民政府办公厅关于成都市促进新能源汽车产业发展的实施意见 [Implementation Opinions of the General Office of Chengdu Municipal People's Government on Promoting the Development of the New Energy Vehicle Industry in Chengdu]” (March 14, 2023), https://www.cdht.gov.cn/cdht/c149031/2023-03/14/content_1e2fcfd20dc740eb81fb4aaa2a967687.shtml.

30 Chengdu Municipal People's Government, “成都市人民政府办公厅关于印发成都市优化交通运输结构促进城市绿色低碳发展行动方案、成都市优化交通运输结构促进城市绿色低碳发展政策措施的通知 [Notice from the General Office of Chengdu Municipal People's Government on Issuing the Action Plan for Optimizing the Transportation Structure and Promoting Green and Low-Carbon Urban Development, and the Policy Measures for Optimizing the Transportation Structure and Promoting Green and Low-Carbon Urban Development]” (July 11, 2022), <https://www.chengdu.gov.cn/gkml/cdsrmzfbgt/qtwj/1613191521748754432.shtml>.

31 “日照港干散货绿色转运启动暨首批100辆豪沃TX新能源重卡交车仪式圆满举行 [Rizhao Port Launches Green Bulk Cargo Transfer with the Successful Delivery of the First 100 HOWO TX New Energy Heavy-Duty Trucks],” *China Road Machinery Network*, March 29, 2023, <https://news.lmjx.net/2023/202305/2023052921203150.shtml>.

Figure 10

Characteristics of new energy dump trucks in the top 10 cities for registrations in 2023



- ★ Pilot cities in Full Vehicle Electrification in the Public Sector program
- ★ Pilot cities in Fuel Cell Vehicle Demonstration program
- ★ Cities in key regions for Ultra-low Emission Campaign on Heavy Industries

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION THEICT.ORG

MID-PACK RUNNERS IN COMMERCIAL VEHICLE ELECTRIFICATION

This section analyzes the two commercial vehicle categories with moderate new energy market penetration: utility vehicles and tractor trucks. As in the above sections, we first provide the national-level electrification overview of the two categories and then select the top-performing cities for further market and policy analysis.

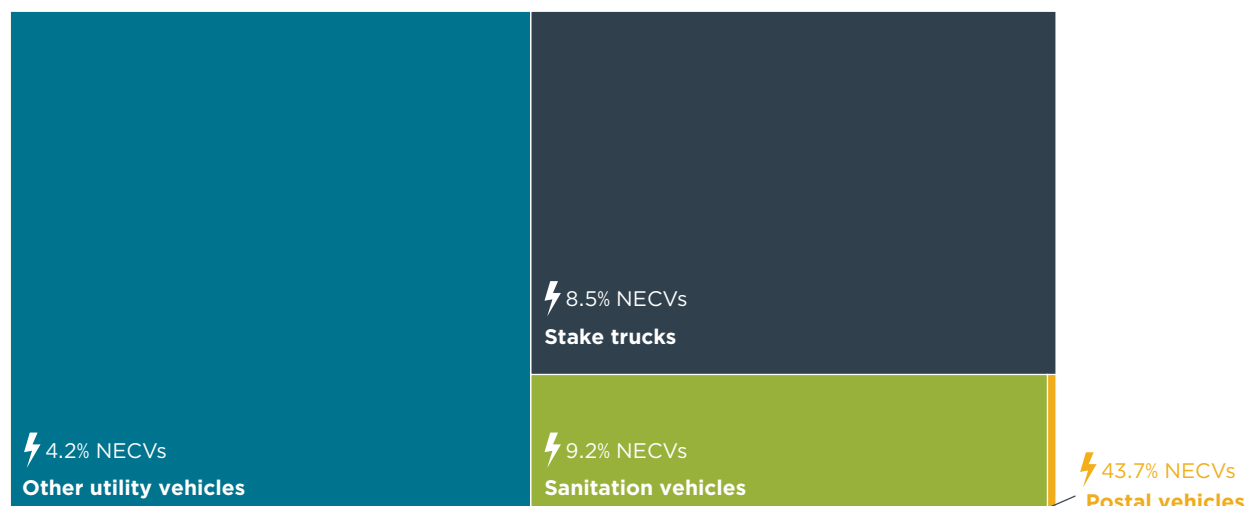
New energy utility vehicles

National overview

Utility vehicles had the fourth-highest new energy penetration rate for commercial vehicles at 6.8% in 2023. Among all vehicle categories, utility vehicles have the highest number of applications, which can be grouped into four major types: sanitation vehicles, postal vehicles, stake trucks (flatbed trucks with removable stakes around the perimeter for enclosing cargo), and others (Figure 11). Among these four types, postal vehicles and sanitation vehicles, which includes road-sweeping vehicles and snow-removal vehicles, had the highest new energy penetration rates at 43.7% and 9.2%, respectively. However, these two types accounted for only 13% of all utility vehicles registered in 2023. The other two application types—stake trucks and other utility vehicles—made up the majority of utility vehicles and had the lowest new energy penetration rates at 8.5% and 4.2%, respectively. Other utility vehicles include hundreds of specific application types, such as refrigerated trucks, concrete mixers, ambulances, and firefighting vehicles. These vehicles often need more power to perform functions in addition to driving, which could make it harder to attract consumers for new energy models; potential buyers may prefer ICE vehicles for their longer range and reputation for reliability. Stake trucks are usually privately owned vehicles used to transport livestock, bottled beverages, and agricultural products in China. These vehicle owners are particularly sensitive to costs, which may be why fewer consumers choose new energy stake trucks with higher price tags than comparable ICE models.

Figure 11

Registrations of utility vehicles of all fuel types by major application type in 2023



THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

Leading cities

The top-performing cities for registrations of new energy utility vehicles collectively deployed 51% of the national total in 2023 with an average new energy penetration rate of 18%. Most of these new energy utility vehicles were battery electric and the most popular application types were stake trucks, which are commonly used in intercity cargo transport, and sanitation vehicles (Figure 12).

All these leading city markets offered road-access privileges to new energy trucks, with varied requirements for vehicle size or geographical scope. This contributed to the deployment of new energy stake trucks. All new energy trucks were exempt from the typical truck travel restrictions in Chengdu, while new energy light-duty trucks in Kunming were exempt from travel restrictions on local trucks in county areas.³²

The national Full Electrification in the Public Sector program helped propel the deployment of new energy sanitation and postal vehicles in these leading cities.³³ As stated in the previous subsection on new energy buses, the program aims to speed up electrification in the public sector between 2023 and 2025; sanitation and postal vehicles fall into the public sector category.

Some cities deployed other types of utility vehicles under the Full Electrification in the Public Sector program as well as the national Green Freight Demonstration program.³⁴ In Chengdu, for example, concrete mixers and transport vehicles were also treated as in

32 “2023年4月成都货车通行最新规定[April 2023 Latest Regulations on Truck Traffic in Chengdu],” *Chengdu Bendibao*, March 22, 2023, <https://cd.bendibao.com/traffic/2023322/156972.shtm>; “3月1日起 云南这地货车通行限制有变! [Starting March 1, Changes to Truck Traffic Restrictions in This Area of Yunnan!],” *Truck Home*, February 16, 2023, <https://www.360che.com/law/230216/178639.html>.

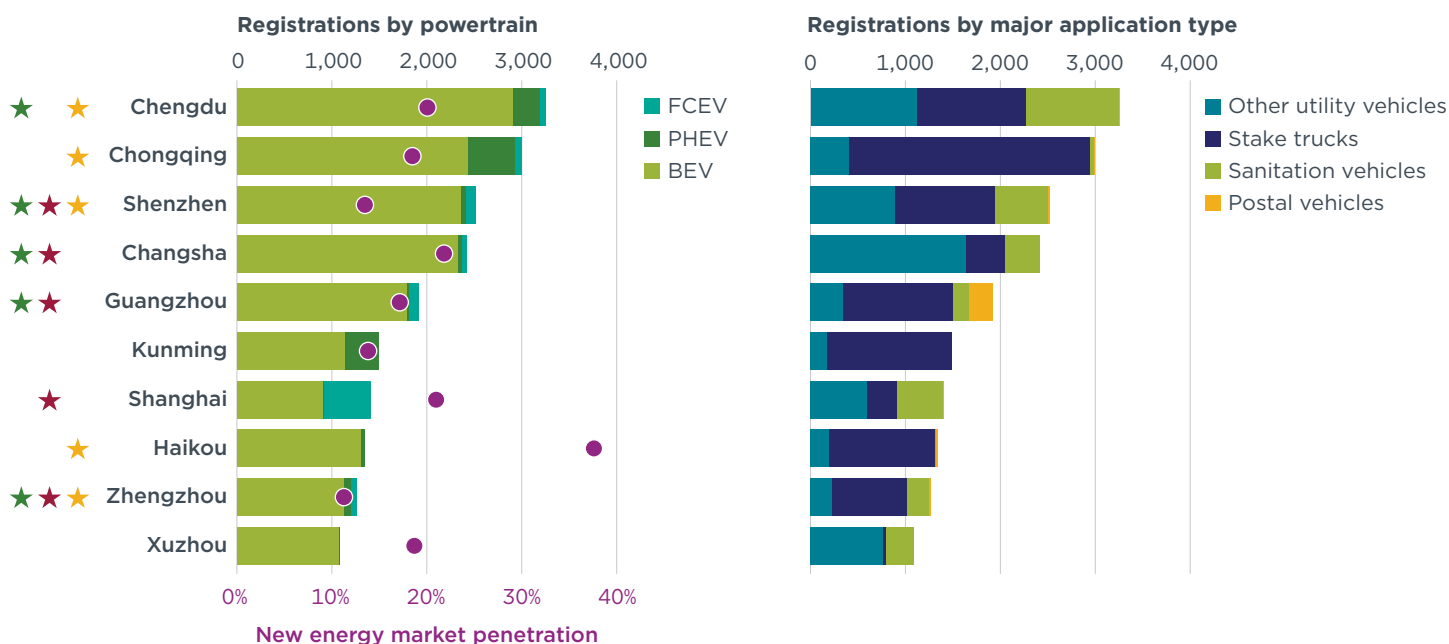
33 Ministry of Industry and Information Technology, “关于组织开展公共领域车辆全面电动化先行区试点工作的通知 [Notice by the Ministry of Industry and Information Technology and Seven Other Departments on Organizing Pilot Work for Fully Electrified Public Sector Vehicles in Pioneer Zones]” (January 30, 2023), https://www.gov.cn/zhengce/zhengceku/2023-02/03/content_5739955.htm.

34 Ministry of Transport, “首批16个‘绿色货运配送示范城市’出炉 [Name List of the 16 Pilot Cities for Green Freight Demonstration Program Released]” (August 12, 2021), http://www.gov.cn/xinwen/2021-08/12/content_5630889.htm.

the public sector, while registrations of refrigerated trucks, frequently used in the urban logistics industry, were influenced by Chengdu’s urban logistics policies.³⁵

Figure 12

Characteristics of new energy utility vehicles in the top 10 cities for registrations in 2023



- ★ Pilot cities in Full Vehicle Electrification in the Public Sector program
- ★ Pilot cities in Fuel Cell Vehicle Demonstration program
- ★ Green Freight Demonstration cities

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

New energy tractor trucks

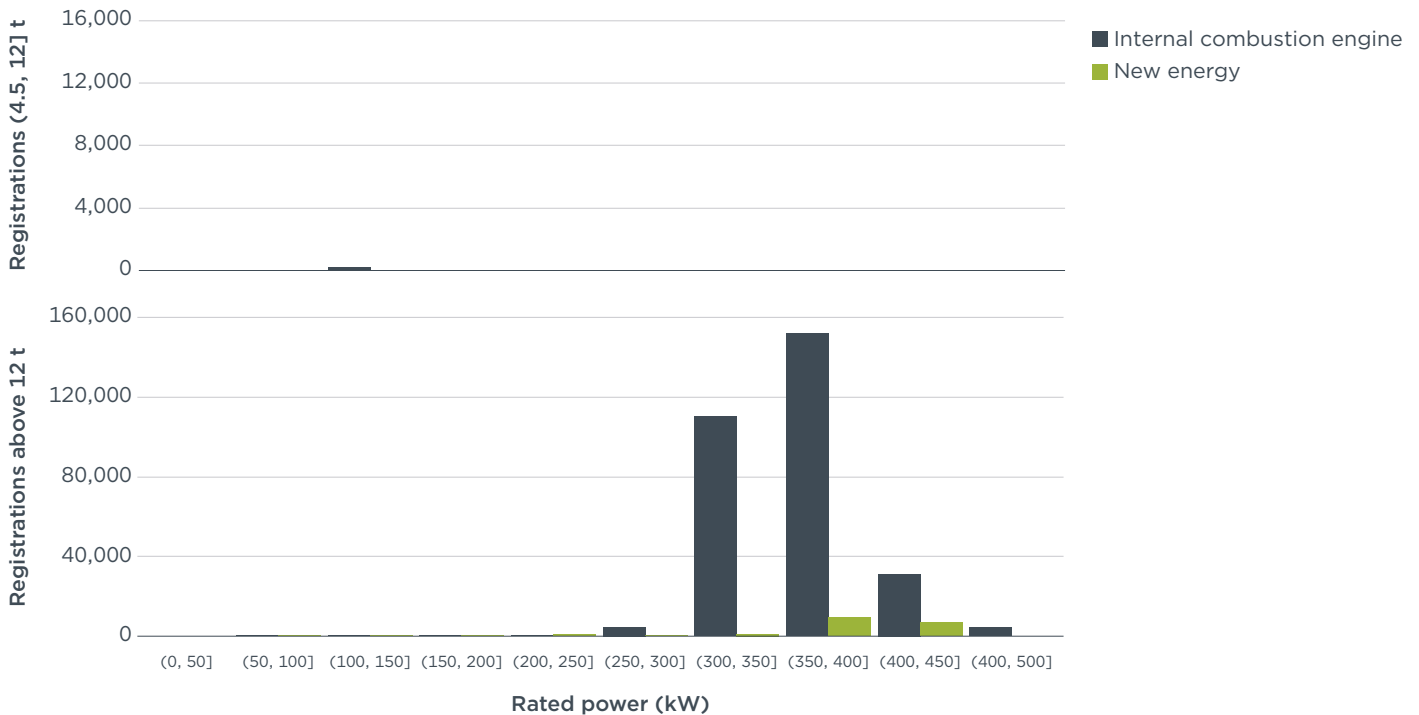
National overview

Tractor trucks had the fifth-highest new energy penetration rate, at 5.9%, among the major commercial vehicle categories in 2023. As Figure 13 shows, most tractor trucks registered in 2023 had a GVW of more than 12 t, regardless of fuel type, and a rated power greater than 300 kW. Despite the relatively low number of registrations, most new energy tractor trucks also had a rated power of more than 300 kW.

³⁵ Chengdu Municipal People’s Government, “成都市人民政府办公厅关于印发成都市优化交通运输结构促进城市绿色低碳发展行动方案、成都市优化交通运输结构促进城市绿色低碳发展政策措施的通知 [Notice from the General Office of Chengdu Municipal People’s Government on Issuing the Action Plan for Optimizing the Transportation Structure and Promoting Green and Low-Carbon Urban Development, and the Policy Measures for Optimizing the Transportation Structure and Promoting Green and Low-Carbon Urban Development]” (July 11, 2022), <https://www.chengdu.gov.cn/gkml/cdsrmzfbgt/qtwj/1613191521748754432.shtml>; Chengdu Xingcheng Investment Group Co., Ltd, “成都兴城集团首批电动搅拌车交付 助力零碳商砼运输新征程 [Chengdu Xingcheng Group Delivers Its First Batch of Electric Concrete Mixers, Advancing Zero-Carbon Commercial Concrete Transportation]” press release, September 21, 2023, https://gzw.chengdu.gov.cn/cdgzw/c107964/2023-09/21/content_448bbac674d1462b8ed40f5fe42dbedb.shtml; “2023年新能源冷藏车市场特征: 累销4853辆增6成, 成都\北京\重庆居前三 [2023 New Energy Refrigerated Truck Market Characteristics: Total Sales Reached 4,853 Units, up 60%, with Chengdu, Beijing, and Chongqing Leading the Rankings],” *Truck Network*, February 2, 2024, https://m.chinatruck.org/news/68_116862.html.

Figure 13

Registrations of tractor trucks by gross vehicle weight and rated power in 2023



THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://theicct.org)

Leading cities

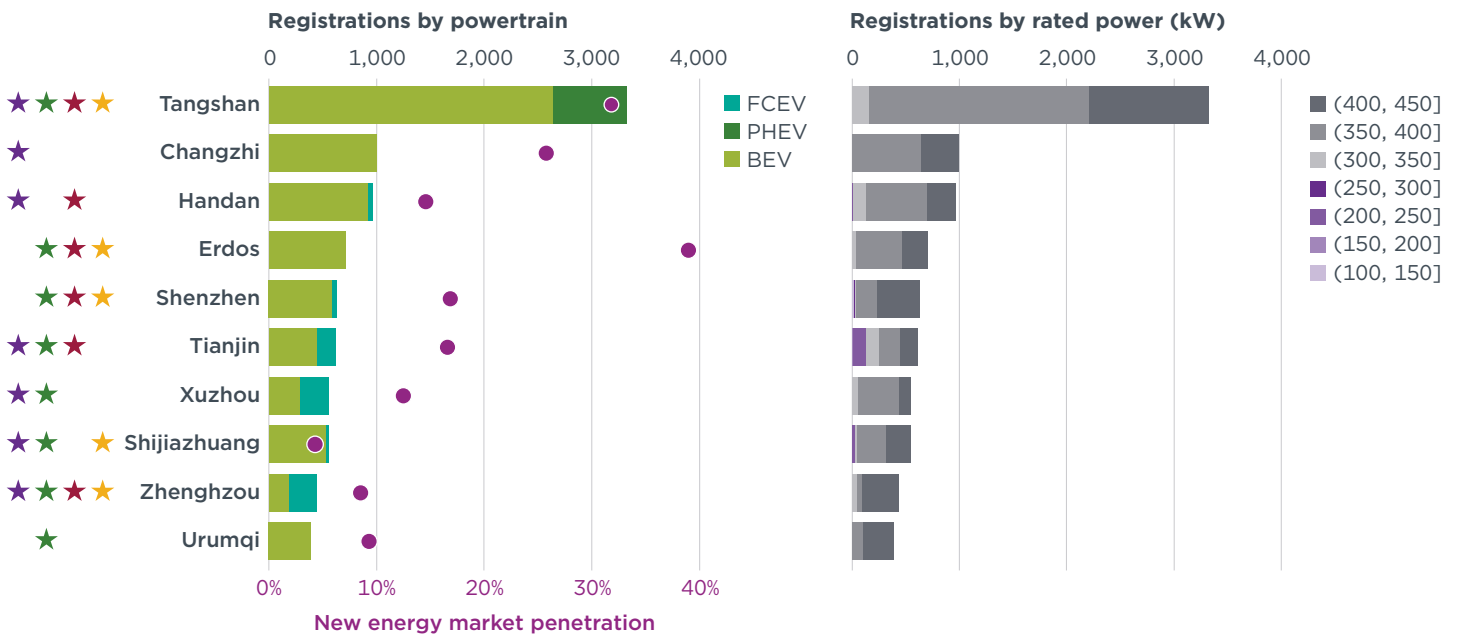
New energy tractor trucks deployed in the top-performing city markets were mostly battery electric and fuel-cell electric models with rated power of 350–450 kW (Figure 14). These cities collectively deployed 49% of the national total of new energy tractor trucks in 2023, with an average new energy penetration rate of 16%. The leading cities actively joined multiple national pilot programs to drive up registrations of new energy vehicles, including new energy tractor trucks. Tangshan, in particular, held a wide lead in the number of new energy tractor trucks.³⁶ In addition to joining the four national programs listed in Figure 14, Tangshan was enlisted as a pilot city for the national Heavy-duty Battery Swapping Vehicle program.³⁷ The city set a goal of deploying 2,600 heavy-duty trucks capable of swapping batteries for use in its port, at steel company sites, and mining sites, and to build 60 new battery-swapping stations between 2022 to 2023.

³⁶ Yidan Chu, Hui He, and Zhixin Cui, *Leading New Energy Vehicle Cities in China: The 2022 Market* (International Council on Clean Transportation, 2024), <https://theicct.org/publication/ev-china-city-markets-2022-update-mar24/>.

³⁷ Ministry of Industry and Information Technology, “工业和信息化部启动新能源汽车换电模式应用试点工作 [Ministry of Industry and Information Technology Launched a Pilot Project for the Application of Battery Swapping Mode for New Energy Vehicles]” (October 28, 2021), https://wap.miit.gov.cn/jgsj/zbys/gzdt/art/2021/art_db26aa91d0434fe98efd2b2937a4173e.html; Tangshan Municipal Industry and Information Technology Bureau, “关于对《唐山市新能源汽车换电模式应用试点实施方案（2022-2023年）》公开征求意见的通知 [Solicit Public Opinions on Tangshan’s Implementation Plan for the Pilot Application of New Energy Vehicle Battery Swap Mode (2022-2023)],” (July 25, 2022), <https://news.0haochuangkou.com/article-6-12206.html>.

Figure 14

Characteristics of new energy tractor trucks in the top 10 cities for registrations in 2023



- ★ Pilot cities in Full Vehicle Electrification in the Public Sector program
- ★ Pilot cities in Fuel Cell Vehicle Demonstration program
- ★ Green Freight Demonstration cities
- ★ Cities in key regions for Ultra-low Emission Campaign on Heavy Industries

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

LAGGARDS IN COMMERCIAL VEHICLE ELECTRIFICATION

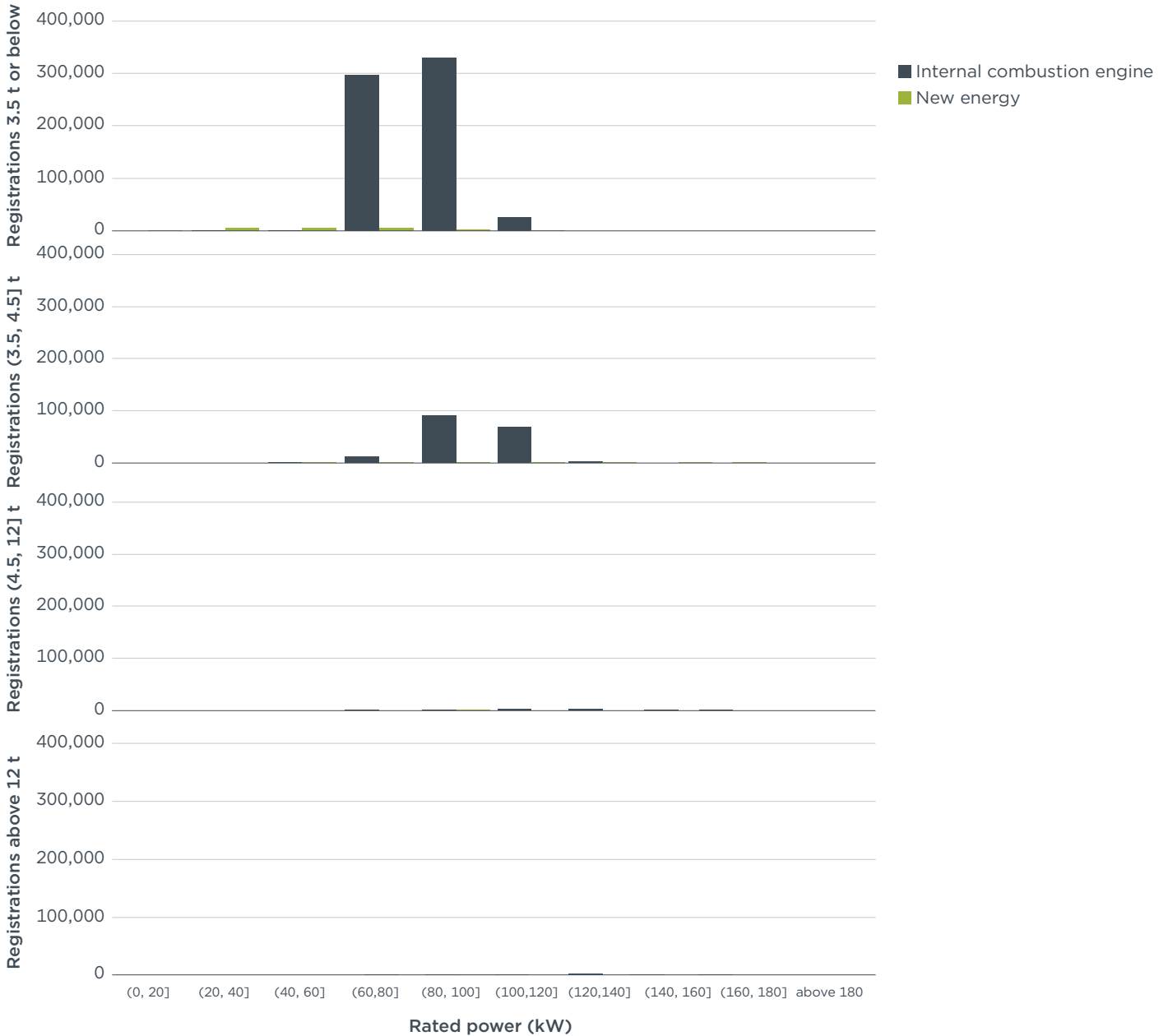
This section looks at the two commercial vehicle categories with the lowest new energy penetrations in 2023: general purpose goods vehicles and pickup trucks. These two categories accounted for 40.4% of all commercial vehicle registrations in 2023, greater than the 28.1% combined share of registrations for urban logistics vehicles, buses, and dump trucks. Electrifying general purpose goods vehicles and pickup trucks would therefore boost the overall market penetration of NECVs.

General purpose goods vehicles

Nearly 21,000 new energy general purpose goods vehicles were registered in China in 2023, a 48% increase compared with 2022. Nevertheless, the new energy penetration rate of this category was only 2.3% in 2023, as shown earlier in Figure 3. Most ICE general purpose goods vehicles registered in 2023 had a GVW of 3.5 t or less and a rated power of 60–120 kW (Figure 15).

Figure 15

Registrations of general purpose goods vehicles by gross vehicle weight and rated power in 2023



THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

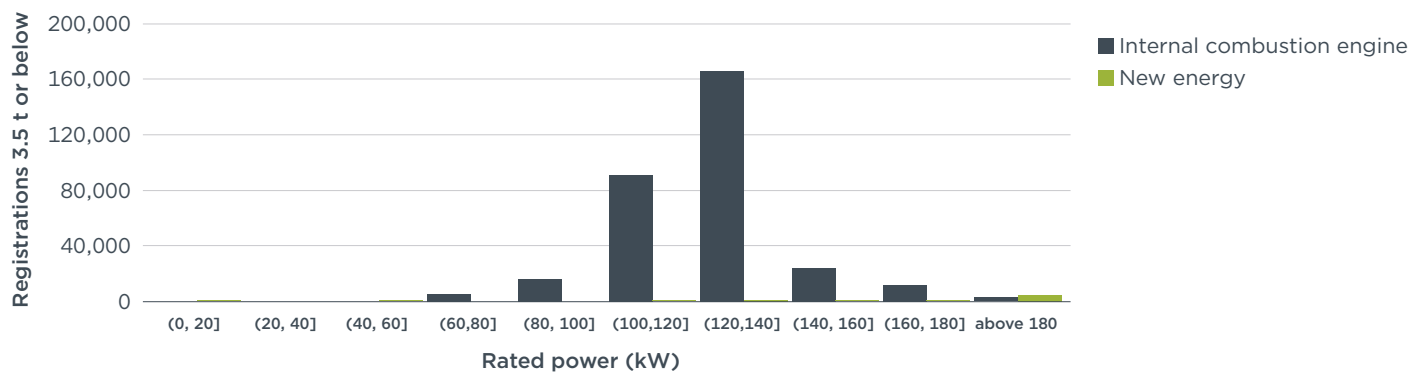
Pickup trucks

Fewer than 7,000 new energy pickup trucks were registered in China in 2023, corresponding to a penetration rate of 2.0%. However, this was a 244% increase in registrations compared with 2022 (Figure 3). As shown in Figure 16, pickup trucks in China had a GVW of 3.5 t or less. The rated power of ICE pickup trucks varied but was mostly concentrated in a range of 80–180 kW.

Although pickup trucks and general purpose goods vehicles are defined in China as commercial vehicles—meaning they are not passenger cars—the vast majority are not dedicated to income-generating purposes. Almost 100% of pickup trucks and 91% of general purpose goods vehicles were registered to be used for noncommercial purposes, which means they could be private, government, or corporate vehicles. Favorable policies and incentives targeting these new energy models in the private sector could help to drive up the new energy penetration rate of these two categories.

Figure 16

Registrations of pickup trucks by gross vehicle weight and rated power in 2023



THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION [THEICCT.ORG](https://www.theicct.org)

SUMMARY

The pace of electrifying commercial vehicles in China sped up in 2023. The number of new registrations increased to more than 333,000 NECVs, up 43% compared with 2022. The corresponding new energy market penetration reached 11.3% of all commercial vehicle sales, up from 9.2% in 2022.

Among all the major commercial vehicle categories, urban logistics vehicles had the highest number of new NECV registrations in 2023, at more than 200,000, and the highest new energy market penetration rate, at 37.1%. General purpose goods vehicles and pickup trucks, with new energy penetration rates of 2.3% and 2.0%, respectively, were the two lagging categories. These two vehicle categories are vital for commercial vehicle electrification in China because they make up 40.4% of the national commercial vehicle market in 2023.

Cities were at the front line in deploying NECVs. Shenzhen, Chengdu, Guangzhou, Chongqing, Beijing, and 15 other cities led the 2023 NECV market. These 20 cities collectively accounted for 55% of all new registrations in China in 2023.

The market performance and characteristics of specific categories of NECVs in the leading cities are a result of China's national pilot programs and municipal efforts. Cities proactively joined multiple national programs promoting certain new energy vehicle fleets. The cities set deployment or development targets and plans and supported these initiatives with detailed policies and measures for implementation. Five programs at the central governmental level—the Green Freight Demonstration program, Full Vehicle Electrification in Public Sector program, Fuel Cell Vehicle Demonstration program, Ultra-low Emission Campaign on Heavy Industries, and the Battery Swapping Vehicle program—were the main drivers encouraging the deployment of NECVs in 2023.

Commercial vehicles continue to be the major contributors of NO_x, PM, and carbon emissions from all motor vehicles in China. Continued efforts at the national and municipal levels can help keep the momentum going in the more popular vehicle categories for electrification. For example, it is worth exploring whether a greater variety of models and road-access privileges would encourage the use of heavier versions of new energy urban logistics vehicles; ICE models now dominate in this category above 3.5 t. Additional actions aimed at electrification in the lagging categories may consider the sensitivity of vehicle owners to upfront costs. Greater new energy market penetration in the commercial vehicle sector can help reduce emissions of air pollutants and help achieve China's carbon-reduction goals.



www.theicct.org

communications@theicct.org

[@theicct.org](https://twitter.com/theicct.org)

