



Newsletter No.06, February 2022

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New energy heavy truck in China, Market summary 2021 and Outlook for 2022

Background

In our previous reports and newsletters, we have addressed the situation of the rapid transformation of electrified transportation in China. With this newsletter, we are shedding light on the dynamics of electrification of heavy trucks in China in 2021 and some outlooks for 2022.

- In 2021, in total, 10,513 units of new energy heavy trucks (NEHT) were sold in China, which is a rapid and large increase compared to 2018-2020.
- The sales volume of NEHT breaks the sales number of 10,000 units for the first time. This becomes a new historical record in China.
- The total sales volume of NEHT greatly exceeded the market expectations. As we can see from the following numbers, the sales volume of NEHT in 2021 is almost four times the 2020 sales number.

At the same time, the total sales number of heavy trucks (including traditional fossil energy heavy trucks and NEHTs) were 1.395 million units in 2021, which decreased 14% compared to the sales number of 2020.

New energy heavy trucks (NEHT) sales volume in China 2018-2021

Year	Sales volume of NEHT
2018	Less than 700
2019	More than 5,034
2020	2,619
2021	10,513

Table 1: New energy heavy trucks sales volume in China 2018-2021

Source: https://www.sohu.com/a/447829002_376032,
https://www.sohu.com/a/516738768_233844

2021 was a sharp trend breaker with almost four folded sale increases of NEHT compared to 2020.

Monthly electric heavy truck sales volume in China, 2019-2021

Figure 1 shows the monthly sales for 2019, 2020, and 2021.

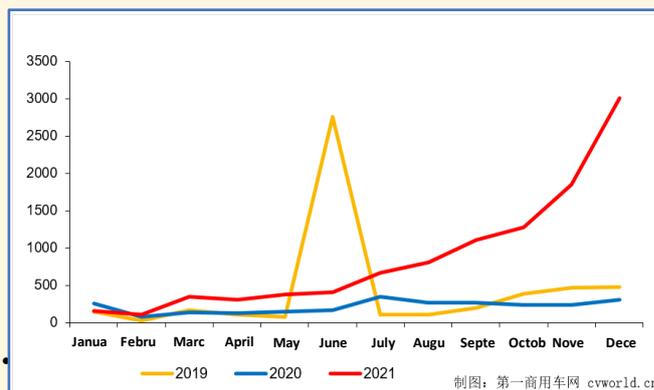


Figure 1: Monthly NEHT sales 2019-2021. Unit: Vehicle units

Source: <https://baijiahao.baidu.com/s?id=1722038066155989832&wfr=spider&for=pc>

We can see three parallel development trends in 2019 with a short and sharp increase in the summertime due to Shenzhen city municipality purchase of more than 3,000 NEHTs, and the very slow growth in 2020, compared to the sharp increase in 2021 and what looks as booming at the end of 2021.

Exploring the sharp rise of NEHT sales volume in China 2021

The reason for the sharp rise in sales is fundamentally driven by China’s strategic goal of energy transformation

“Reaching the peak of carbon emission in 2030 and reaching carbon neutralization in 2060.”

China officially proposed the goal at the 75th UN General Assembly on September 22, 2020. Under the requirement of this strategic goal, all Chinese organizations are facing a strict



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and time-pressing task of carbon emission reduction. Steel mills, mines, urban construction, sanitation, ports, power plants, warehouses and other segments have great demand for introducing NEHTs to support the national energy transformational targets.

Furthermore, the new regulations for truck emission standards and changes of the subsidiaries were the two most important factors pushing the sale volumes in late 2021. The strictest so far new national emission standard for heavy trucks was fully implemented in the middle of 2021 and the expected 20% reduction of subsidy to NEHTs by the end of 2021, which pushed the demand of NEHT to the new height in China. Some companies used the existing subsidiaries to make early investments in NEHT while it was the lower price in 2021.

On the supply side, in 2021, major heavy truck manufacturing enterprises were actively developing new NEHTs models. Many new models of electric trucks and battery swapping based NEHTs were assigned government certification in 2021 (in total, 159 new models were battery swapping based).

The following table 2 lists the numbers of monthly newly certified battery swapping NEHT models by the Ministry of industry and information technology in 2021.

Number of monthly newly certified battery swapping NEHT models in China in 2021

Number of newly certified battery swapping models	January	February	March	April	May	June	July	August	September	October	November	December	Total
	4	3	10	11	3	6	18	15	23	19	21	26	159

Table 2 Number of monthly newly certified battery swapping NEHT models in China in 2021

Many new NEHT models available in 2021 provided more choices for the market. It can stimulate the demand of the market as it appeals to customer-specific needs and provides a strong guarantee for the continuation of the sustainable growth of NEHT supply as well as the market demands. Traditional heavy truck leading brands such as FAW and China Heavy Truck has vigorously developed new models of NEHTs, which will strongly promote the growth of NEHT sales in general as the market and customers can trust that the supply side is committed to develop new NEHTs. Geely, Deepway and other new actors are successively joining the NEHT manufacturing as well.

In addition, more players have joined the battery swapping solution field, including State Grid and Aulton. Aulton, a leading battery swapping solution provider for passenger vehicles, has announced that they would launch their new battery swapping solution for NEHTs in the first quarter of 2022 to compete with the established Enneagon system solution. Some battery asset management companies have also established and started exploring battery swapping system solutions. The entire ecosystem of NEHT is new and is, at the early stage of establishment and still in the shaping stage. However, the trend is clear, more and more players are joining in the battery swapping system solutions.

On the customer experience side, establishing one hundred or so demonstration projects of battery swapping stations for NEHTs achieved satisfactory economic and technical performance. By showing the technical performance as well as the operational and business outcomes, it becomes the

door opener for getting more attention and new players enter the scenery with new customers and operators.

Source: <https://baijiahao.baidu.com/s?id=1723016880098755824&wfr=spider&for=pc>



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Proportion of NEHTs by product type in 2021

Major changes have taken place in the sales structure of NEHT products in 2021. As shown in the figure below, in 2021, the market share of new energy tractor trucks reached 52.91%, an increase of 26.49% over the same period last year. On the other hand, the proportion of new energy heavy special purpose vehicles decreased from 55.10% in the same period last year to 26.6% in 2021, a decrease of 28.50%.

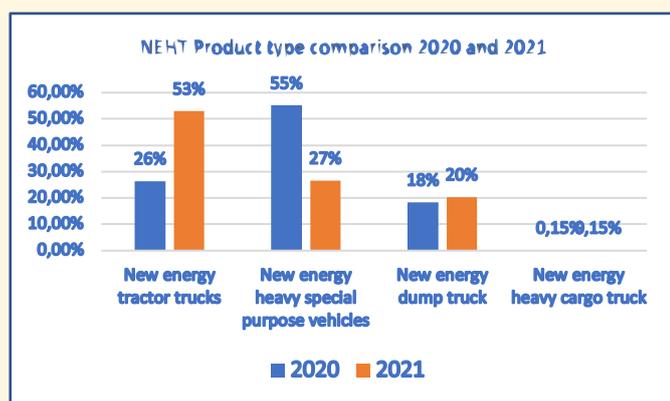


Figure 2: NEHTs product types 2020 and 2021.

Source: <https://baijiahao.baidu.com/s?id=1722038066155989832&wfr=spider&for=pc>

The main reason for this situation is that, on the one hand,

tractor trucks increased by 699% in 2021). On the other hand, the pressure on regional governments' financial expenditure was great in 2021. The sales growth of the new energy sanitation vehicle segment was lower than expected (regional governments pay the purchase of sanitation vehicles in most cities). New energy sanitation vehicle was the largest seller among different types of new energy special purpose vehicles.

In 2021, more than 7,500 units of new energy logistic heavy trucks were sold in China (including new energy tractor trucks, new energy dump trucks and new energy cargo trucks). Compared to the new energy special purpose vehicle market, where public actors are major buyers, the new energy logistic heavy truck market is more supported by business actors. This reflects that NEHTs are becoming popular in the field of logistics and freight transportation and getting early commercial success, and the process of replacing heavy fuel trucks with NEHTs will be accelerated.

Proportion of NEHTs by energy supplement type in 2021

Following table 3 shows new energy heavy truck energy supplement type analysis in China 2021. The sales volume of battery swapping heavy trucks and fuel cell heavy trucks continued to grow in 2021. See table 3.

Energy supplement type	January	February	March	April	May	June	July	August	September	October	November	December	Total
Cable charged electric	836					275	384	412	592	760	1 155	2 073	6 487
	63.48%					66.26%	57.91%	50.06%	52.34%	59.42%	62.09%	68.53%	61.70%
Battery swapping	259					122	165	373	522	490	557	740	3 228
	19.67%					29.40%	24.89%	45.32%	46.16%	38.31%	29.95%	24.46%	30.70%
Fuel cell	222					18	113	38	17	29	148	194	779
	16.85%					4.34%	17.04%	4.62%	1.50%	2.27%	7.96%	6.41%	7.42%
Hybrid	0					0	1	0	0	0	0	18	19
	0					0	0.16%	0	0	0	0	0.60%	0.18%
Total	166	120	347	304	380	415	663	823	1 131	1 279	1 860	3 025	10 513

under the background of the national strategic goal of carbon emission reduction, battery swapping new energy tractor truck has achieved commercial and technical feasibility in fixed line scenarios such as mines, steel mills, power plants and ports (the annual sales of new energy

Table 3 NEHTs energy supplement type analysis in China 2021, Sales volume (Units) / percentage

Source: <https://www.evpartner.com/news/231/detail-59740.html>
<https://www.evpartner.com/news/135/detail-58266.html>
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New energy heavy truck energy supplement type analysis in China 2021

The table 3 shows the dynamics of sales of NEHTs in china during 2021. Due to technical reasons, we can only show January-May as five months total sale, while for the period of June-December we have accessible data on monthly bases.

- Cable charged heavy electric trucks show an increase in relative sales of NEHTs from 66,26% in May to 68,53% in December, making it to 61,70% on the annual 2021 part of the total NEHTs sales.
- Battery swapping as a new system solution has moved from 29,40% in June to 46,16% in September and 24,46% in December, making it 30,70% as the annual average portion of NEHTs in 2021.
- Battery swapping system solutions is 49,76% of the cable charged electric heavy truck sale number. Battery swapping system solutions accounted for 48% of battery based electric logistic heavy trucks sales number in 2021. This indicates that battery swapping is taking a large portion of electric NEHTs.
- Fuel cells continued to grow from 4,34% in May to 6,41% in December 2021, making it 7,42% on the annual 2021 rate.
- The hybrid version of NEHTs is on a very low level indicating clearly that the dynamics of NEHTs is towards electric trucks with battery swapping while the fuel cells NEHTs are steadily growing, although at a low level still. Only 19 sold trucks of 10,513 are fuel cells. One was sold in June and 18 in December 2021.

Distribution of NEHTs in China in 2021

Figure 3 is based on Table 3 and graphically shows the dynamics of the main technology routes of NEHTs in China in 2021.

Industry observer's perception of the year 2021 is that, for the NEHT industry, it is a turning point year, and it is the year the market starting to take off.

In Figure 3, we can see those three trends depicted in Table 3:

- Cable charged heavy electric trucks are increasing in sale volumes.

- Battery swapping NEHTs are increasing and holds almost 30% of the NEHTs sale and almost 50% of the sale volume of cable charged heavy electric trucks.

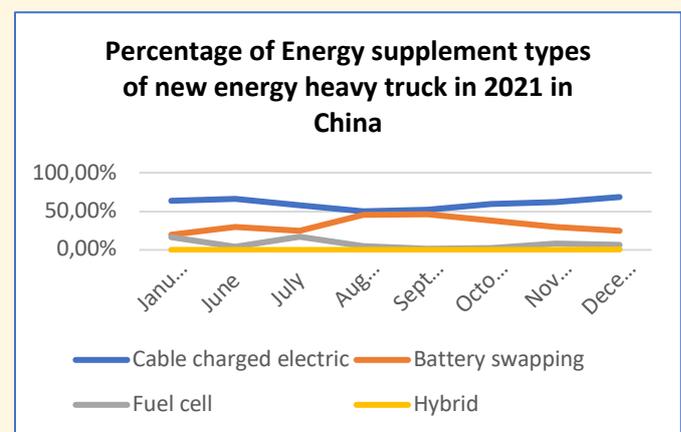


Figure 3: Distribution of NEHTs in China in 2021.

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- Fuel cell NEHTs are slowly decreasing monthly but steadily increasing on an annual basis during 2021.
- Hybrid systems NEHTs are almost at the zero level of sales during 2021.

Those numbers clearly indicate the turning point in China for the growth of cable charged electrical NEHTs and battery swapping NEHTs while hydrogen based NETHs are slowly growing in sales. Hybrids are almost ignored by the market.

Outlook of NEHT market in 2022 - Sales volume estimation

It is expected that the sales volume of NEHTs will continue to rise even more sharply in 2022. Policy support continues to play an important role in this development. Multi policies' enacting will strongly influence the market development and diffusion of NEHTs.

In 2021, the "Ministry of Industry and Information Technology" issued the Notice on starting the pilot work of the application of battery swapping new energy vehicles, which listed Tangshan, Baotou, and Yibin as key cities for battery swapping NEHT demonstration projects. These cities responded positively, formulated clear promotion



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objectives, and issued several local supporting policies to support the promotion and application of battery swapping NEHTs. 2022 is the key year for these cities to achieve their goals, which will promote the rapid growth of the sales of battery swapping NEHTs in 2022.

In 2022, the subsidy standard for new energy vehicles will decline by 20% to 30% based on 2021. In 2022, the sales volume of NEHTs may have a sharp rise at the end of the year again, when most enterprises in the industry rush to get the final subsidy.

2022 will be a booming year for NEHT

- The sales of NEHTs in China in January 2022 are 2,283 vehicles.
- On an annual basis, the total sales of NEHTs in 2022 might be as high as 25,000 – 35,000 vehicles.
- Accordingly, battery swapping might be on an annual level of 10,000 – 15,000 vehicles.

These numbers indicate the speed and scope of the development of electrification of NEHTs in China.

Technical progress

In terms of technical challenges,

- NEHT OEMs are striving to decrease the weight of NEHTs;
- Battery suppliers of battery swapping NEHTs are facing the challenge of providing more variety of battery packs or flexible capacity of battery packs.
- Energy producers and energy sellers are working hard to integrate battery swapping NEHT solutions with cheaper energy storage devices to shape an energy center solution for the future.

Regarding the progress of technical standards:

- FAW (one of the largest truck OEMs in China) is taking the lead in formulating the technical specifications for the construction of shared battery swapping station for medium and heavy electric trucks, which involves the preparation of new 14 battery swapping standards, including 1 general principle, 8 regarding swapping stations and 5 regarding vehicle standards.

XCMG (one of the largest truck OEMs in China) is planning to establish a comprehensive energy supplement center to provide energy supplement by combining solar power, wind power and valley power from the grid. The energy supplement center has the functions of energy storage, charging solutions and battery swapping solutions. The energy supplement center will cooperate with mobile battery swapping vehicles, easy to move battery swapping stations, rescue vehicles and multi-functional battery transport vehicles to realize the layout of battery swapping solutions in urban areas. The solution can solve the difficulty of urban planning and land acquisition for the construction of battery swapping stations.

According to the white paper on the development of battery swapping mode based electric vehicles in 2021, by 2025, more than 26,200 GWh of supplementary energy demand will be completed through the battery swapping model, accounting for about 17% of the whole EV energy supplement market. Charging vehicles by cable charging technology and or with battery swapping system solutions is not exclusive of each other. These two technologies have a symbiotic but competitive relationship that competes and complements each other at the same time. Society needs them both.

How to further promote the electrification of heavy trucks in China in the future? Answer: Large-scale experimental approach

We have noticed that although the electrification of transport systems develops fast in China, there are no best technologies that are ready to step in as dominant solutions yet.

Battery based NEHTs are leading the scenery of NEHTs now in China, but in general, the charging infrastructure solutions are a large bottleneck for electric vehicles. Thus, battery swapping is becoming one complementary system solution. As the total number of electric vehicles grows, the charging infrastructure must also be developed.

Hydrogen and fuel cells are growing both as technology development and market development.

Fossil based vehicles are in general declining as well as hybrid system solutions.



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The conclusion is that all those technologies for vehicles becoming clean and charging infrastructure still is facing rapid expansion diffusion as well as technology development at the same time.

Some leading Chinese Industry experts have pointed out that:

"Policy support alone is not enough. We need to align the technical route with the real market demand to help the development of the industry and help master more core technologies in our own hands. Let different technological routes compete freely and find long-term effective methods that do not rely on subsidies, which meet the needs of users in the domestic and international markets."

Scientist estimation and China's national strategic development target share a similar judgment that fuel cell heavy trucks' commercial utilization will not be reached until 2030 to 2035 in China. With ambitious carbon emission reduction goals and rapid replacement of fossil energy based heavy trucks targets, actors in NEHT field need to keep working hard in exploration.

Sources:

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