



### *Newsletter No.3, August 2021*

Sweden-China Bridge – Collaborative Academic Platform for the Electrification of Transportation Systems project is funded by Trafikverket-TRV (Swedish Transport Administration) and started on September 1, 2020.

The authors of Newsletter No 3 are Dr. Jasmine Lihua Liu and Prof. Mike Danilovic.

## Exploring Battery-Swapping For Heavy Truck In China 1.0.

### Battery-swapping for trucks is here

- In China, the number of heavy trucks were about ten million in 2020.
- Nearly one million heavy trucks work for short-distance high-frequency operation scenarios. Battery-swapping has become an essential complementary charging solution for both passengers and heavy electric vehicles (EHT).
- The cable-based charging is insufficient to fully support a rapidly growing number of electric vehicles in general and overcome the shortcomings of the established charging infrastructure based on charging piles.
- Battery-swapping is a solution to the low operational efficiency of heavy trucks in terms of operating range, driving time, and long recharging time.
- In 2020, 2,619 EHTs were sold in China, down 48% from 5,034 in the same period of 2019.
- By 2035 there will be about 5 million light commercial electric vehicles and 600,000 medium and heavy electric trucks in China.
- 98,7% of all sold new energy trucks in China in 2020 were pure electric, and 0,69% were hydrogen.
- In 2021, in China (Nanjing), 17 new energy heavy trucks were introduced in the "International new energy and Intelligent connected vehicles" exhibition in June 2021.
- Thirteen (13) models are pure battery EHTs; 11 provide both battery-swapping and cable-charging solutions for energy supplements, while only two models choose only the cable-charging supplement solution<sup>1</sup>.
- This indicates that battery-swapping technology is becoming a dominant technology for BEH in China in 2021.
- Our experiences tell that swapping systems might become the new standard solution for EHTs in China due to the dual operational mode, combining cable-charging with battery-swapping method enabling the operator to choose multiple ways of charging.
- The battery-swapping has received strong support from the central government and institutions and is placed on the national strategic list as the technology of national importance.
- We estimate that in 2021 there might be more than 400 battery-swapping stations for EHTs in China, and the number will rapidly grow.
- By utilizing the battery-swapping, the operational efficiency is improved by extending the access to EHTs significantly during a working day, from 4 h to 8 h, i.e., doubling the efficiency.
- Battery-swapping enables the EHTs to operate on long-distance operations complicated by the operational shortcomings only by using cable charging.
- China has developed an entire value chain for developing and manufacturing all-electric passenger vehicles, trucks, and buses.

### Barriers to adopting electric trucks in China

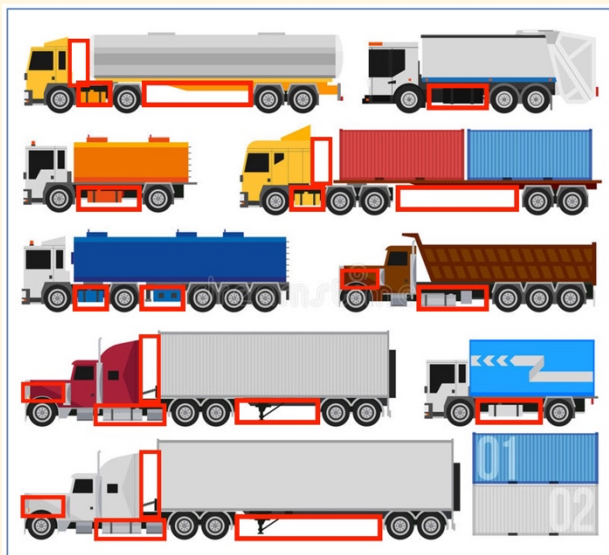
- The high price of EHTs and low operational efficiency of EHTs in terms of operating range (driving distance and recharging time) are two major barriers EHT is facing.
- By 2021 the price for EHT is almost double the cost of traditional ICE-based diesel trucks.
- Low operational efficiency, short driving range, and long charging time are some of the main barriers.



## Newsletter No.3, August 2021

### Placements of battery-swapping solutions on trucks

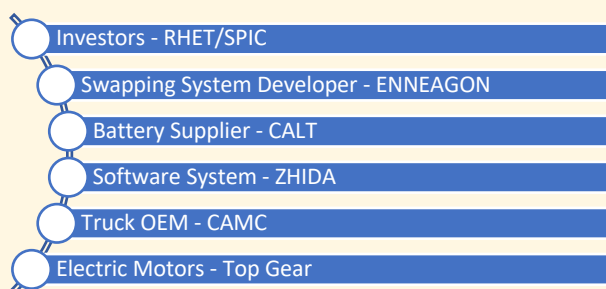
- Basically, the swappable batteries can be placed under the chassis, behind the cabin, or in the front nose of the truck.



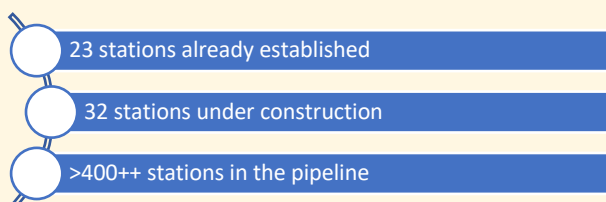
- The dominant solution in China, for the time being, is behind the cabin.
- The dominant battery size is 282kWh, and all use a lithium-ion battery. The size might vary between 50-500 kWh.
- One illustration of battery-swapping SAIC truck:



### Key actors in developing, establishing, and operating battery-swapping in China



### The battery-swapping situation in China in 2021



### The new business model – Flexible dual-mode for heavy electric trucks – cable charging & battery-swapping

#### The main component of the business model is the separation of vehicle and battery.

- Operators buy the vehicle and can choose to buy or rent the battery separately, subscribe to recharging in a swapping station or combine all according to the needs.

#### Benefits of battery-swapping solution for trucks

- Lower operational cost
- Lower repair and maintenance cost
- Lower investment cost.
- Longer warranty time of the battery when charged in the swapping station.
- Foreseeable battery life-cycle cost.
- Total life-cycle cost is reduced by 24% compared to diesel trucks.





## Newsletter No.3, August 2021

### The progress of battery-swapping in china

The full report shows six demonstration projects with battery-swapping system solutions.

In total, there are in China:

- 23 finished projects
- 32 projects under construction and
- 400 projects in the pipeline.

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### GET THE FULL REPORT:

Exploring Battery-Swapping For Heavy Trucks In China 1.0.

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## Newsletter No.3, August 2021

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