Huawei FusionCharge Megawatt Charging Solution for Heavy Goods Vehicles

Contents

Against the backdrop of emerging favorable policies, HGVs are facing an irreversible and imperative trend of electrification

In China: Renewable energy transformation in the heavy goods vehicle (HGV) field

Release Date and Name	Content	
	Keyword	Key Point
July 2025 The General Office of the National Development and Reform Commission (NDRC) and others released the Notice on Promoting the Scientific Planning and Construction of High-Power Charging Facilities.	**High-power charging facilities dedicated to HGVs, research on single-connector megawatt charging technology**	Encourage the construction of intelligent and orderly high-power charging stations, and build photovoltaic power generation and energy storage facilities based on local conditions. Conduct research on and pilot application of single-connector megawatt charging technology for high-capacity and high-rate power battery application scenarios such as electric HGVs.
In May 2025, the article "The Ministry of Transport will focus on five aspects to promote the integration of transportation and energy and achieve practical results" was released.	**Large-scale application of renewable energy HGVs, research on megawatt charging technology, and formulation of standards for electric HGVs**	Promote the large-scale application of renewable energy HGVs. Research on key technologies such as megawatt charging. Promote the development and utilization of clean energy in transportation infrastructure, and the formulation and revision of standards related to electric HGVs.
In April 2025, the General Office of the Ministry of Industry and Information Technology released the Key Points of Automotive Standardization Work in 2025.	**Pre-research on megawatt charging standards for commercial vehicles**	Perform pre-research on megawatt charging standards for commercial vehicles. Focus on key links, application scenarios, core technologies, and products in the automotive industry chain, and accelerate the formulation and revision of key standards.
In March 2025, the Ministry of Transport and nine other departments released the Guidelines on Promoting the Integration of Transportation and Energy.	**Large-scale application of renewable energy HGVs, elimination of vehicles at the China IV stage, and grid forming ESSs**	By 2035, large-scale application of renewable energy HGVs will be implemented. Promote the elimination and update of vehicles at the China IV stage or earlier, promote the large-scale application of renewable energy HGVs based on local conditions, and develop zero-emission freight. Accelerate the demonstration of smart microgrids, vehicle-to-grid (V2G), and virtual power plants (VPPs). Promote new technologies such as smart regulation and grid forming ESS.

Outside China: Zero-carbon HGVs and charging standards are progressing together

Country/Applicable Scope	Name	Content
General standards led by CharIN	MCS charging standards	The maximum voltage is 1250 V DC, the maximum current is 3000 A, and the maximum power is 3.75 MW.
US	Inflation Reduction Act, Advanced Clean Fleets (ACF) regulation, Clean Truck & Bus Vouchers (HVIP) incentive program, etc.	Replace fossil fuel-powered HGVs, support the construction of zero-emission vehicle infrastructure, and implement rapid and clean replacement of diesel fuel-powered HGVs.
EU	EU Clean Vehicle Directive, EU Regulation 2019/1242, etc.	By 2025, zero-emission vehicles will account for 6% to 10% of the total sales of medium and heavy goods vehicles. From 2035, non-zero-emission new fuel-powered vehicles will be banned in the EU.

Replacing oil with electricity is an inevitable trend
Large-scale application of renewable energy HGVs

High-power charging is the development direction
High-power charging facilities dedicated to HGVs

Upgrade of standards and certification specifications for the full industry chain
Pre-research on megawatt charging standards

New technology application
VPP/V2G/Grid forming energy storage system (ESS)

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Multiple subsidy policies are introduced to promote the transformation of the HGV market and accelerate the popularization of renewable energy HGVs

In China: Subsidy policies promote the development of renewable energy HGVs

Region/Ministry	Policy Subsidy
Ministry of Transport, Ministry of Finance, etc.	Early scrapping: subsidy of CNY45,000 for vehicles that have been used for four years or more
	Subsidy of CNY95,000 for new purchase of EVs
Shenzhen	Owners of registered diesel-fueled HGVs at the China III stage in Shenzhen can receive a subsidy of up to CNY23,000 if the HGVs are scrapped between July 1, 2024, and December 31, 2025, and the scrapped HGVs have been used for one year or more before being scrapped.
Shanghai	The subsidy amount for EV replacement is determined based on the EV type, battery capacity, and subsidy reduction ratio. If the EV type is the same as or smaller than that of the scrapped diesel-fueled HGVs at the China IV stage, the subsidy is based on the purchased EV type. If the EV type is larger than the scrapped diesel-fueled HGVs at the China IV stage, the subsidy is based on the scrapped vehicle type. For vehicles purchased after January 1, 2026, the actual subsidy amount is 80% of the subsidy standard. The subsidy reduction ratio is 20%.
Ningde, Fujian	For renewable energy HGVs that have been used for more than five years, a replacement subsidy of CNY10,000 per vehicle is provided if the HGVs are replaced with qualified electric HGVs.
Datong, Shanxi	Renewable energy commercial vehicle manufacturers that have obtained the Announcement of Road Motor Vehicle Manufacturers and Products of the Ministry of Industry and Information Technology are given a one-off new product development reward of CNY5 million.
Yunnan	Renewable energy trucks (excluding special operation vehicles) that pass through the province and pay tolls using ETC are given a 10% discount on the tolls due for the trip.

Outside China: Subsidies cover multiple phases from vehicle purchase to charging station construction

Country	Policy Subsidy
Germany	Based on the Power to the Road initiative, 350 charging points are deployed along highways. The first round of bidding and related network connection financing have been allocated €2.1 billion.
Sweden	Consumers are supported to purchase electric light goods vehicles (LGVs), with a maximum subsidy of 50,000 SEK. Small and medium-sized enterprises (SMEs) are eligible for a subsidy covering up to 25% of the purchase price for heavier zero-emission trucks.
Netherlands	By 2027, larger transport companies can claim 40% of the purchase price difference (between electric trucks and diesel trucks). Small companies with up to 10 employees are eligible for a maximum of 60% reimbursement of the additional purchase cost.
UK	Under the Plan for Change, the maximum subsidies provided for different vehicle models are as follows: £2,500 for small vans, £5,000 for large vans, £16,000 for small trucks, and £25,000 for large trucks.
Spain	Under the MOVES III Programme, users who purchase an electric vehicle (EV) and scrap an old fuel-powered vehicle may receive up to €9,000 in subsidies for commercial vehicles. In addition, 20% to 80% of the funding is provided for charging infrastructure construction.

Logistics electrification is the next wave with significant social value

Vehicle electrification continues to accelerate, ushering in an energy feast for HGVs

Mature | EV boom | **Electrified logistics** | Incubating

First wave
Bus/Taxi/Ride-hailing

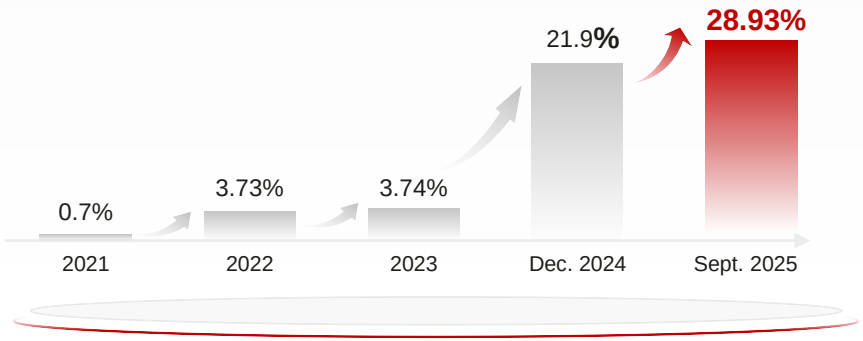
Second wave
Passenger EV

CNY3 trillion
Vehicle market

Third wave
HGV/LGV

CNY2 trillion
Fuel market

Fourth wave
Ship, etc.



China has over 8 million HGVs which bear CNY6 trillion logistics revenue

8+ million
Number of HGVs

CNY6 trillion
Logistics freight

60%
Road carbon emissions

- **3%** of total vehicles consume **54%** of fuel for road transportation, equal to **1/3** of crude oil imports

- **CNY1.8 trillion:** income of 17.28 million drivers
- **CNY2 trillion:** expenses for 260 billion liters of fuel and services
- **CNY0.7 trillion:** expenses for vehicle depreciation and repair
- **CNY1.1 trillion:** expenses for highway services and others

- Particle emissions from mobile sources: **80%**
- Automobile NO*x* emissions: **80%**
- Road traffic carbon emissions: **60%+**

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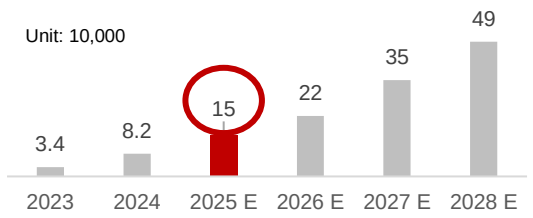
Among diverse energy sources for HGVs, electric energy will stand out

A 49-ton HGV as an example

	Fuel	Hydrogen	LNG	Electricity
				
Energy consumption per km	0.38 L ≈ CNY2.8	0.09 kg ≈ CNY3.15 (subsidized price)	0.35 kg ≈ CNY2.09	1.5 kWh ≈ CNY1.3
Energy price fluctuation	Medium	**High** (restricted by regions)	High	Low
Penetration rate change	Decreasing	Extremely low	Stable	Surging

VS

In 2024, the sales of electric HGVs grew explosively, and the sales volume will reach 150,000 units nationwide in 2025, doubling the sales volume



- In 2024, the sales volume of renewable energy HGVs was 82,000 units, up by **140%** year-on-year, accounting for 13.62% of the total sales volume of HGVs.
- In March 2025, the Chinese government launched the "trade-in" policy, which included natural gas-powered HGVs in the scope of scrapping and new purchase subsidies, directly driving the explosive growth of the renewable energy HGV market. **From January to July, the total sales volume was 82,200 units, up by 191% year-on-year.**

Compared with passenger vehicles, electric HGVs are more hungry for electric energy

	Single charge	Charge frequency	Annual mileage
	≈ 300 kWh	Three times a day	≥ 100,000 km
	≈ 50 kWh	Once a week	< 20,000 km

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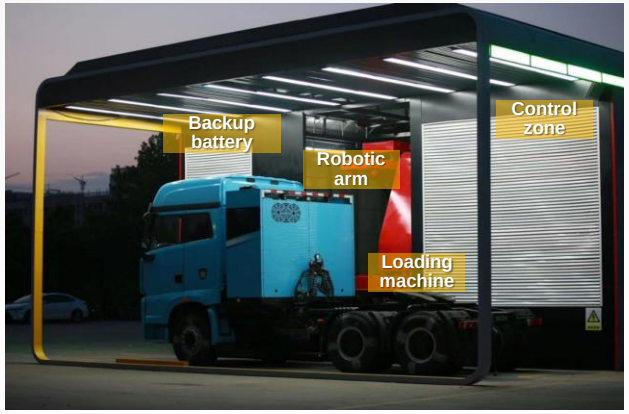
EVs support both battery swapping and charging, but battery swapping still faces challenges such as high investment costs and complex network deployment

Charging is the essence of battery swapping



The essence of battery swapping is about robotic operation, backup batteries, and manual maintenance on the basis of charging.

Three challenges in battery swapping hinder network construction

Difficult construction

CAPEX ≈ CNY6 million

Total (CNY10,000)	581
Battery swapping equipment	250
Battery + support	231
Power access	100

Low ROI

OPEX ≈ CNY840,000

Total (CNY10,000)	84
Robotic arm replacement	20
Labor cost/Electricity loss	59
Fault suspension	5

High risk

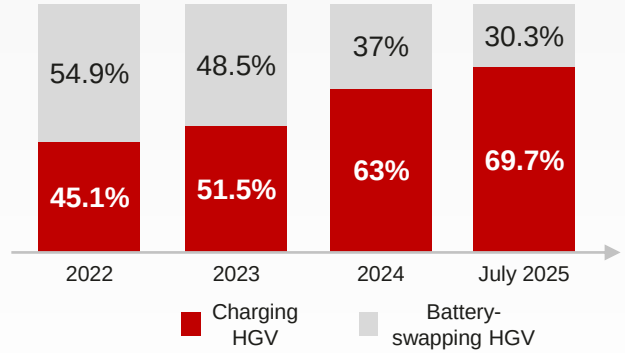
Closed scenario

Fluctuating transport capacity
Incompatible with evolving vehicle models
Applicable to either commercial or passenger vehicles only

Battery swapping does not fundamentally improve charging efficiency—queuing is still inevitable during peak hours.

The market has made a choice

The sales volume of charging HGVs that support charging has exceeded that of battery-swapping HGVs.



Driven by business factors, the growth of charging-type HGVs is still accelerating.

Opinions of an operator of a battery swapping station

High investment
Two 7+1 battery swapping stations, with an initial investment of CNY10+ million (excluding battery leasing fees)

High O&M costs
Frequent battery faults, requiring monthly maintenance

Private charging station
Compatible with specific EV models only

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Ultra-fast charging technology: Overcoming industry hurdles and paving the way for HGV electrification

Ultra-fast charging has four advantages over battery swapping.

Low cost

CNY8 million → CNY2 million

High compatibility

Incompatible with HGVs → Compatible with **taxis/HGVs,** etc.

Easy maintenance

3 persons/ station → 0 persons

Small footprint

769 m^2 7+1 spots at a battery swapping station → **357 m²** Two spots

(equivalent to 40 HGVs)

Ultra-fast charging allows HGVs to carry 15% more goods compared with fast charging ones.

Slow charging

1 hour per charge (1C battery)

A mine in Sichuan

3-hour charging per day, transport capacity ↓ 15%

Immature network

Few sites and poor coverage

Chengdu-Chongqing logistics backbone

Six charging cycles for round trips, transport capacity ↓ 25%

Charging for 3 hours, losing the time to cover 150 km of transport.

6-year lifetime net revenue of an HGV

CNY437,000 more revenue vs. fuel

CNY339,000 more revenue vs. traditional charging

Annual revenue: CNY720,000 for a fuel HGV, CNY708,000 for an ultra-fast charging HGV, and CNY684,000 for a common HGV

Holding Cost	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Fuel	69.7	108.3	147.0	185.7	224.4	263.0
Ultra-fast charging	76.6	103.7	130.8	157.9	185.0	212.1
Common charging	79.9	110.2	140.6	170.9	201.3	231.6

The cost calculation does not include the driver's salary or highway service fee. The unit is CNY10,000.

Ultra-fast charging technology alleviates range anxiety and covers from short-haul to long-haul transportation for electric HGVs

Short-haul scenario
Daily transport distance: about 300 km/vehicle

Typical operation scenarios:
- Sand, stone, and coal transportation
- Mine-to-stockyard short-haul transportation
- Large logistics campus shuttle
- Port/Terminal container transfer

Mode: closed and centralized
Energy: ~250 kWh battery
Duration: 15 minutes/cycle

Medium/Long-haul scenario
Daily transport distance: about 500 km/vehicle

Typical operation scenarios:
- Regional trunk logistics
- Bulk commodities transportation
- Cold chain logistics

Mode: multimodal transport
Energy: ~400 kWh battery
Duration: 20 minutes/cycle

Long-haul scenario
Daily transport distance: about 800 km/vehicle

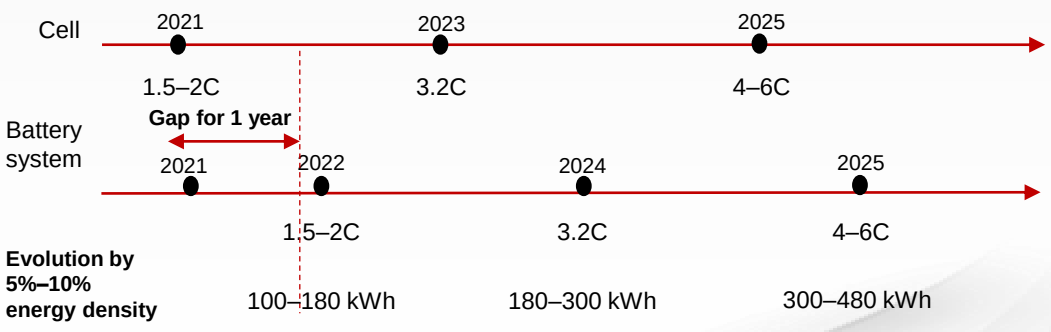
Typical operation scenarios:
- Cross-province long-haul freight
- Seasonal long-haul transportation of agricultural products
- Special goods long-haul transportation

Mode: open road
Energy: > 500 kWh battery
Duration: 30 minutes/cycle

Power limited: High-C-rate batteries require higher heat dissipation capability of vehicles

Wide application of high-C-rate cells in passenger vehicles drives the maturity of 3C+ batteries in HGVs.

Faster charging speed | **Lower internal resistance** | **Longer range**



Heat dissipation is the most critical barrier to high-C-rate charging technologies

$$Q = I^2 \times R \times t$$

When the current is **doubled**, the heat generation is **quadrupled**.

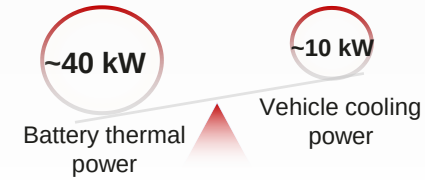
Increased battery C-rate

1C → **3.5C**

Increased battery thermal power

8 → **40 kW**

The vehicle cooling capability is limited



* System heat dissipation power increases, vehicle costs increase, space is occupied, and the cargo capacity decreases by about 1 ton.

Components are prone to overtemperature impacts

Charging cable temperature

~70°C @ 500 A

Battery temperature

~60°C @ 1.5C cell

Ensure temperature uniformity of battery cells

Avoid performance deterioration and safety risks caused by heat accumulation

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Limited reliability: Logistics environments are much harsher than urban ones, requiring industrial-grade high reliability and cyber security protection

Traditional air-cooled module circuit boards are fully exposed to the outside world. Station breakdown will lead to significant economic losses.

Challenge 1
Service life of only 1–3 years

Challenge 2
Failure rate increasing from 3% to 8%

Challenge 3
Maintenance costs increasing by 2–3 times

High humidity, salt mist

Typical scenario: ports

Dusty, heavy sandstorm

Mines, steel mills, and logistics parks

Distance between stations

National highways and service areas

Limited return on investment (ROI): Low grid power utilization, expensive power fees, long interval, and limited vehicle models

The utilization rate of traditional stations is generally less than 15%, which wastes the power grid capacity.

Challenges

1. **Difficult grid access and expensive fees**
2. **Great impact on the grid, affecting long-term capacity expansion**
3. **Private stations, few vehicle models and numbers under service**

Traditional solutions do not support power pooling

Low capacity utilization but high oversizing of grid capacity

- Low capacity utilization of **~30%**
- Oversizing grid capacity applied for installation of **20%**

Private stations, limited vehicle models and numbers under service

- **Incompatible** with HGVs, LGVs, and passenger vehicles
- Closed scenarios, not open to external vehicles

Lack of ecosystem enablement, unable to form a network

- Lack of a unified ecosystem for the nationwide charging network
- Poor vehicle-charger synergy evolution and slow technology development

Summary of industry trends and challenges

Policy subsidies

- **Regulation:** Against the backdrop of emerging favorable policies, HGVs are facing an irreversible and imperative trend of electrification.
- **Subsidy:** Multiple subsidy policies are introduced to promote the transformation of the HGV market and accelerate the popularization of renewable energy HGVs.

Market trends

- **Logistics electrification is a social trend:** Logistics electrification is the next wave of development with significant social value.
- **Electric energy is the optimal energy source for HGVs:** Electric energy will stand out from the energy mix.
- **Charging is the optimal solution for electric HGVs:** The industry hopes that battery swapping can solve the pain points of charging. However, there are still pain points such as high investment and difficult network construction.
- **Ultra-fast charging technology is of significant value:** It can completely eliminate the industry breakpoints and has four advantages.

Industry pain points

- **Limited power:** The heat dissipation capability of the vehicle is limited due to high-C-rate batteries, which restricts the charging output power.
- **Limited reliability:** Logistics scenario environments are much harsher than those in urban areas, and the air cooling architecture cannot adapt to those harsh environments.
- **Limited ROI:** Low grid power utilization, expensive power fees, long interval, and limited vehicle models

Contents

Huawei provides deep technical enablement for the entire industry chain, and works with partners to research, build, and share solutions.

"Electrified logistics" online platform

Jointly define requirements, design with final goals in mind, and achieve efficient and collaborative development.

Automaker

Lithium-ion battery factory

Technical enablement

- Unified specifications, interfaces, and protocols
- ...

From chargers to vehicles
Core solution for high-power charging

- On-board and off-board collaborative cooling
- MW-level power and kA-level charging
- ...

Off-board cooling system

100+ scenarios under survey

200+ technical workshops

10+ automakers for joint verification

Joint innovation center

20+ business showcases

* The off-board liquid thermal management system (LTMS), charging cable management module, heavy goods vehicle, and battery are provided by third parties who will be responsible for after-sales services, delivery, and quality.

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Launch the industry's first "15-minute" megawatt charging solution

Joint design and definition

Charging challenges resolved

High speed

High-C-rate battery
3.5C+ rate, 4000 cycles

High-current technology
Dual-connector continuous output at 2400 A

Revolutionary cooling innovation
Off-board cooling of batteries and charging cables

Superior quality

Long service life
Liquid-cooled charging

High reliability
Four-level high reliability

Intelligent O&M
OTA update

Higher safety
E2E safety protection

Optimal ROI

More cargo

Low station cost

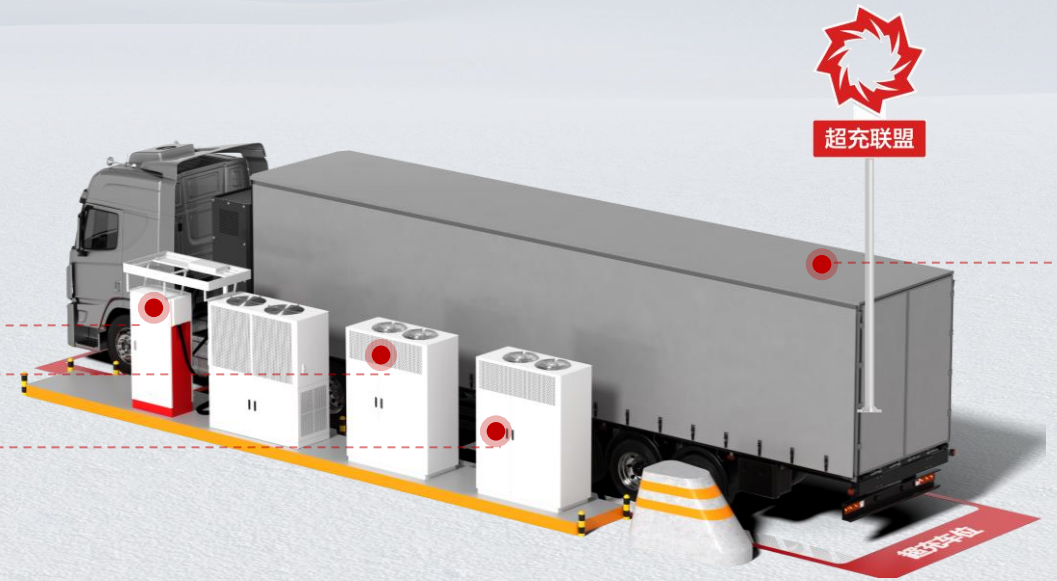
PV+ESS+charger

Evolution ready

Fully compatible

FusionCharge One-Fits-All Solution

Fully modular architecture, delivering high quality throughout the lifecycle



Covering all vehicle models in all scenarios

Applicable to all vehicle types, including tractors, mixer trucks, cargo trucks, and mining trucks

59 models will be released by partners in 2025.

* Data of released models will be updated continuously.

* The off-board liquid thermal management system (LTMS), charging cable management module, heavy goods vehicle, and battery are provided by third parties who will be responsible for after-sales services, delivery, and quality.

High current: 2400 A continuous output, innovative megawatt charging port standard, and dual positive and negative loops

Charging port innovation

Lightweight PBT materials, making the connector lighter and safer

Smooth evolution to the GB 2015+ standard

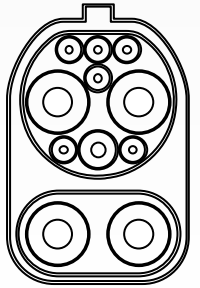
Cables with silver plating

Current: 3000 A
Maximum voltage: 1250+ V

Architecture innovation

Dual positive and negative loops, doubling the through-current capacity

Dual loops through the power unit, dispenser, and vehicle-mounted battery, supporting a maximum current output of 3000 A



Through-current capacity and cooling capacity are adjusted dynamically in real time

Forward compatibility and dual-loop decoupling
The upper part uses the GB 2015+ standard port, and the lower part uses 12 mm power terminals.

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Summary: "15-minute" charging, charging as fast as fueling, "5-min charge for 100-km range"

Megawatt-level power

Power pooling, dual power units (1.44 MW)

kA-level current

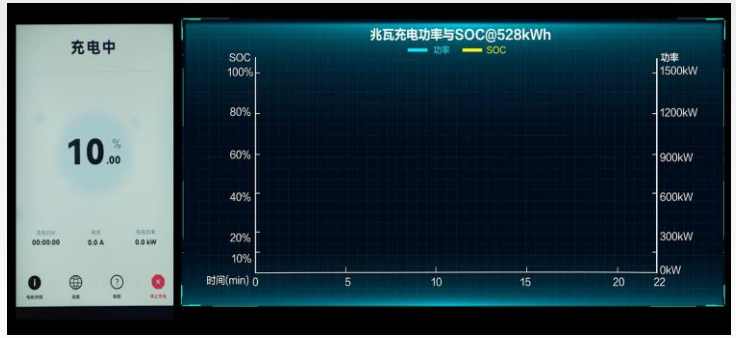
Low flow resistance, electrical and thermal compartment collaboration, and 2400 A continuous output capacity[1] by the charger

15-min level[2]

SOC from 10% to 80%

1.44 MW[3]

Stable and continuous output



[1] Refers to the charger capability. The data is obtained in the lab environment. The actual charging current may vary by vehicle model, battery, software version, and environment.
[2] SOC increase from 10% to 80% in 15 minutes, battery capacity of 318–528 kWh, and 3.5C or higher. The charging duration may vary by vehicle model, battery, parameters, and temperature.
[3] The data is obtained in the lab environment. The actual charging power may vary by battery, software version, and environment. The actual performance may vary.

Long service life: fully liquid-cooled architecture, adaptable to extreme working environments of HGVs

Extremely harsh logistics environments

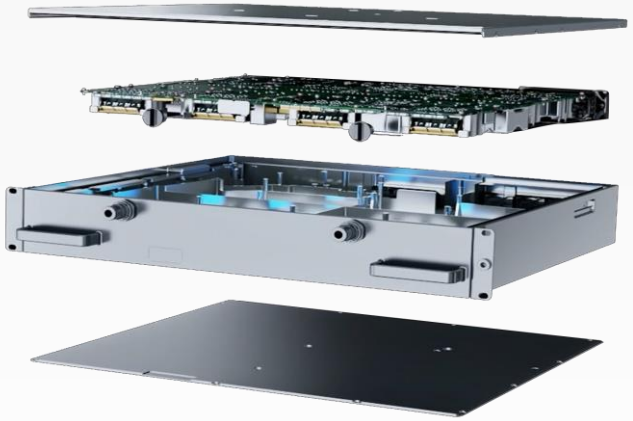
Traditional air-cooled chargers cannot adapt to these environments

Circuit boards of traditional air-cooled modules are fully exposed to the outside environments.

High failure rate: 1% → **8%**

Short service life: Only **1–3 years**

Huawei fully liquid-cooled circuit boards are 100% isolated from outside environments



Integrated die-casting, no leakage during the service life

10-year service life*, applicable to all scenarios **One-time investment for continuous revenue**

* 10 years or 20 million kWh charge, whichever comes earlier

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High reliability: Ensuring long-term stable operation of devices and building always-on electrified logistics

High loads and difficult maintenance for HGV charging stations

5000+ kWh per day
per connector

Station loads

40% HGV logistics → 8% Passenger vehicle

Difficult maintenance
in remote areas

Highway average maintenance distance

300 km HGV logistics → 50 km Passenger vehicle

High site downtime loss

Increased loss **Over 10x**

Station breakdown leads to **traffic jam**

Huawei's four-level high reliability

Reliable components

High-standard components
Derating

Reliable products

IPD
Automated production

Reliable solutions

Millions of tests
N+1 redundancy

Reliable networks

Dual-link backup
99%+ online rate

8x reliability improvement, ensuring always-on electrified logistics

Industry failure rate: 8%; Huawei system failure rate: 1%*

* The data is obtained in the lab environment. In actual use cases, the charging performance may vary with vehicle models, software versions, usage conditions, and environmental factors.

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Intelligent O&M: Component-level status management, remote fault locating, and continuous OTA update

Huawei's power management system (PMS)

Accurate remote O&M

- **Refined management of components**, and more accurate fault locating
- More detailed alarms with **higher accuracy**
- Auto generation of station equipment alarm management logs

Proactive inspection service

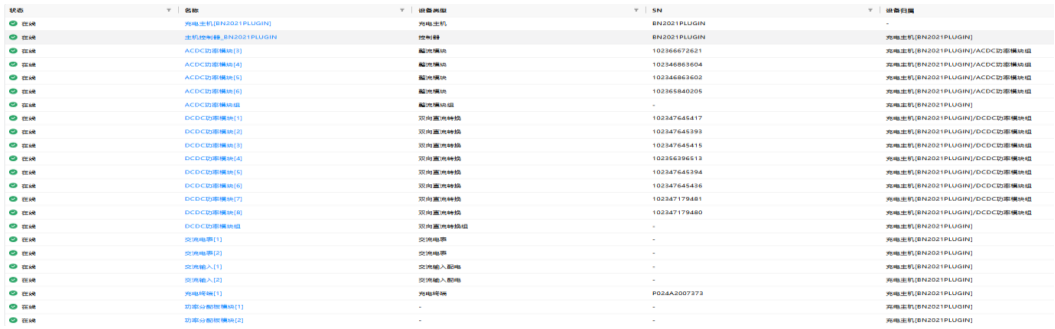
- Remote generation of network-wide equipment **inspection reports, few site visits**
- **Generation of health check reports, improving maintenance efficiency**
- **Assurance in advance for peak hours during holidays**

OTA update

- **OTA** update, remote seamless operation
- **Network-wide push and on-demand update**

Visible station information online

Visualized management of 41 components of a power unit



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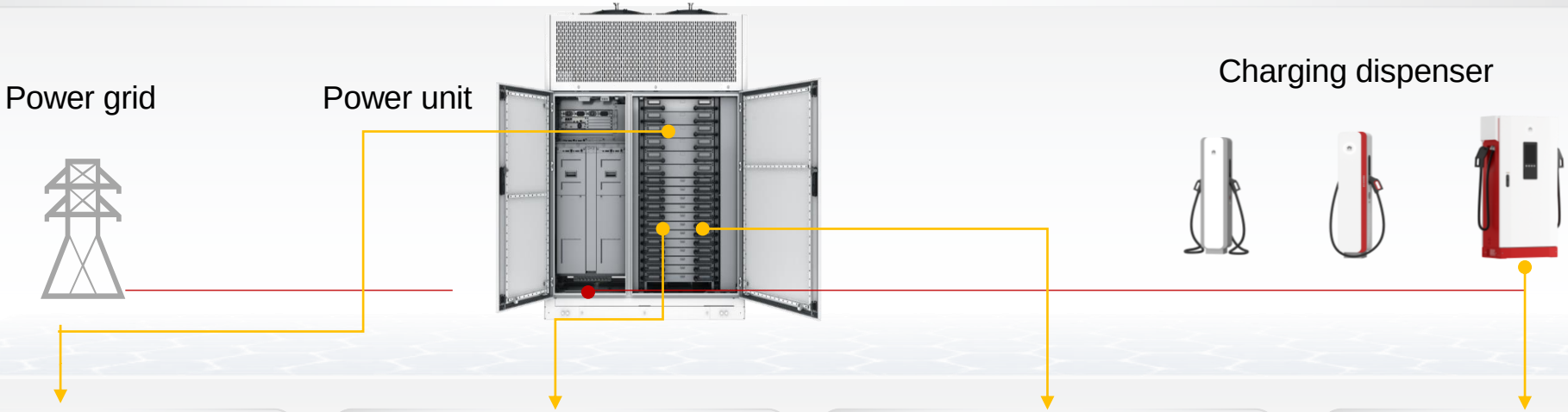
Higher safety: Enhanced assurance for power routing algorithm by four-level protection to prevent short circuits during charging

E2E four-level safety protection; entering safety mode upon failure



Level 1 Software short-circuit prevention algorithm of a power unit

- Intelligent power routing algorithm, which determines the power distribution principles and switching paths

Level 2 Power routing board control policy algorithm

Synchronous signal line control policy to prevent path short circuits

- Whoever controls is responsible for driving
- Occupying the busbar before controlling the contactor
- Disconnecting the contactor before releasing the busbar
- Minimizing risks, and disconnecting the contactor if failure occurs

Level 3 Power routing execution control algorithm

- The power routing logic controller and routing board form a dual-level logic verification to back up each other, preventing short circuits of power routing.

Level 4 Safety control algorithm of a dispenser (charging connector)

- Before the contactor is closed, the voltages at both ends are detected and verified to avoid sparking caused by voltage difference.
- Prevention: terminal bias current risk, electric shock protection risk, and system short-circuit protection risk

High quality throughout lifecycle, maximizing every investment

Stick to high quality

CNY1 billion+ invested in R&D

3000-ton integrated die casting

Automated production line

Steadily consolidate high quality

300+ reliability tests

250,000 coolant channel pulse tests

Long-term reliability in all scenarios

Implement high-quality development

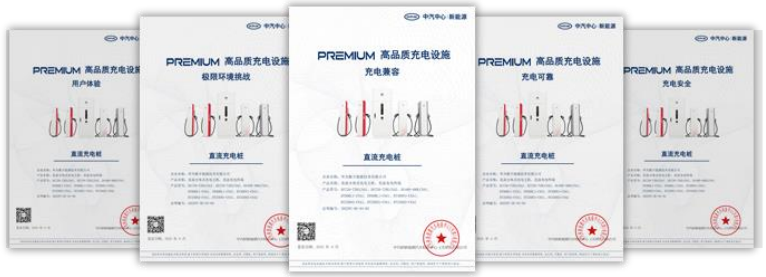
Rollout of ultra-fast charging stations along the G318 Highway, stable operation for 1+ year, and "zero" downtime

Rollout of ultra-fast charging stations along the G318 Highway

Up to 4713 m altitude

Promote high-quality standards

First high quality certification



* User experience, charging compatibility, reliability, safety, and extreme environment challenges

CATARC Star of Megawatt Charging

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More cargo: Save 2 hours of charging time per day and increase the cargo range by 15%, resolving the efficiency issue of electrified logistics

3.5C HGV vs. 1C HGV

60 minutes
Common fast charging

VS

15 minutes
Megawatt charging

2+ hours/day
Less charging time

600 hours/year
Less logistics time

12 hours of cargo transport per day on average

50 more days
For carrying cargo each year

Transporting goods for 50 more days ≈ Carrying 15% more cargo ≈ An additional CNY95,000 in logistics revenue

* The data is estimated based on multiple parties' experience and is for reference only. The actual savings may vary significantly from the theoretical data due to factors such as road conditions and load. The actual business result shall prevail.

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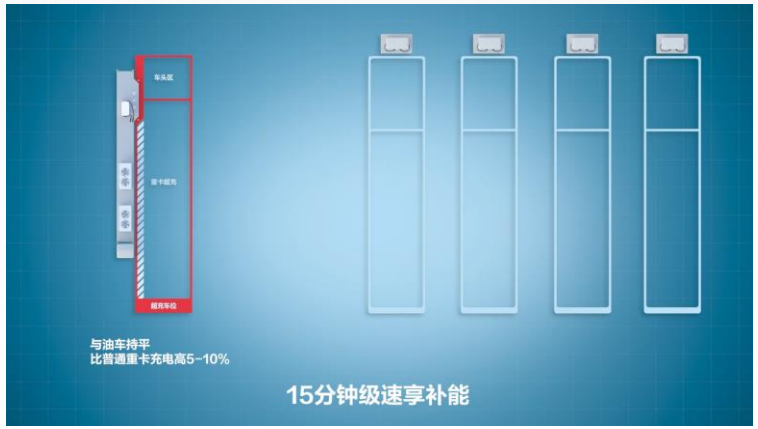
Low CAPEX: Increase the turnover rate by four times and reduce the footprint by 70%, slashing CAPEX in an end-to-end manner

Serving 100 HGVs with the megawatt charging solution saves CNY3.89 million in CAPEX (excluding charging equipment costs)

1C low-power charging solution for HGVs
40 charging spots @8533 m^2

Land purchase	≈ CNY1.92 million
Land hardening	≈ CNY2.56 million
Cable cost	≈ CNY2.9 million
Power access	≈ CNY4.5 million

Small footprint: one station replacing four traditional ones



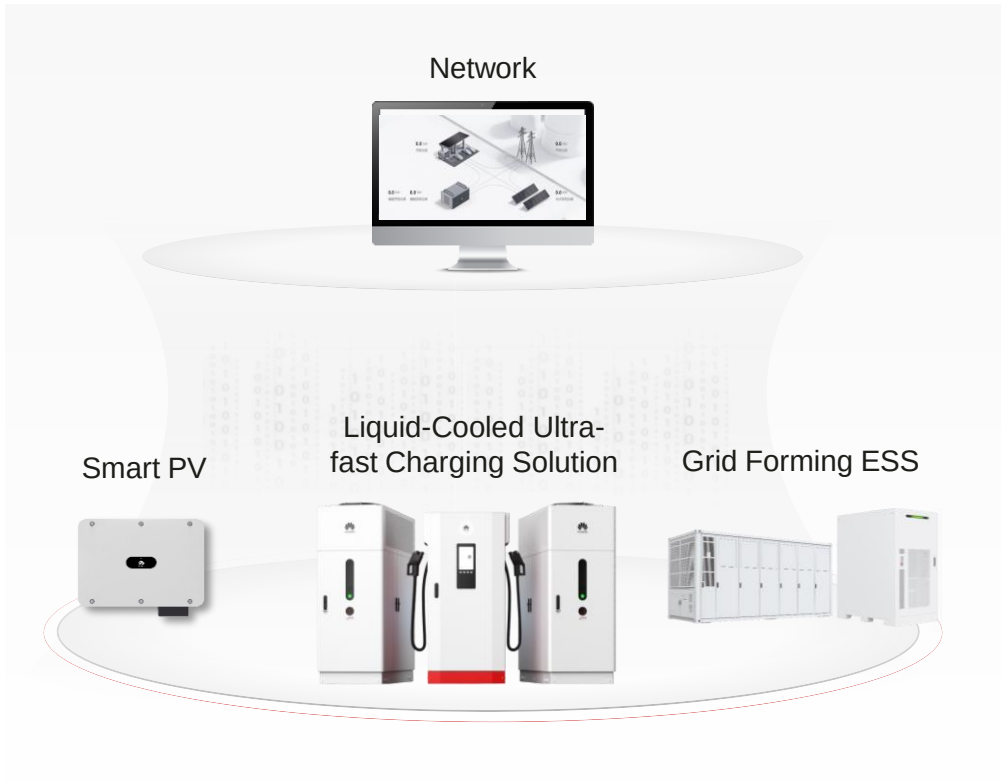
3.5C high-power charging solution for HGVs
10 charging spots @2666 m^2

Land purchase	≈ CNY0.6 million	**Saving CNY1.32 million**
Land hardening	≈ CNY1.08 million	**Saving CNY1.48 million**
Cable cost	≈ CNY1.81 million	**Saving CNY1.09 million**
Power access	≈ CNY4.5 million	On par

* The preceding data is calculated based on the configuration of every three power units and two dispensers for two charging spots. Assuming a station utilization rate of 30%, serving 100 HGVs requires 10 megawatt charging spots—compared to 40 common fast charging spots in the industry.

PV+ESS+charger: Offer grid-friendly operation, higher revenue, ultimate safety, and assured transport capacity

Intelligent PV+ESS+charger integration enables peak shaving, improving ROI



Power grid: better friendliness	**Little impact and high utilization** Harmonic suppression algorithm Multi-level power pooling and sharing	**Intelligent collaboration from source to load**
Station owner: maximized revenue	**AI-based peak shaving/staggering, "zero" PV curtailment** AI-based global prediction of station loads Intelligent PV+ESS+charger collaboration	**Optimal LCOE throughout the lifecycle**
Vehicle owner: uncompromising safety	**200+ scenario-based tests** 24 key protection mechanisms Export limitation < 2s	**Full-link electrical safety**
Transport capacity: assured operations	**On/Off-grid switching** On/Off-grid switching in 200 ms Automatic saving of in-transit order information	**All-scenario transport capacity assurance**

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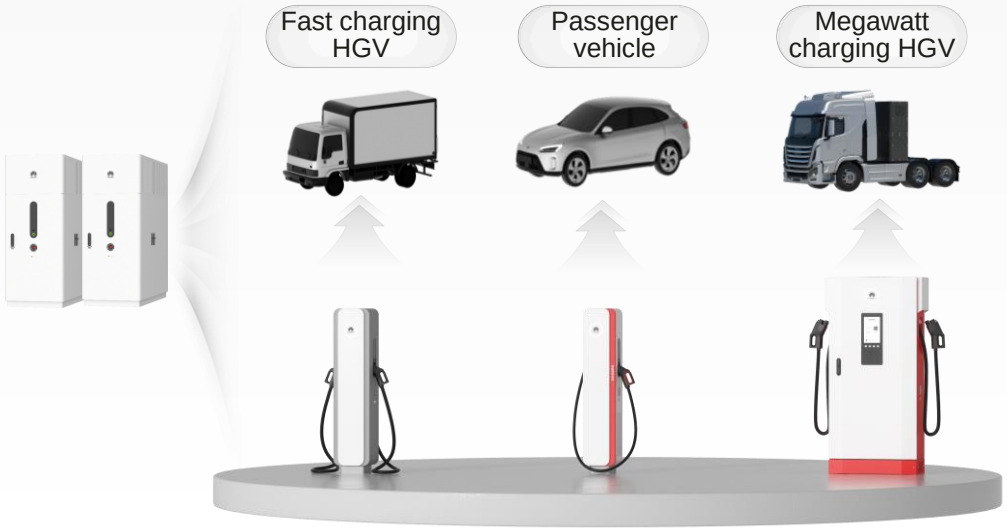
Fully compatible: A fully open technical architecture supports various vehicle models and encourages charge point operators (CPOs) to invest in charging networks

Megawatt charging: compatible with all vehicle models, future-proof investment

One platform compatible with multiple models, one investment paid by three types of returns



Ultra-fast charging for HGVs: compatible with common charging

Minimized range anxiety and maximized freight revenue

Charging everywhere: compatible with all types of charging stations, including common urban charging stations, common HGV charging stations, and megawatt charging stations

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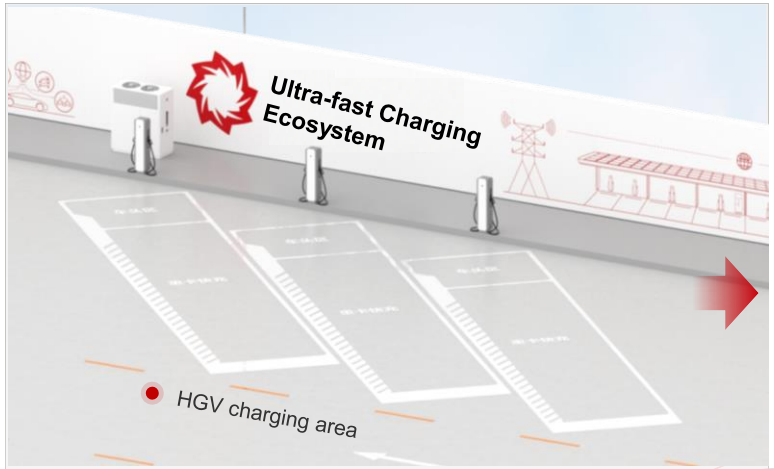
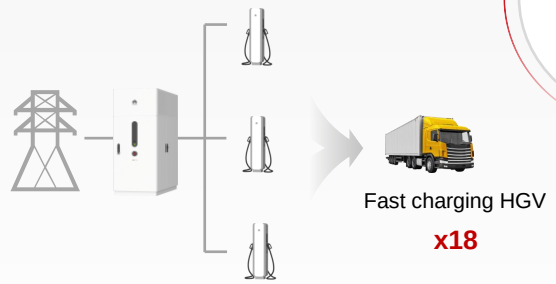
Evolution ready: Compatible with all vehicle models, supporting smooth update and evolution of stations to meet massive market requirements

Initial scale

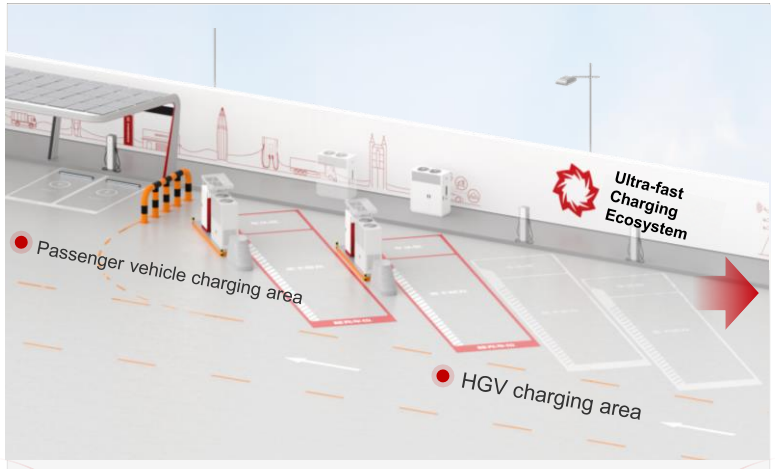
1 power unit + 3 fast charging spots for HGVs





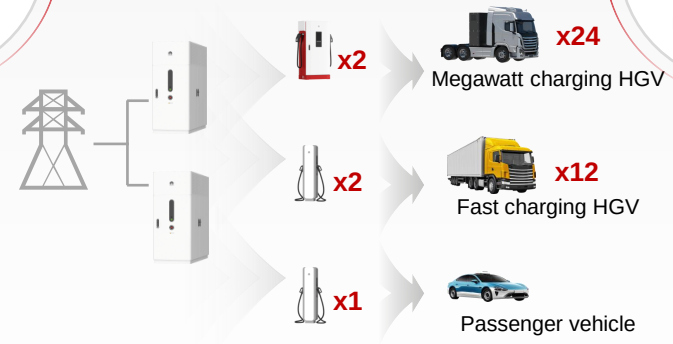
Phase 1 capacity expansion

2 power units + 2 megawatt charging spots for HGVs + 2 fast charging spots for HGVs + 2 charging spots for passenger vehicles



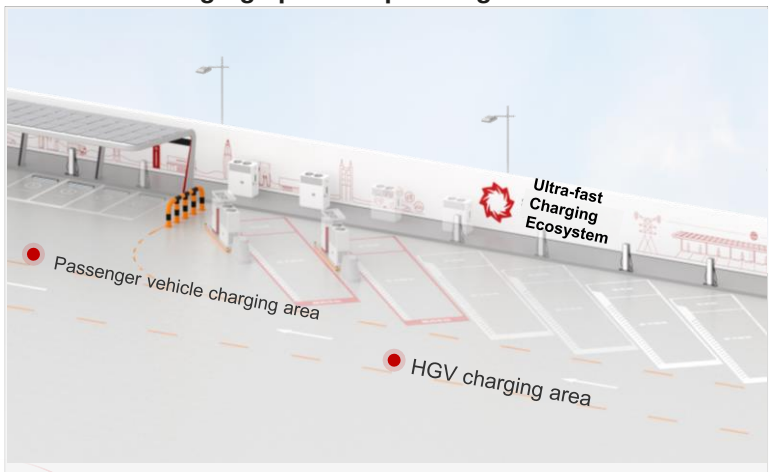
Smooth capacity expansion*

+2 Megawatt dispenser + Power unit



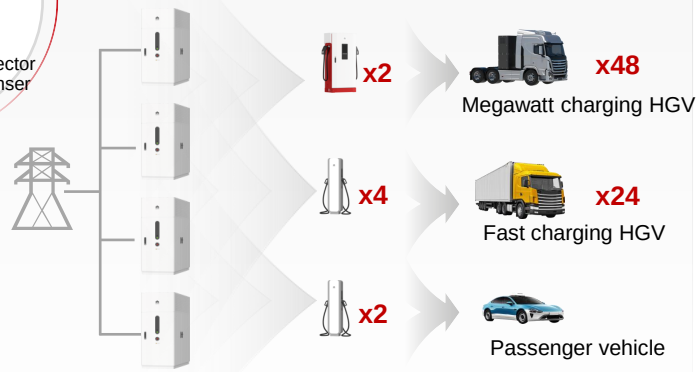
Phase 2 capacity expansion

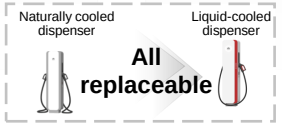
4 power units + 2 megawatt charging spots for HGVs + 4 fast charging spots for HGVs + 4 charging spots for passenger vehicles



Smooth capacity expansion

+2 Power unit + +4 Dual-connector fast dispenser





* The recommended number of dispensers is used (the dispensers are fully utilized at HGV stations). Maximum number of dispensers that can be configured: 2 power units + 2 megawatt dispensers + 4 naturally cooled dispensers; 4 power units + 2 megawatt dispensers + 16 naturally cooled dispensers
* The power unit is 720-720 kW, the dual-connector megawatt dispenser continuously outputs at 2400 A, the dual-connector fast charging dispenser at 600 A, and the single-connector liquid-cooled charging dispenser at 600 A.

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Summary of megawatt charging solution for heavy goods vehicles: One platform supports all scenarios and all vehicle models with more promising ROI

Huawei Charging Network

1 power unit platform, 3 types of dispensers in all scenarios and covering all vehicle models

Power grid:

(Optional) **ESS**

Fully liquid-cooled ultra-fast charging power unit

720 kW to 1.44 MW

Megawatt dispenser

Dual-connector continuous output at 2400 A

(Optional)
Ultra-fast charging dispenser
Single-connector 600 A

(Optional)
Fast charging dispenser
300 A x 2

Provided by the third party

Off-board cooling system

Charging cable management module

* After-sales services, delivery services, and quality warranties are provided by third parties.

Supports all vehicle models, such as ultra-fast charging HGVs, common trucks, and passenger vehicles.

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Contents

Site construction solution, ROI comparison, and route planning in the HGV scenario

Pain points

Difficult site selection

Optimal charge point planning

Complex calculation logic

Oil vs. Electricity
Charging cost vs. Battery swapping cost
Profit rise

High cost of logistics route identification

The logistics route and station location are identified offline, resulting in high costs and low efficiency.

Core capabilities: route planning, configuration suggestions, and revenue calculation

Logistics route networking

Route optimization/Point marking

Station-based solution

Calculation of each solution for the cargo and power unit quantity

Solution revenue

Pricing/Financial revenue indicators

Application output

Comparison report of each station construction solution

Analysis report on the investment and operation of fuel, gas, battery swapping, fast charging, and ultra-fast charging solutions

Site selection and configuration solution

Route location selection and configuration solution of each location

Overall/Single-point revenue calculation

Calculation of key charging operation and financial indicators in each year

Typical configuration 1: Primarily serve existing 1C HGVs, with limited support for 3C+ ultra-fast charging HGVs

2 megawatt charging spots +
2 fast charging spots for HGVs

720 kW fully liquid-cooled power unit x 2

Megawatt dispenser x 2

(2400 A x 2)

Ultra-fast charging HGV

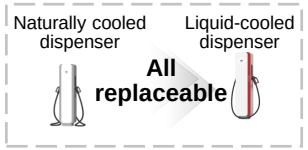
Serving **24** HGVs/day
@30% utilization

Naturally cooled dispenser x 2

(300 A x 2)

Common HGV

Serving **14** HGVs/day
@30% utilization
(not charging HGVs simultaneously with megawatt dispensers)



* In this scenario with 2 power units and 2 megawatt dispensers, the maximum number of dispensers that can be configured is 4 liquid-cooled dispensers + 2 naturally cooled dispensers, or only 4 naturally cooled dispensers.
* The data is obtained in the lab environment. In actual use cases, the charging performance may vary with vehicle models, software versions, usage conditions, and environmental factors.

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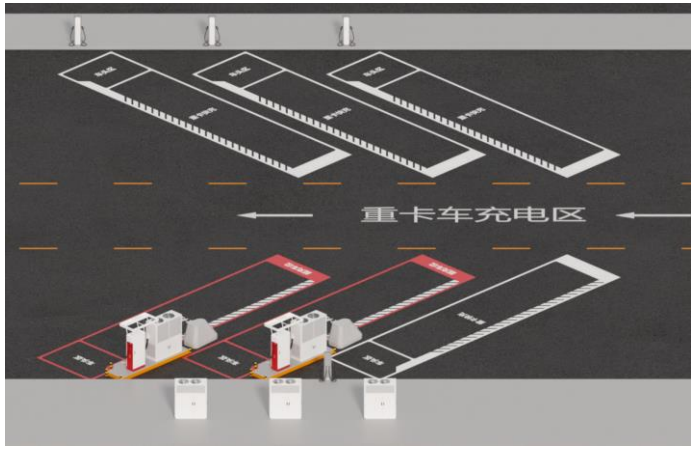
Typical configuration 2: Serve ultra-fast and fast charging HGV models, delivering a balance of charging speed and cost-effectiveness

2 megawatt charging spots + 4 fast charging spots for HGVs



720 kW fully liquid-cooled power unit x 3

Megawatt dispenser x 2

(2400 A x 2)

Ultra-fast charging HGV

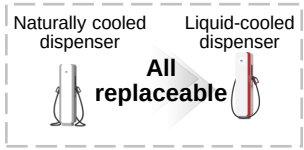
Serving **36** HGVs/day
@30% utilization

Naturally cooled dispenser x 4

(300 A x 2)

Common HGV

Serving **28** HGVs/day
@30% utilization
(not charging HGVs simultaneously with megawatt dispensers)



* In this scenario with 2 power units and 3 megawatt dispensers, the maximum number of dispensers that can be configured is 6 liquid-cooled dispensers + 7 naturally cooled dispensers, or only 10 naturally cooled dispensers.
* The data is obtained in the lab environment. In actual use cases, the charging performance may vary with vehicle models, software versions, usage conditions, and environmental factors.

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Typical configuration 3: Primarily serve megawatt charging HGVs for efficient logistics, with limited support for 1C fast charging HGVs

2 megawatt charging spots + 6 fast charging spots for HGVs

720 kW fully liquid-cooled power unit x 4

Megawatt dispenser x 2
(2400 A x 2)

Ultra-fast charging HGV

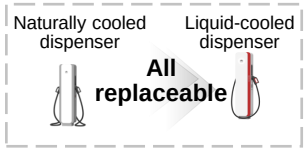
Serving **48** HGVs/day
@30% utilization

Naturally cooled dispenser x 6

(300 A x 2)

Common HGV

Serving **42** HGVs/day
@30% utilization
(not charging HGVs simultaneously with megawatt dispensers)



* In this scenario with 2 power units and 4 megawatt dispensers, the maximum number of dispensers that can be configured is 8 liquid-cooled dispensers + 12 naturally cooled dispensers, or only 16 naturally cooled dispensers.
* The data is obtained in the lab environment. In actual use cases, the charging performance may vary with vehicle models, software versions, usage conditions, and environmental factors.

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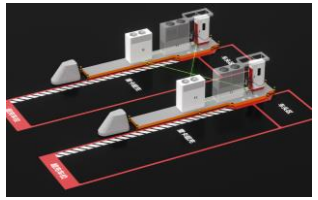
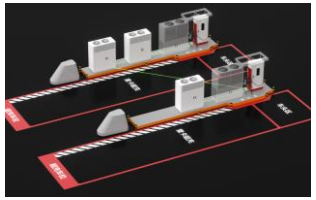
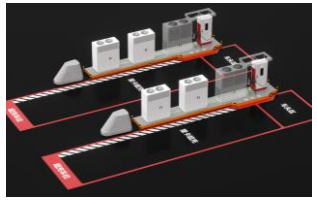
Huawei device selection and configuration

Typical Configuration [1]	X Configuration	X-Pro Configuration	X-Ultra Configuration
			
Number of power units and dispensers	One charging spot: 1 power unit + 1 megawatt dispenser Two charging spots: 2 power units + 2 megawatt dispensers	One charging spot: 1.5 power units + 1 megawatt dispenser Two charging spots: 3 power units + 2 megawatt dispensers	One charging spot: 2 power units + 1 megawatt dispenser Two charging spots: 4 power units + 2 megawatt dispensers
Serving [2]	24 HGVs/day @30% utilization	36 HGVs/day @30% utilization	48 HGVs/day @30% utilization
Power [3]	Max: 1.2 MW per spot, dual spots Constant: 1.44 MW in total by dual spots	Max: 1.32 MW per spot, dual spots Constant: 2.16 MW in total by dual spots	Max: 1.44 MW per spot, dual spots Constant: 2.88 MW in total by dual spots
Current	2400 A	2400 A	2400 A
Recommended number of dispensers for capacity expansion [4]	Naturally cooled dispenser x 2	Naturally cooled dispenser x 4	Naturally cooled dispenser x 6
Optional equipment	Liquid-cooled dispenser, naturally cooled dispenser (5 m or 7.4 m cables), 215 kWh ESS, 4.5 MWh ESS, and 720-720 power unit		

[1] Refers to a typical configuration in the dual-spot scenario. The off-board cooling system and charging cable management module are provided by a third party.
[2] Refers to the number of HGVs that can be served by 2 charging spots. For example, the charging duration of the X-Ultra spots is about 18 minutes (including the time for HGVs to enter and exit the station and the operation time). The actual charging duration may vary by vehicle model and environmental factors.
[3] Refers to the charger capability. The data is obtained in the lab environment. The actual charging current may vary by vehicle model, battery, software version, and environment.
[4] Refers to the maximum number of dispensers that can be configured in 2 charging spots: For the X configuration, 4 liquid-cooled dispensers + 2 naturally cooled dispensers or 4 naturally cooled dispensers only; for the X-Pro configuration, 6 liquid-cooled dispensers + 7 naturally cooled dispensers or 10 naturally cooled dispensers only; for the X-Ultra configuration, 8 liquid-cooled dispensers + 12 naturally cooled dispensers or 16 naturally cooled dispensers only.

A powerful ecosystem brand that drives high returns for premium charging stations and enables electric HGVs to travel at will

Unified network construction

- **Unified standards:** megawatt charging capability
- **Unified specifications:** civil engineering and appearance
- **Unified brand:** Ultra-fast Charging Ecosystem
- **Unified portal:** AntoEco

High-standard station construction and large-scale traffic attraction

Ultra-fast Charging Ecosystem

Unified design standards, easily building high-quality stations

Excellent experience

Plug-and-charge, ready in 15 minutes

Assured operations

Branded stations, higher safety

Visual appeal

Unified brand logo across the country

Good reputation

Recognizing megawatt charging upon seeing the logo

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Safety constraints for an ESS deployed in a charging station

Category	No.	Item	Detailed Constraint	Safety Level	Constraint Source
Site selection	1	Installation position	An ESS must not be installed in an indoor environment or in a basement.	I	GB 51048, JFPA 0007-2021, and ESS safety baselines
	2	Clearance to buildings	The clearance between an ESS and a densely populated building shall be ≥ 12 m and that between an ESS and a school or hospital shall be > 30.5 m. (If the clearance requirements cannot be met, a fire partition can be added to shorten the required clearance to 1 m.)	I	GB 51048 Design code for electrochemical energy storage station
	3	Surrounding environment	There must be no combustible materials within 3 m of an ESS or the site to prevent fire from spreading. (Exemption: Single specimens of trees, shrubbery, or cultivated ground cover such as green grass, ivy, succulents, or similar plants used as ground covers can be permitted to be exempt provided that they do not form a means of readily transmitting fire.)	I	GB 51048 Design code for electrochemical energy storage station
	4	Coastal environment	Do not use an ESS in a coastal C5 environment. (If an ESS must be used, review it based on the project location.)	II	Environment test specifications of Huawei products
Deployment	5	Clearance to roads	The clearance between an ESS deployed at a charging station and a public road shall be ≥ 3 m. (If this requirement cannot be met, a fire partition can be added to shorten the required clearance to 1 m.)	I	GB 51048 Design code for electrochemical energy storage station
	6	Clearance to parking spots	The clearance between an ESS deployed at a charging station and a parking spot shall be ≥ 3 m. (If this requirement cannot be met, a fire partition can be added to shorten the required clearance to 1 m.)	I	GB 51048-2022 (draft for comments) Design code for electrochemical energy storage station
	7	Overhead structure	You are advised not to add any overhead structure above the ESS. If an overhead structure is necessary in special scenarios, the following conditions must be met: (1) The distance between the overhead structure and the top of the ESS shall be > twice the turning radius of the explosion relief plate or twice the length of the explosion relief traction rope. (2) The overhead structure shall be non-combustible.	II	GB 51048 Design code for electrochemical energy storage station, and the Company's safety baseline requirements
Installation	8	Clearance to power units	The clearance between an ESS and a power unit shall be ≤ 100 m.	II	The FE communication distance is < 100 m.
	9	Parallel installation	If parallel ESSs are installed, the side-to-side clearance shall be ≥ 0.1 m, and the rear-to-rear clearance shall be ≥ 0.3 m.	II	Baseline requirements for ESS safety and containment
	10	Protective fence	If the number of ESSs is > 4, protective fences must be installed. If the number of ESSs is ≤ 4, protective fences are recommended. (C&I ESS)	II	GB 51048 Design code for electrochemical energy storage station
Fire partition (If the requirements of 2356 are not met, requirements 11 and 12 are triggered.)	11	Fire resistance rating	When a fire partition is added, its fire resistance duration must be ≥ 3 hours in China.	II	GB 51048 Design code for electrochemical energy storage station
	12	Partition wall dimensions	When a fire partition is added, the length and height must exceed the outline of the ESS. The length and height must be ≥ 1 m in China.	II	GB 51048 Design code for electrochemical energy storage station
Power management system (PMS) after power-on	13	PMS after power-on	After an ESS is powered on, it shall be connected to the PMS (AntoEco) where the ESS operating status and alarm information can be viewed and the maintenance and update of the ESS can be performed.	II	Safety requirements for O&M of electrical safety transformation

Note: The *FusionCharge Energy Storage System Safety Constraints V1.4* is released this time. The R&D department will update the document as required based on the energy storage industry progress and related research results. Class I requirements are mandatory and non-negotiable. Class II requirements require decision-making if conditions are not met.

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Megawatt charging has gained unstoppable momentum, with a "point-line-plane" strategy for building a megawatt charging network

"Point"

Building electric demonstrations at core hubs

Dongguan Degao: Megawatt charging station at a cement plant

Two more trips per day for ultra-fast charging HGVs, increasing the profit margin by 50%

Beichuan, Sichuan: The world's largest PV+ESS+charger megawatt charging station

The first 100 MW-level charging station for heavy goods vehicles with a daily charge of 300,000 kWh

"Line"

Deploying electrified transportation along logistics backbones

Shanghai Huaxing Honghe: Megawatt charging route across the Yangtze River Delta

Main transport corridor for Xinjiang coal exports: Ultra-fast charging network for logistics backbones in Xinjiang, Gansu, Ningxia, etc.

"Plane"

All-domain collaboration policy and ecosystem enablement

Chongqing: Top-level planning of a megawatt charging network, facilitating ultra-fast charging 2.0

Shenzhen: Development of ultra-fast charging city 2.0, driving full electrification of HGVs

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