

Factors Influencing Design

Regulations

Legal Dimensions for Road-Approved Autonomous Vehicles

<Beijing Autonomous Delivery Vehicle Road Testing and Commercial Demonstration Management Measures> (Trial)
https://www.beijing.gov.cn/zhengce/zhengcefagui/2023/06/12/20230608_3126678.html

Length ∈ [1500,3000](mm);
Width ∈ [900mm,1100](mm);
Height ∈ [300mm,1700](mm).

Group A

Safety Issues

Visibility:

Unobstructive to view of drivers and pedestrians.

Height (general vehicles)
∈[1400,1800] (mm).

Group B

Detection:

Omnidirectional autonomous driving sensors

Collision Safety:

Reduce protrusions to prevent potential collision damage.

Efficiency & Aerodynamics

Energy Density & Volume:

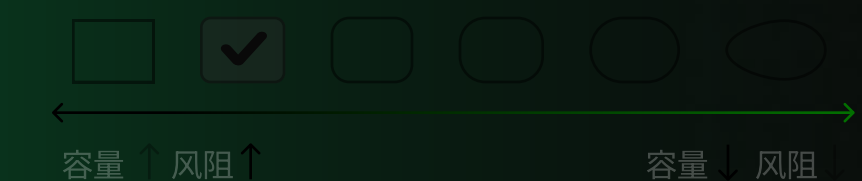
Determining **volumetric and gravimetric energy density** helps estimate vehicle weight and battery capacity.

Tesla Model 3
- Battery pack capacity: ~75 kWh
- Battery pack weight: ~480 kg
- Battery pack volume: ~0.3 m³

Form Factor:

For mobile charging vehicles,

Importance (high capacity) > **Importance** (low wind drag).



Size Vehicle=
Max Value of
[Group(A) nC]

Length = 2200mm;
Width = 1300mm;
Height = 1400mm.

Size Battery

Length ≈ 1700mm;
Width ≈ 1200mm;
Height ≈ 780mm.

Volume (Battery)
≈ 1.591m³

if (Energy Density)
=300 Wh/L

Can fully charge
6.4 Tesla Model 3
4.8 Tesla Model S

Application Scenarios

Road Infrastructure:

Width (Vehicle) < [Width (non-motorized lane) = 2500-3500 mm]

Parking Lot Infrastructure:

Length (Vehicle) < Width (Parking Space)

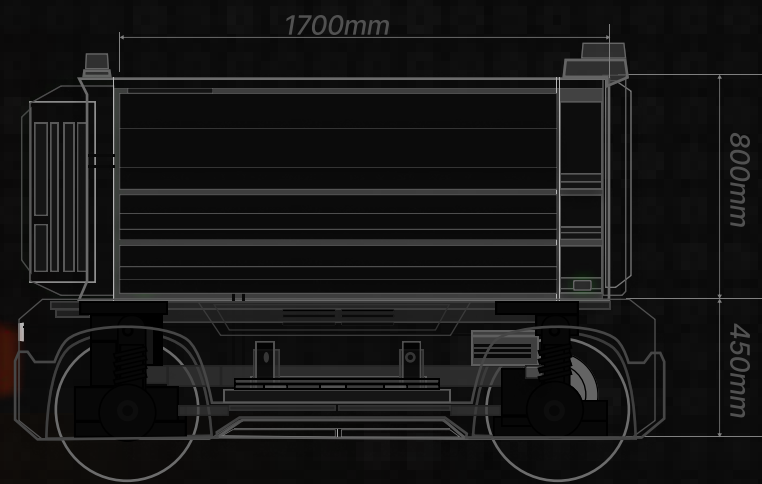
Length ∈ [5500,6000](mm);
Width ∈ [2200,2500](mm).

Group C

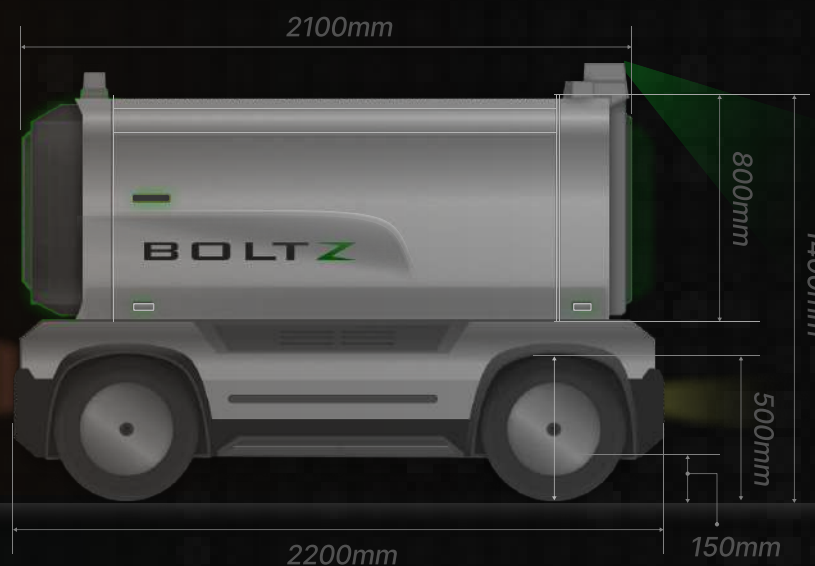
Environment & Road Conditions:

Smaller size = Agility in urban settings (tight spaces).

Product Layout



side view



front view



back view



Inner Structure Analysis

1.Control System

- 1.1_ Actuator
- 1.2_ Electronic Control Unit

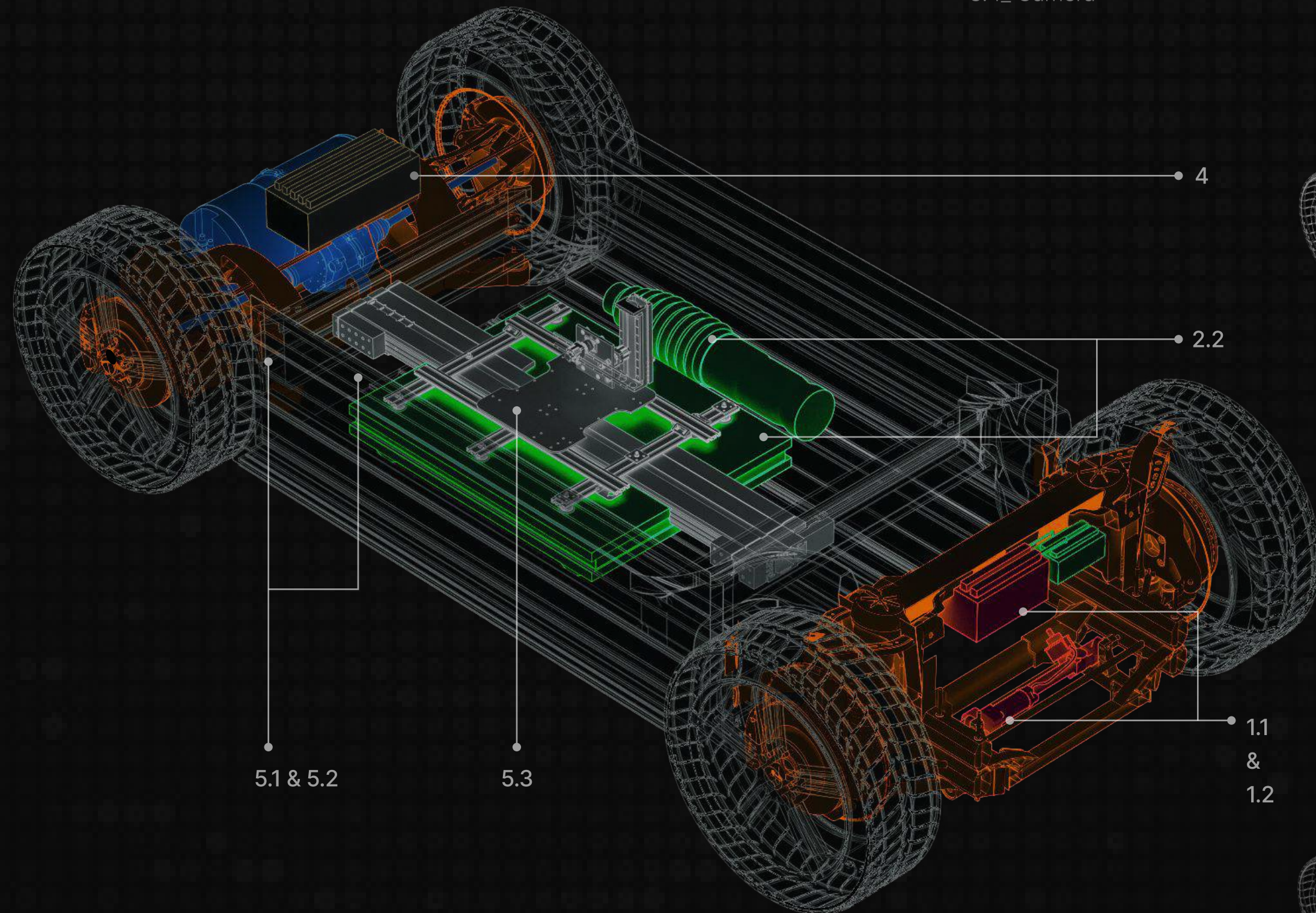
2.Energy Management System

- 2.1_ Battery Pack
- 2.2_ Mobile Wireless Charging System
- 2.3_ Backup Charging Gun

3.Sensor Array

- 3.1_ Ultrasonic Sensor
- 3.2_ Range Sensor
- 3.3_ LiDAR
- 3.4_ Camera

Based on extensive data collection and integration, developers have defined the essential functional structure modules required for autonomous vehicles.



4.Central Computing System

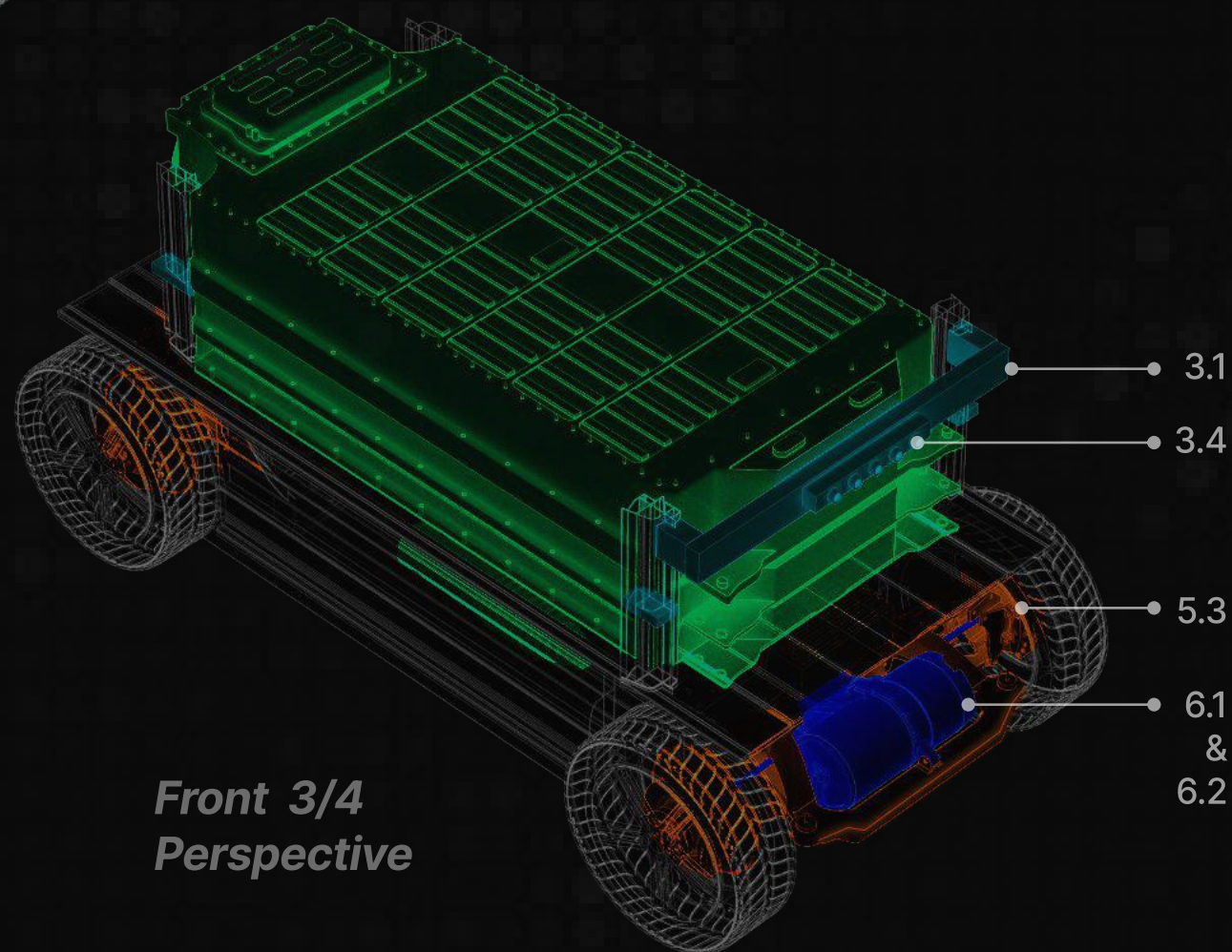
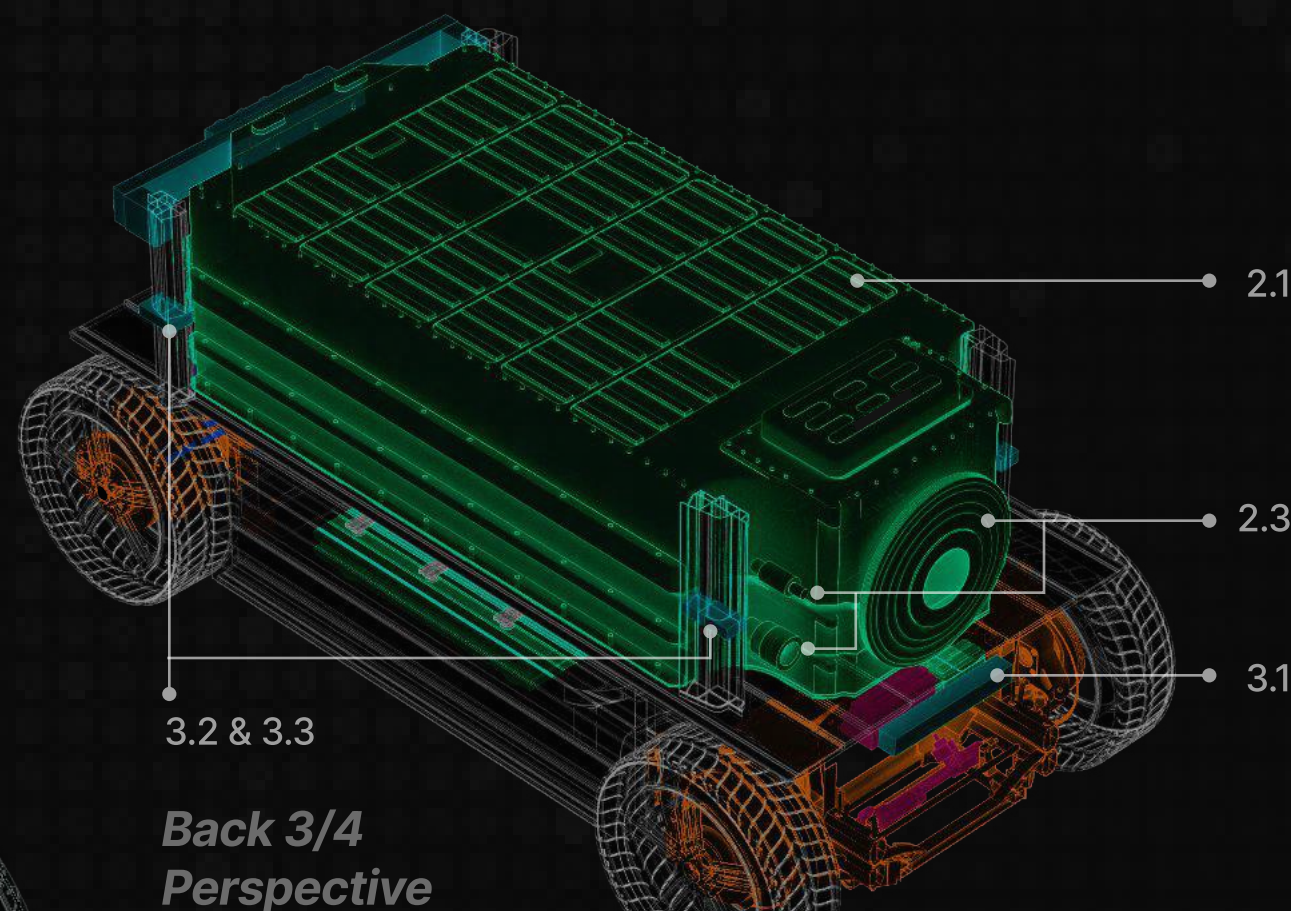
- 4.1_ Computer Vision & Perception System
- 4.2_ Localization & Navigation System
- 4.3_ Vehicle Control Unit
- 4.4_ Communication System
- 4.5_ Safety System

5.Auxiliary Systems

- 5.1_ Braking System
- 5.2_ Steering System
- 5.3_ Suspension System
- 5.4_ (O) Truss System

6.Powertrain

- 6.1_ Electric Motor
- 6.2_Transmission System



Charging Process

Why Wireless ?

Fits current parking infrastructure layouts.



Eliminates port compatibility issues across EVs.



Reduces the risk of sparks or electric shocks.



The mobile charging vehicle arrives, then **scans the license plate to confirm** it's the target EV.



The MCV then **deploys a flat mini robot** capable of moving freely within a certain range to charge.



The robot **aligns with the EV's wireless charging port** and starts the wireless charging service.