



SUSTAINABLE DEVELOPMENT STRATEGY FOR EV BATTERY

TOM ZHAO
Managing Director



»»»» What are **WE** facing today ?

»»»» What can **BYD** do ?

»»»» What can **WE** do more ?



WHAT ARE WE

FACING TODAY ?



LFP & NMC is the mainstream of the market

BYD ED Roadmap

Rapid Growth of Lithium-ion Battery

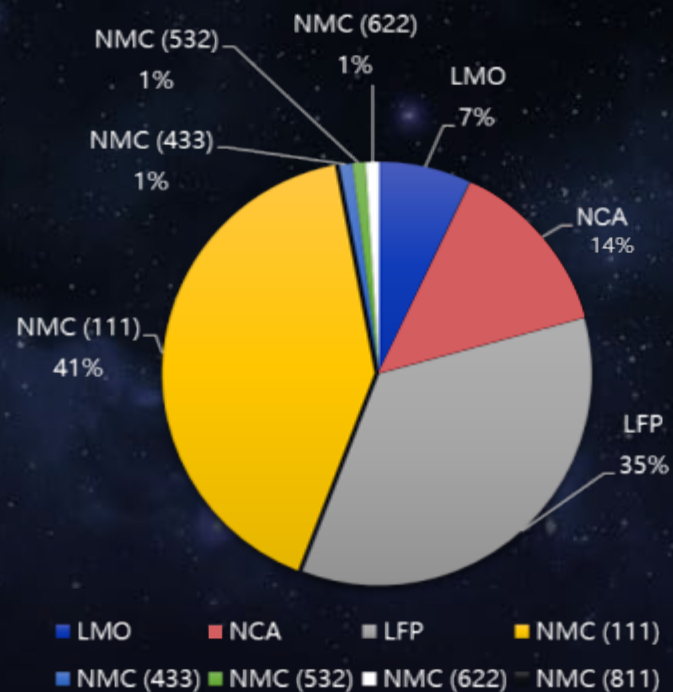
Cobalt price increased by leaps and bounds



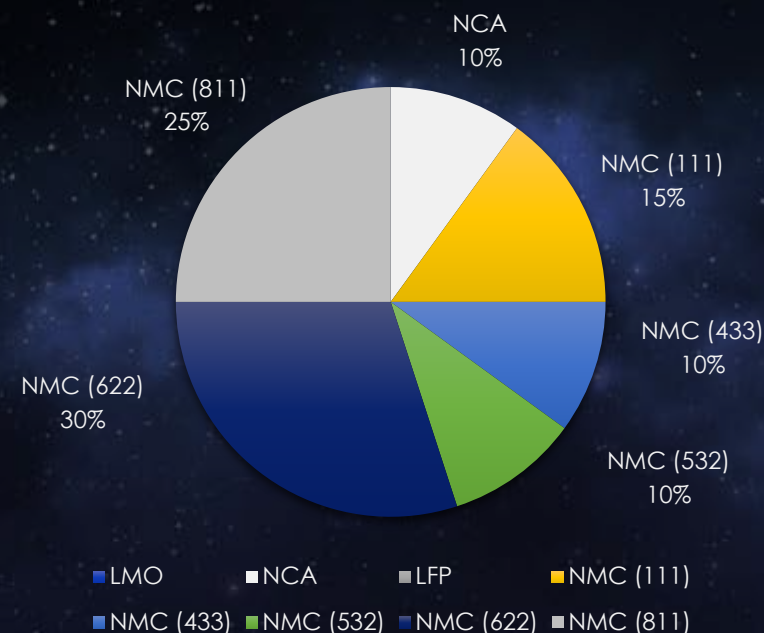


LFP & NMC is the mainstream of the market

EV



2016

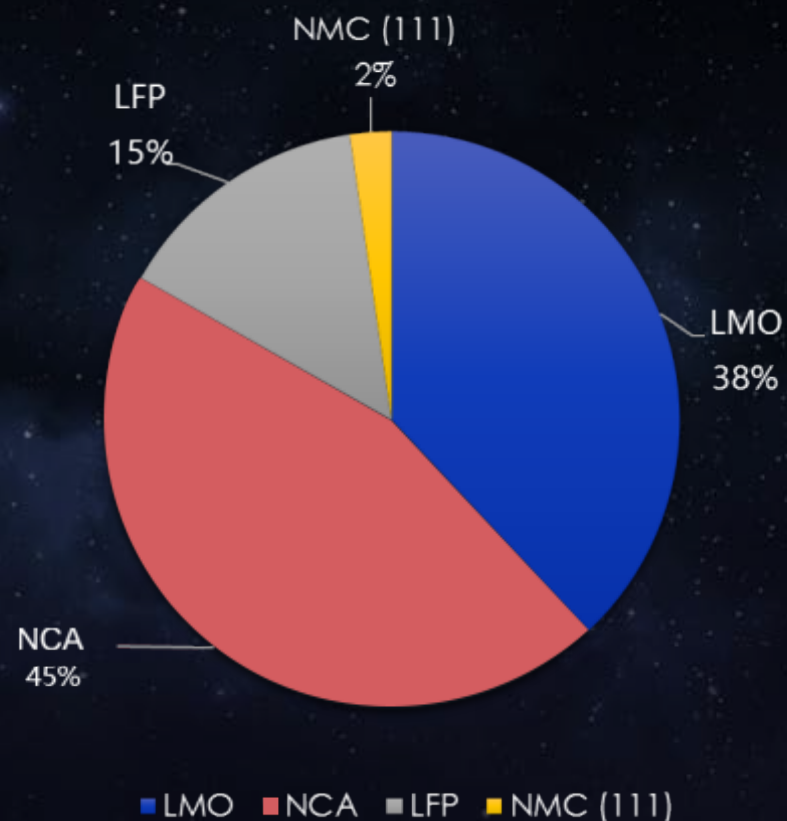


2030

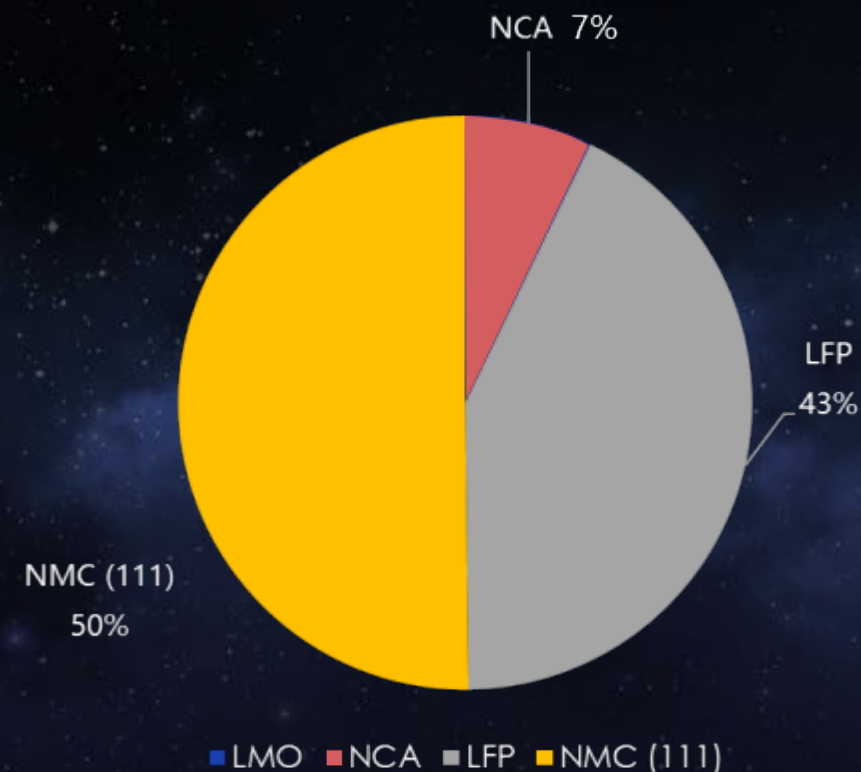


LFP & NMC is the mainstream of the market

Storage



2016

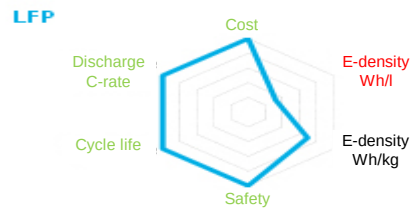


2017-2030

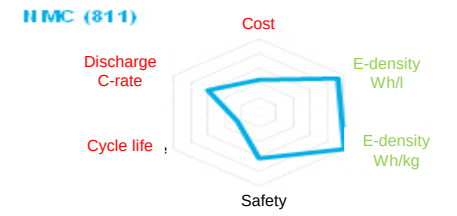
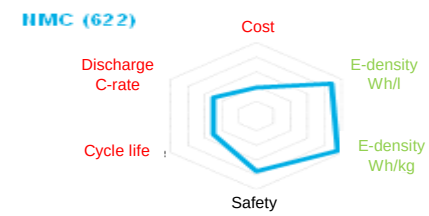
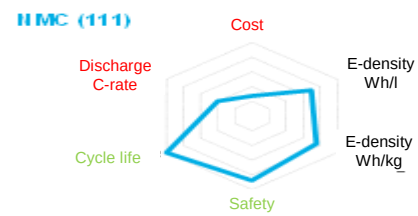


LFP vs NMC

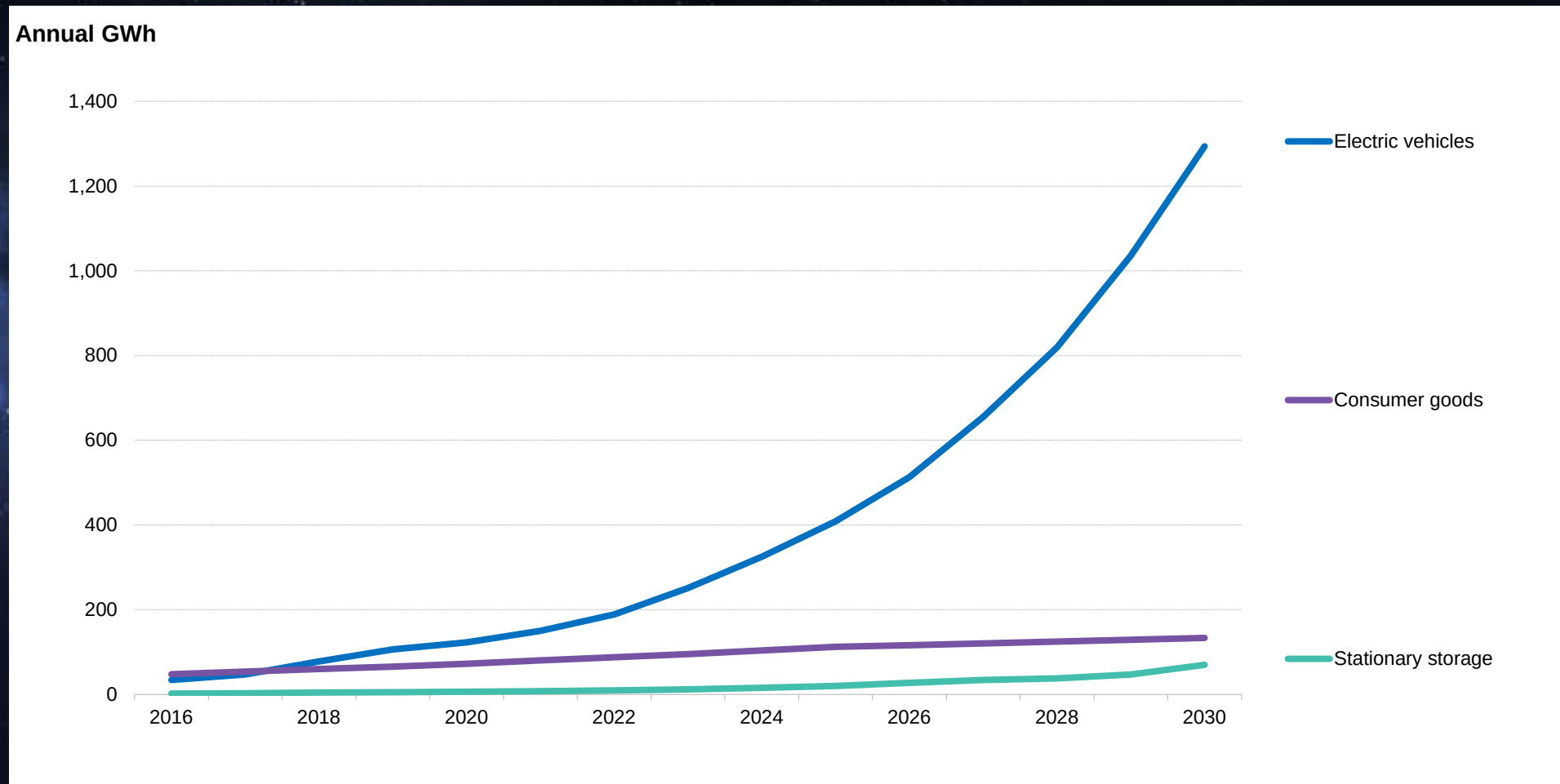
LFP



NMC



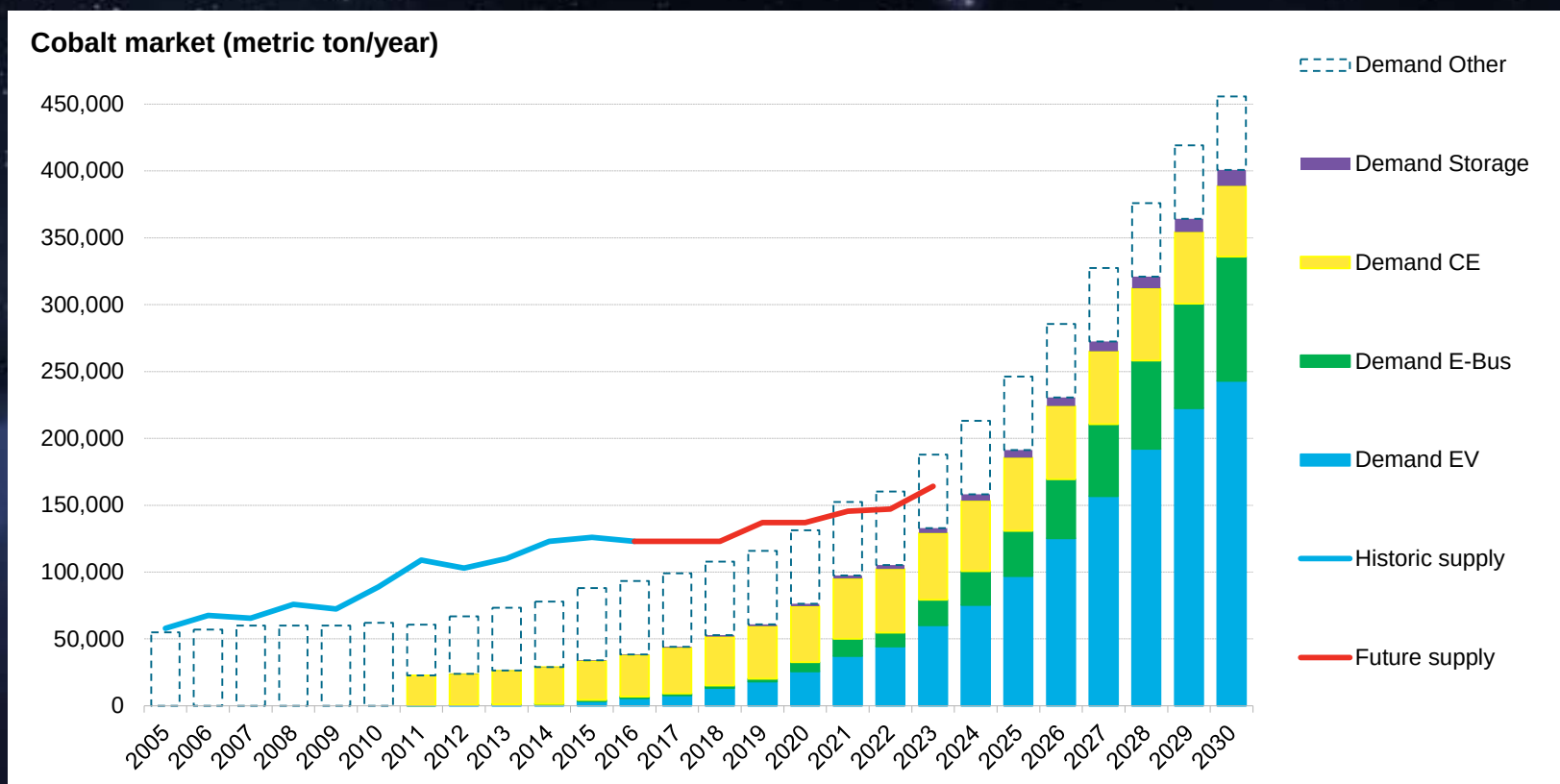
Rapid Growth of Lithium-ion Battery



Source: Bloomberg New Energy Finance. Note: Assumes 100% of stationary is lithium-ion.



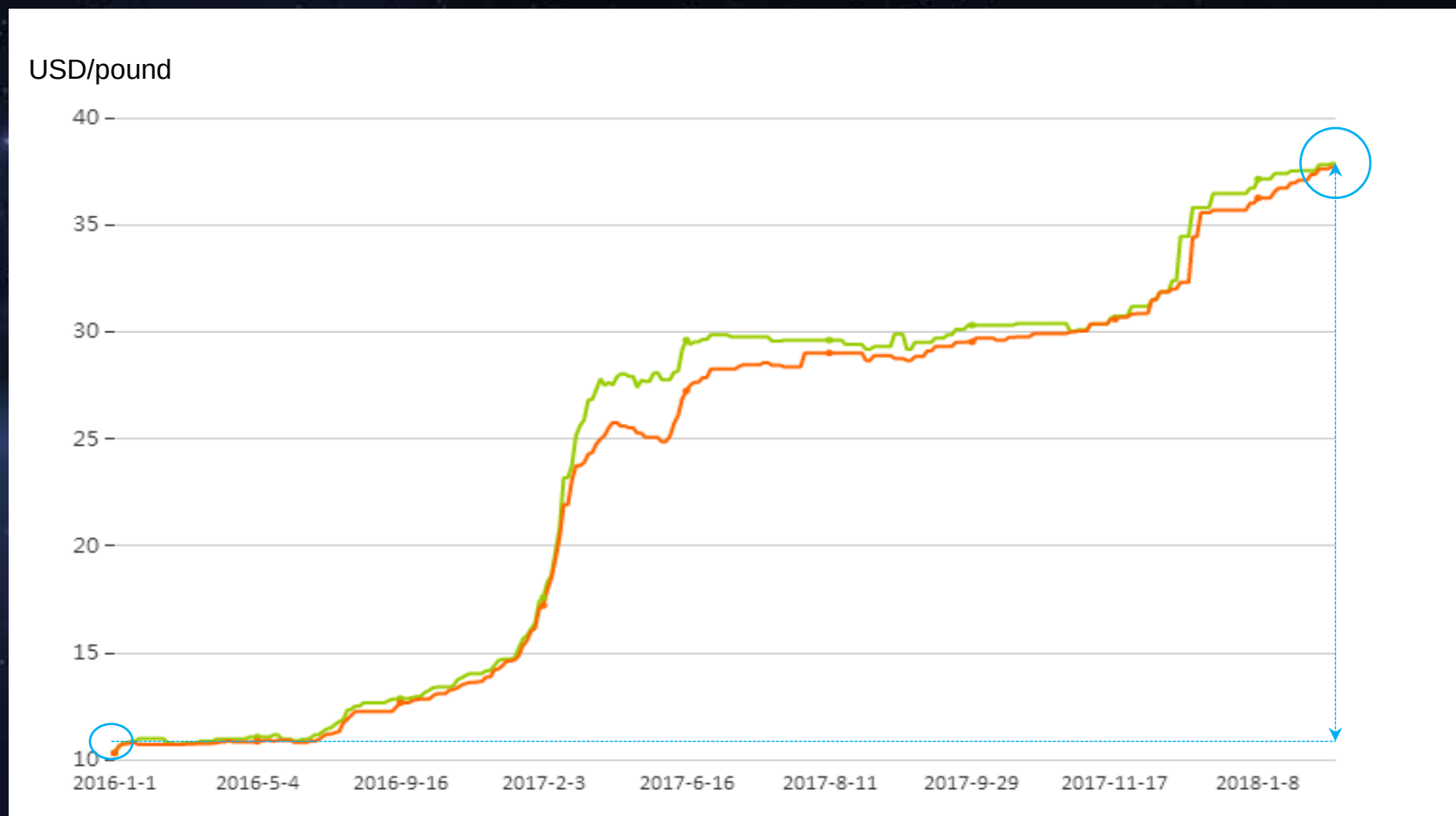
Cobalt would meet shortage sometime later



Source: Bloomberg New Energy Finance, press releases, Avicenne, USGS, IDTechEX, Wealthdaily

Note: CE refers to consumer electronics, E-bus refers to electric buses

Cobalt Price increased more than 3 times in one year



Cobalt $\geq 99.8\%$



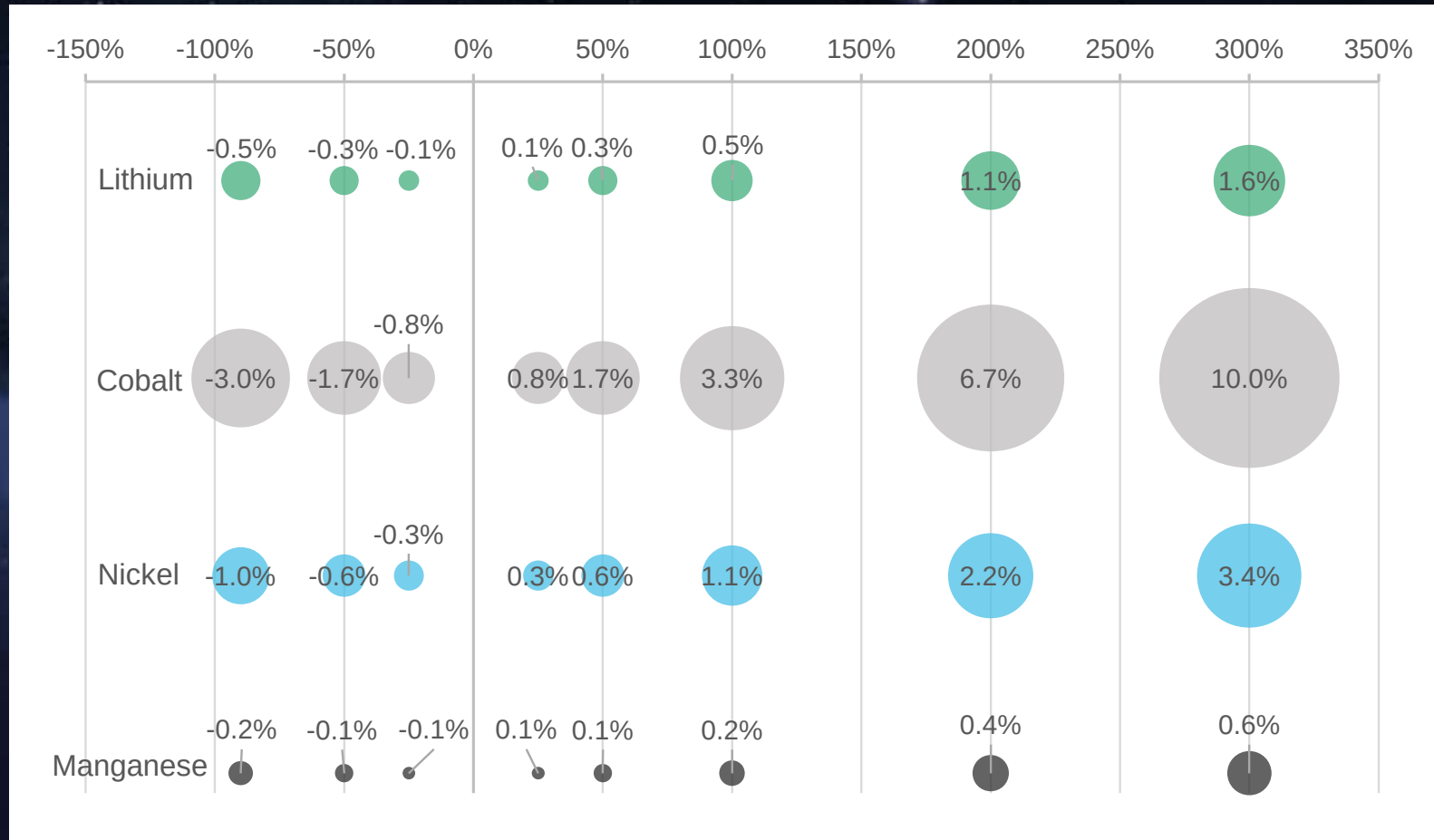
Cobalt $\geq 99.3\%$

Source: cbcie.com



Cobalt is the most fluctuations factor for NMC battery

Percentage change in commodity price (%)



Source: Bloomberg New Energy Finance. Note: NMC chemistry modelled here is NMC (111). NMC battery pack cost is \$223/kWh.



WHAT CAN

BYD

DO ?





BYD Strategy

**Technology
Upgrading
on NMC**

**Repurpose
&
Recycling**

**Strong Tech.
Backup-LFP**



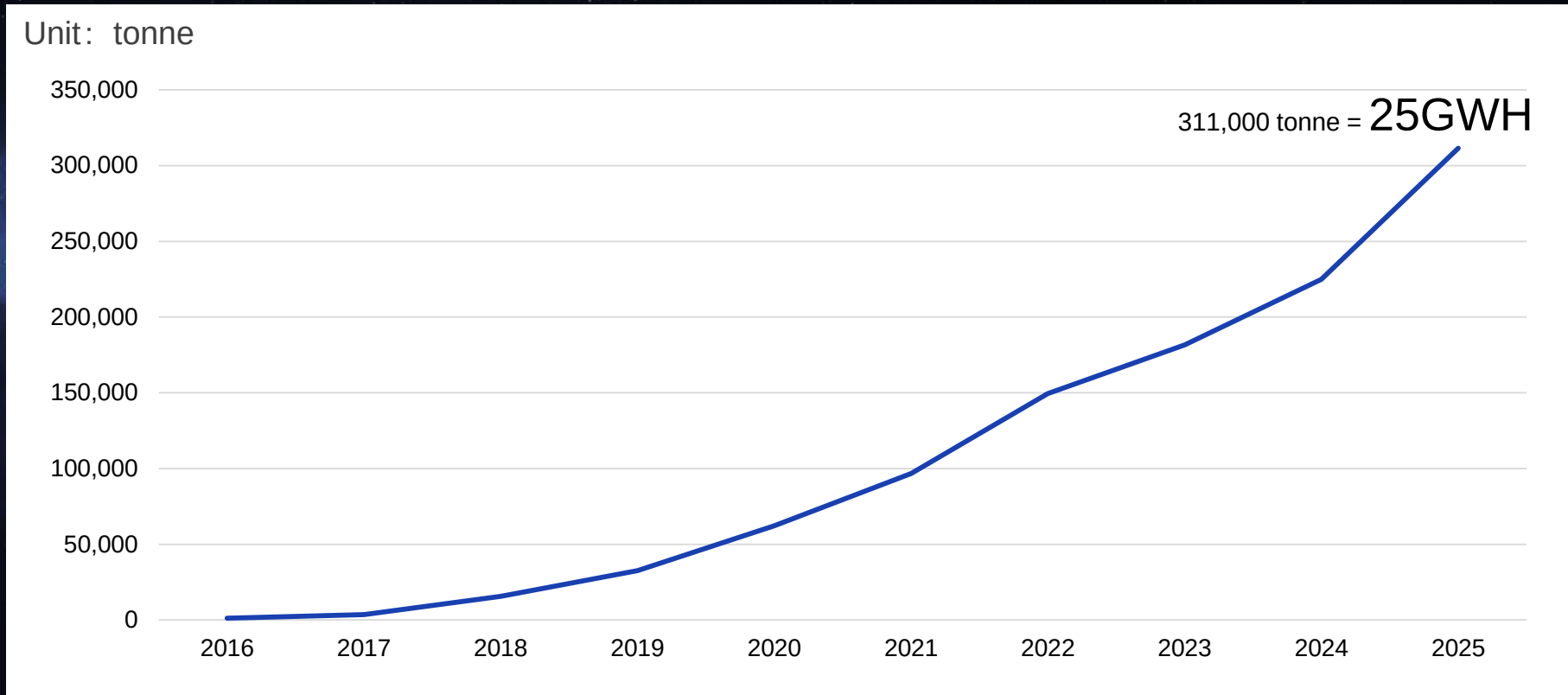


**Technology
Upgrading
on NMC**

**Repurpose
&
Recycling**

**Strong
Tech.
Backup-LFP**

Forecast mass of used batteries coming out of electric vehicles



Battery Data

Mass of a 24kWh battery pack	0.29 tonnes
Energy content of a tonne of batteries	83 kWh

• Notes: ONLY EV

• Source: Bloomberg New Energy Finance

Battery Repurpose & Recycling



Repurpose - Energy Storage (Utility Scale)



Baolong, Shenzhen

Capacity: 15MW/30MWH

Area: 1800 m²

Working Condition : 3 cycle/day 0.5C

Operating time : 1700+cycles

SOC range: 10%-100%

Changsha Plant

Capacity: 10MW/22.6MWH

Area: 2500 m²

Working Condition: 2 cycle/day 0.3C

Under Construction



Repurpose - Communication Base Station



Capacity: 48V/150Ah,
Load: 70A

Capacity: 48V/600Ah
Load: 60A





Repurpose - AGV

AGV (Automatic Guided Vehicle)

Capacity : 12V/150Ah ; 24V/150Ah



Raw Material Recycling

Battery disassembling take 3 steps

3.Regeneration

Graphite removing impurity, cladding, regeneration and activation
Lithium iron phosphate regeneration: lithium extraction, precursor preparation
NMC elements extraction and regeneration

2. Material Recycling

Graphite elution, copper foil recycling.
The positive material desorption, aluminum foil recycling

1.Disassembling

Battery disassembling automatically
Separation of battery components
Positive & negative plate drying & deodorization.

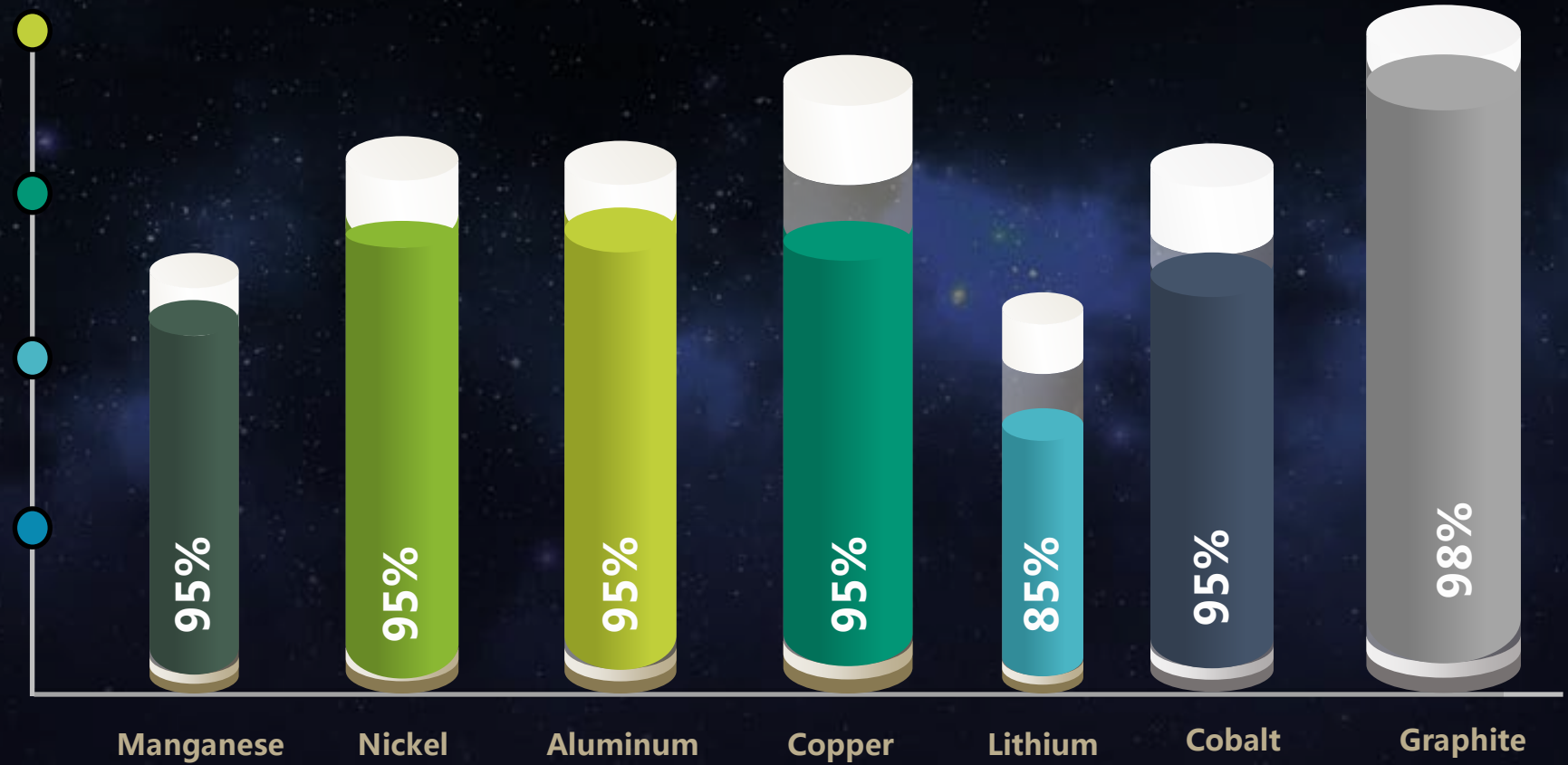
Raw Material Recycling



Table 3: Metal content of a 24kWh NMC battery

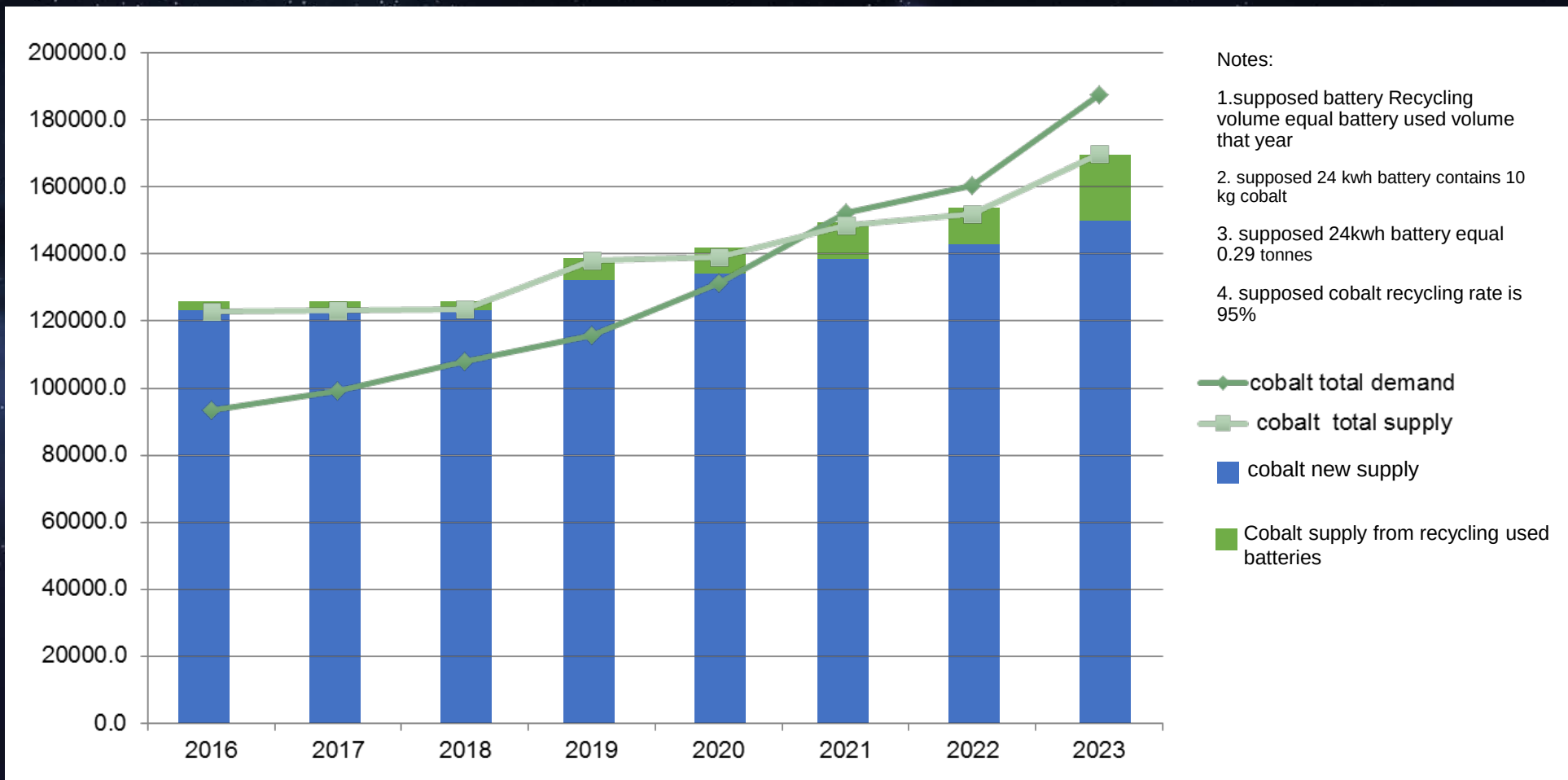
Metal	Kg per battery
copper	31
Auminium	21
Cobalt	10
Nickel	10
Manganese	9
Lithium	4

Source: Bloomberg New Energy Finance





Gap in the Future



**Technology
Upgrading
on NMC**

**Repurpose
&
Recycling**

**Strong
Tech.
Backup
-LFP**



Chinese Government Subsidy Policy

Item	2017 China national subsidy standards		2018 China national subsidy standards		Change	Remark
Recharge Mileage	$100 \leq R < 150$	20	/	/	Cancel subsidies	1. More detailed grading, from three Levels to five Levels. 2. The threshold of recharge mileage increased to 150 km.
	$150 \leq R < 250$	36	$150 \leq R < 200$	15	-58.3%	
			$200 \leq R < 250$	24	-33.3%	
	$R \geq 250$	44	$250 \leq R < 300$	34	-22.7%	
			$300 \leq R < 400$	45	2.2%	
			$R \geq 400$	50	13.6%	

Source: VehicleTrend



Driving Demand



80km /day *5 days=400 km is enough for daily driving
One Week Drive without Additional Charge
Zero Range Anxiety for 400KM



BYD EV Recharge Mileage



Environmentally-Friendly
Battery

140kph

400 km



Fire Safe

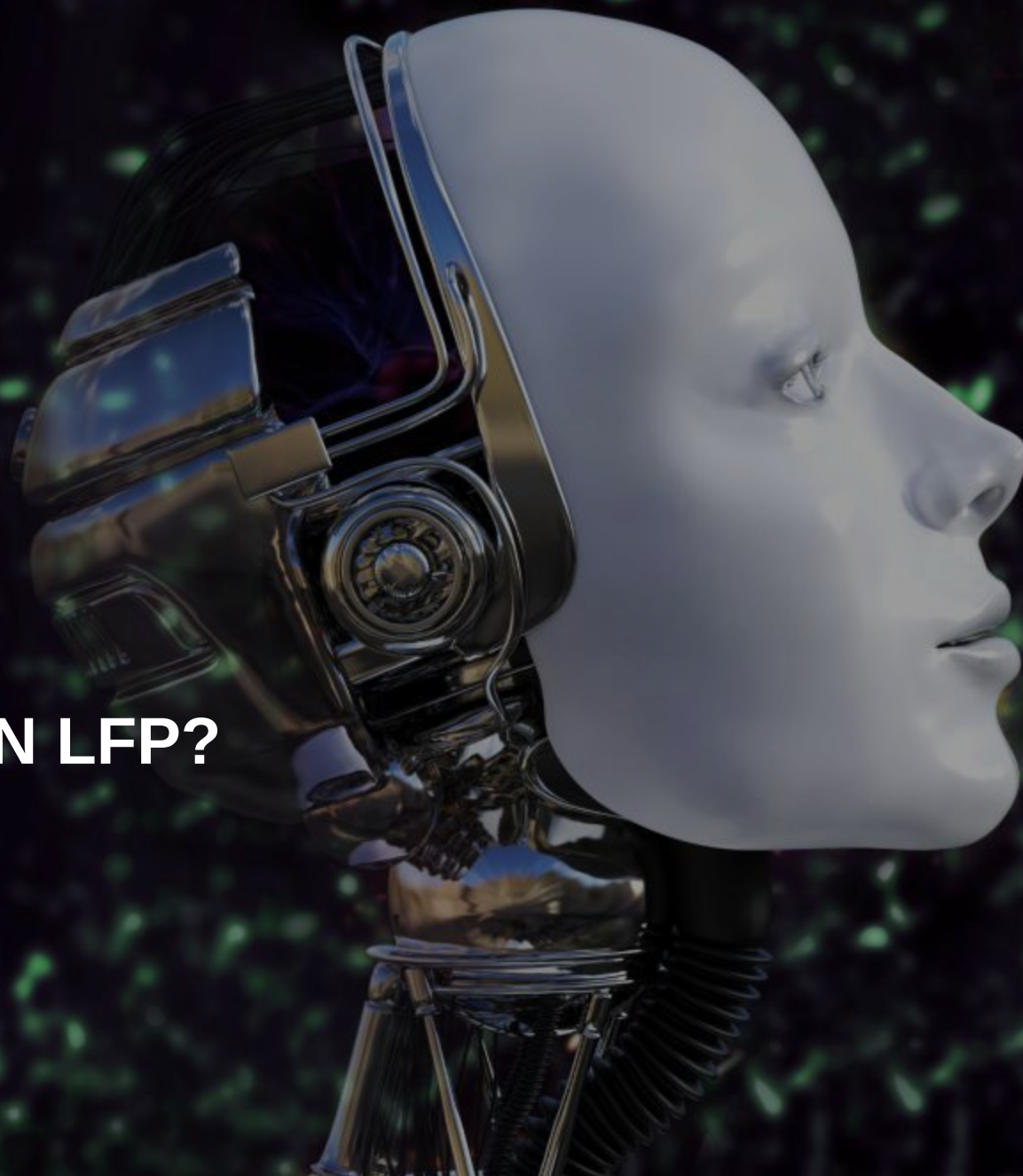




WHAT CAN

WE

DO MORE ON LFP?





BYD Commercial Vehicle







BYD Skyrail





BYD Energy Storage





THANK YOU