TRANSPORTASI JAKARTA

CONNECTING THE LIFE OF JAKARTA

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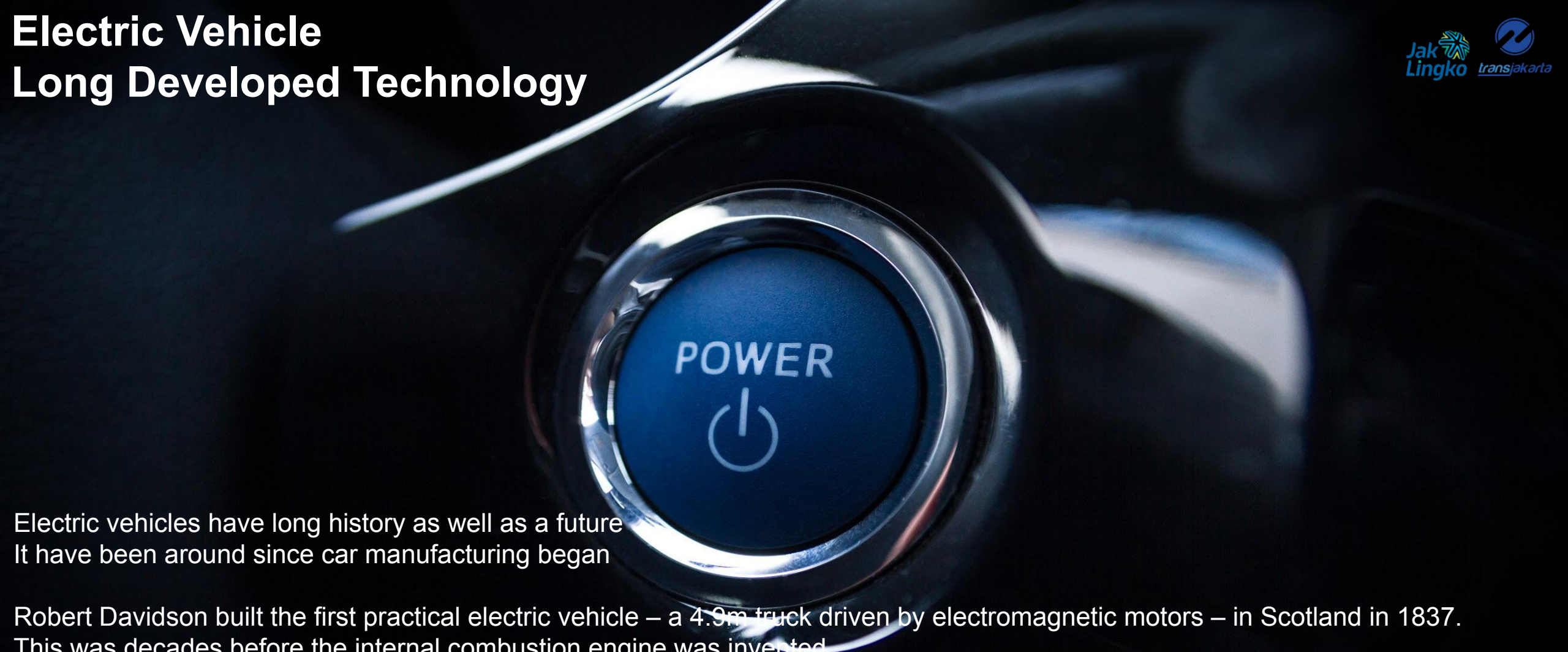
Electric Vehicle
Long Developed Technology



Electric vehicles have long history as well as a future
It have been around since car manufacturing began

Robert Davidson built the first practical electric vehicle – a 4.9m truck driven by electromagnetic motors – in Scotland in 1837.
This was decades before the internal combustion engine was invented.

As early as 1881, battery-operated buses operated in Paris.
They were soon adopted in other cities, including Berlin, London and New York.

Then, beginning in 1914, the Detroit Taxicab and Transfer Company built and ran a fleet of nearly 100 electric taxis

The Conversation, September 1, 2022

Battery Technology

The breakthrough came as early as the 1990s, when rechargeable lithium ion batteries emerged. Almost 20 years ago, Tesla was founded to take advantage of this technology and between 2008 and 2020, the price of battery packs dropped 80%

Batteries have improved dramatically since then, with new architectures and chemistries increasing driving range from only 4 miles around the time Edison spoke, to 70 miles for General Motors Co.’s 137-horsepower EV1 in the 1990s, to 375 miles for an 825-horsepower Tesla Model S today. Scientists and manufacturers promise similarly dramatic improvements with the next generation of batteries that will power vehicles even farther, charge faster, last longer, and require fewer rare or toxic materials such as cobalt, lithium, and nickel. And they’ll be cheap enough for use even in budget models.

Although the challenges are significant, industry leaders are confident they can go beyond today’s lithium-ion technology with new materials such as silicon or lithium-metal anodes and solid electrolytes

Performance metrics

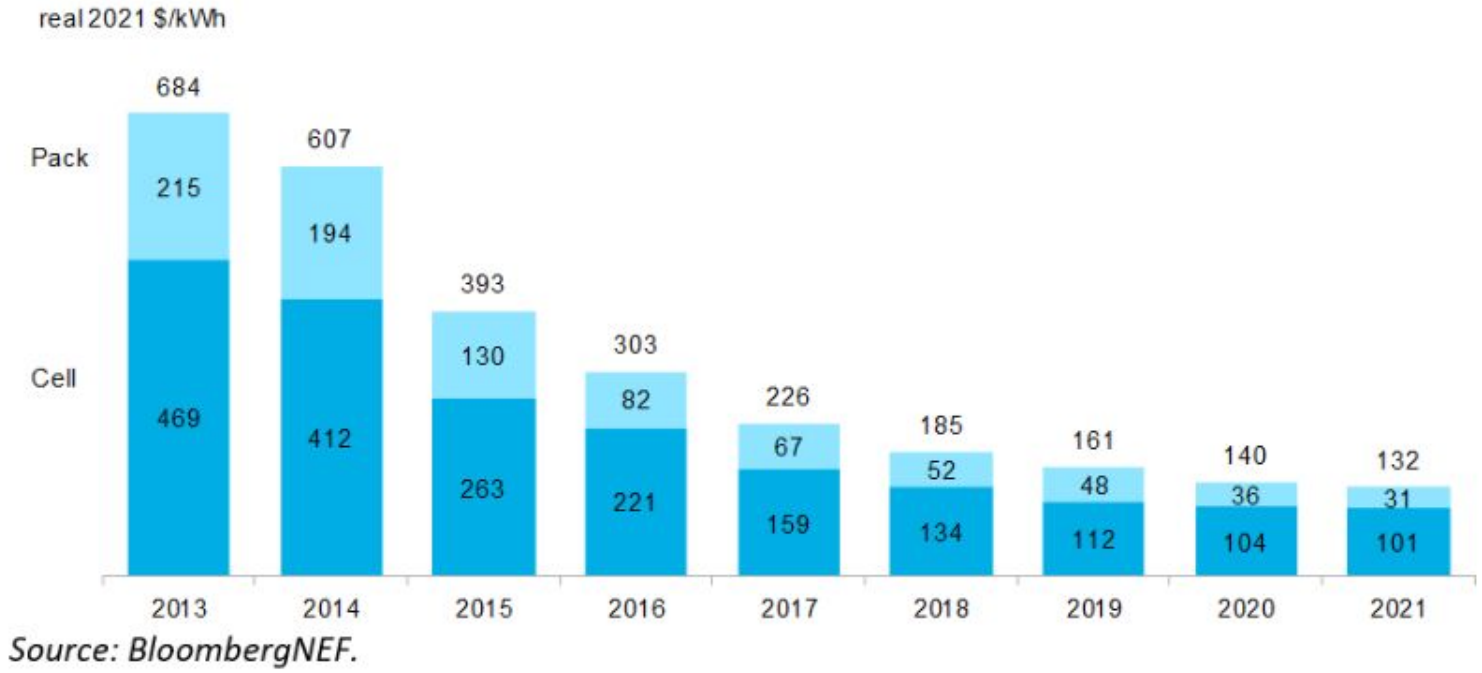
- Energy density
  It’s important for manufacturers to show how density holds up after hundreds of charges and whether those charges were fast or slow.
- Performance at temperature extremes
- Safety

Battery Price

Reducing battery pack prices to $ 100/kWh is now an achievable goal with the emerging generation of battery chemistries and cell designs

Bloomberg 2021 lithium-ion battery price survey show that LFP packs had the lowest volume-weighted average prices of just under $100/kWh

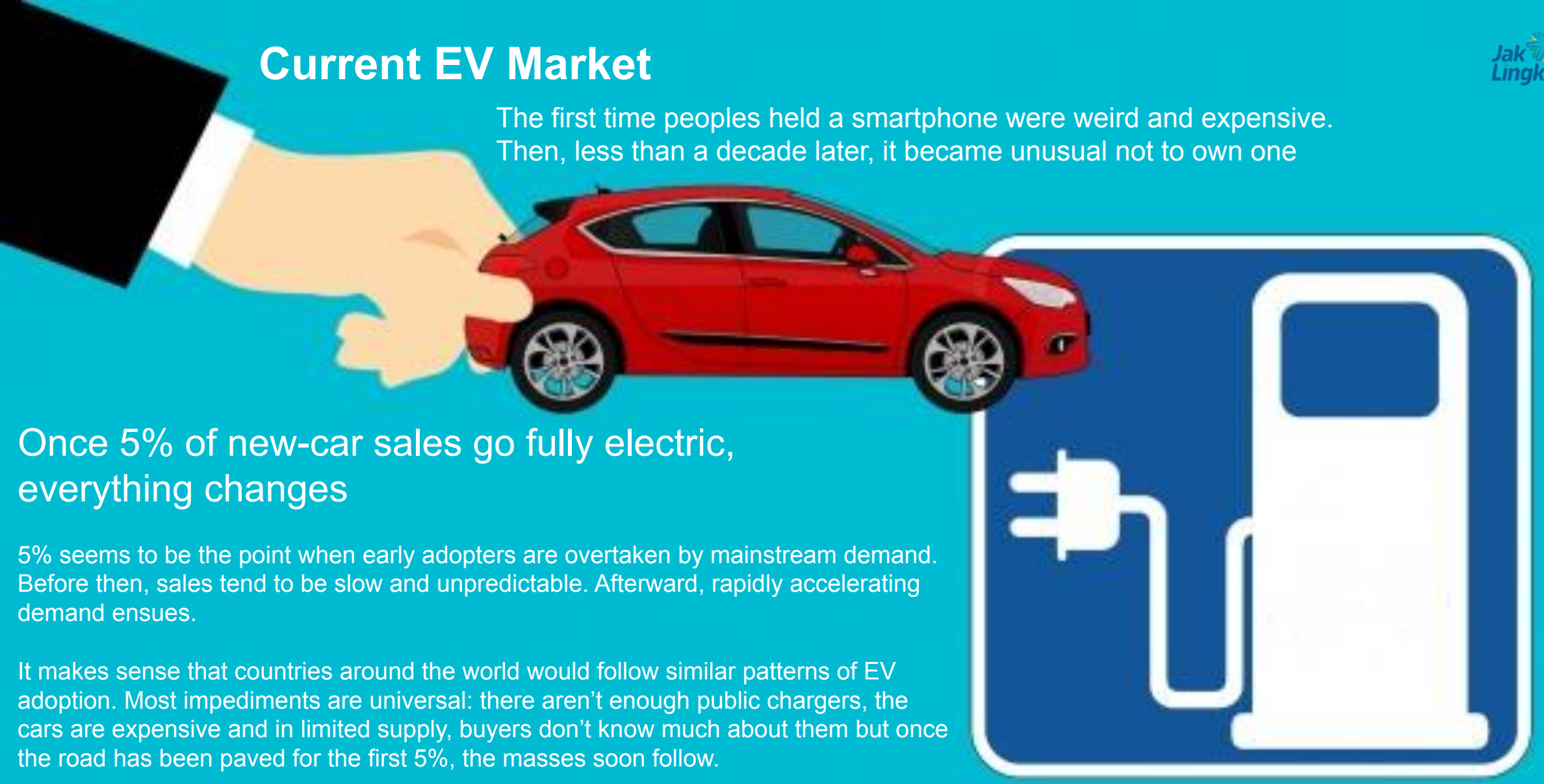
The introduction of new-nickel, high-energy density cathode material, like NMC, alongside new manufacturing processes and techniques, should make pack price of less than $100/kWh possible for performance-based battery packs in the next few years.



Source: BloombergNEF.

Current EV Market

The first time peoples held a smartphone were weird and expensive.
Then, less than a decade later, it became unusual not to own one



Once 5% of new-car sales go fully electric, everything changes

5% seems to be the point when early adopters are overtaken by mainstream demand. Before then, sales tend to be slow and unpredictable. Afterward, rapidly accelerating demand ensues.

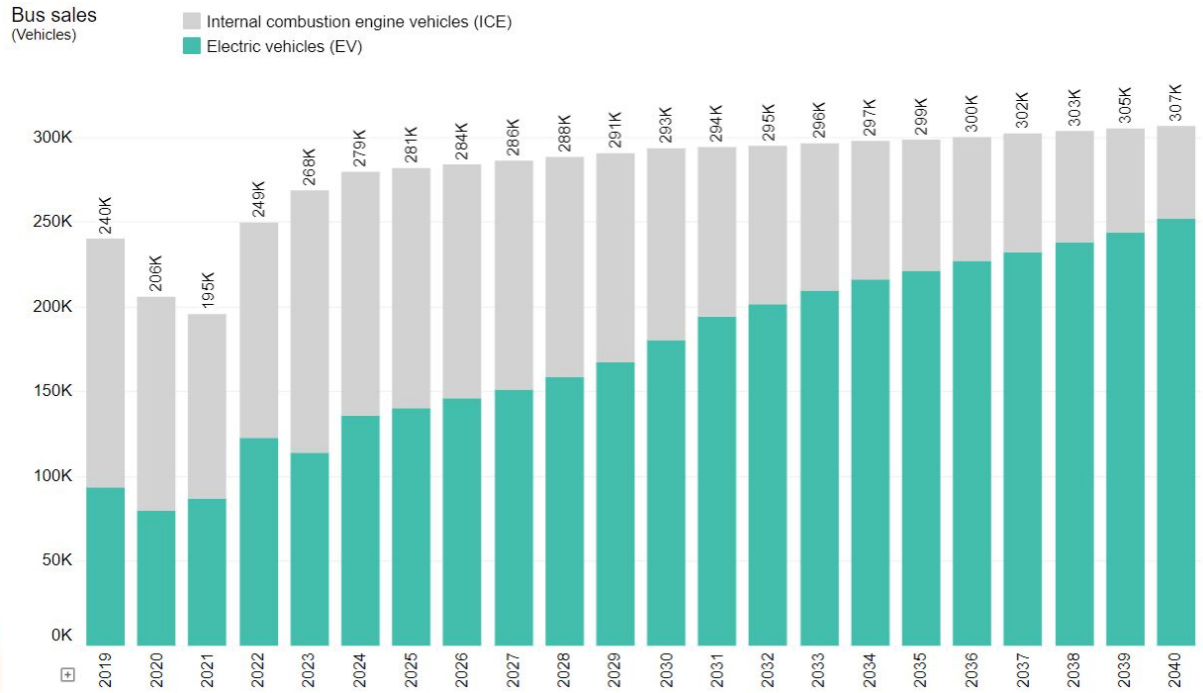
It makes sense that countries around the world would follow similar patterns of EV adoption. Most impediments are universal: there aren't enough public chargers, the cars are expensive and in limited supply, buyers don't know much about them but once the road has been paved for the first 5%, the masses soon follow.

Thus the adoption curve followed by South Korea starting in 2021 ends up looking a lot like the one taken by China in 2018.
The next major car markets approaching the tipping point this year include Canada, Australia, and Spain.

Bloomberg, July 13, 2022

Current EV Market

China has 685,000 electric buses on the road and 195 million electric two-wheelers; 17% of light commercial vehicles sales in South Korea were electric in 2021, and almost 40% of India's three-wheeler fleet is already electric.



The market for medium- and heavy-duty trucks is also starting to move, with close to 10,000 units sold in 2021. That is set to continue, as some of the largest global truck makers are targeting between 35% and 60% of their annual sales to be zero-emission, and primarily all-electric, by 2030

Bloomberg, June 01, 2022

Government DKI Commitment

Gov. Jakarta Regulation 90/2021

Establish net zero emissions by 2050

BRT Services

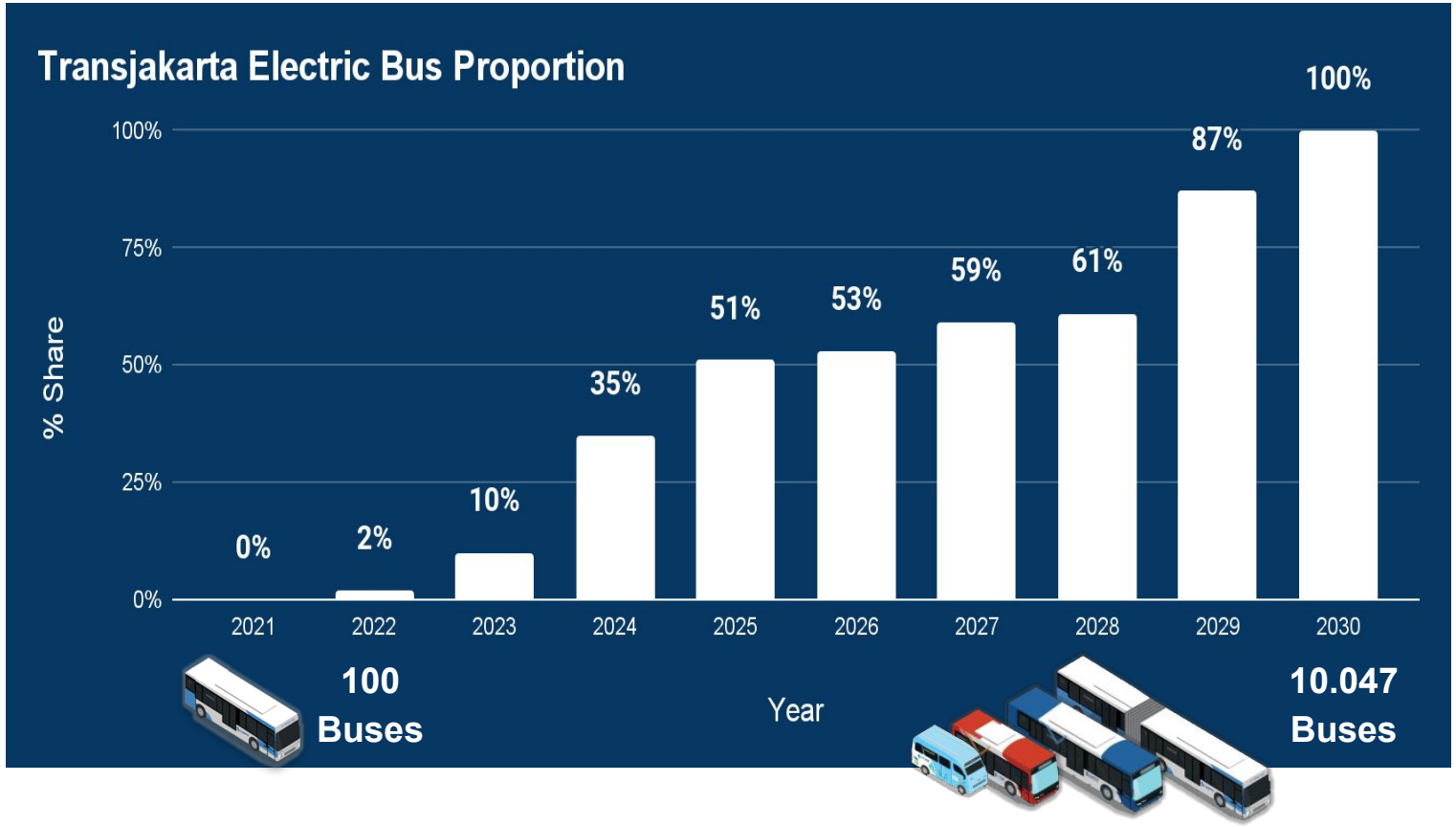
100% Electric Bus by 2030

C40 Commitment

- **Procuring zero-emission buses only from 2025 onward**
- **Ensuring the most areas of Jakarta City are emission-free by 2030**

Commitment of Electrification

Electrification Roadmap



2022 - 2023

Low Entry Buses

- Electrification Bus Low-Entry 12-meter
- On-depot charging station (overnight charging)

Medium Low-Entry Buses

- Electrification medium of 8-meter
- On-depot and on-Terminal charging station

2023 - 2025

High-Floor BRT Buses

- Electrification High-Floor BRT 12-meter per corridor
- On-depot and on-Terminal charging station

Mikrotrans

- Electrification microbuses of 5 meter
- On-depot charging station

2025 - 2030

Retrofitting Existing Buses

- Retrofitting plan for existing diesel/CNG Transjakarta buses

Commitment of Electrification

First Electric Bus Operation in 2022

A part of 100-buses purchase plan in 2022 with 30 buses already procured and operated

BUS

30 low-entry buses
with 324-kWh battery

CHARGING

10 overnight fast chargers
with 200 kW of power each

Operation

Full operation on **June 7, 2022**

196 km of daily mileage for non-BRT routes:

- 1P : Bundaran Senayan - Terminal Senen
- 1N : Blok M - Tanah Abang
- 6D : Stasiun Tebet - Karet via Underpass

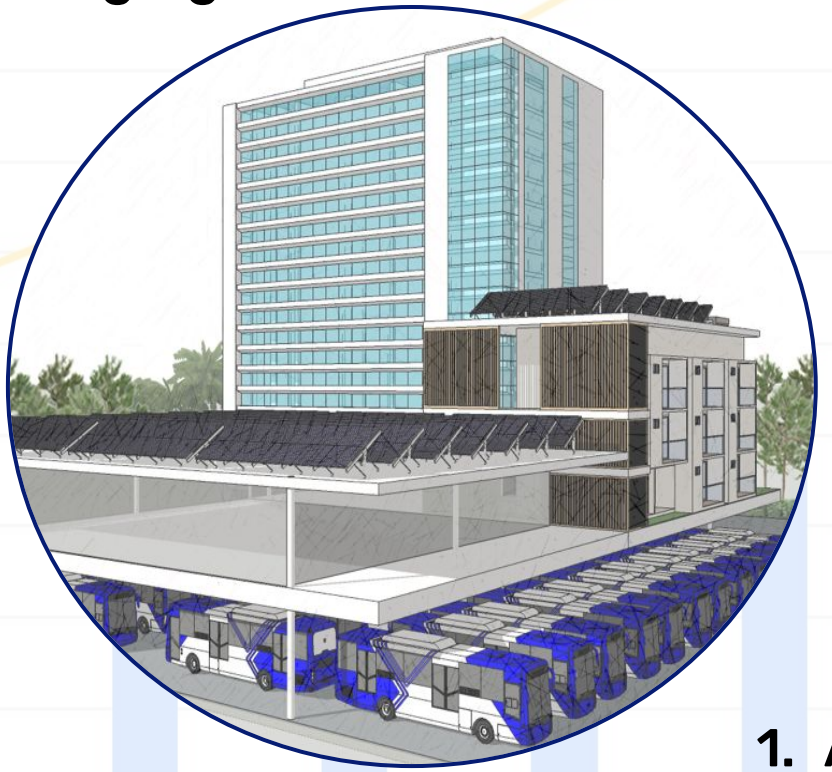
Commitment of Electrification

Creative Financing

Bus Procurement

1. Asset owning
2. Lease (Mobility as A Service)

Charging Station



1. Asset owning
2. Pay as A Service (Rp/kWh)
3. Pay as A Service + Property Management

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