



# Cleantech Forum **Asia**

**Singapore** | November 13-14, 2018



Cleantech Forum **Asia** | Singapore

# PART 1

Next Generation Mobility:  
Smarter, Increasingly Electrified  
and Ever More Connected



# Cleantech Forum **Asia** | Singapore

## PART 1 Next Generation Mobility



**MODERATOR:  
LEO ZHANG,**  
Research  
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Head Of PSA  
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**OLIVIA OO**  
Director, Strategic  
Development,  
SP Group



Cleantech Forum **Asia** | Singapore

## PART 2

Next Generation Mobility:  
Smarter, Increasingly Electrified  
and Ever More Connected



# Cleantech Forum **Asia** | Singapore

## PART 2 Next Generation Mobility



**PIYUSH GUPTA**  
CEO, Lithion Power



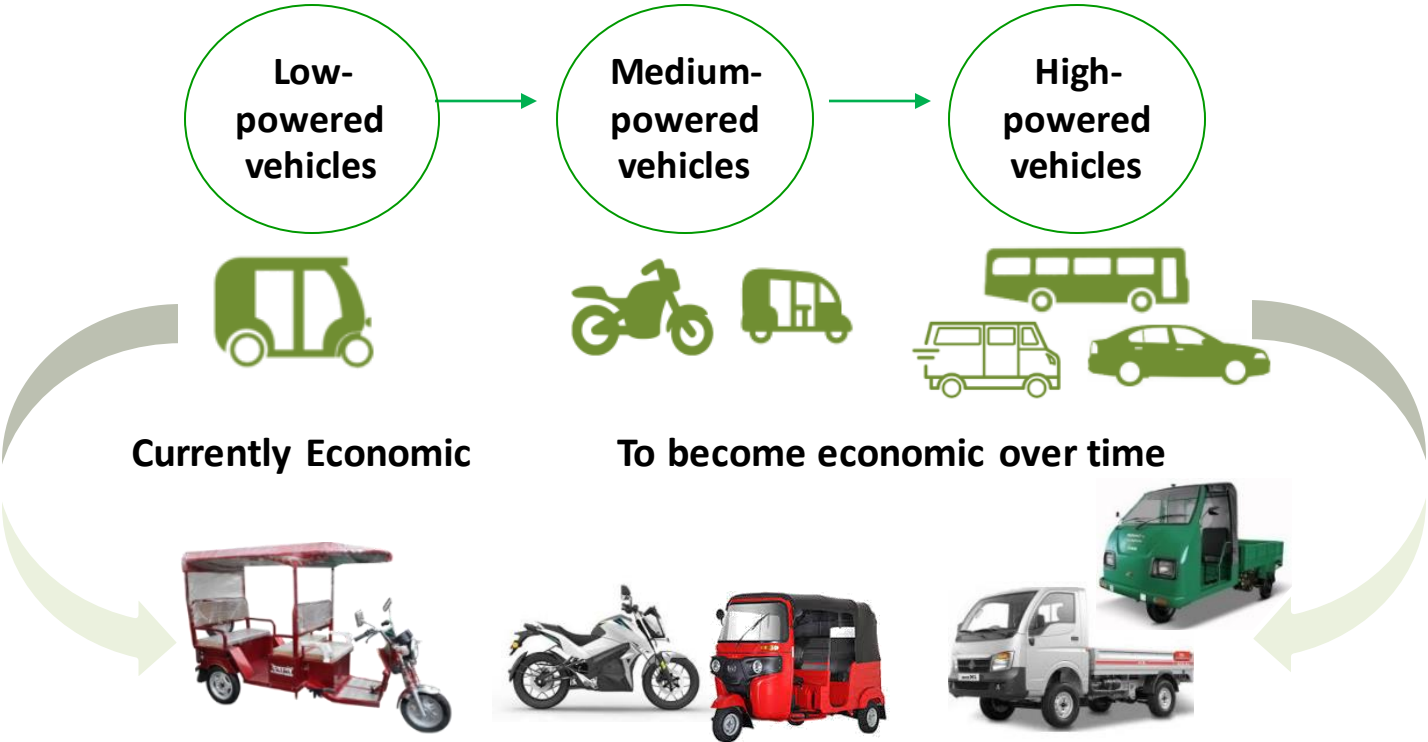
**Charging India**

India's First "**Battery as a Service**" Provider

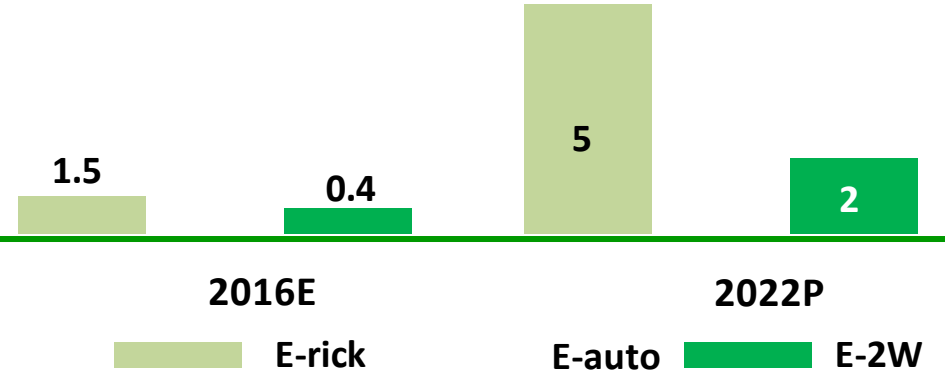
**Enabling the transition to "Electric Mobility" in India**

[piyush@lithionpower.com](mailto:piyush@lithionpower.com)

## Low Medium Power (LMP) vehicles to lead EV adoption in India



## Projected growth in LMP EVs in India (In millions)



### Key Considerations

- Lower cost for EVs
- Personal vs Pubic mobility
- Charging vs Swap possibility

Source: National Institute of Urban Affairs, Telegraph India, Economic Times, The Hindu, Frost & Sullivan, and Lithion Power estimates, NITI Aayog

Last-mile connectivity and Economics of the LMP vehicles is attracting a host of EV makers



# Lithium-ion batteries are dominant way to store energy



## Supersedes on all key Performance Parameters

Energy density	Very low (X)	High (4X)
Storage Efficiency	~70%	>95%
Cycle life	~300	~2000
Cost	Low (X)	High (3X)



## Costs are on the decline globally



Lithion Ion batteries are world leader in energy storage  
Newer technologies are still in evaluation stage

Cost has been decreasing due to Technology improvements, Economics of scale and Fierce competition between major battery manufacturers

Source: Bloomberg New Energy Finance, June 2017, Lithion Power Analysis. Notes: 1. Includes cells plus pack prices - pack enclosure, module housings, wiring, circuitry & plumbing adds to 20-40% of the cost of cells themselves

Capacity to make Lithium Ion batteries is increasing manifold bringing cost further down



# Battery swap trumps charging stations in emerging markets



Changing storage medium



Plug in chargers

Battery swap leads to faster vehicle turnaround

**Lithion Power supplies fuel (Energy!) to low-to-medium power Electric Vehicles using Battery Swap  
We are an on-demand provider for Li-Ion batteries (Think Uber!)**



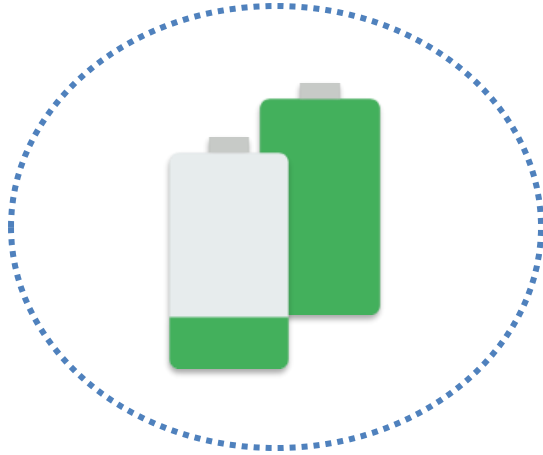
***At the heart of it – we are an IoT, AI & big-data powered platform,  
enabling energy supply & battery leasing for EVs***

- Commercially live in Delhi NCR for 7 months for e-rickshaws
- Market leadership on swapping model with 200 swapping stations by Mar'19
- More than 10 Patent pending Technologies.
- Partnership with NBFC for offering innovative battery financing for drivers
- Reliable supply chain partners for Li-ion batteries
- This month our first driver completed 25,000 km in 9 months!

# Product description

**LITHION**

Swappable  
battery pack-  
smaller,  
lighter, safer &  
lasts longer



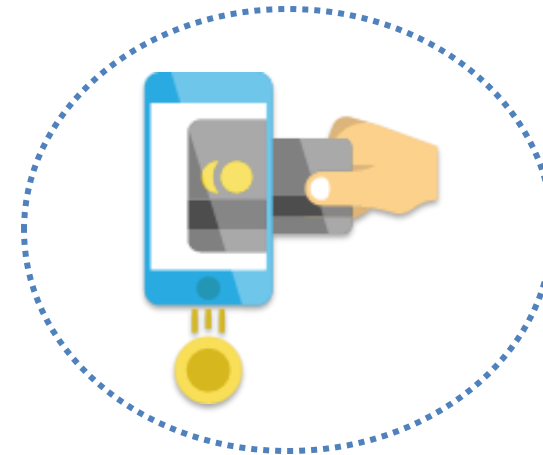
IoT enabled  
smart battery-  
secure,  
intelligent and  
convenient



User-friendly  
mobile app to  
track battery  
parameters  
live in real-  
time on map



Digital  
payment  
mechanism  
(pay-per-use  
model)





**1. Customers win with our system**



**2. Two-sided swap platform**



**3. Technology at heart of ecosystem**

Name	Function	Experience
Piyush Gupta	Chief Executive Officer	40 years, B.Tech (IIT Kharagpur), MBA (INSEAD)
Manish Chhajed	Chief Finance Officer	41 years, Ex Temasek, MBA (IIM Ahmedabad)
Chandrashekhar Bhide	Chief Product Officer	41 years, B.Tech (IIT Bombay), MBA (IIM Ahmedabad)
Priya Krishnamachari	Head of Business Development	40 years, MBA (INSEAD)



We are raising Series-A!

---





**Charging India**

**Electrifying every journey on roads!**

**Thank you!**

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# Cleantech Forum **Asia** | Singapore

## PART 2 Next Generation Mobility



**CRAIG KNIGHT**

Co-Founder and Director, Horizon Fuel Cell Technologies



## Introduction to Horizon Fuel Cell and relevance to Advanced Mobility

Cleantech Forum Asia

November 2018



Craig Knight  
Co-Founder





## Why Hydrogen Anyway?

### ○ Clean Energy

- Very high energy density, but zero carbon
- The cleanest possible source of energy
- Eliminate diesel generators in some applications
- Reduce reliance on batteries containing heavy and exotic metals
- Hydrogen aids the shift to clean, electric vehicles for transportation and material handling applications

### ○ Fuel Cell technologies are Maturing

- Various Fuel Cell applications validated in recent years
- Hydrogen solutions becoming more attractive
- Fuel Cells finally moving into mass production







## Why Fuel Cells in Mobility?



*Safe* - *Clean* - *Efficient*

### ○ **Material Handling – Electric Forklifts**

- Electric forklifts have been around for decades
- Highly mature electrical systems still have limitations
- These are illustrative “electric vehicle fleets”

### ○ **Benefits Captured moving to Fuel Cells**

- Improved efficiency and enhanced safety of shift-change, through elimination of battery charging requirements
- Better performance from equipment; no voltage drop over shift
- Lower total cost, obtained through savings in electricity tariffs and demand charges for battery charging
- Increase in profit-generating warehouse space, through elimination of battery charging and storage stations
- Decarbonization and a cleaner, safer working environment



## Company Introduction

### ○ A Patient Approach Toward Massive Markets

- Horizon focused initially on small fuel cells and systems, accumulating IP and experience
- Now is the time to penetrate very large markets in automotive, material handling, stationary power generation
- Many component technologies have been validated along the way, lowering risks involved

### ○ World Class Fuel Cell Technology Platform

- Horizon has established a broad technology base, not only PEM fuel cells, but much component and material IP
- Horizon is currently the largest volume manufacturer of air-cooled fuel cells
- Rapidly developing our liquid-cooled fuel cell platform for higher-power applications
- Horizon starting to establish “verticals” in specific applications / markets: Automotive Stacks, Material Handling

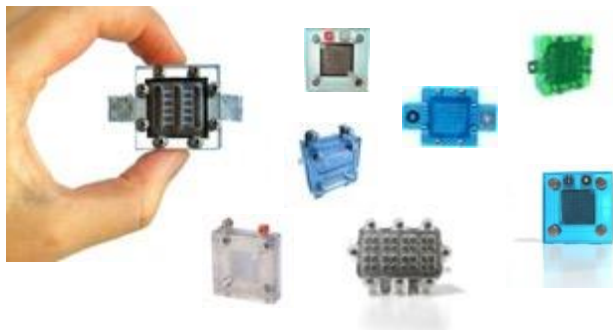
Think Big ..

Start Small ..





## Horizon Product Range



- OEM and Educational uses
- Reversible PEMFC
- Small Electrolyzer
- Thin-film PEMFCs

### <20W “micro-fuel cells”

- Already sold over 1 million units
- Educational products, Toys
- Horizon is educating the world on Hydrogen



- Air-cooled / Liquid Cooled
- Compact size / weight
- Minimal peripherals
- Competitive cost
- Modules up to 100kW being tested for stationary / microgrid

### 100W-100kW “Industrial PEMFC”

- Widest range of “off-the-shelf” products
- Stacks integrated with Methanol reformers
- Liquid Cooled System for high power output
- Easily configured for MW-scale microgrids



- 30 and 40kW modules validated for vehicles in China
- Focus on China market initially
- Liquid Cooled stacks deliver excellent scalability

### Automotive Liquid-Cooled PEM FC

- Excellent Power Density (patented plate technology)
- Highly suitable for automotive and material handling
- Easily configured for MW-scale microgrids





## Fuel Cells Come of Age

- **Very Large Markets being Validated Now**
- Some of us have been “long-suffering” in Fuel Cell technology
- The Chinese government has been very proactive in pushing towards electrification of vehicles, and there is an understanding that fleet vehicles are better suited to “Fuel Cell Electric” design, increasing drive time and eliminating charging “down-time”
- Many bus and delivery truck trials are underway now



- Stationary power generation is taking off in South Korea, facilitated by Government Incentives



## High-Powered Plans

### ○ Growth Plans in Liquid-Cooled Fuel Cells

- Horizon encouraged by Jiangsu Govt to set up new production facility in Rugao, an aspiring Hydrogen City
- Phase I investment USD 30M, total investment USD 150M+
- Production capacity 30MW of PEM Fuel Cells



### ○ A New Era in Fuel Cells

- Horizon Rugao is a highly automated facility, one of few such facilities anywhere
- The latest innovations in high-power stacks increase power density and make more Mobility applications attractive for Fuel Cell Electric Vehicle designs





HORIZON FUEL CELL TECHNOLOGIES



**Let's work together for Clean Power  
and Zero Emission Mobility**

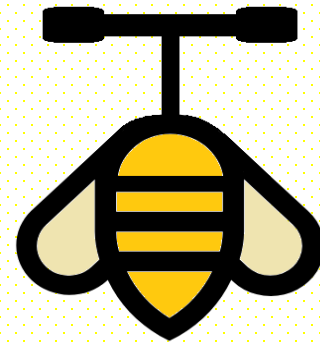


# Cleantech Forum **Asia** | Singapore

## PART 2 Next Generation Mobility



**JASMINE SAINI**  
Operations Manager, Scootbee



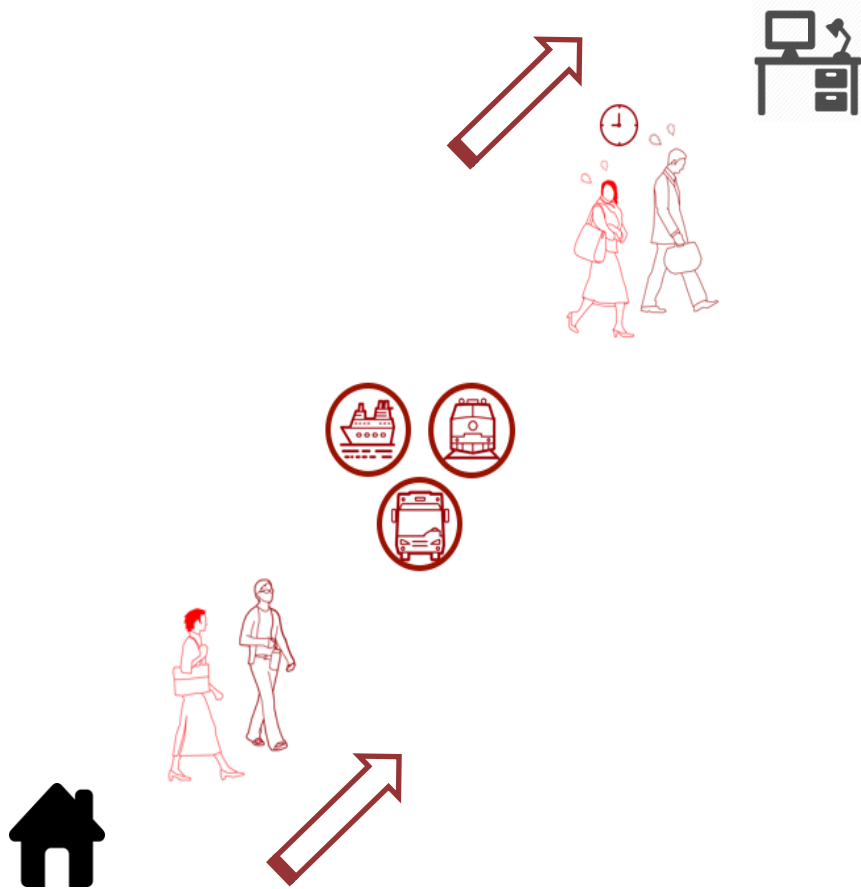
# SCOOTBEE

## Redefining Mobility

Cleantech Forum  
13 Oct 2018

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# FIRST MILE LAST MILE TRAVEL SOLUTIONS



Grab

UBER



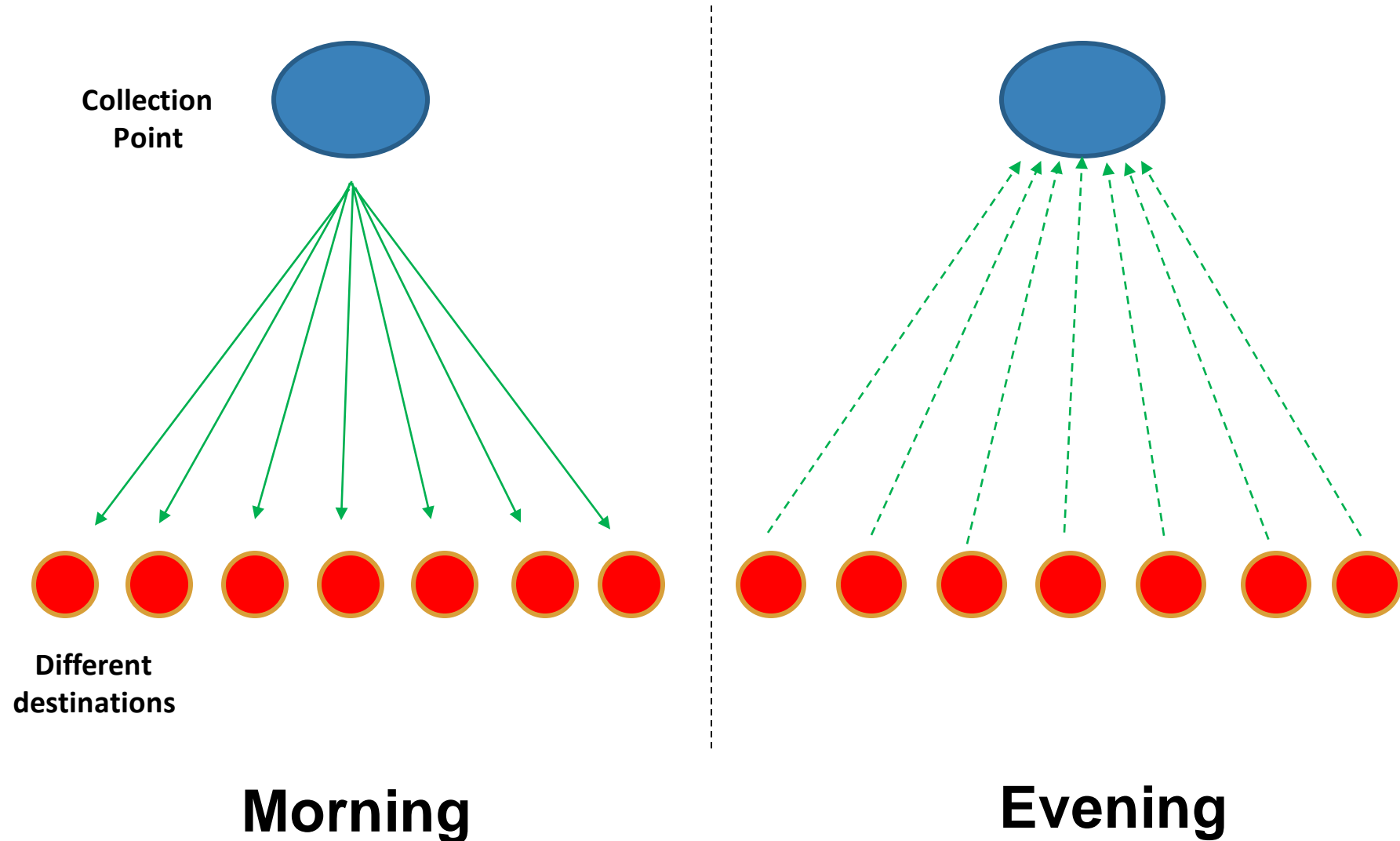


# Challenge 1: Manual redistribution





## Challenge 2: One-sided trip structure



## Challenge 3: Low usage efficiency

# New bike-sharing system gets rolling

oBike users, who pay \$1 for 30 minutes, do not have to return bike at fixed stations

Danson Cheong

Without any fanfare, a new bicycle-sharing scheme has hit the road in the northern and western parts of Singapore.

The white, single-gear oBikes, which come with a bell and reflectors, are available for hire at MRT stations such as Buona Vista, Jurong East, Bukit Batok, Woodlands and Sembawang, among others.

Each can be rented through a mobile app at a cost of \$1 for 30 minutes. A user scans a QR code on a bike with his phone, which automatically unlocks the machine.

It can then be ridden and parked at a bicycle parking bay near the user's destination. Charges stop once the bike is locked.

Payment is done via credit card.

oBike, a Chinese company, has broken away from other players making moves into the local market. They include Ofo and Mobike, which operate in major Chinese cities including Beijing and Shanghai.

It is not known how many oBikes there are in Singapore but The Straits Times found more than a dozen each at Buona Vista and Jurong East yesterday. A road test of the system found it easy to use.

The company did not respond to

### HOW IT WORKS



ST PHOTOS: LAU TOOK KONG

1 Users can search for and reserve an available bike using oBike's mobile app (available on both Google Play and iOS app store). They can then unlock the bike by scanning a QR code with their phone.



2 Users are charged \$1 for every half hour of use. Payment is made with their credit card.

3 Bikes can be parked in any public bicycle park. Rental is ended by manually locking the bike (above).



requests for comment.

Company records for that two of the company's directors are from Shanghai. The address is a corporate firm which is helping with the company's presence here. A staff member at the corporate services firm told The Straits Times that oBike's operations are currently in the trial phase.

The new scheme is a concerted shift towards

In an interview with *Mashable*, its co-founder Yu Xin, and VP of Ofo's U.S. unit, Grace Lin, revealed that the company is dealing with users mistreating its bikes in China by flooding cities with shared bikes.

The idea is to have users realise that the bikes are a common commodity, and that they don't need to hog them because the next one is readily available, said Lin.

ST PHOTO: LAU TOOK KONG

**100,000 shared bicycles**  
by 6 operators

Each shared bicycle used for only  
**0.62 – 1.64 trips per day**

On average a bicycle is used for  
**only half an hour a day**

LIM, A. (2018). Shared bicycles used just half an hour a day, Singapore-MIT study finds. [online] The Straits Times. Available at: <http://www.straitstimes.com/singapore/transport/shared-bicycles-used-just-half-an-hour-a-day-singapore-mit-study-finds> [Accessed 2 Apr. 2018].



# Challenge 4: Dumping



East Coast Fongshan Town Council placed removal notices on bike-share bicycles calling for the immediate removal of the rental two-wheelers and threatening confiscation. ST PHOTO: KEVIN LIM

## Bike-sharing firms face parking woes

Their bikes not allowed at public racks in one estate; elsewhere, they are seen blocking way

Zhaki Abdullah

As bike-sharing takes off here, one town council has taken issue with commercial bicycles parked at its public racks.

The East Coast Fongshan Town Council has placed removal notices on bike-share bicycles belonging to local firm olike and others parked at racks around the Bedok Town Centre. The notices say the racks are not to be used for "rental

business" and that the bikes are to be removed immediately or risk confiscation.

The Straits Times found 12 bicycles belonging to the three bike-share firms operating here olike, Mobike and ofo at racks near the Bedok Interchange Hawker Centre on Tuesday. Two of the bikes had removal notices on them. Another notice was found in the basket of another private bike.

In response to queries, the town council said it had been "monitor-

ing the situation" since Thursday last week.

"These bicycle parking racks are constructed to prevent indiscriminate parking of bicycles at our common areas and are not for commercial activity," said a spokesman, adding that olike had not informed it of plans to use the space.

She said that it had contacted olike to remove the bicycles but had not yet received a response.

ST understands that Mobike and ofo were not contacted by the East Coast Fongshan Town Council.

The Sembawang Town Council also said it had received feedback from residents about shared bicycles obstructing "important access points" such as dry risers, adding that it had contacted the bike-share

## Shared bikes grind Shanghai's gears

SHANGHAI • Shanghai has impounded thousands of brightly coloured bikes placed on city streets by bicycle-sharing companies, in the latest sign of impatience with an explosion of the haphazardly parked two-wheelers.

The bike-sharing sector has become one of the fastest-growing industries in the country, with users typically renting the bicycles for short periods by first unlocking them through the use of mobile phone apps.

Costs can be as low as one yuan (20 Singapore cents) per hour and the bikes can be left anywhere for the next user to come along.

While hailed as a way to fight road traffic and pollution, the phenomenon has become viewed as a nuisance in some communities.

The bicycles are often left behind by the users in non-designated parking areas such as pavements and even freeways.

Row upon row of mostly orange and silver bikes from the company Mobike sat collecting dust in a massive carpark in Shanghai's Huangpu district, near the city's famed riverfront Bund area. They had been rounded up by a private company hired by the government to oversee bicycle parking.

The bikes began to accumulate over the past month, said a woman whose balcony overlooks the crowded storage area.

A Huangpu district government spokesman said shared bikes are not exempt from parking rules.

"Any vehicles that violate parking



Impounded bicycles from service providers Mobike and ofo spotted in Shanghai last Wednesday. While hailed as a way to tackle traffic jams and pollution, bike sharing has become viewed as a nuisance in some communities, with the two-wheelers often left behind by users outside designated parking areas such as pavements and even freeways. PHOTO: AGENCE FRANCE PRESSE

regulations will be impounded. It's the same for everyone," she added. Mobike said it is in touch with the authorities and seeking to clarify what it called a "misunderstanding" by the company hired to round up the bikes.

The bike-share concept has at-

tracted huge amounts of venture capital investment for key players Mobike and ofo, which have funnelled that money into placing hundreds of thousands of bikes in dozens of Chinese cities.

ofo alone has brokered more than 300 million rides. It has more

than 20 million users with operations in nearly 40 cities in China, the United States, Singapore and Britain.

China's state-run Xinhua news agency said last Thursday that, over the past two years, more than 29 service providers have sprung up, plac-

ing more than three million bikes on streets around the country.

They may have to factor irate communities into business costs.

A community in Beijing called Mentougou impounded hundreds of shared bikes that were parked helter-skelter last month.

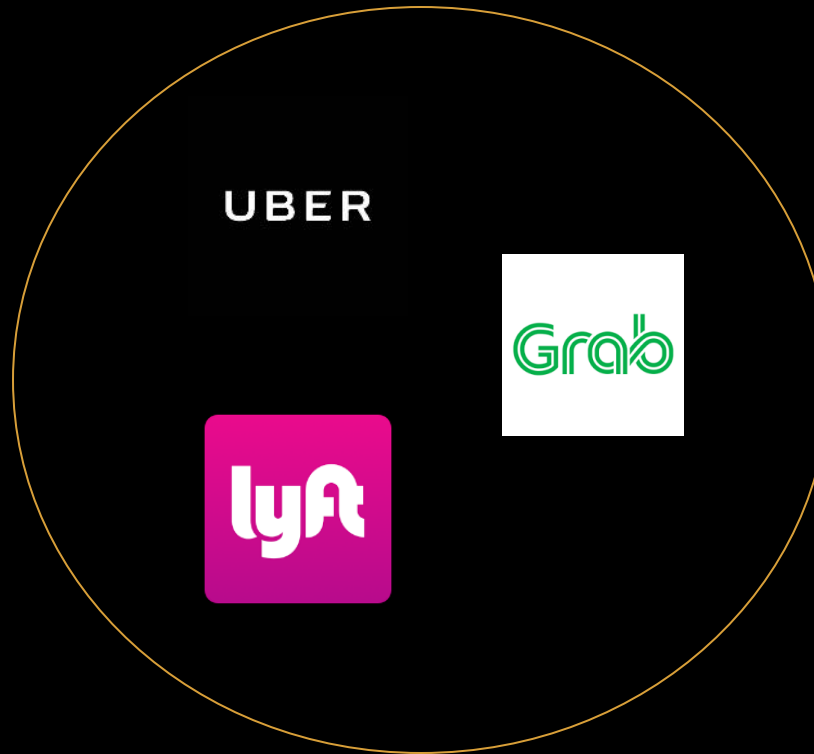
The machines were later returned to the providers.

More than 500 bicycles were dumped in huge piles on the streets of the southern city of Shenzhen in January, with images of the nearly 3m-high jumbled stacks going viral. AGENCE FRANCE PRESSE, BLOOMBERG

# IS THERE A BETTER WAY?



Dockless

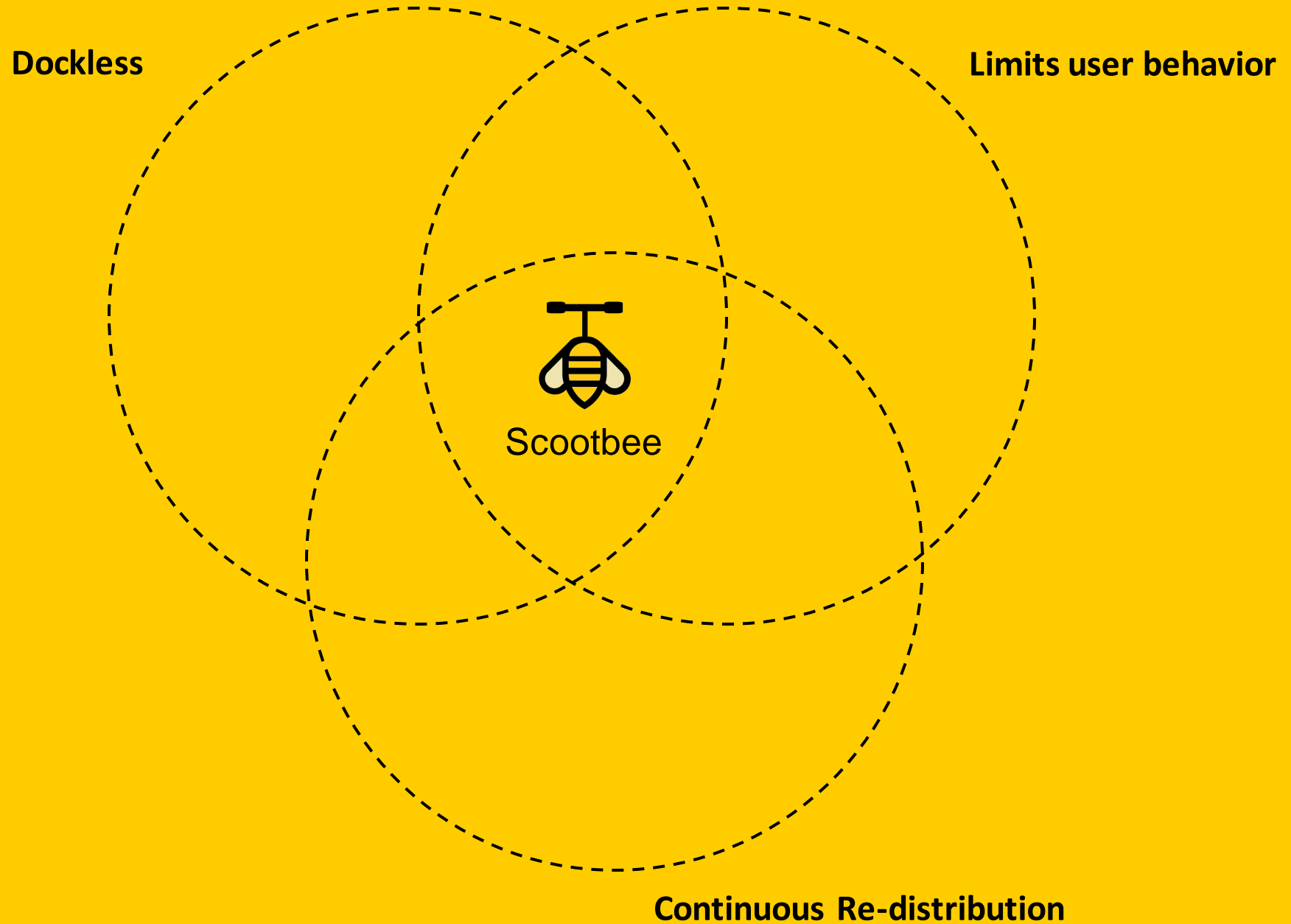


Available on request



Limit User behavior

**A networked Personal Mobility Device (PMD) capable of continuous re-distribution and responding to real-time requests anywhere.**







# RIDING MODE

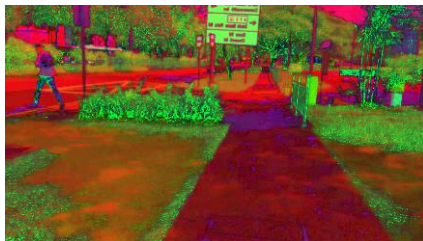




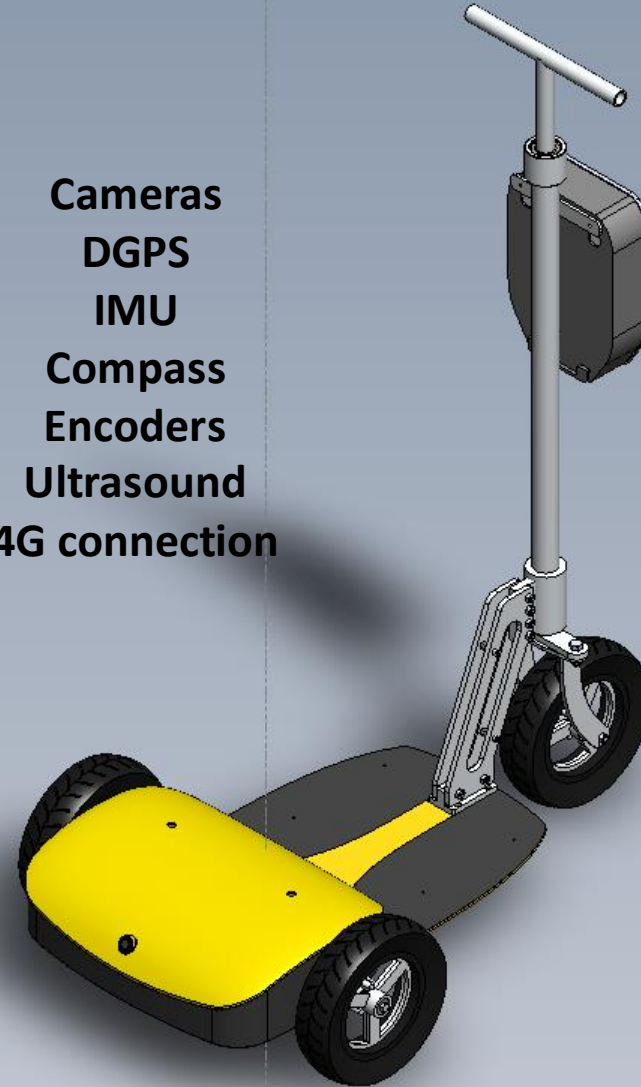
# NON RIDING MODE



# SCOOTBEE



Cameras  
DGPS  
IMU  
Compass  
Encoders  
Ultrasound  
4G connection





**WHY  
SCOOTBEE**



Continuous redistribution throughout the day



Higher use per Scootbee per day, leading to faster breakeven



Backlash against dumping will lead to more regulation and fewer scooters



Existing business model will not work in the future - efficiency trumps numbers



Better unit economics due to constant shifting of supply to meet demand



Smaller deployment numbers to effectively cover an area, with lowered capital cost

# TRACTION

- Trial at One-North district since 10 Jul 2018
- Press – mentions:



#4 Product of the day



Scootbee, world's first on-demand e-scooter service, trialled in Singapore



纬壹科技城共享智能踏板车 随传随到  
自行回停放处



Forget shared bicycles. Here come self-driving scooters

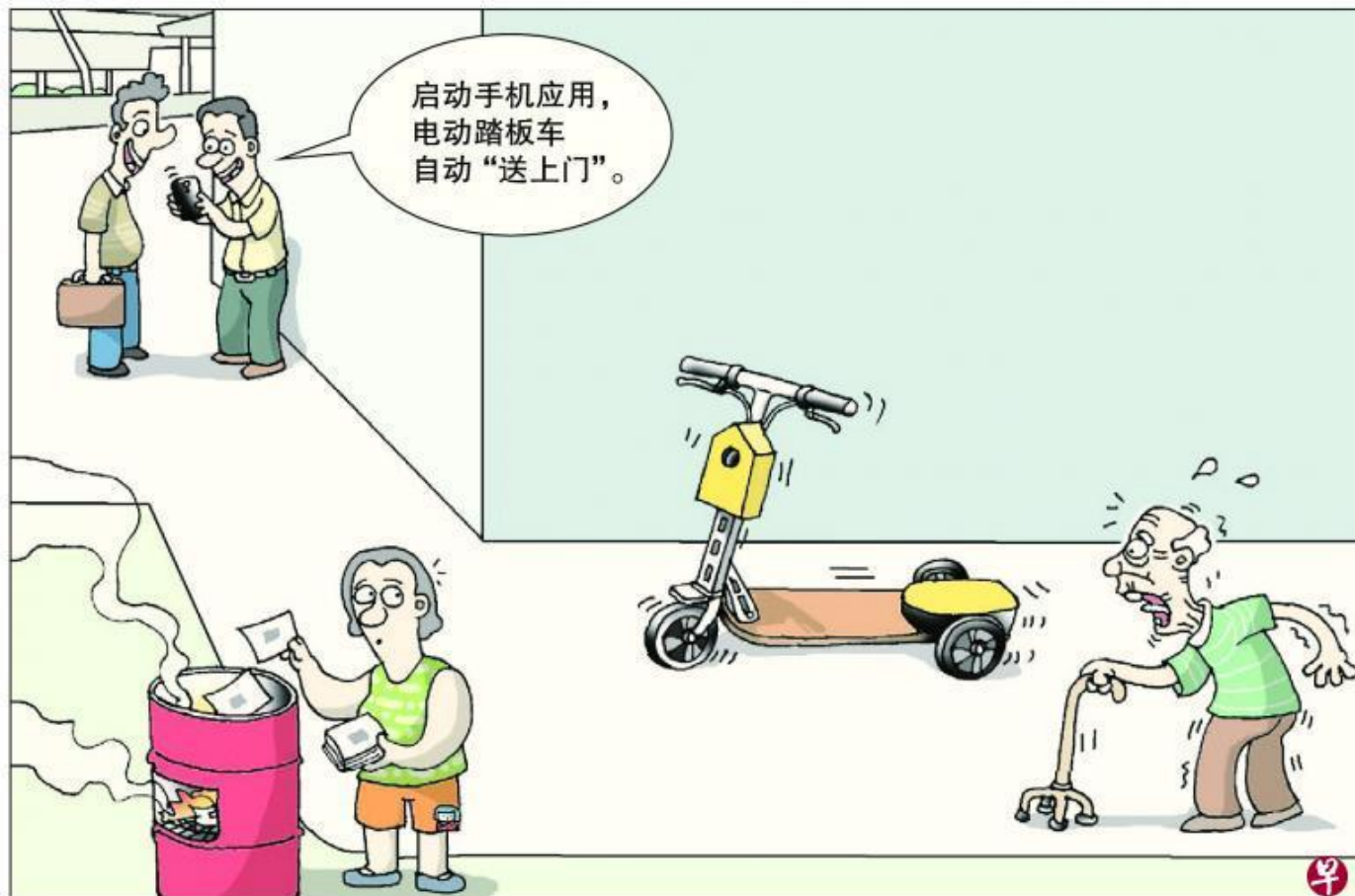


手机应用一召 电动踏板车自动“上门”



どこでも乗り捨てOKなシェアキックスケーター





# THANK YOU

75 Ayer Rajah Crescent #01-06

S139953 Singapore

[www.scootbee.com](http://www.scootbee.com)

<https://www.zaobao.com.sg/forum/comic/story20180915-891397>

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# Cleantech Forum **Asia** | Singapore

## PART 2 Next Generation Mobility



**CHIN FOONG (CF) TONG,**  
Co-Founder & CEO, Xnergy Autonomous Power  
Technologies



# Xenergy

Established in 2017  
2 Cleantech Loop, #04-09, Singapore 637144

VISION AND  
MOTIVATION

Speed up electrification of everything

Dr. Tong Chin Foong, CEO

# Xnergy

## KEY FACTS

1. Contactless fast charging
2. Technology development since 2010
3. Established 2017
4. 4 Industrial Phds, 2 Masters and 2 Champions
5. Completed 3 pilots installation

# E-MOBILITY DREAM

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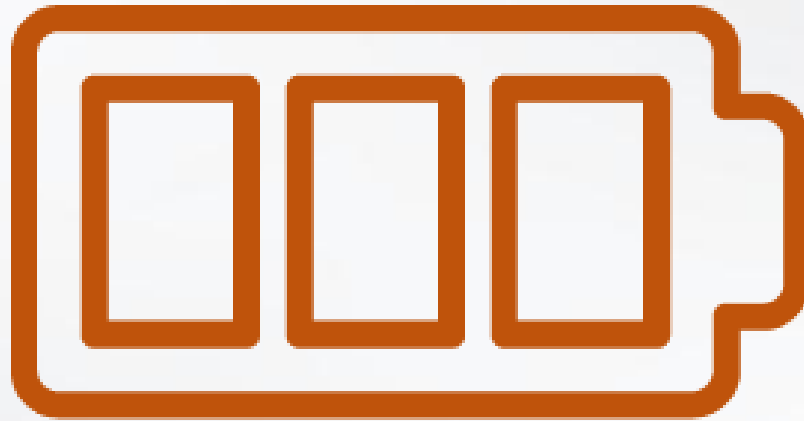


**Clean**  
**Autonomous**  
**Infinite energy**

WHAT IS E-MOBILITY DREAM?

# PROBLEMS!!!

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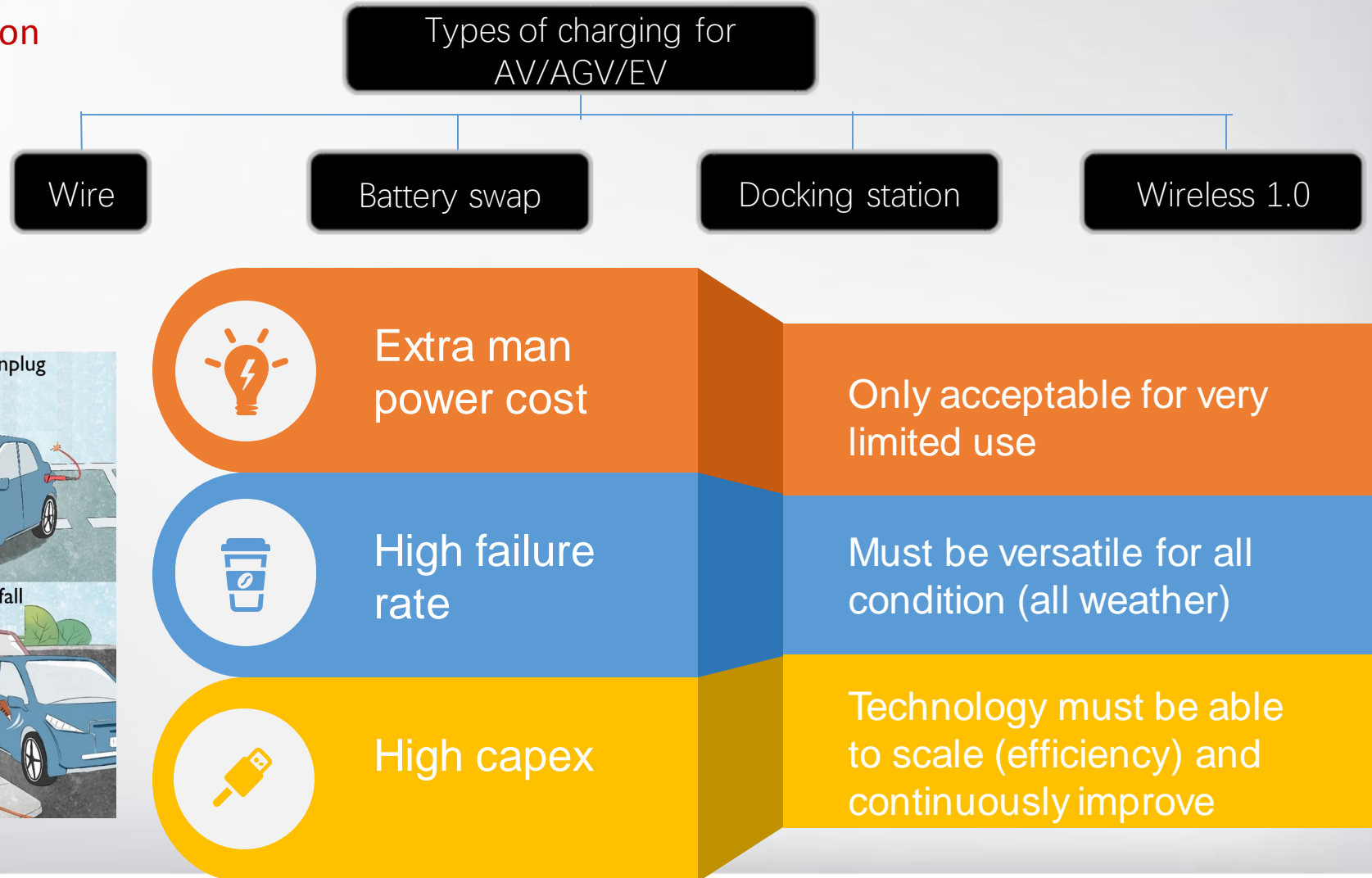
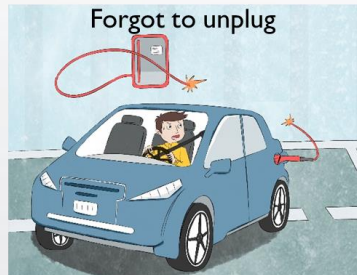


1. Limited time use (finite energy)
2. Long charging time



# THE EXISTING SOLUTION?

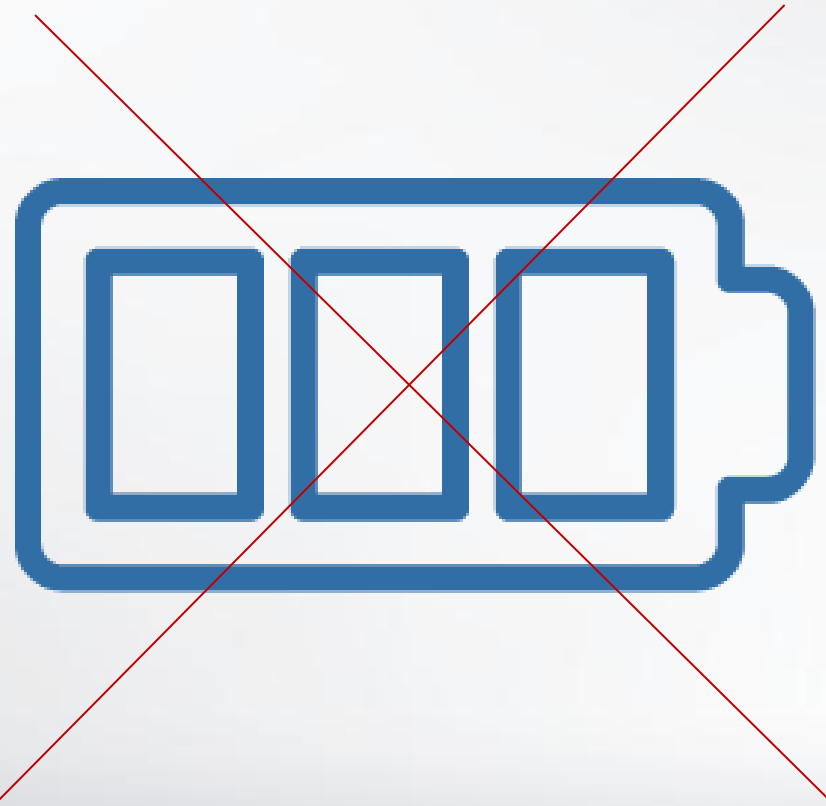
## Issues for contact based solution



# IDEALLY

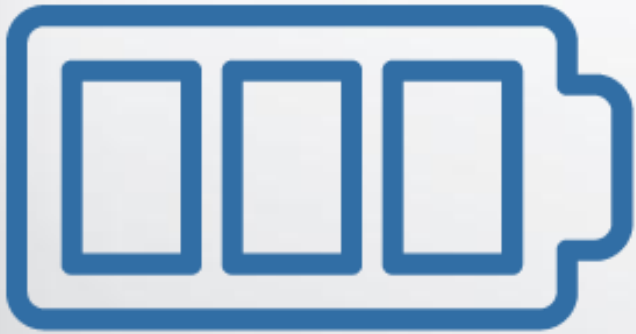
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no charging is required



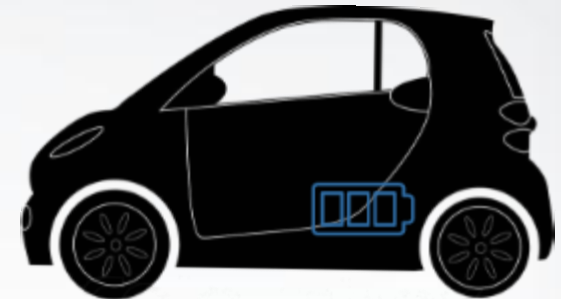
# CHARGING METHOD

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Battery swapping

Cable connector



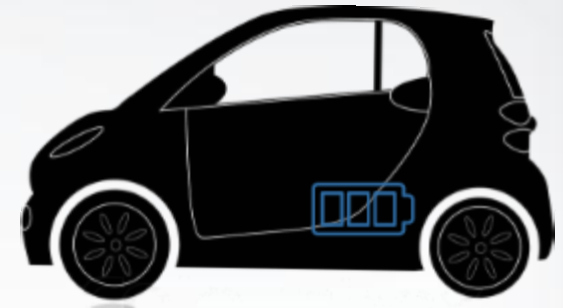
# HOLY GRAIL CHARGING METHOD

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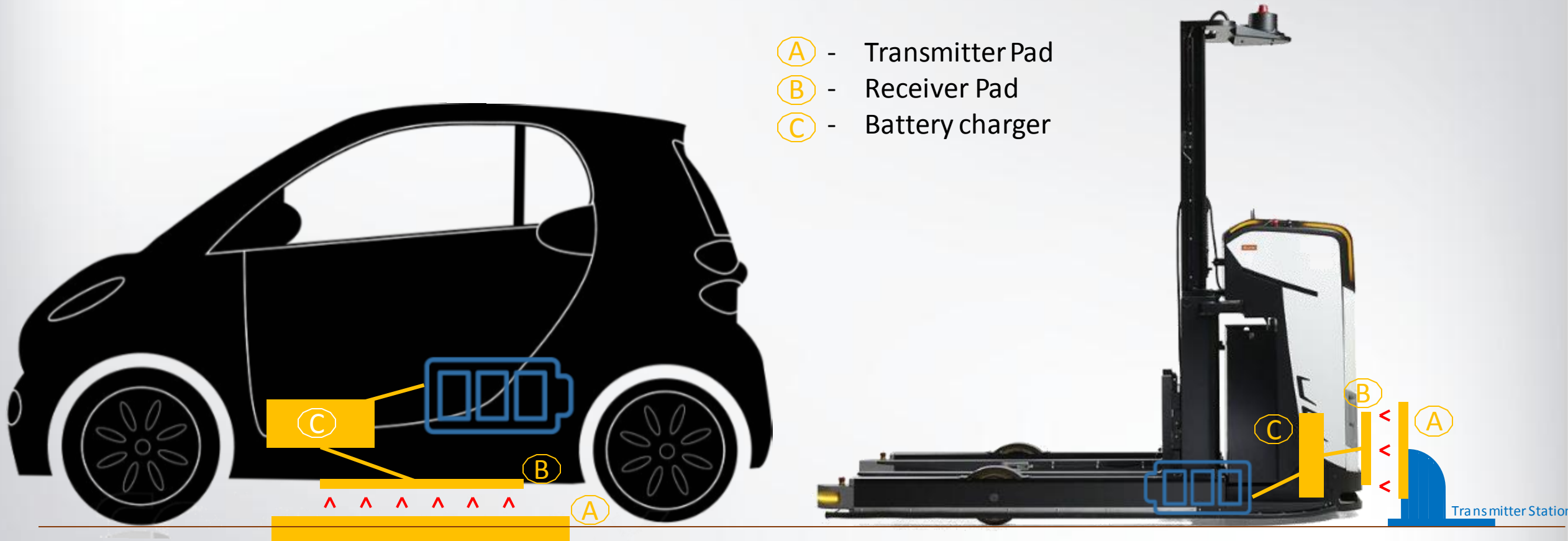
Autonomous

Opportunity

Safe



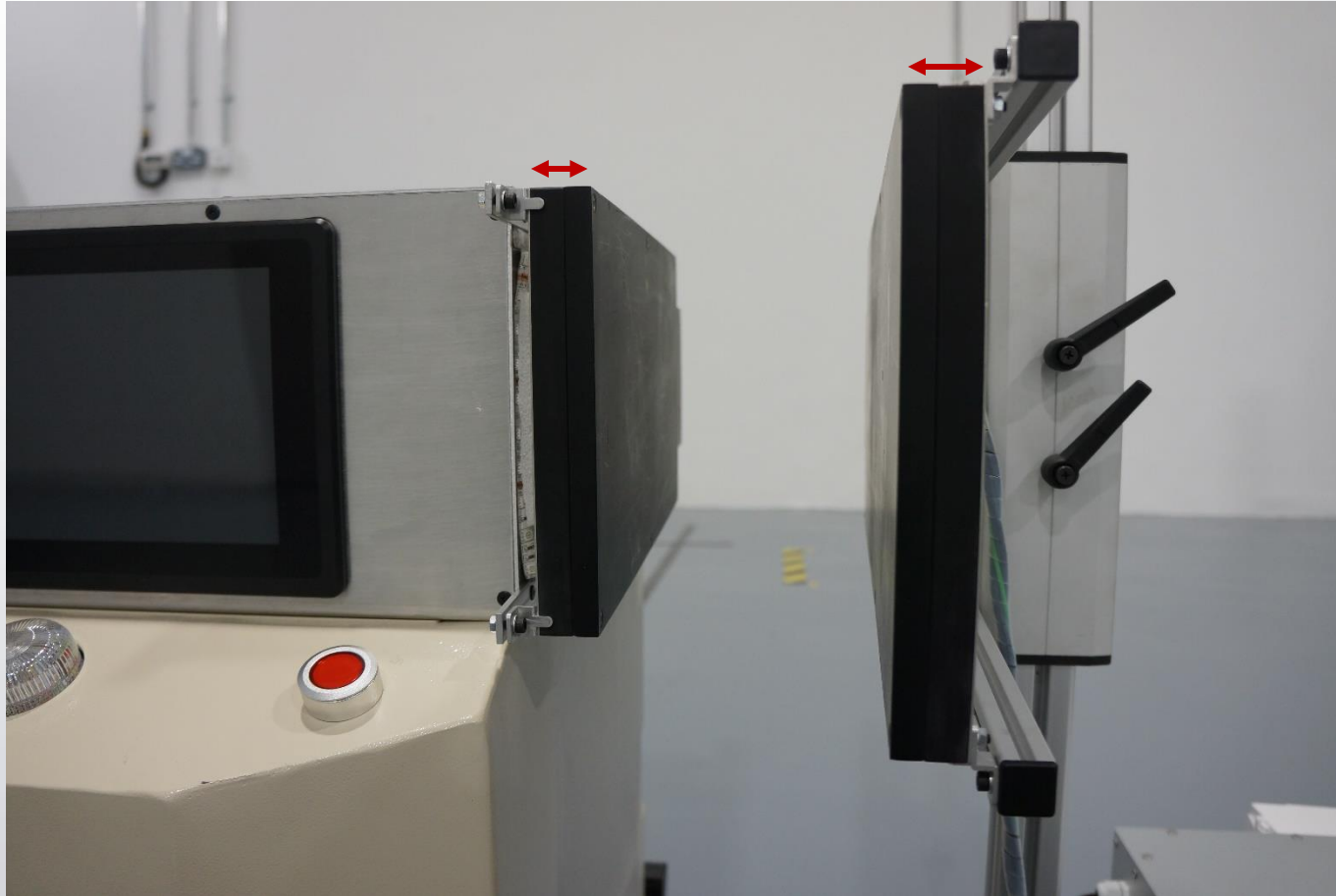
# WIRELESS CHARGING METHOD





# OUR SOLUTION

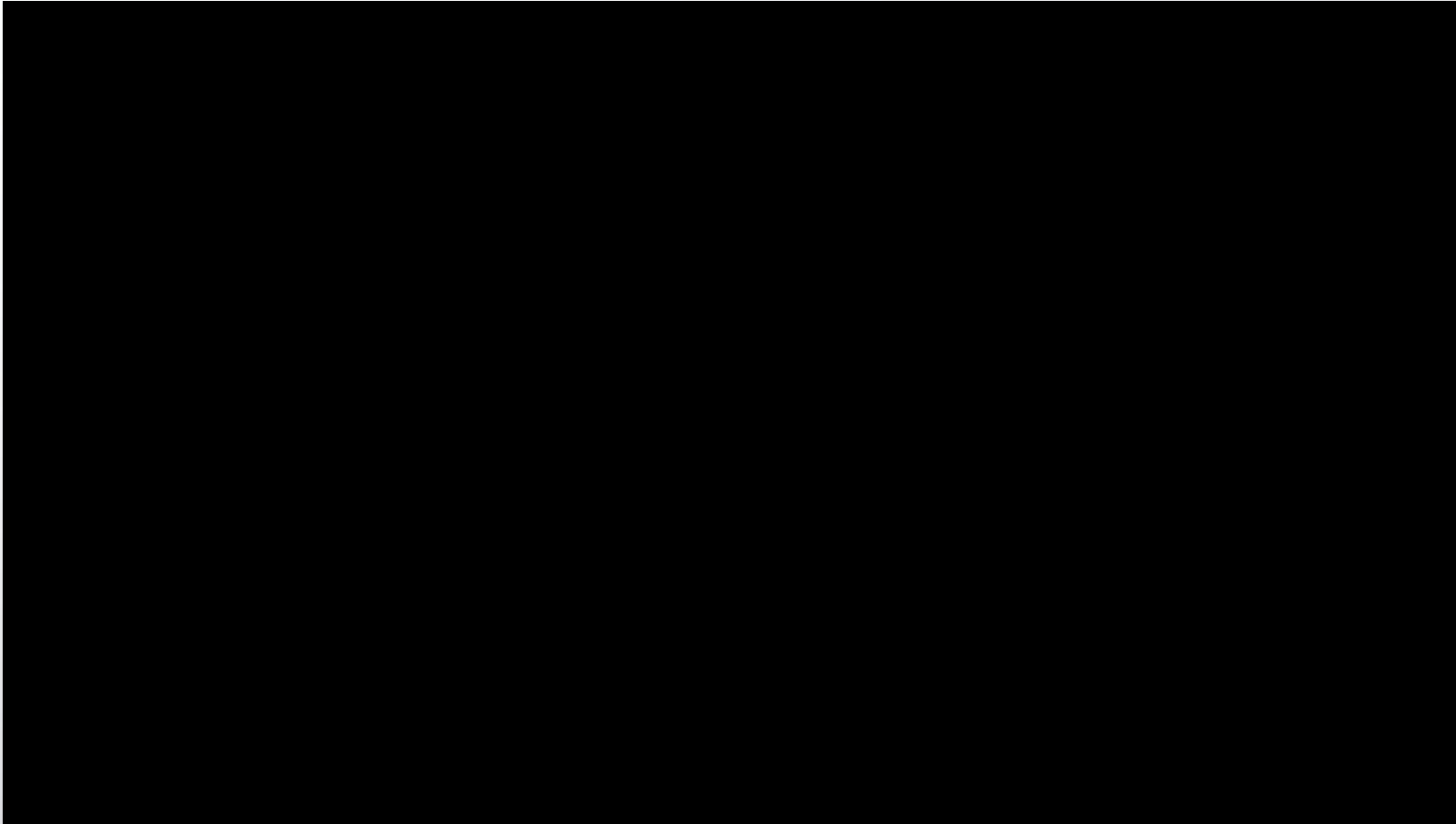
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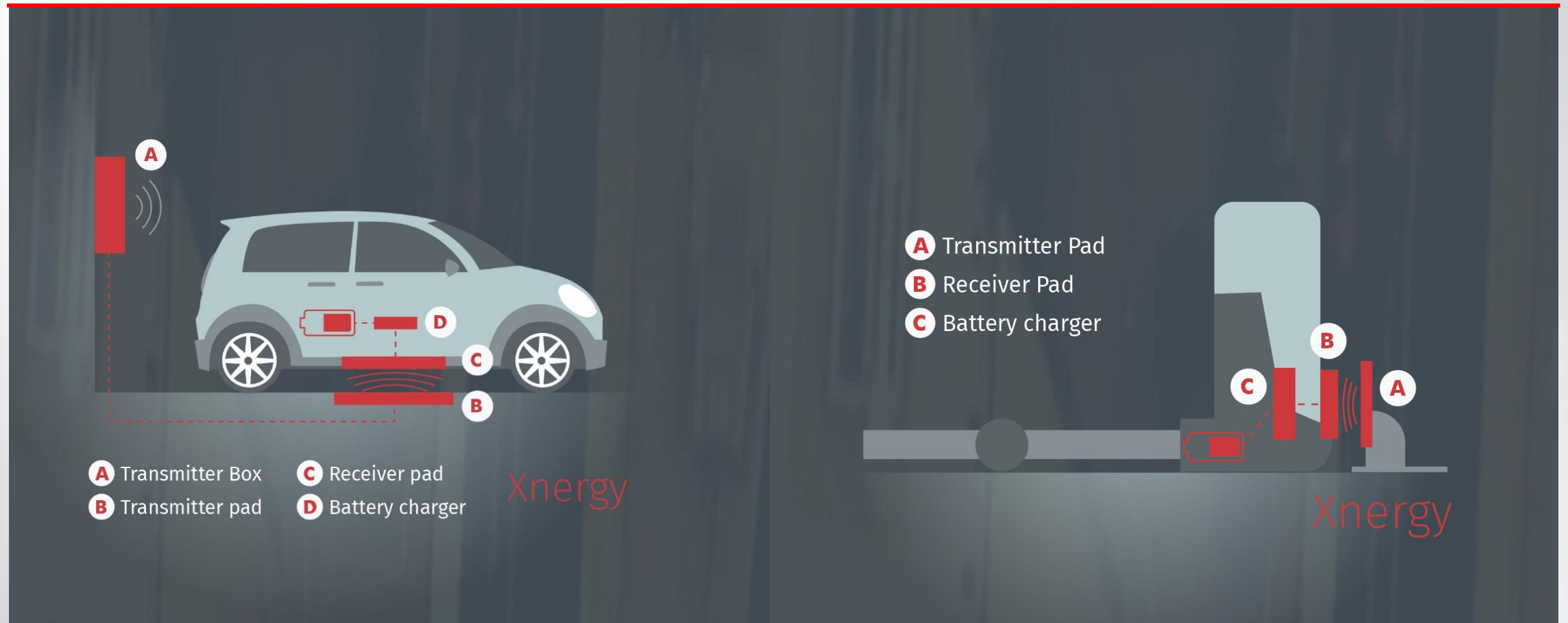
2cm thick  
Size of an A5

# POWER WITH EASE!


---



# KEY TAKEAWAYS



Just like you never needing to charge it  
(let it happen at the background)

A robotic platform is shown on a light gray floor. It consists of a black base with yellow and black hazard stripes, a silver sensor arm extending upwards, and a control unit with a screen and buttons. The text "BEGIN YOUR AUTONOMOUS CHARGING JOURNEY" is overlaid in red.

# BEGIN YOUR AUTONOMOUS CHARGING JOURNEY

Xnergy

Autonomous Power Technologies



# Cleantech Forum **Asia** | Singapore

## PART 2 Next Generation Mobility



**JUSTIN SIM**  
CEO, QIQ Global





# INTEGRATED & SUSTAINABLE URBAN MOBILITY FRANCHISE

[www.qiq.global](http://www.qiq.global)  
[justin@qiq.global](mailto:justin@qiq.global)

Justin Sim





WORLD POPULATION WILL GROW  
TO 10 BILLION BY 2050 AND  
70% OF THEM WILL LIVE IN CITIES



# MICRO-MOBILITY IS GROWING OVER 60% OF TRIPS UNDER 2 KM

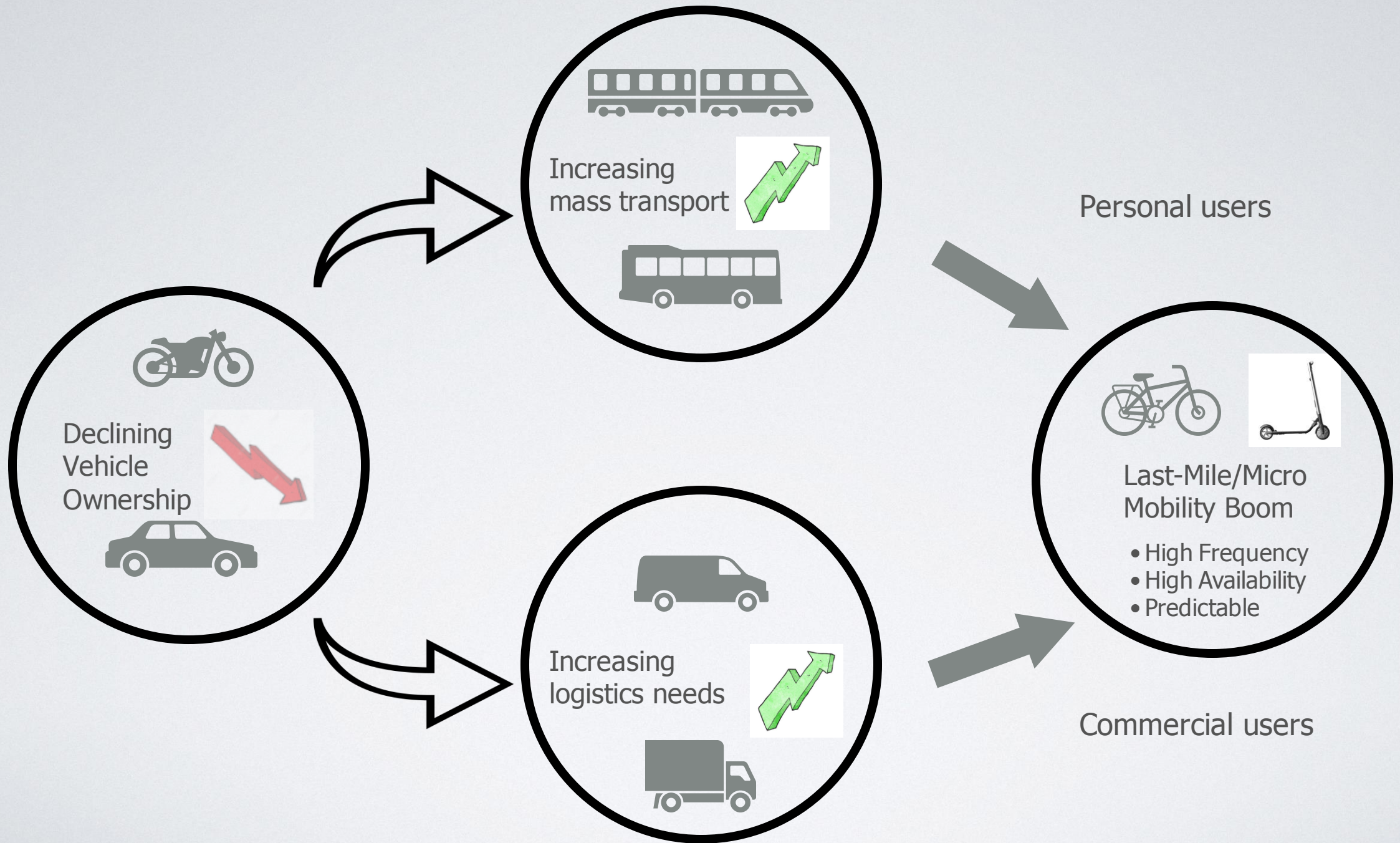
Personal Mobility is Big Business



Commercial  
/Home Delivery is Bigger Business









BUT.....

DOES TODAY'S  
SOLUTION WORK ?





EA  
**NIGHTBEAT**

BAY AREA  
**NIGHTBEAT**

BAY AREA  
**NIGHTBEAT**

**KBCW**  
44 CABLE 12





## ISSUES WITH DOCKLESS BIKE & SCOOTER-SHARING SYSTEM

- Unable to control the number of bikes and quality of bikes
- The bikes are easily damaged due to low maintenance
- The bikes flooded the cities, causing environmental issues
- Ofo left Australia, USA & Japan market
- Obike ceased operations in Singapore
- Millions of bikes are flooding China



# Disruptor Strategy





- Local Startups & Industry pushback
- Government Control & Regulations



Does Dockless work ?



Government Control & Regulations + ??? Local Startups Local Business = QIQ Franchise





# QIQ URBAN MOBILITY SOLUTION

## Benefits:

- Location-based parking with optional charging & docking stationsBetter control of number of e-vehicles and quality of every e-vehicles
  - Flexible implementation
  - Charging grid in city for total society's need
- Connected Vehicular Network
  - Smart Tracking and Monitoring
  - Real Time Users Management and Controls
- Non-Lithium based Rapid Charge Power Storage
  - No disposal problem of lithium battery
  - Outlast Lithium batteries life by 20x - over 50,000 charging cycles
  - Rapid charging time - only in 7 minutes - ensure higher availability
- Multi-Vehicle solutions
  - many options of vehicles provided
- Franchise Model
  - working in partnership with local companies and governments to create long lasting solutions





7 min rapid charging Urban Mobility Solution









THANK YOU

[justin@QIQ.GLOBAL](mailto:justin@QIQ.GLOBAL) ● [dalston@QIQ.GLOBAL](mailto:dalston@QIQ.GLOBAL) ● [ben@QIQ.GLOBAL](mailto:ben@QIQ.GLOBAL) ● [WWW.QIQ.GLOBAL](http://WWW.QIQ.GLOBAL)

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