



MINISTRY OF NATURAL RESOURCES AND
ENVIRONMENTAL SUSTAINABILITY



GEF7-UNIDO Accelerating the Adoption and Scale up of Climate Smart Transport in Malaysia (AASCT): Project 8 Findings & Recommendations



Accelerating the Adoption and Scale up of Climate Smart Transport in Malaysia (AASCT) (2022 - 2027)



to facilitate the adoption of electric mobility technology and its commercialization, supported by implementation of policies for GHG emission reduction in transport

Component 1

Strengthening national policy and institutional frameworks



National Reference and Recommendation for RE-based Smart Charging and Harmonization of EV Supply Equipment



Ministry of Transport



EV and Sustainable Battery Ecosystem and Value Chain Roadmap

Component 2

Investment and commercialization of electric mobility technologies



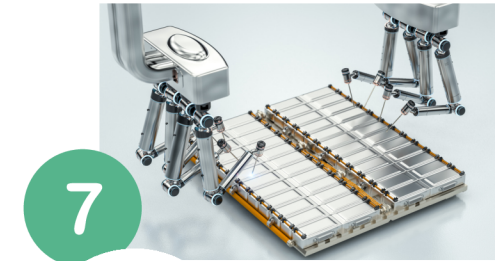
Proof of Value for EV Interoperability Centre (EVIC): Vehicle-to-Grid (V2G)



Rapid Penang Solar Smart Electric Bus Charging Station Demonstration



Kuching Metro Solar Smart Electric Bus Charging Station Demonstration



EV Battery Second Life Application Value-Chain: Demonstration on Remanufactured EV Battery



Electric Motorcycle Battery Swapping Technology Demonstrations

Component 3

Capacity building and scale-up



Training, Preparation and dissemination of knowledge products for specific target groups



Training on EV, sustainable battery ecosystem and value chain with a focus on women



Knowledge exchange and scale-up through participation in regional and international platforms



Demonstration of Electric Motorcycle with Battery Swapping Systems (BSS) in Malaysia

Project#8 - GEF-7 Accelerating the Adoption of Smart-Climate Transport (AASCT) Project



Flag-off Demonstration of Electric Motorcycle BSS

Date: 9 December 2024 (Monday)

Venue: MGTC Seksyen 9 Bandar Baru Bangi

Officiated by Datuk Nor Yahati Binti Awang the Deputy Secretary-General for Environmental Sustainability of NRES

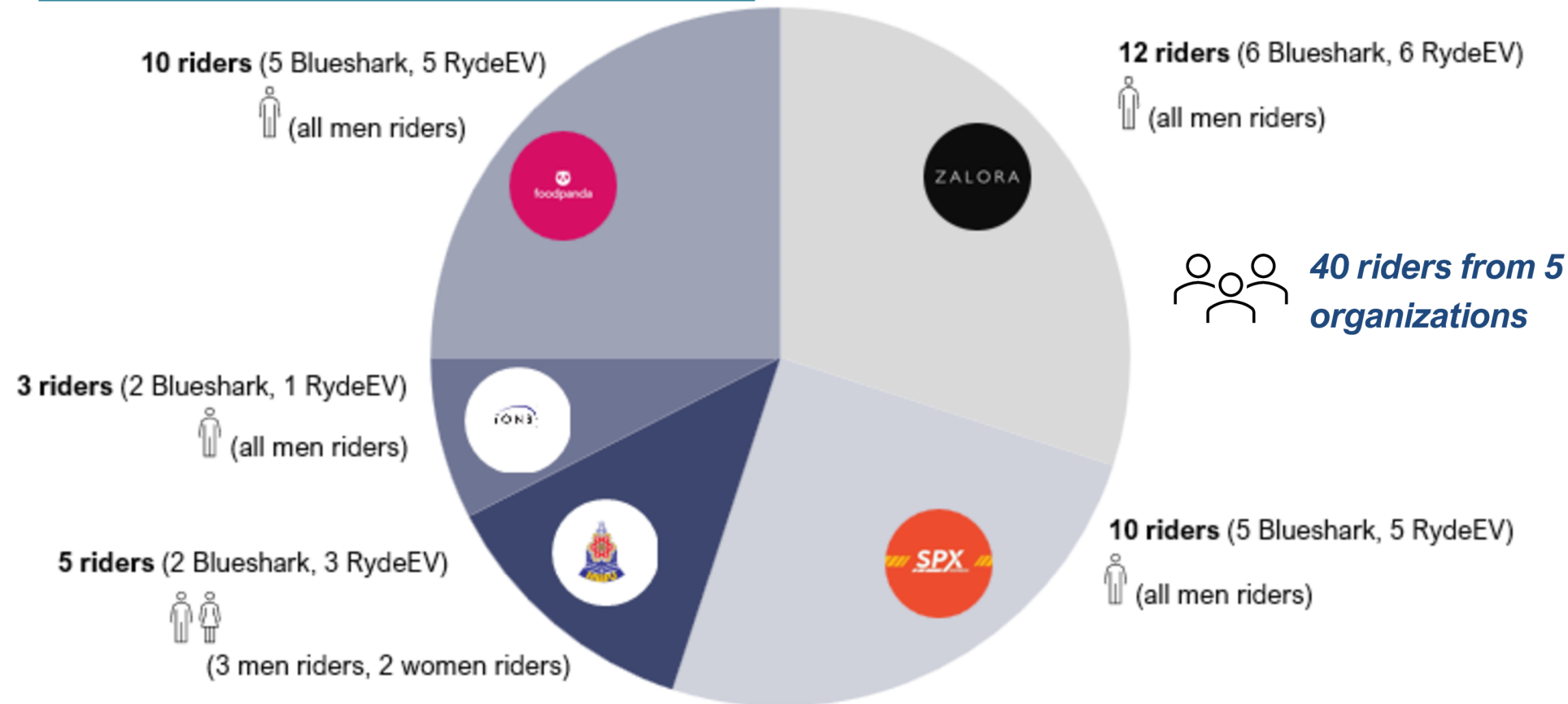




Project Overview

Main purpose: To demonstrate the **battery-swapping technology** to support and scale up **electric motorcycles** in Malaysia.

A. Implementation Partners

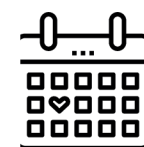
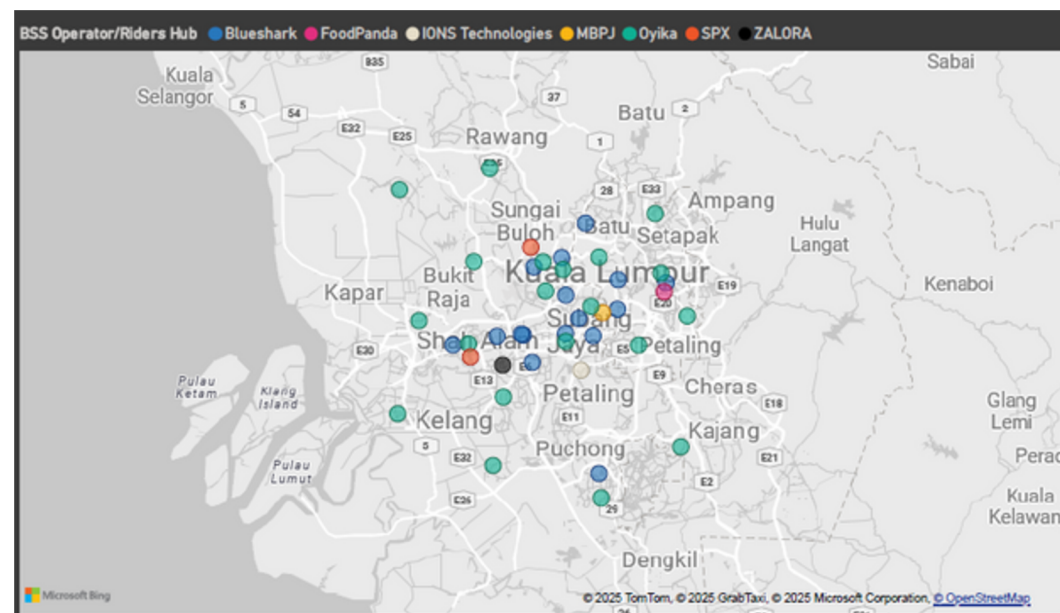


B. Leasing of Electric Motorcycles with Swapping Subscription

Parameter	Blueshark R1	RydeEV Hyper
Motor Power	5kW	4kW
Range	110 km	100 km
Max Speed	80 km/h	90 km/h
Kerb Weight	92 kg	97 kg



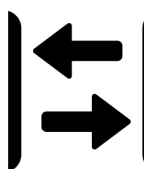
C. BSS Locations



2 months
(10 Dec - 9 Feb 2025)

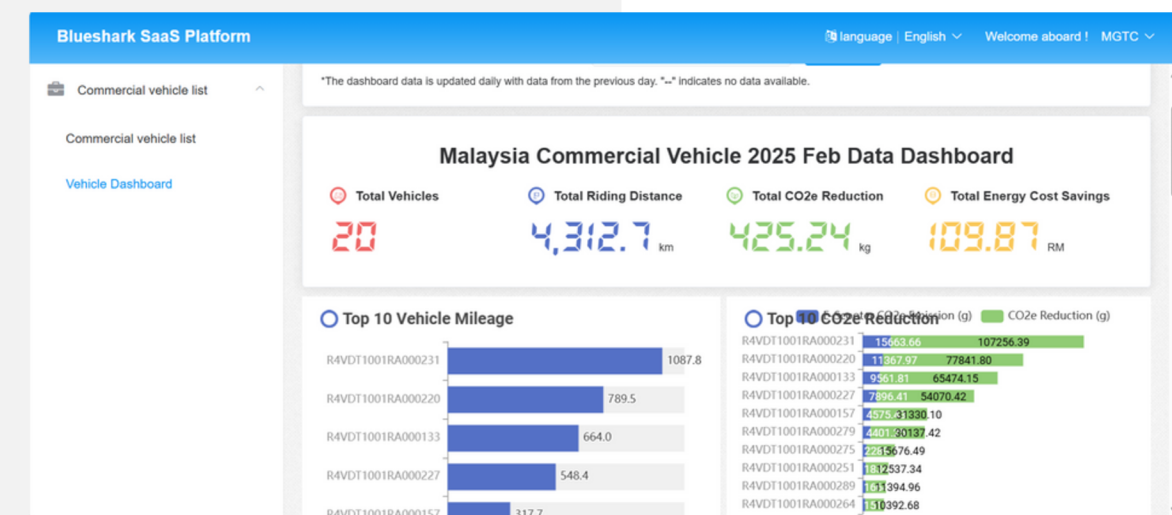


Klang Valley



29 BSS Locations
at petrol stations
convenience stores and
shopping malls

D. Data Collection Tools



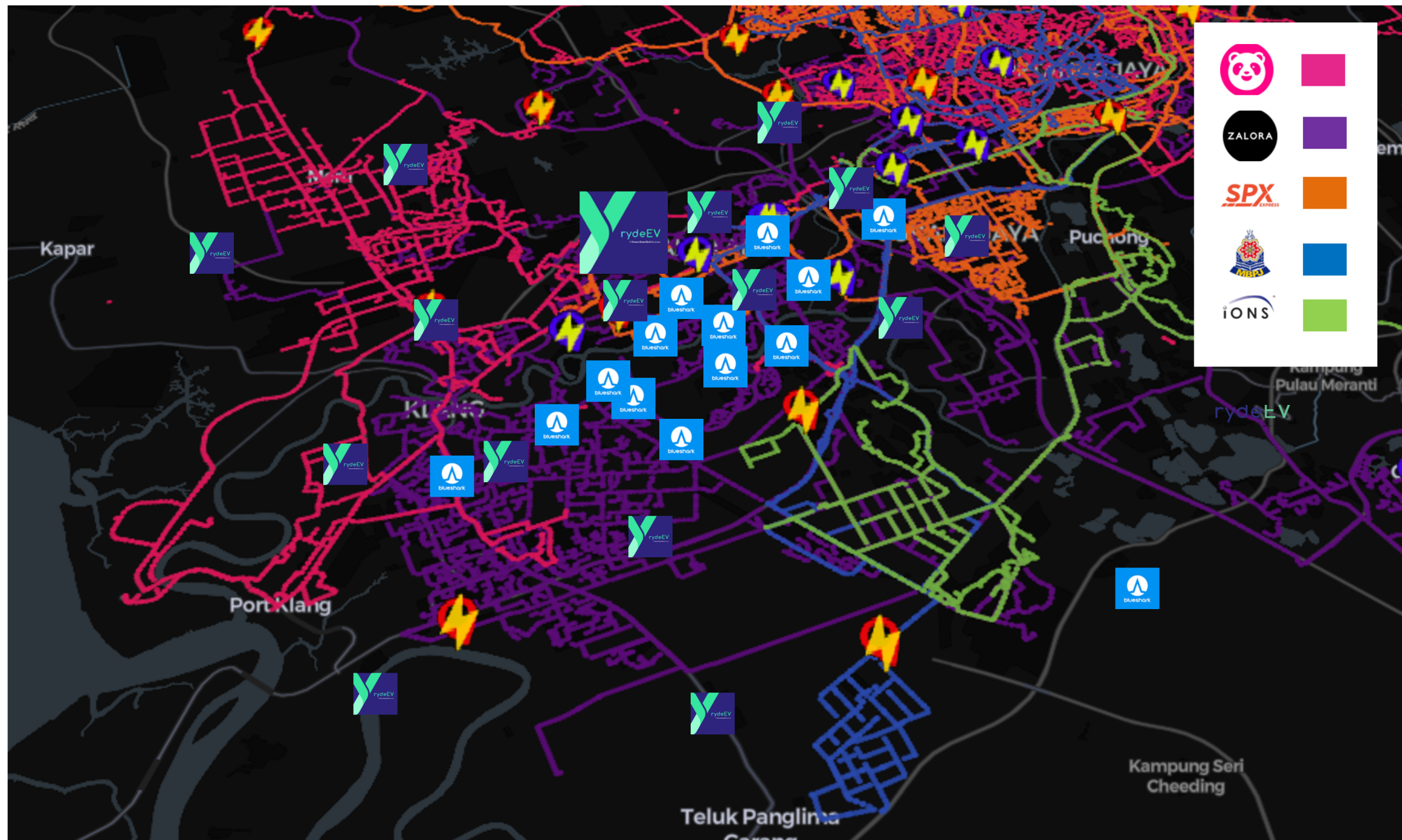
Service Provider backend platform



Vehicle Data Logger

MGTC Project Results

1. Route map combining all companies GPS tracking during the demo and overlaid these routes with the existing BSS network to assess BSS station coverage.
2. The map shows good BSS concentration in certain areas. However, challenge becomes clear when battery systems are not compatible across brands. Blueshark and RydeEV use diff system, sizes and connectors which limits flexibility and user convenience.





Total Cost of Ownership (TCO)

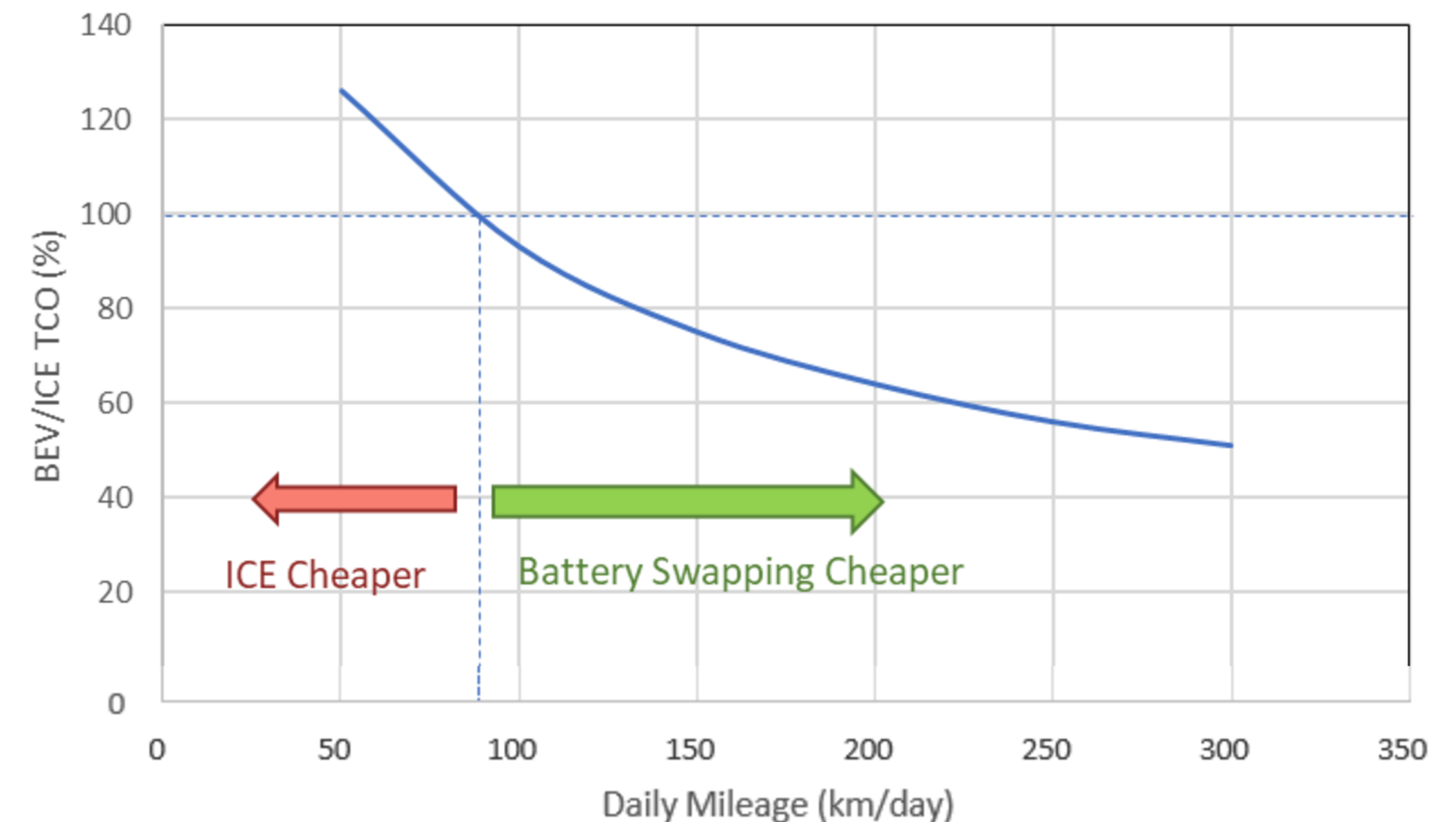
Total Cost of Ownership (TCO) – Vehicle User

Battery swapping electric motorcycles offer 37% lower total cost than ICE motorcycles, making them a cost-effective solution for high-mileage users

Total Cost of Ownership	ICE	BEV	BSV
Years of Operation	4	4	4
Vehicle Purchase Price	13,205	14,986	8,388
Vehicle Resale Value	2,750	3,122	1,748
Depreciated Vehicle Value	8,250	11,766	7,643
Total Fees	13.00	8.00	8.00
Total Maintenance Cost	10,654	3,536	3,510
Total Fuel/Energy Cost	11,682	2,913	8,160
TOTAL COST (RM)	30,599	18,223	19,321

Notes:

1. Based on fuel and electricity prices
2. Vehicle purchase price includes registration, financing and subsidy (if available)
3. Assumption is riders travel 200km/day



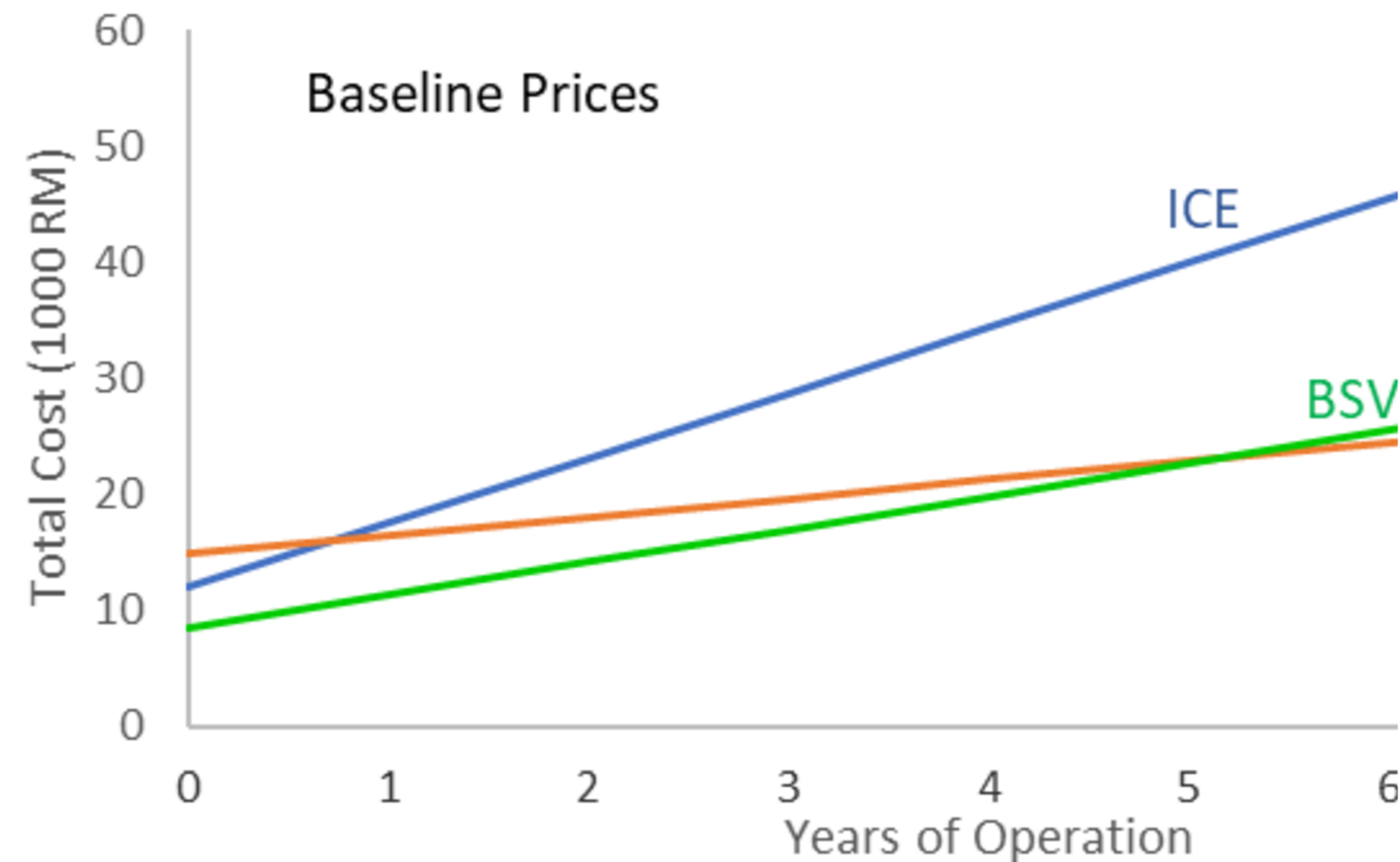
Key Highlights

- This fuel price brings break even range down to about 70km/day... close to the Malaysian average, thus enabling up to half of all motorcycles to benefit from BSS
- Riders with higher daily mileage (80+ km/day), especially delivery and frequent-use riders, benefit most from adopting battery swapping technology.



Total Cost of Ownership (TCO)

Cost Benefit Analysis



Due to its lower upfront cost, the battery swapping vehicle is the most affordable option from the start, while fixed-battery EVs surpass ICE motorcycles in cost savings within the first year at 200 km daily usage.

TCO INPUT PARAMETERS

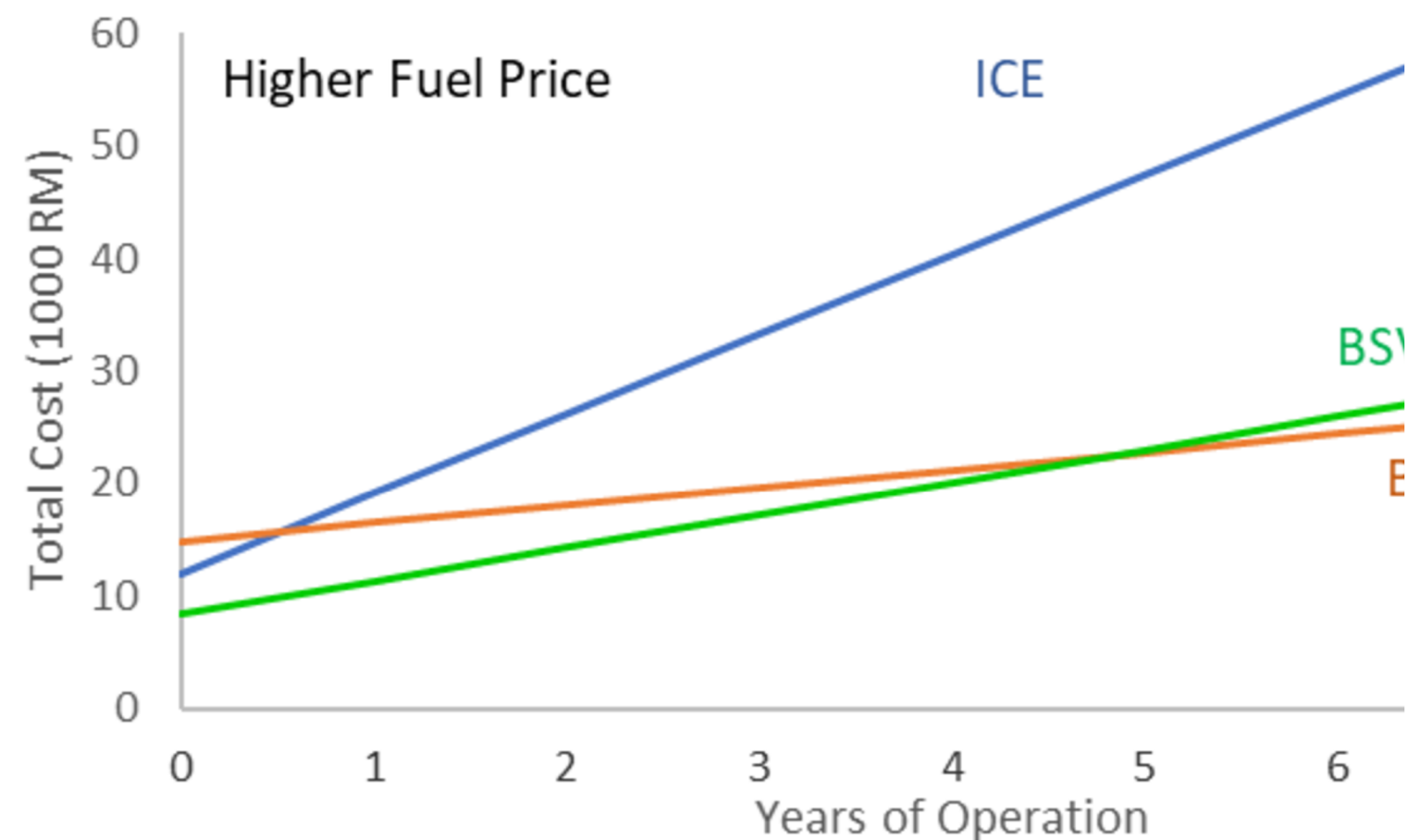
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Notes:

1. Based on fuel and electricity prices
2. Vehicle purchase price includes registration, financing and subsidy (if available)
3. Daily range of 200km, and resale value has been excluded from the calculation

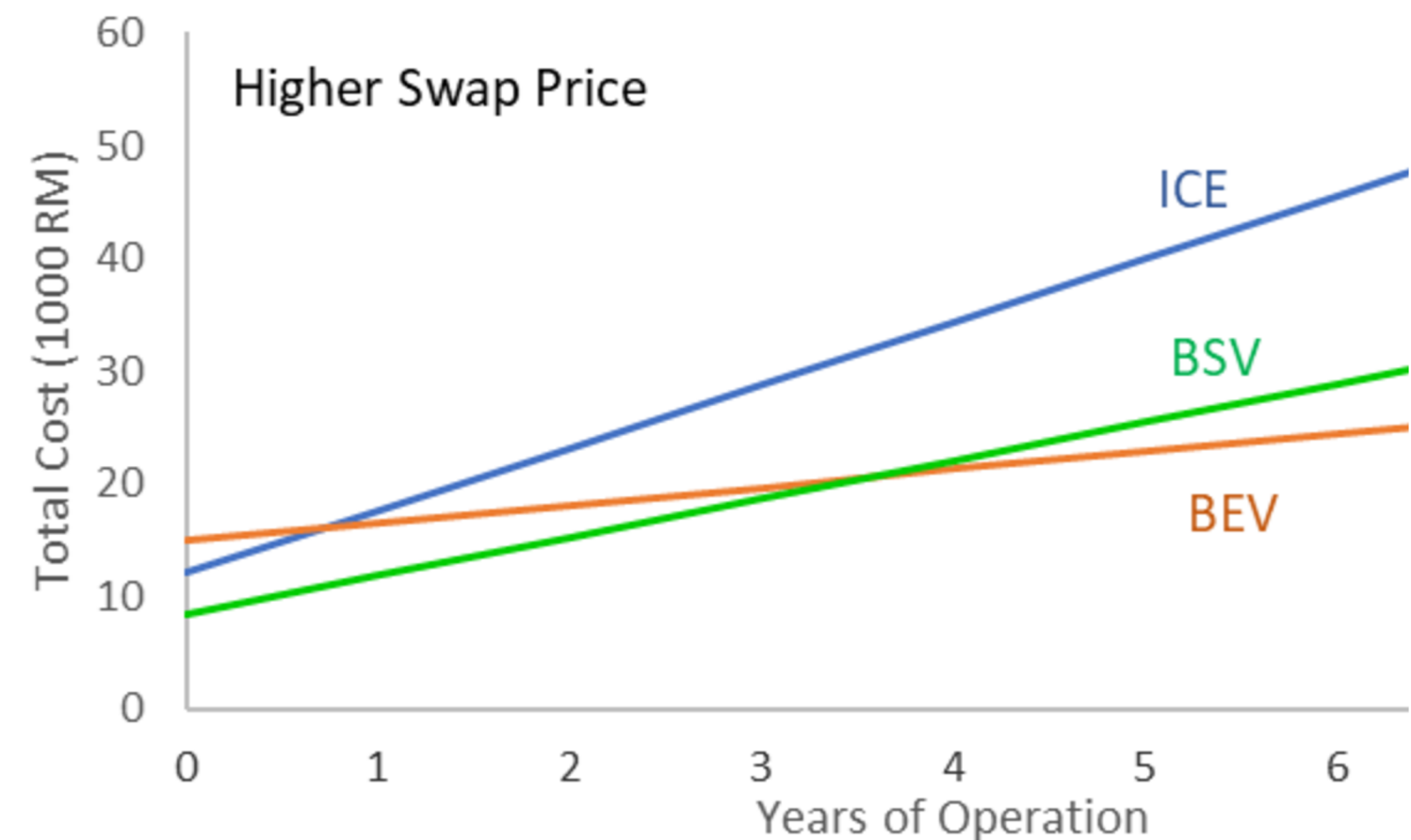
Total Cost of Ownership (TCO)

Cost Benefit Analysis - Fuel & Swap Price Scenarios



Scenario	Fuel Price (RM/L)	Swap Price (RM/month)	Key Feature
Baseline	RM2.05	RM170	Current market prices
High Fuel Price	RM3.10	RM170	Reflects max fuel price

At higher fuel price, BEVs become cheaper than ICE motorcycles in less than 1 year, while BSVs remain the lowest-cost option from the start due to lower upfront costs



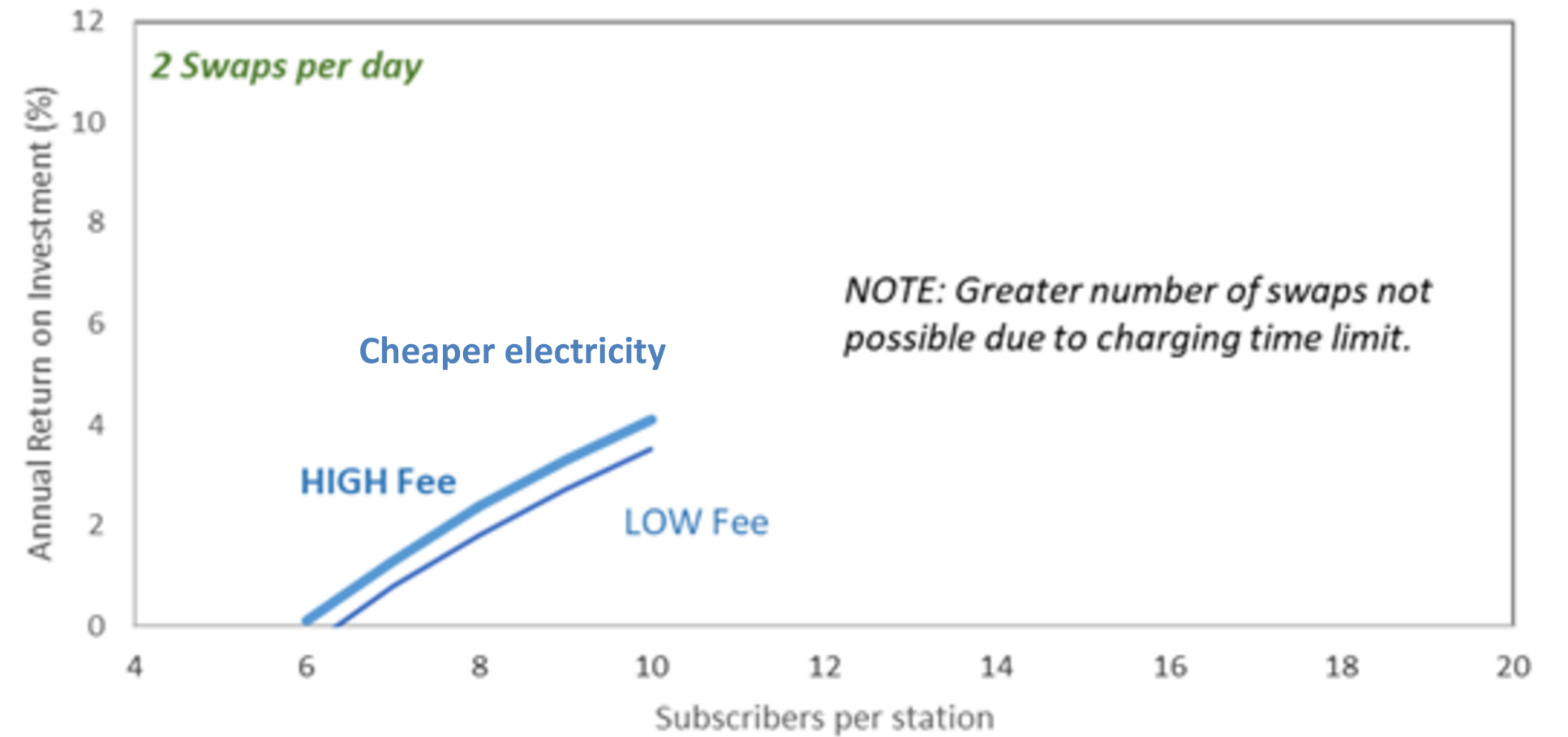
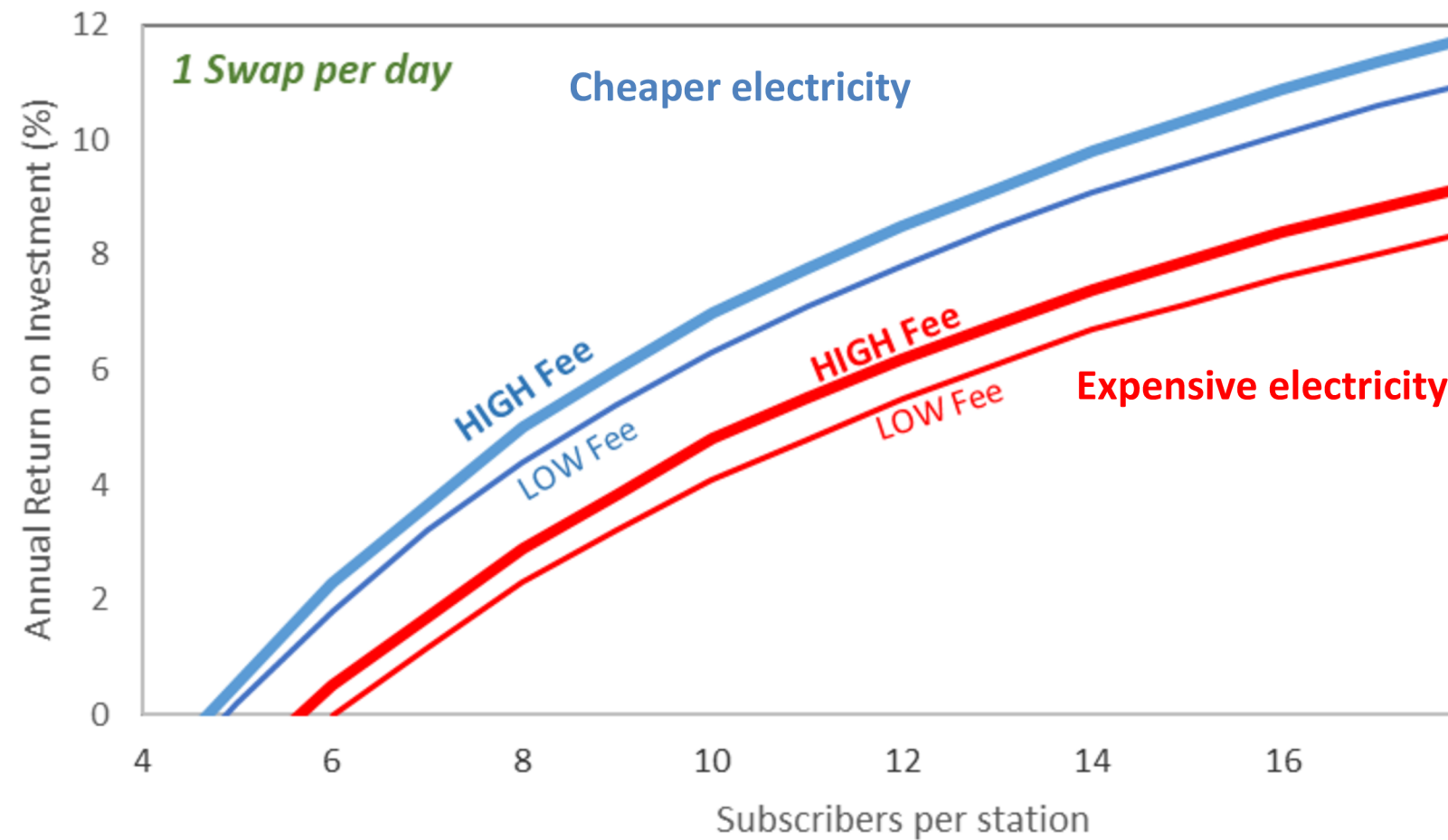
Scenario	Fuel Price (RM/L)	Swap Price (RM/month)	Key Feature
Baseline	RM2.05	RM170	Current market prices
High Swap Price	RM2.05	RM210	Increased BSS operating cost

With increased swap pricing, BSVs become more costly over time, and BEVs overtake them in cost-effectiveness after 3.5 years, while still beating ICE within the first year



Total Cost of Ownership (TCO)

Total Cost of Ownership (TCO) – BSS Service Provider





Key Findings

Technical Feasibility

1. Charging time per battery: 2–2.5 hours (40%SOC) supporting quick turnaround
2. Supported delivery riders cover 50–250 km/day, proving the capability for high mileage user cases
3. Range per full battery: ~100–110 km depending on the model
4. Max speed: 80km/h — sufficient for urban roads but slightly below ICE motorcycles (typically >100 km/h).
5. Regenerative braking extended vehicle range by >10%
6. Frequent swapping (3–5 times/day) required; hence, BSS station proximity (<5 km) is key for practicality.

Economic Feasibility

1. BSVs are financially viable for riders covering >85 km/day, with >RM300/month in savings
2. Lower upfront vehicle cost supports affordability
3. With rising fuel prices, up to 50% of riders could financially benefit from BSV adoption

User Experience

1. Users found battery swapping faster than charging, especially with stations in strategic locations (eg: rider hubs, convenience stores).
2. Most riders can handle batteries up to 12kg, so the weight should be kept at or below this level.
3. Mobile app received positive feedback for ease of use and battery reservation features
4. Stations were generally rated acceptable for safety, access, and lighting, though rain protection remains a concern

Market Acceptance

1. Stronger interest observed among high-mileage users and logistics operators
2. Companies highlighted EV adoption as part of their socio-environmental responsibility and ESG goals
3. Speed and power of BSS motorcycles are good for city deliveries, though long-distance or highway use may need more powerful models.
4. Strategic locations of BSS stations at depots and rider hubs to enhance accessibility and user convenience

Project Recommendation

Strategic Recommendations to Support Battery Swapping Ecosystem



Expand Availability of High-Performance Electric Motorcycles

- 1 Support entry of high-performance electric motorcycle models with higher battery capacities through incentives
- 2 Encourage partnerships with global manufacturers to introduce models suited for local delivery and patrol operations.

Promote Adoption Among P-Hailing Groups

- 1 Provide targeted incentives for gig / p-hailing riders to switch to electric motorcycles or collaborate with delivery platforms to co-fund subscription or lease models.
- 2 Set Target of compulsory Green First Mile / Last Mile delivery using E2W in 3 years (2028)

Support for Charging/ BSS Infrastructure Development

- 1 Allocate government or municipal-owned land at no cost for installation of BSS or charging stations, especially in high-traffic public locations or transit-oriented locations e.g petrol stations, highways, shoplots, transport hub
- 2 Introduce Gender-Sensitive Battery Swapping Design smart system for “female-friendly” slots

Provide Electricity Bill Rebate Programme for BSS Operators

- 1 Introduce a dedicated Electricity Bill Rebate Programme for BSS operators that offer electricity bill rebates based on kWh used for battery charging, capped monthly.

Government Tax Support and Incentives

- 1 Introduce targeted financial incentives such as grants to attract EV and battery manufacturers to localize production
- 2 Offer import duty exemptions for EV BSS cabinets, Batteries and key components.

Promote Battery Standardization

- 1 Encourage development of common battery specifications across manufacturers to enable interoperability, reduce infrastructure redundancy, and promote a unified swapping ecosystem.
- 2 Promote the battery-as-a-service model to make EV more affordable and accessible



Project Impact

rydeEV



Over 50 electric motorcycles sold post-demo (Foodpanda riders) via subscription model (RM350/month, 48 months, includes swaps & maintenance).





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AND ENVIRONMENTAL SUSTAINABILITY

Thank you

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