



giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH


Office of Transport and Traffic Policy and Planning

Financial Assessment of Motorcycle- Taxi Electrification in Bangkok

10 October 2023

TRANSfer III | Development of Public Transport Electrification in Bangkok



Key Output of the study
along with operation
concept and identified roles
for stakeholders



- Long-term sustainable financial mechanisms
- Pilot for whole-fleet transformation
- Transparency and scalability



Demand side
(Public transport operators,
e.g., buses, minibuses,
motorcycle taxis)

Financial Assessment of Motorcycle-Taxi Electrification in Bangkok



Status of motorcycle taxi in Bangkok

Status of motorcycle taxi operators in Bangkok

Total cost of ownership (Gasoline & electric motorcycle)

Financial and technical challenges for motorcycle taxi electrification

Proposed business models for motorcycle taxi electrification

Roadmap to promote motorcycle taxi electrification

Status of motorcycle taxi in Bangkok

Service Demand Size, 2020 (ridership)

300 million passenger-trip/year
(for BKK & metro)

Service Supply Size, 2020

5,564 motorcycle taxi stands (วิน: Win)
84,889 motorcycle taxi riders

Vehicle Supply Size, 2020

87,960 motorcycle taxis
Honda, Yamaha, Suzuki are the most popular vehicle brands



Key stakeholders

- Regulators: Department of Land Transport (DLT)
Metropolitan Police Bureau
Bangkok Metropolitan Administration (BMA)
- Associations: The motorcycle taxi association
- Large operators: Chatuchak, Rajathevi



Licensing & Routing

- Fare is partly regulated, but also subject to negotiation between drivers and clients



Existing motorcycle fleet profile

Number of total fleet (national and/or BKK), categorised by fuel type, emission standards or any other criterion that is available at DLT



E-motorcycle manufacturers or operators or Pilot projects

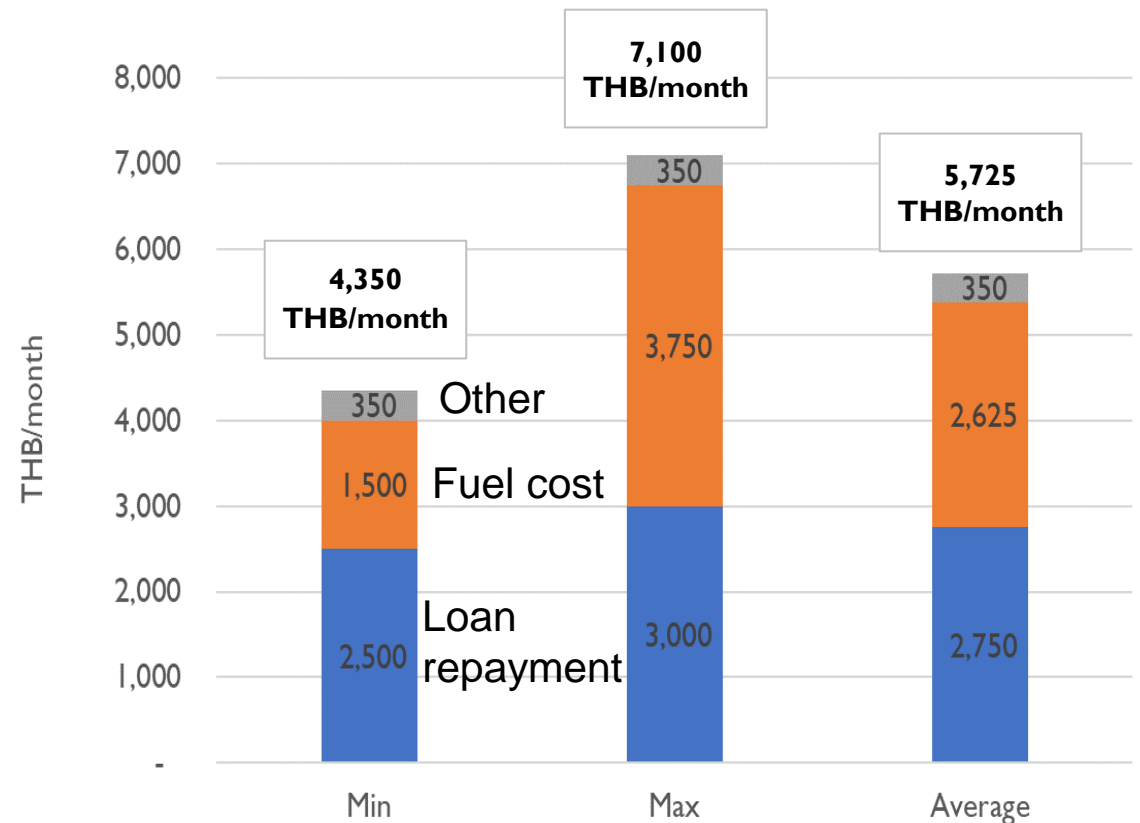
Example: Edison, Elon, Tatung, Winnonie

Status of motorcycle taxi operators in Bangkok

According to the field survey, the status of riders is as follows:

- **Individual operators** (majority): own vehicles and provide taxi service
- **Unstable income**, with an average of around **620 THB/day**, varying from around 300-1,000 THB/day.
- Their expenses are approximately **4,350 – 7,100 THB/month**, divided into
 - (1) Loan/leasing repayment for vehicle: **2,500 - 3,000 THB/month**
 - (1) Fuel cost: **1,500 – 3,750 THB/month**
 - (2) Others: **about 300 – 400 THB/month**
- Estimated travel: **100 – 160 km/day**

Operating cost of public motorcycle taxi (excluding income of rider)



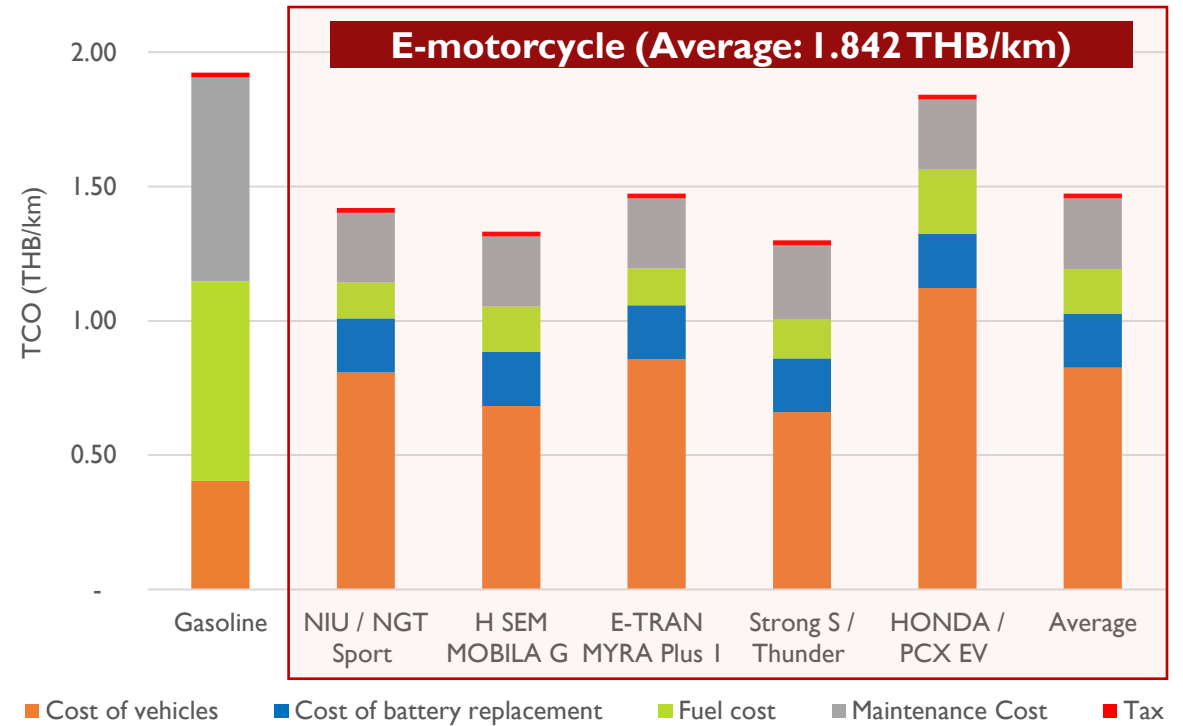
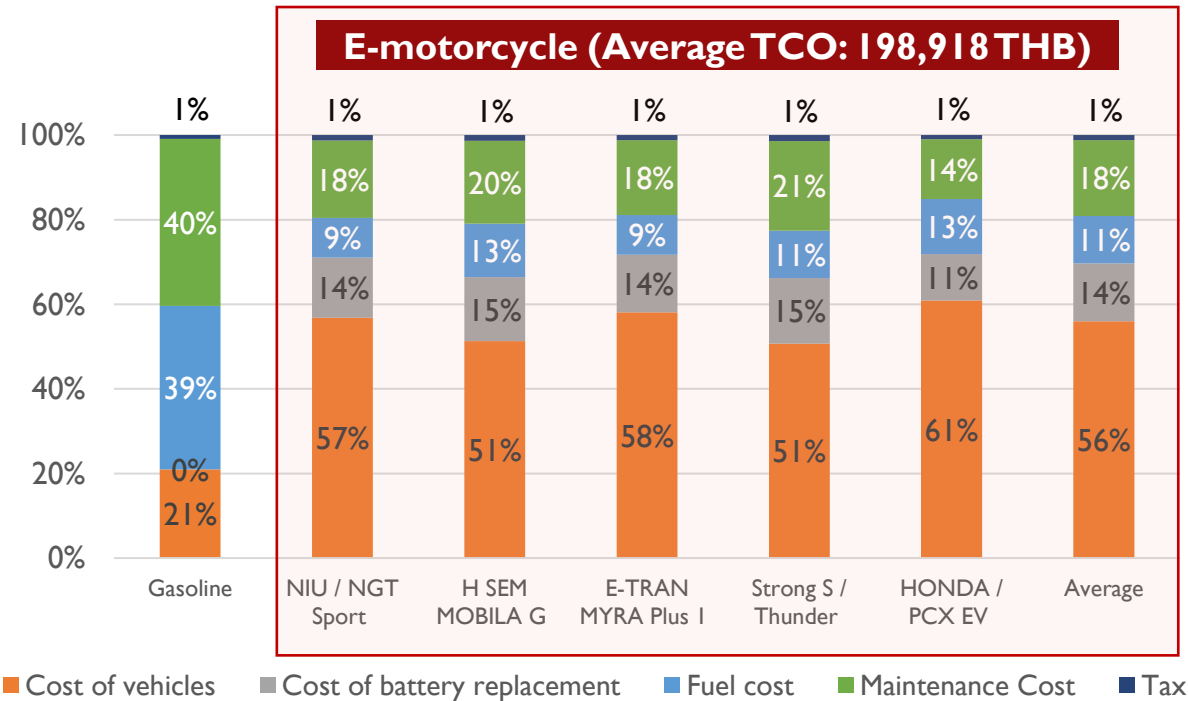
Total cost of ownership (TCO): Diesel and Electric Motorcycle Taxi

CAPEX & OPEX over 6 years (lifetime)

Cost	Model	ICE	NIU / NGT Sport	H SEM MOBILA G	E-TRAN MYRA Plus 1	Strong S / Thunder	HONDA / PCX EV
CAPEX (THB)		54,500	136,181	119,381	142,741	116,181	178,692
OPEX (THB)		205,202	55,553	60,394	56,195	59,284	69,991
Total (THB)		259,702	191,733	179,775	198,935	175,465	248,684

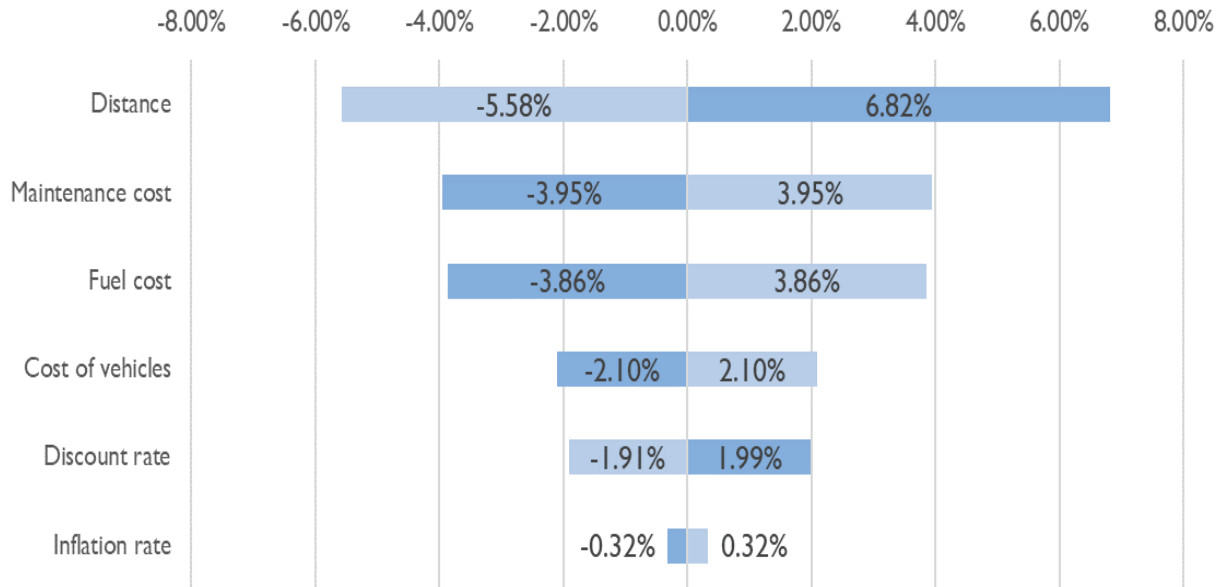
TCO : THB/km.

Cost	Model	ICE	NIU / NGT Sport	NIU/N Series	Strong S / Ezy	Strong S / Thunder	HONDA / PCX EV
TCO (THB/month)		3,607	2,663	2,497	2,763	2,437	3,454
TCO (THB/km)		1.924	1.420	1.332	1.474	1.300	1.842

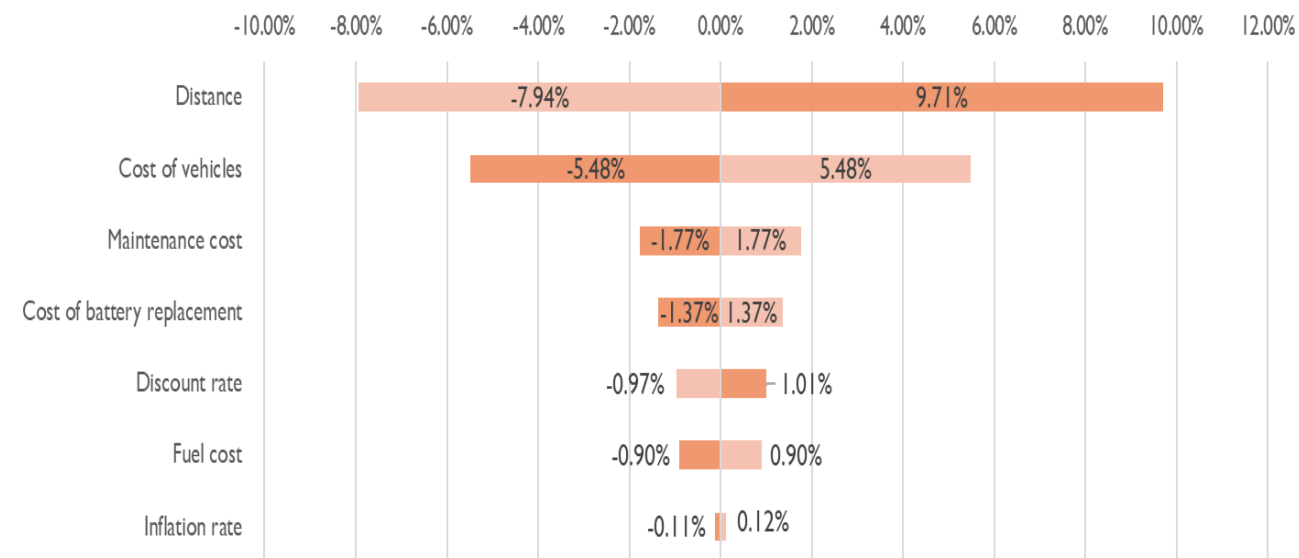


Sensitivity analysis of TCO

Changes of TCO of gasoline motorbike (%)



Changes of TCO of electric motorbike (%)



- The change distance will have the greatest impact on TCO, especially impact on TCO of electric motorbike (9.71%).
- The change in cost of vehicle affects TCO of an electric motorcycle around 5.48%, but the impact on TCO of gasoline motorcycle is 2.10%.
- The change in fuel costs affects TCO of gasoline motorcycles at 3.86% more than that of electric motorcycles at 0.9%.
- The change in the maintenance cost affects the TCO of diesel motorcycles by around 3.95%, but the impact on the TCO of electric motorcycles is 1.77%

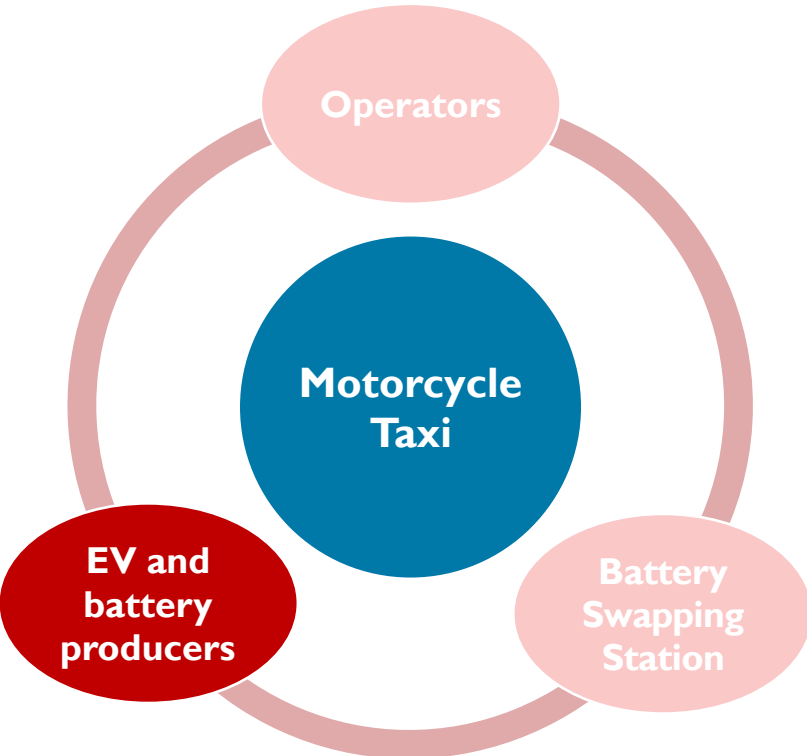
Financial and technical challenges for motorcycle taxi electrification

Financial

- **Limited access to finance** and lack of confidence from financial institutions on EV manufacturers
- **Higher production cost** for local manufacturers compare to import cost (especially exemption of import tax)
- **No reference for the residual value** of EV, especially public EV that commercial bank can be applied for assessing project financing

Technical

- **Uncertain demand** of electric motorcycle
- Needs for the model of which the battery capacity is sufficient for 100 – 160 km/day
- Existing models of e-motorcycle in the market (small & low speed) do not match with the application of motorcycle taxi.
- Timely process for local certification of e-motorcycle
- Lack of operators' awareness on safety of electric motorcycle



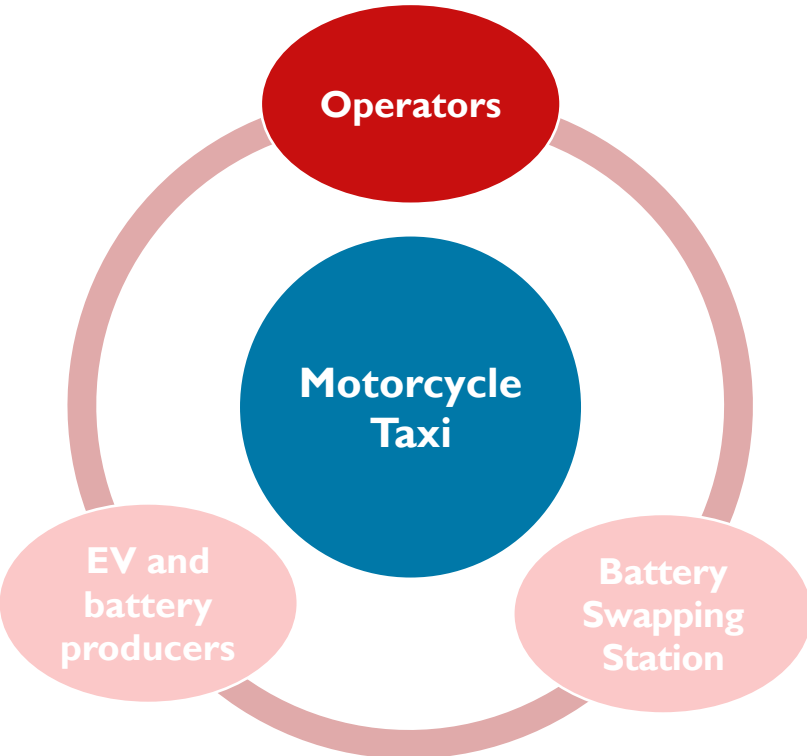
Financial and technical challenges for motorcycle taxi electrification

Financial

- Relatively **high investment cost** of battery swapping stations
- Require new business model – **battery as a service** – to reduce upfront cost
- Unstable electricity price

Technical

- **No universal batteries for all models**
- Timely and **complicated process for registration** of e-motorcycle
- **Limited technical capacity** to maintain and repair of e-motorcycle
- Existing models do not match the application of motorcycle taxi (small & low speed)



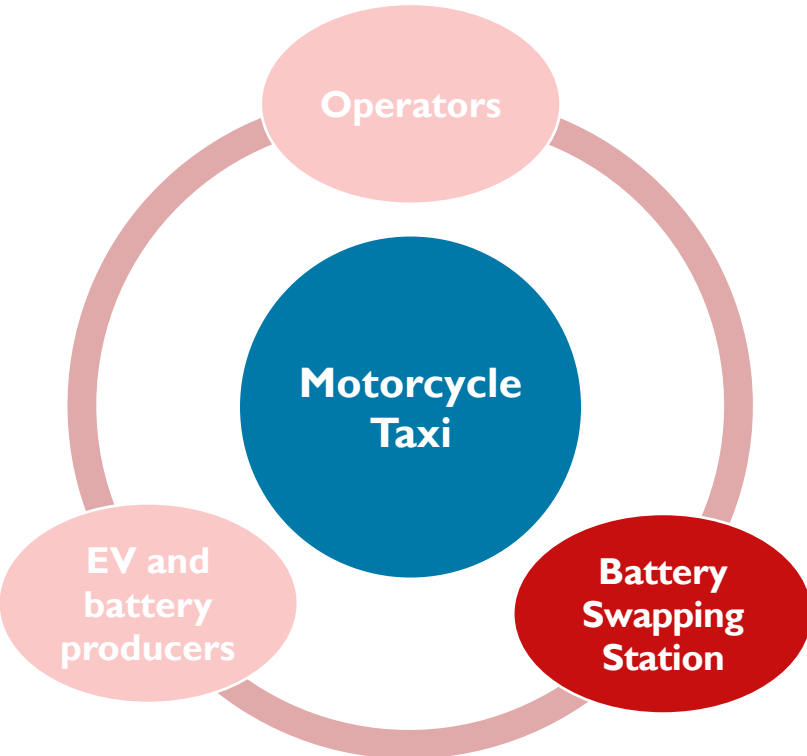
Financial and technical challenges for motorcycle taxi electrification

Financial

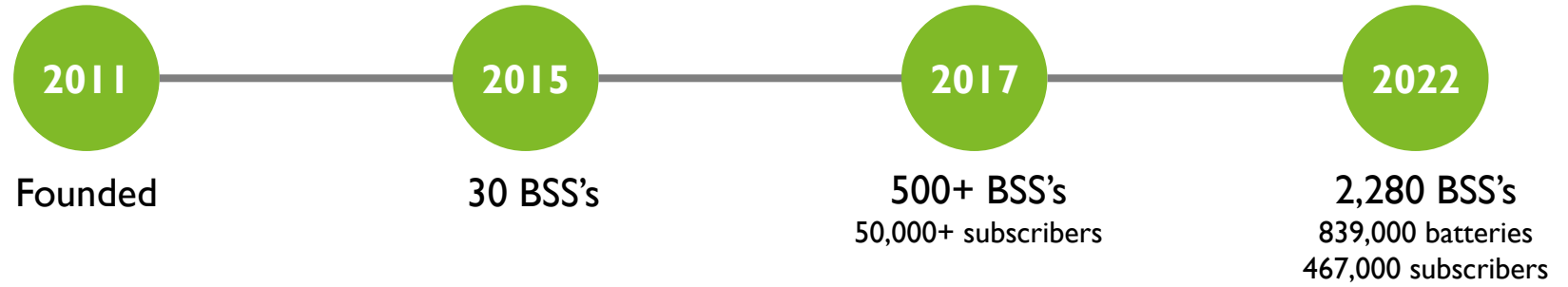
- **Limited access to finance** and lack of confidence from financial institutions on EV manufacturers
- **Higher production cost** for local manufacturers compare to import cost (especially exemption of import tax)
- **No reference for the residual value** of EV, especially public EV that commercial bank can be applied for assessing project financing

- **Uncertain demand** due to small number of e-motorcycle
- No clear standard and in-charge public sector on battery swapping stations in Thailand – Difficult to access to financial support from the government
- Timely and complicated permission process

Technical

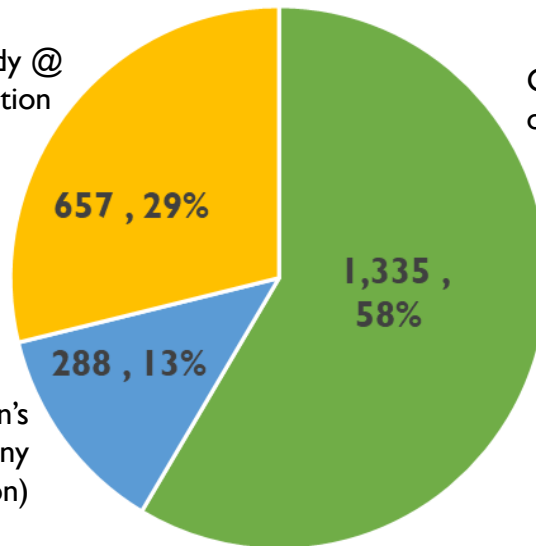


Case study: Battery swapping stations: “Gogoro, Taiwan”



Government subsidy @
USD10,140 per station

Belong to Taiwan's
national oil company
(CPC corporation)

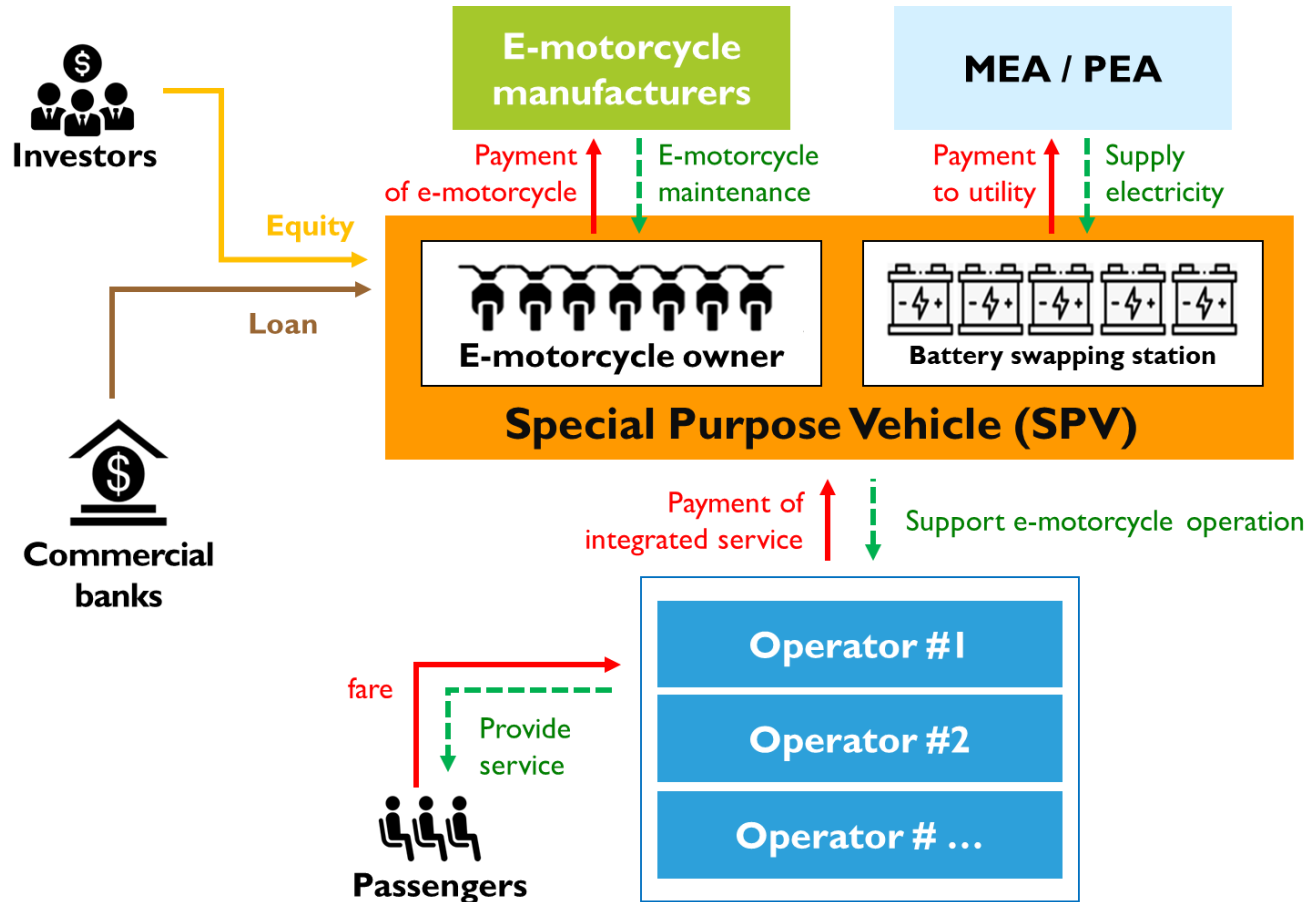


Gogoro's
own fund

Financial support from the government

- 30 million USD investment in Gogoro through National Development fund (2015)
- Subsidy for BSS; 10,140 USD/station (2018)
- CPC corporation (Taiwan's state-owned company) invested in 288 BBS outside Taipei area
- Subsidy in electric motorcycle taxi

Proposed Model: Integrated End-to-end Financing Model



- This model aims to bundle all services/products required for motorcycle taxi electrification (mainly vehicle, battery, and charging infrastructure) to provide an integrated solution.
- Key players include:
 - **Integrated end-to-end service SPV:** owning all assets required for motorcycle taxi electrification through a long-term contract with e-motorcycle manufacturers as well as charging infrastructure suppliers and providing an integrated end-to-end service to the motorcycle taxi operators under monthly or yearly contracts.
 - **Motorcycle taxi operators (riders):** providing service to passengers. Operators can rent electric motorcycles together with maintenance and charging services through the SPV. **Operators will be charged for integrated service on a monthly basis while the revenue comes from the fare collection.**

Financial assessment of integrated end-to-end financing model

Concept: Find a charging rate for end-to-end service (THB/year) that allows an attractive investment return to integrated service SPV. (IRR > 10%)

For Scenario III, the service fee is lower than the operators' baseline operating cost due to the large-scale adoption of the e-motorcycle.

However, Scenario I&II requires support for all competitiveness with the baseline situation.

Items	Unit	Scenario I	Scenario II	Scenario III
Targets of e-motorcycle in 2030	units	10,000	85,000	650,000
Total batteries in 2030	pieces	15,000	127,500	975,000
Total modules of batteries in 2030	modules	750	6,375	45,000
Operating cost of operators				
Service fee	THB/year	56,500	53,000	50,500
Baseline operating cost of operator	THB/year	52,200		
Return on investment: Integrated service SPV				
• NPV	MB	137.36	833.07	5,283.95
• IRR	%	10.36%	10.13%	10.17%
• Payback Period	years	9.5	9.8	9.6

Remarks: Scenario I: Assumed by consultants at 1,000 e-motorcycle deployed each year
 Scenario II: All motorcycle taxi in Bangkok changes to e-motorcycle
 Scenario III: Targets of national plan (30@30)



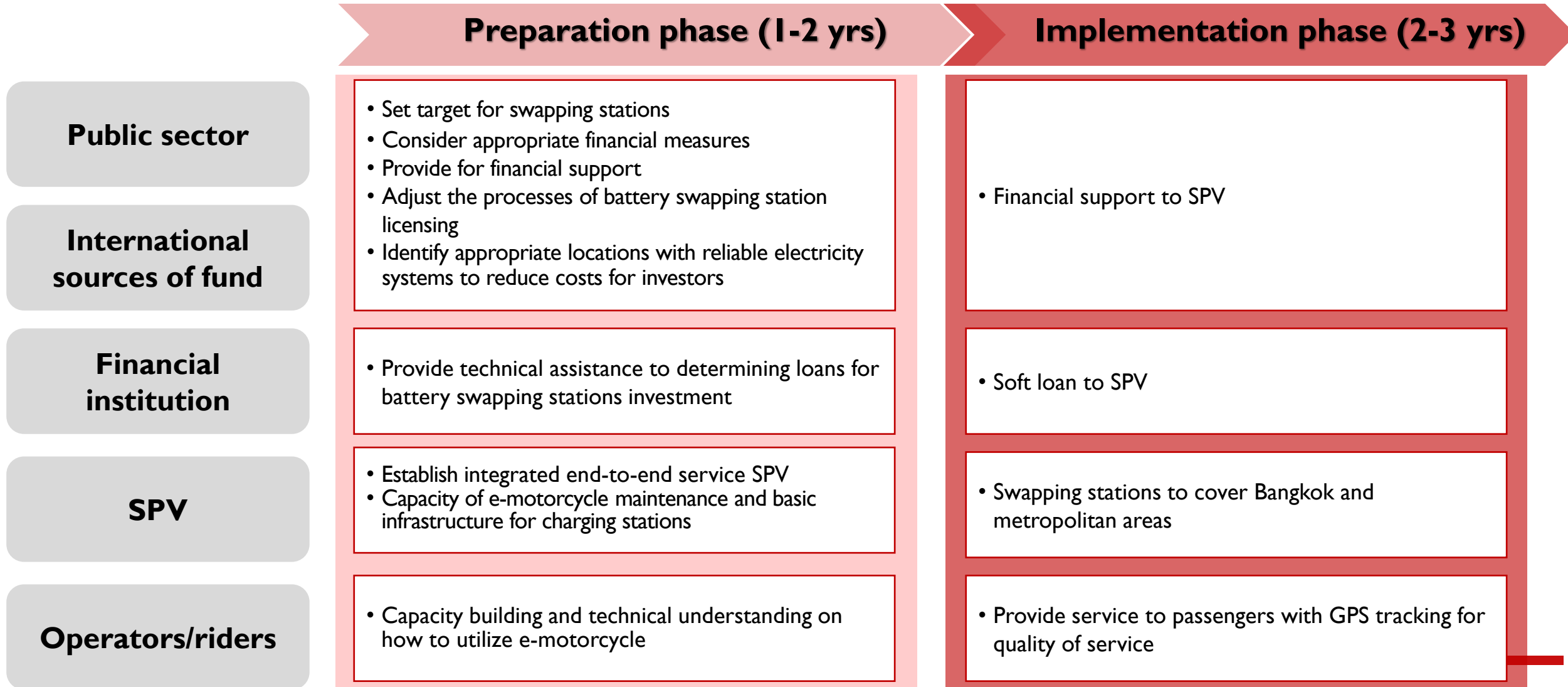
Source: <https://www.global-imi.com/blog/electric-vehicle-battery-swapping-boom-or-bust>

Scenario analysis on support needed integrated end-to-end financing model

Items	Unit	Scenario I	Scenario II	Scenario III
Targets of e-motorcycle in 2030	units	10,000	85,000	650,000
Total batteries in 2030	pieces	15,000	127,500	975,000
Total modules of batteries in 2030	modules	750	6,375	4,500
Operating cost of operators				
Baseline operating cost of operator	THB/year		52,200	
Service fee estimated at 10% Discount fom baseline	THB/year		46,980	
Investment subsidy needed for Battery Swapping Stations				
• Subsidy per module	THB	150,000	110,000	70,000
• NPV of subsidy	%	472.83	2,325.14	9,517.53
Return on investment: Integrated service SPV				
• NPV	MB	96.51	735.76	4,954.08
• IRR	%	10.22%	10.32%	10.32%
• Payback Period	years	9.4	9.6	9.4
Return on investment with carbon revenues: Integrated service SPV				
• NPV with carbon revenues	MB	99.31	752.24	5,383.20
• IRR	%	10.29%	10.37%	10.52%
• Changes in NPV	MB	2.81	16.48	429.13

Remarks: Scenario I: Assumed by consultants at 1,000 e-motorcycle deployed each year
 Scenario II: All motorcycle taxi in Bangkok changes to e-motorcycle
 Scenario III: Targets of national plan (30@30)

Roadmap to promote battery swapping stations for public electric motorcycle



Contact



Pan Piyasil
Advisor

Tel: (+66) 82 022 0699

Email: pan.piyasil@giz.de

Website: <https://www.changing-transport.org/>