The Development of Fuel Cell Scooters in Taiwan

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Outline

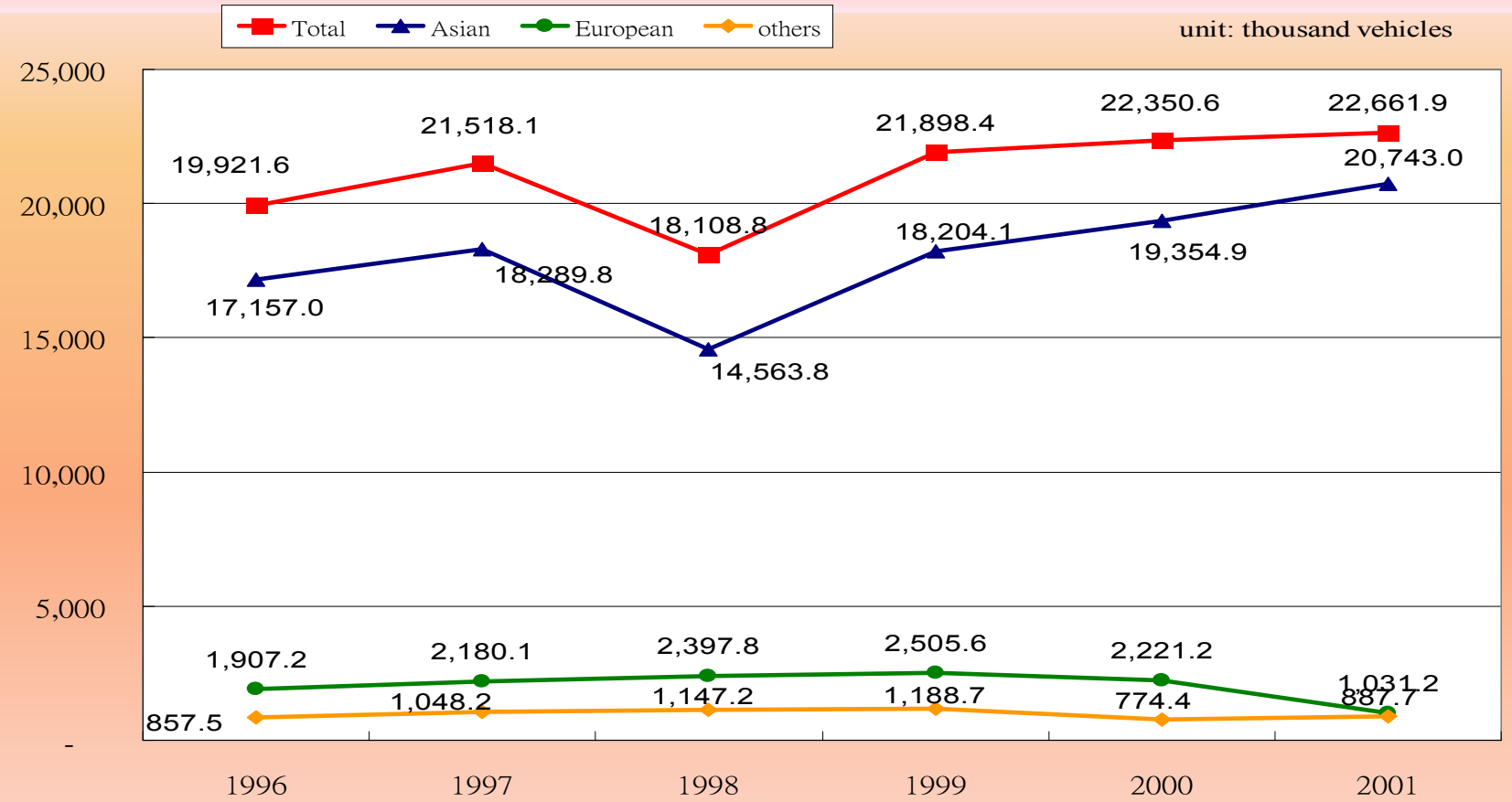
1. Introduction

Scooter volume：11.7 million (12/2001)

～Every 2 people owns one scooter～

2. Scooter Market

2.1 Scooter Sales in Major Countries



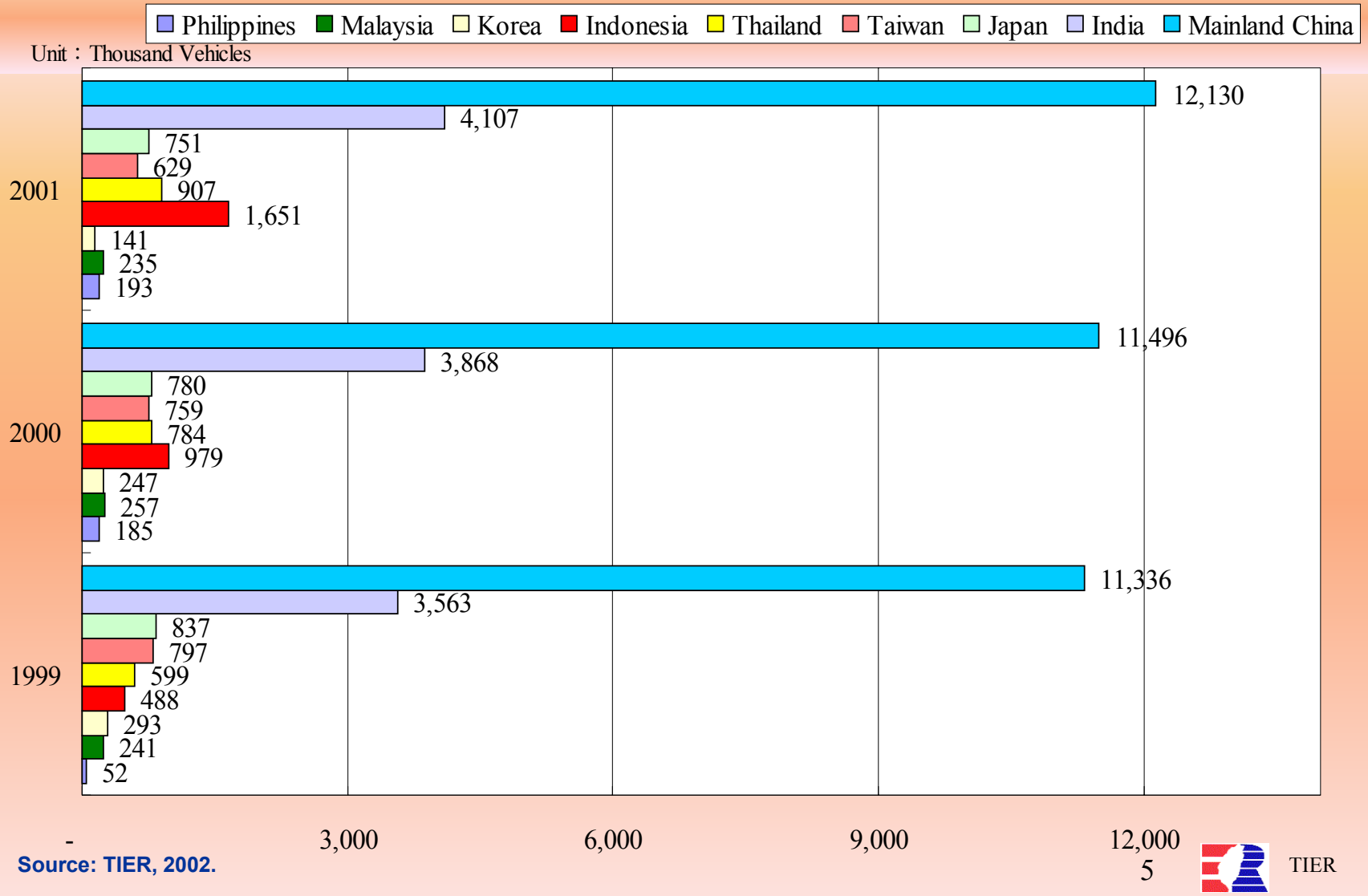
Note：The Asia countries include the Philippines, Malaysia, South Korea, Indonesia, Thailand, Taiwan, Japan, India, and Mainland China.

The European countries include Greece, Belgium, the Netherlands, the United Kingdom, Germany, France, Spain, and Italy.

The Other countries include Australia, Columbia, Argentina, Brazil, and the United States.

Source: TIER, 2002.

2.2 Scooter Sales in Asia



Source: TIER, 2002.

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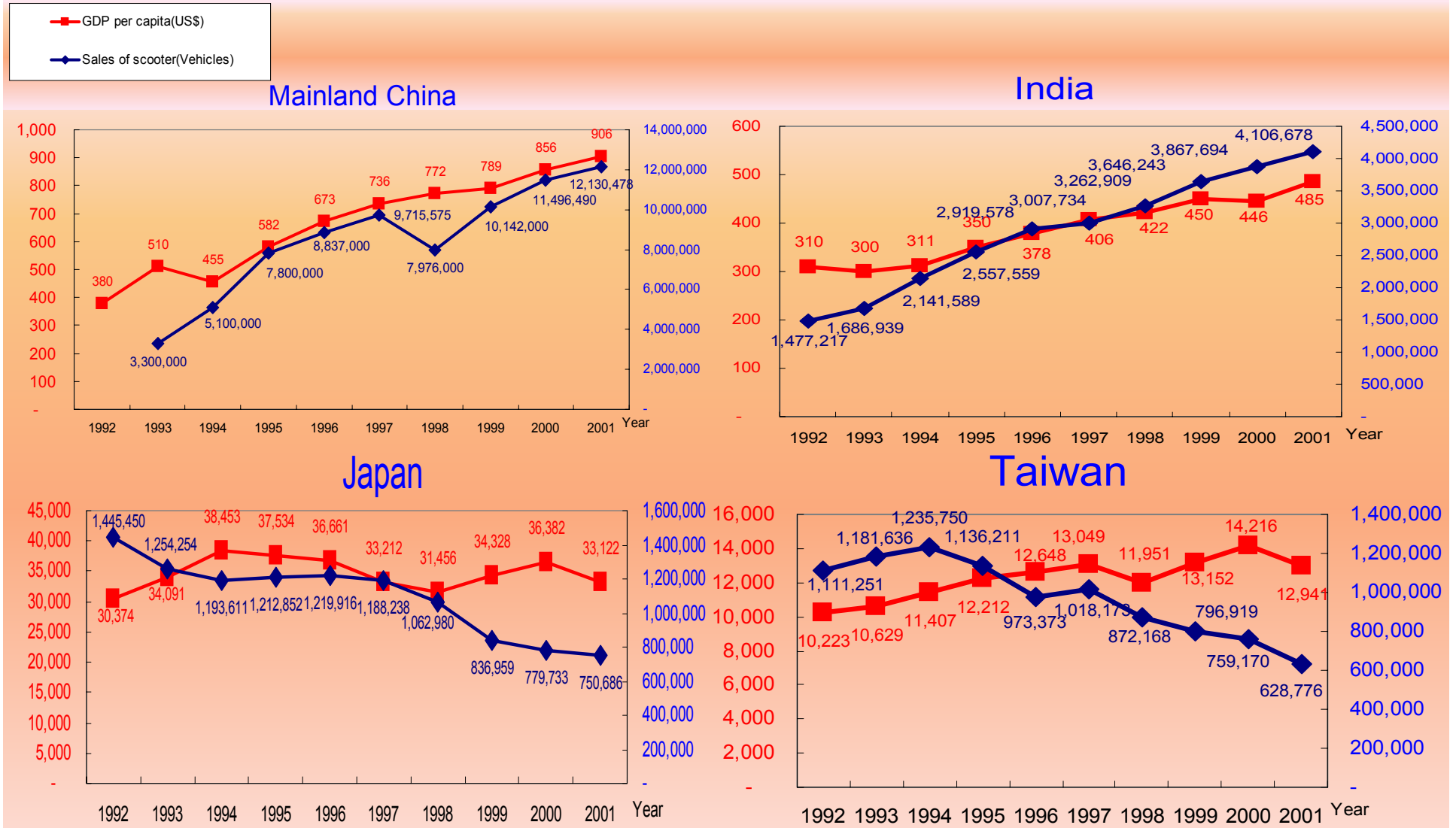
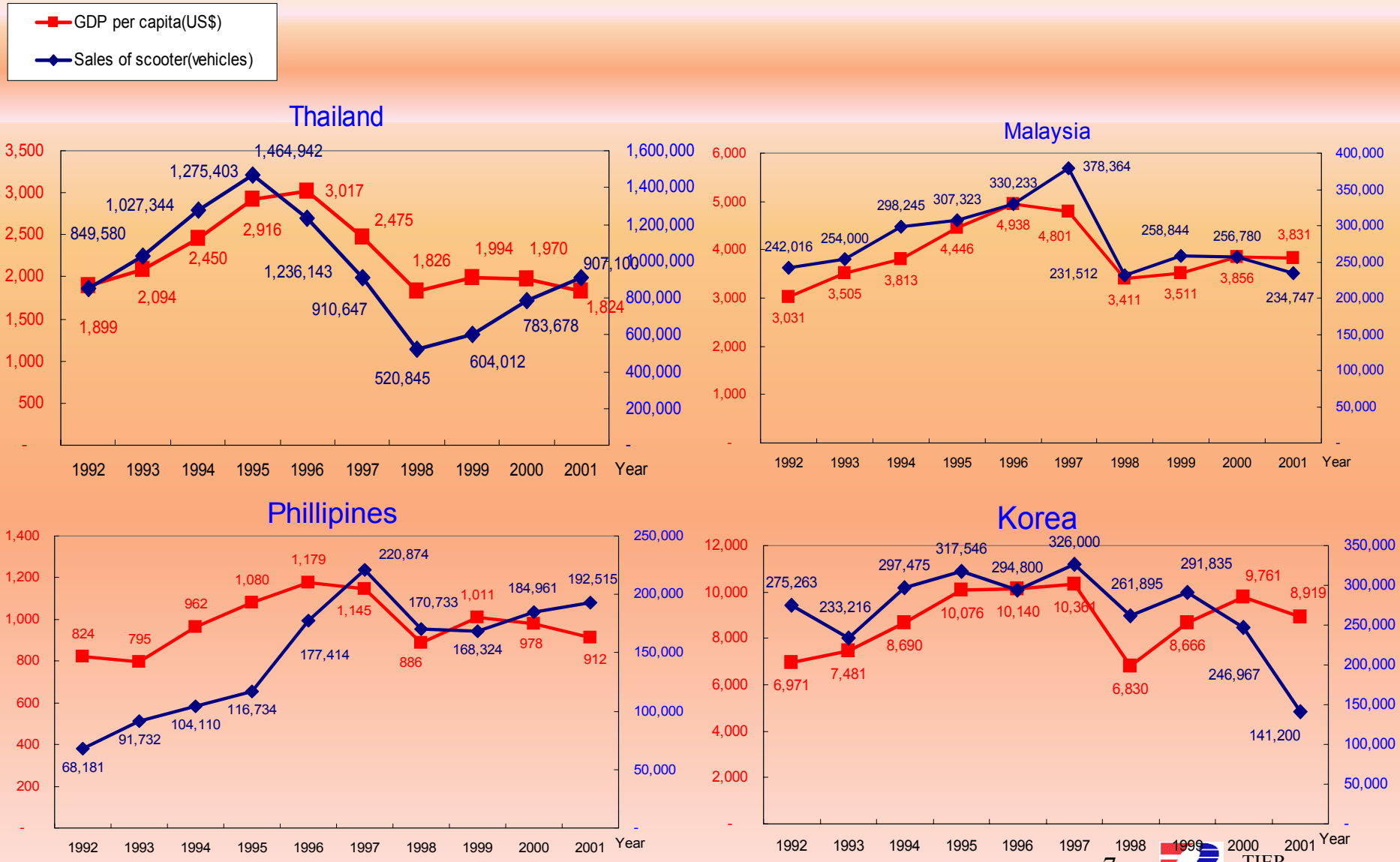
2.3 GDP & Scooter Sales in Asian Countries



GDP & Scooter Sales in Asian Countries



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3. Governmental Policies

3.1 Strict Exhaust Standard

Test Item		Unit	Criterion Ⅱ (Practice：1991/7/1)	Criterion Ⅲ (Practice：1998/1/1)	Criterion Ⅳ(Estimated Practice：2004/1/1)	
					Two Stroke	Four Stroke
Movement	CO	g/k	4.5	3.5	7.0	7.0
	HC+Nox	g/k	3.0	2.0	1.0	2.0
Idle	CO	%	4.5	4	3.0	3.0
	HC+Nox	PPM	7000	6000	2000	2000
Particulate Pollutant		%	15	15	15	15

Note: Criterion Ⅲ adopts the test criteria of warm-car states; Criterion Ⅳ adopts that of cold-car states.
Source: EPA, 2002.

3.2 Electric Motorcycle Development Action Plan

- **Proposed by the Environmental Protection Administration (EPA) with an estimated budget of US$185 million**
- **After 2000, 2% of each scooter manufacturers' sales must be from electric scooters**
- **In 2006, it is estimated that 400 thousand electric scooters will be sold, comprising 40% of annual scooter sales**
- **Generate more than US$1.5 billion for related industries**

3.3 Subsidy for Purchasing Electric Scooters

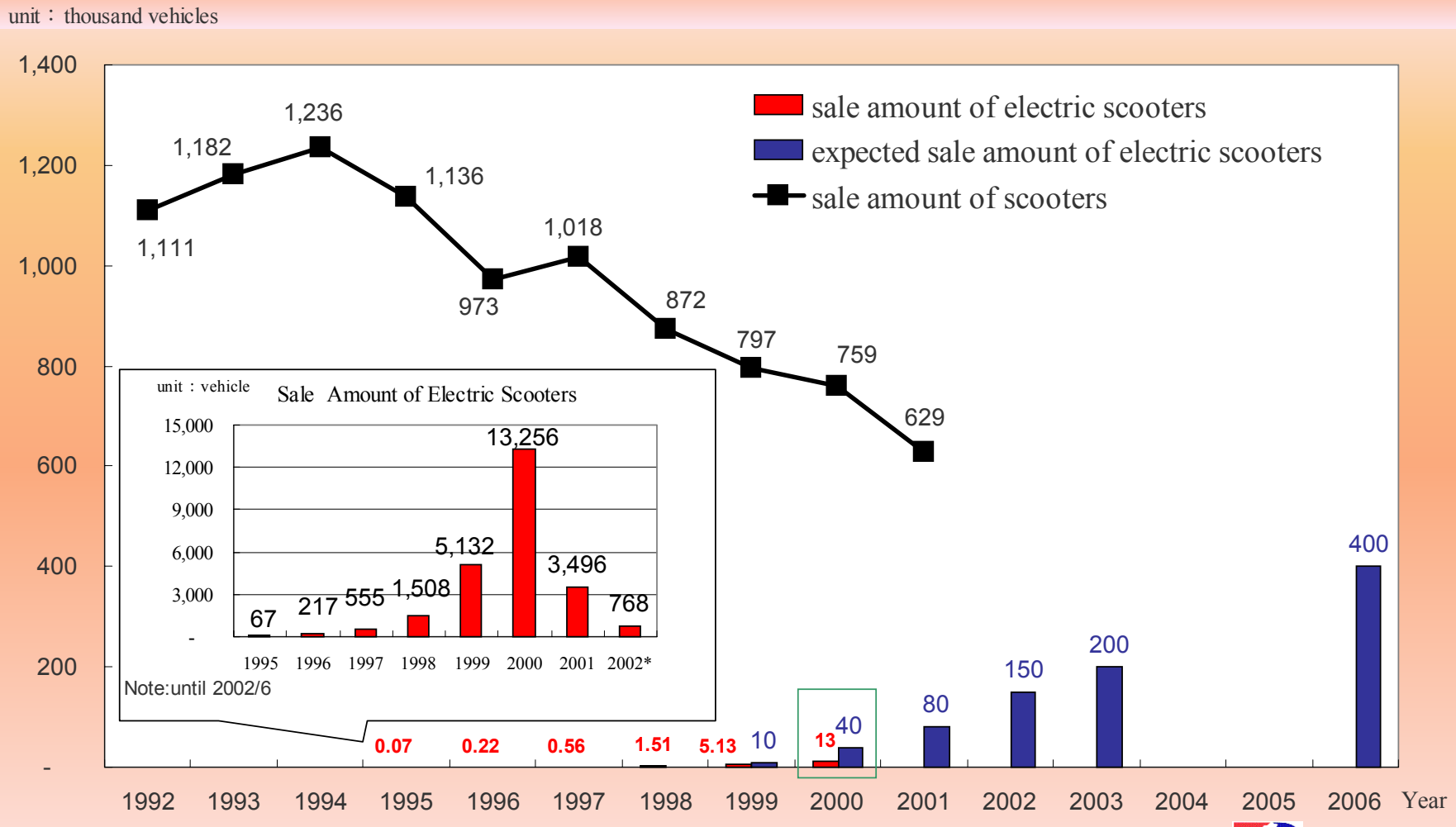
- 1st phase (5/1998～12/1999)
  - US$150 for each scooter
  - US$60 ~ US$75 for other accessories
- 2nd phase (1/2000～12/2002)：
  - US$90 ～ US$150 for each scooter
  - US$735 ～ US$970 for battery

Consumer payment ：

US$880 for each electric scooter ≒ 50C.C. gasoline scooter

3.4 Outcome

~ Taiwan Scooter Market ~



Source: TIER, 2002

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4.Latest Promotional Activities of Fuel Cell Scooters

4.1 Accomplishments of Fuel Cell Scooters in Taiwan

ZES I

ZES II

ZES II.5

ZES II.6

ZES III

Performance of Various Scooter Types

		125C.C IC Engine	Lead-Acid Battery	ZES I	ZES II	ZES III	ZES IV (2004)
Max Speed	Km/h	85-90	50	35	55	58	85
Climb (8 degrees with 90 kg load)	Km/h	60	24	18	-	20	40
Range	Km	240	38	25	70	120	160
Weight	Kg	105	125	130	105	143	105
Energy Usage （30km/hr）	wh/km	315	22	27	25	-	20
Fuel Refill (Recharge) Time	hr	0.03	7	1	0.02	0.05	0.03
Noise Pollution	db	75	65	70	65	78	65
Pollutant Emission		Yes	No	No	No	No	No

Source: APFCT, 2002.

Industry Structure of Fuel Cell Scooter

Fuel Cell Stack

Fuel Cell Scooter

Consumers

Exchange Station

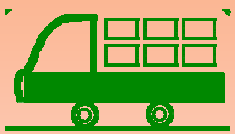
Gas Station

Convenient Store

Repair Store

Metal Hydride Canisters

Logistics



4.2 Taiwan Fuel Cell Partnership

The missions :

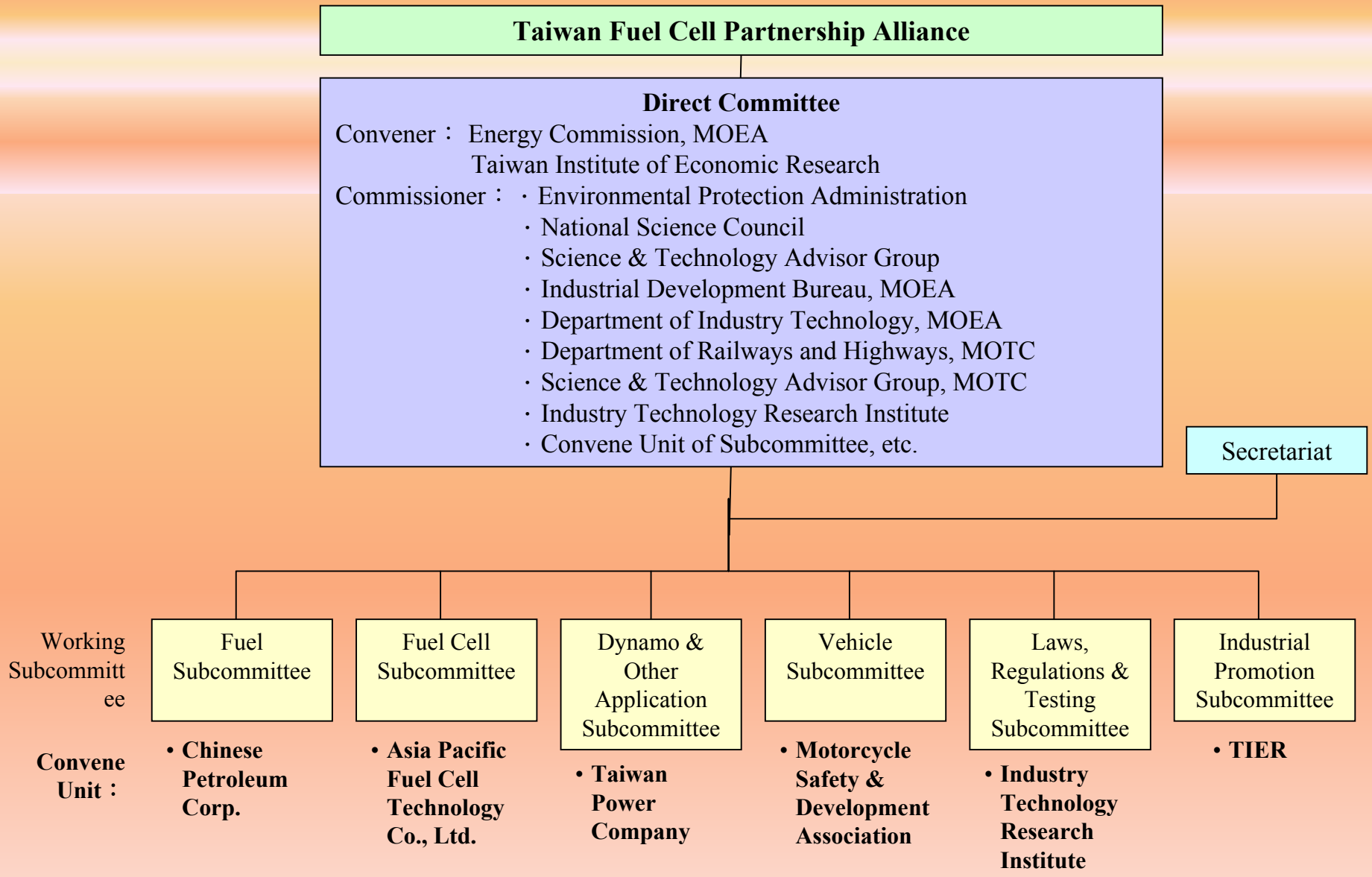
a. To develop the standards and regulations of fuel cells, fuel supply systems, and fuel cell scooters;

b. To test and verify fuel cell scooters;

c. To demonstrate the fuel cell scooter fleet;

d.To hold The Domestic Fuel Cell Forum and The International Fuel Cell Conference; and

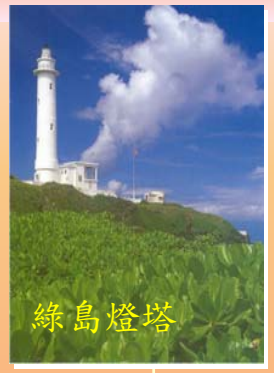
e. To establish the Taiwan Fuel Cell Partnership website and publish the "Taiwan Fuel Cell Development" newsletter.


Taiwan Fuel Cell Partnership Alliance
Direct Committee
Convener： Energy Commission, MOEA
Taiwan Institute of Economic Research
Commissioner： · Environmental Protection Administration
· National Science Council
· Science & Technology Advisor Group
· Industrial Development Bureau, MOEA
· Department of Industry Technology, MOEA
· Department of Railways and Highways, MOTC
· Science & Technology Advisor Group, MOTC
· Industry Technology Research Institute
· Convene Unit of Subcommittee, etc.
Secretariat
Working Subcommittee
Fuel Subcommittee
Fuel Cell Subcommittee
Dynamo & Other Application Subcommittee
Vehicle Subcommittee
Laws, Regulations & Testing Subcommittee
Industrial Promotion Subcommittee
Convene Unit：
• Chinese Petroleum Corp.
• Asia Pacific Fuel Cell Technology Co., Ltd.
• Taiwan Power Company
• Motorcycle Safety & Development Association
• Industry Technology Research Institute
• TIER

4.3 Green Island

- E For Green Hope -

Fuel Cell Scooter Demonstration Fleet



5. Conclusion & Suggestion

- There are tremendous gasoline scooters making serious air pollution problems in Taiwan and Asia.
- Taiwan government implemented several polices to promote battery powered electric scooters, but failed.
- It has been proved to have the technical capability to apply the fuel cells on scooters in Taiwan.
- The goals of "Taiwan Fuel Cell Partnership" and the project of fuel cell scooter demonstration fleet in Green Island are both to promote fuel cell scooters.
- By the strong ability to produce scooters and proximity to the tremendous scooter markets in Asia, Taiwan has the advantage to develop the fuel cell scooters.
- In order to accelerate the promotion of fuel cell scooters in the cross-strait, the TFCP would like to find a counterpart to cooperate with each other.