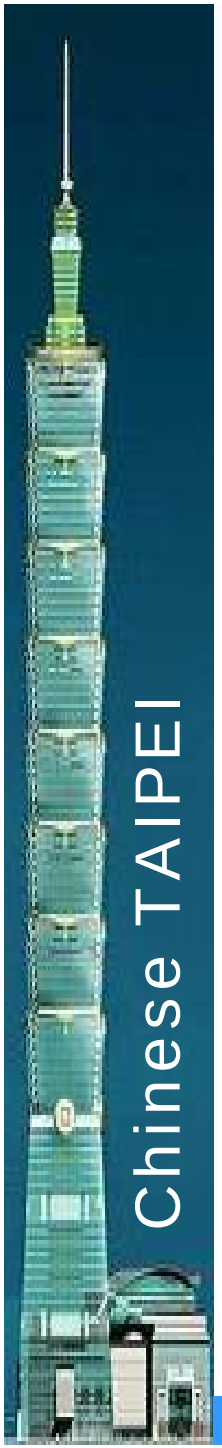


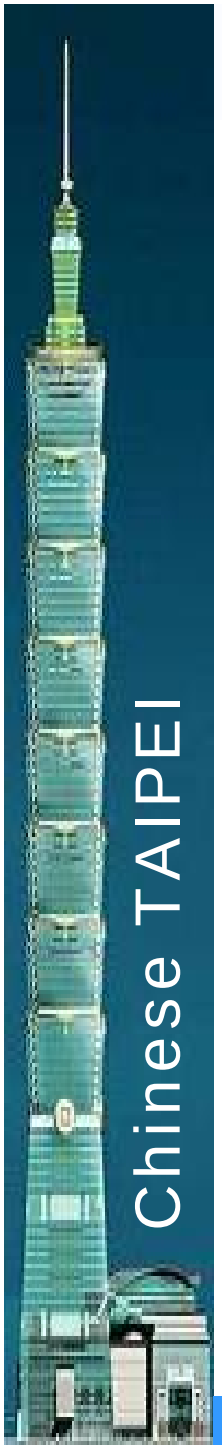
APEC New & Renewable Energy Technologies Expert Group Meeting
36th Meeting, February 28- March 4, 2011, Washington, D.C., USA

New and Renewable Energies in Transportation in Chinese Taipei

Yu-Chin Huang

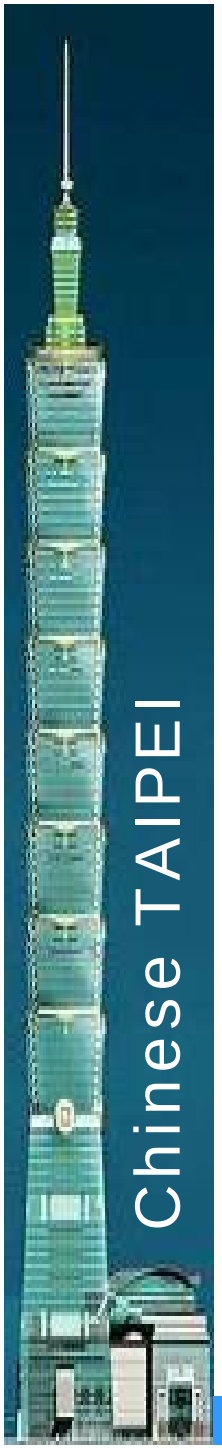
Bureau of Energy
Ministry of Economic Affairs

Feb 28- Mar 4, 2011, Washington, D.C., USA



Outline

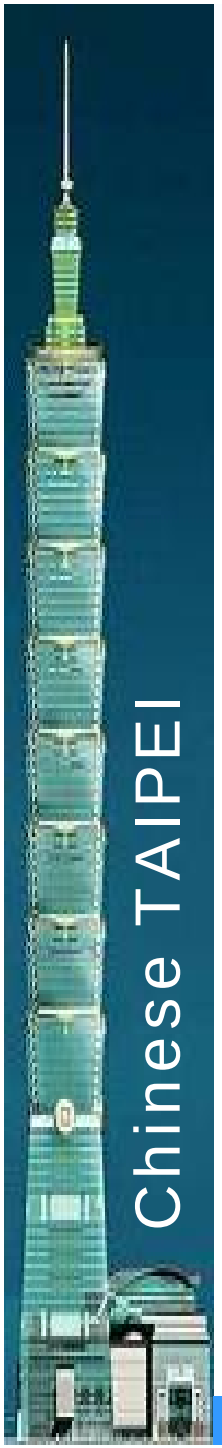
- Low Carbon Policy in Chinese Taipei
- Master Plan on Energy Conservation and Emission Reduction
- Biofuels Utilization in Chinese Taipei
- Development of SEVs in Chinese Taipei
- Solar-powered Boats in Chinese Taipei
- Production of Biofuels and SEVs in 2010
- Concluding Remarks



Low Carbon Policy in Chinese Taipei

Jun. 5, 2008	Framework of Sustainable Energy Policy
Apr. 14-15, 2009	3rd National Energy Conference
Apr., 2009	Green Energy Industry Program
Jul. 8, 2009	Renewable Energy Development Act
	Amendment of Energy Management Law
Nov. 20, 2009	Special Report on Energy Conservation and Emission Reduction
Dec., 2009	Establishment of the Committee on Energy Conservation and Emission Reduction
May, 2010	Approval of the Master Plan on Energy Conservation and Emission Reduction

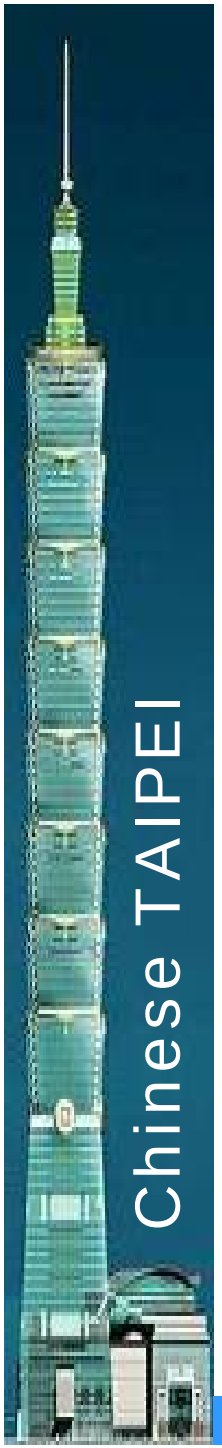
Developing a Low Carbon Energy Structure by 2025



Master Plan on Energy Conservation and Emission Reduction

> 10 Landmark Programs <

01. Sound Legal Framework (4 projects)
02. Low carbon Energy System (4 projects)
03. Low Carbon Community & Society (4 projects)
04. Low Carbon Industry (4 projects)
05. Green Transportation (5 projects)
06. Green Agriculture & Building (4 projects)
07. Energy Saving and Emission Reduction Technology (2 projects)
08. Low Carbon Public Construction (3 projects)
09. Energy Saving and Emission Reduction Education (3 projects)
10. Public Education (2 projects)



04. Low Carbon Industry

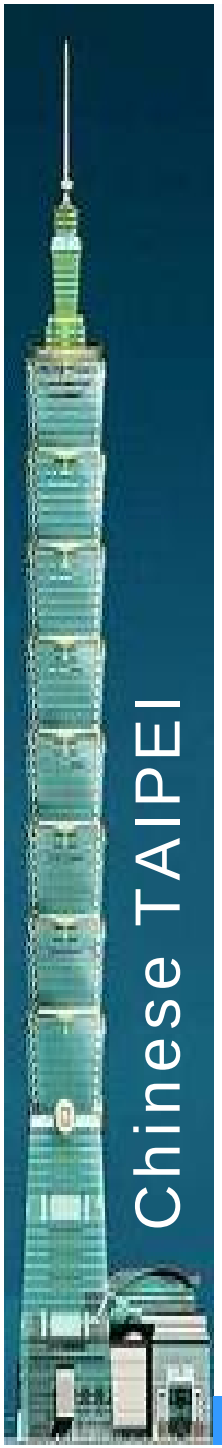
> 4 Projects <

(1) Industry Energy Conservation and Carbon reduction Project

(2) Environmental impact assessment on Energy-intensive Industry Development Policy

(3) Green Energy Industry Program

(4) Agriculture Energy Conservation and Carbon reduction Project



04. Low Carbon Industry

(3) Green Energy Industry Program

GHG Reduction

Developing Renewable Energy

Promoting Energy Conservation

Energy Industries

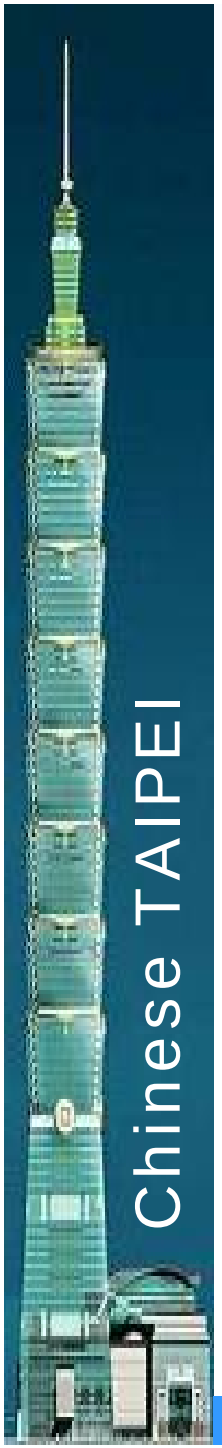
Major Industries

Solar PV, LED

Potential Industries

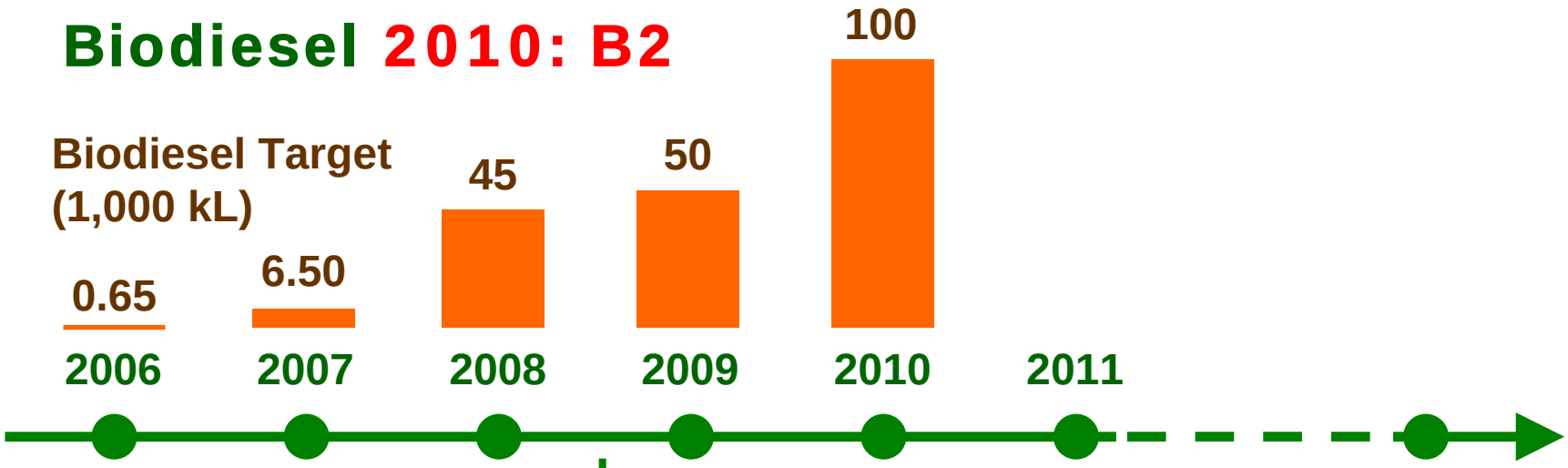
Wind power, **Biofuels**,
H_2 & Fuel cell, Energy IC,
Electric vehicle (EV)

Source: BOE (2009)



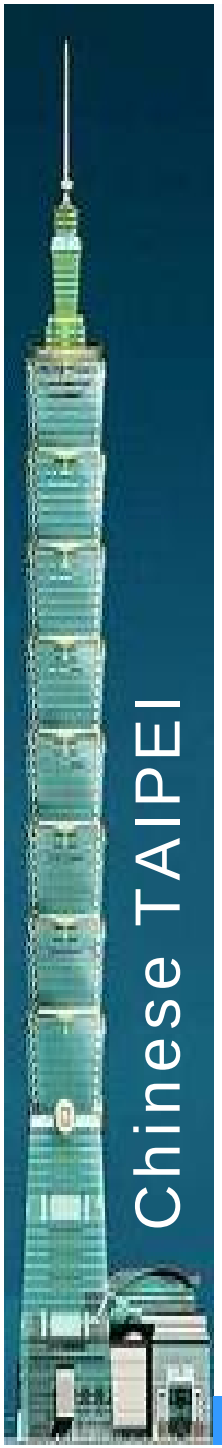
Promoting Biodiesel in Chinese Taipei

Biodiesel 2010: B2



- Mandatory B2 - 2010.07
- Mandatory B1 - 2008.07~ 2010.06
- Green County Demo Program
  2007.01~ 2008.06
  - B1 in the demo county
- Preliminary Subvention Program (Green Bus)
  2006.10~ 2008.06
  - Public transportation buses fueled by B5 in a selected area

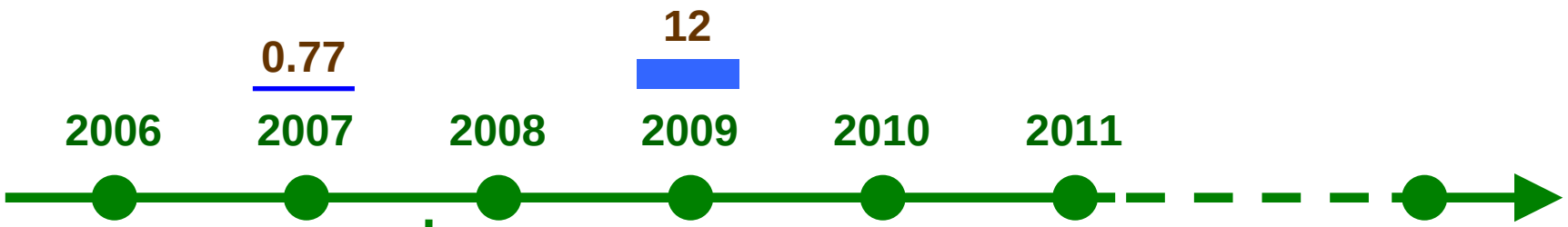
Source: BOE (2010)



Promoting Bioethanol in Chinese Taipei

Bioethanol 2011: E3

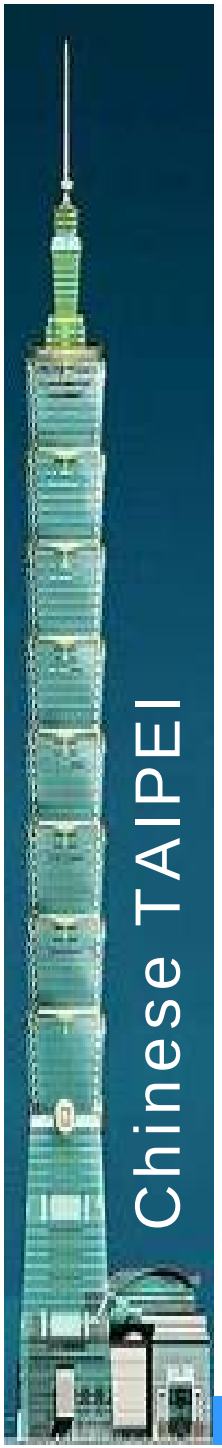
Bioethanol Target (1,000 kL)



Government Vehicles Demo Program
2007.09~ 2009. 07
- Government Vehicles in Taipei are fueled E3 (~8 stations)

E3 Demo Program in Taipei & Kaohsiung
2009.07~ 2010.12
- 14 gas stations in Taipei and Kaohsiung provide E3

Source: BOE (2010)

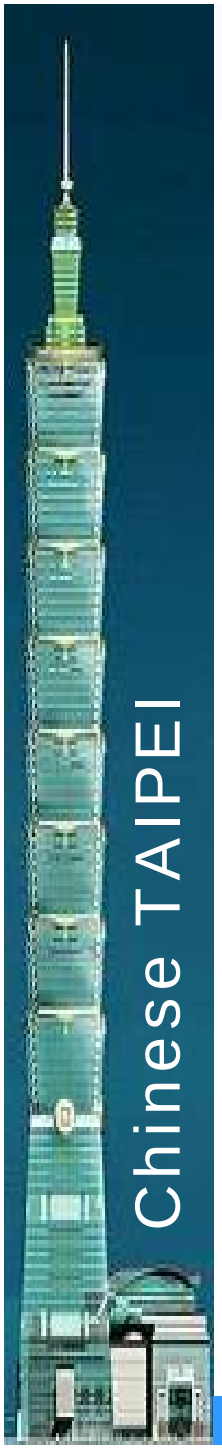


Current Biofuels Utilization in Chinese Taipei

- **Mandatory B1 since July 2008, and B2 from July 2010**
  - Annual consumption of biodiesel (B100) ~ 47,000 kL in 2009.
  - ~70% domestic production from mostly waste cooking oil
  - 10 licensed biodiesel plants with ~US$ 43 million production
  - Completed biodiesel supply chain including feedstock suppliers, manufacturers, and marketing.

- **E3 demonstration since Sep. 2007**
  - 14 gas stations in Taipei and Kaohsiung Cities

Source: BOE (2010)



Development Strategy & Action Plan for Smart Electric Vehicle (SEV)

April 30, 2010

Development Target

Hybrid Electric Vehicle, HEV

Plug-in Hybrid Electric Vehicle PHEV

✓ **Battery Electric Vehicle, BEV**

✓ **Electric Scooters** [1]

priority

HEV

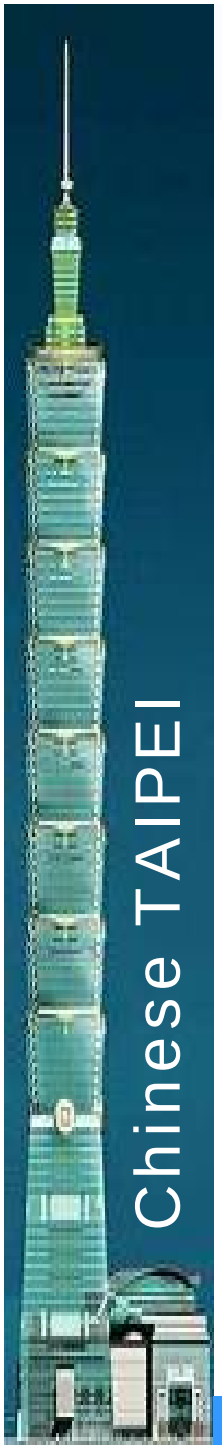
PHEV

BEV

E-Scooter

[1] Advanced E-Scooters Development Project (2009): Subsidize 160,000 scooters in 5 years (2009-2013)

Source: MOEA (2010)

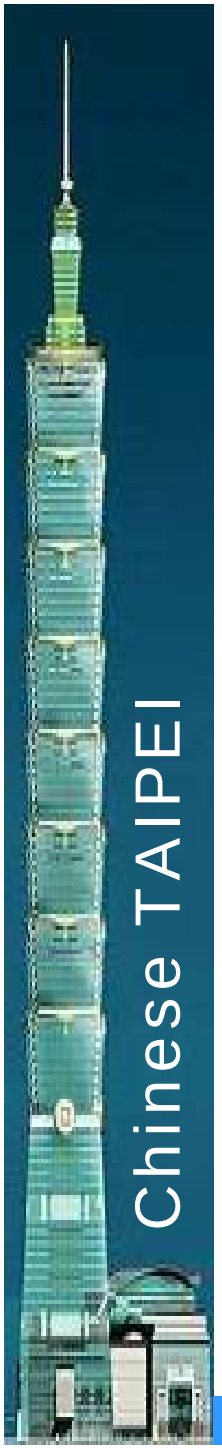


Development Strategy & Action Plan for Smart Electric Vehicle

Roadmap

Phase I	Phase II	Phase III
Starting	Growing	Expanding
Demonstration	Domestic & emerging market promotion	Global market Promotion
2010-2013	**2014-2016**	**2017-2020**
Subsidize the purchase and use of 3,000 pilot electric vehicles by 10 municipalities The budget is almost US$333 million	Total sales: 60,000 vehicles (Domestic: 45,000; Export: 15,000) Incubating the global top 10 BEV manufacturers	Total sales: 1,200,000 vehicles (Domestic: 200,000; Export: 1,000,000) Becoming the global top five BEV export economies

Source: MOEA (2010)



Developing Smart Electric Vehicle (SEV) in Chinese Taipei

Current

Vehicle Components

Future

Whole Vehicle

Vehicle Components

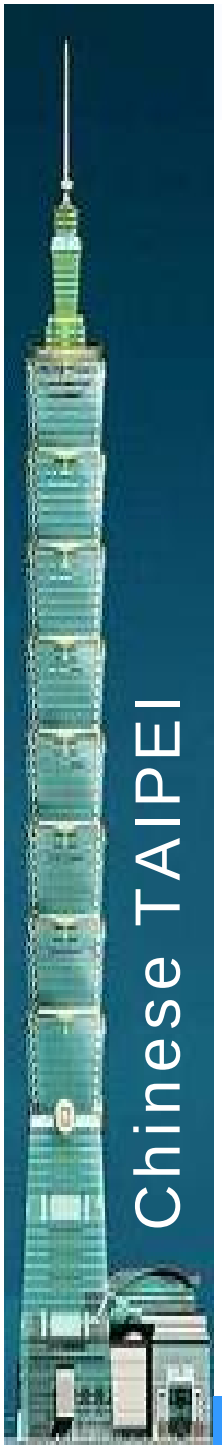
Services

Power Electronic Unit (PEU)

Battery Pack

Motor

Source: MOEA (2010)
Photo: Luxgen (2011)



Smart Electric Vehicle Manufacturers in Chinese Taipei

LUXGEN

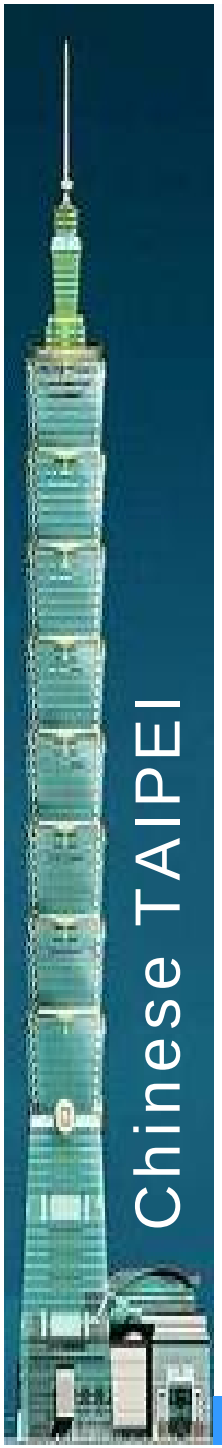
必翔集團 PIHSIANG

Luxgen7 MPV

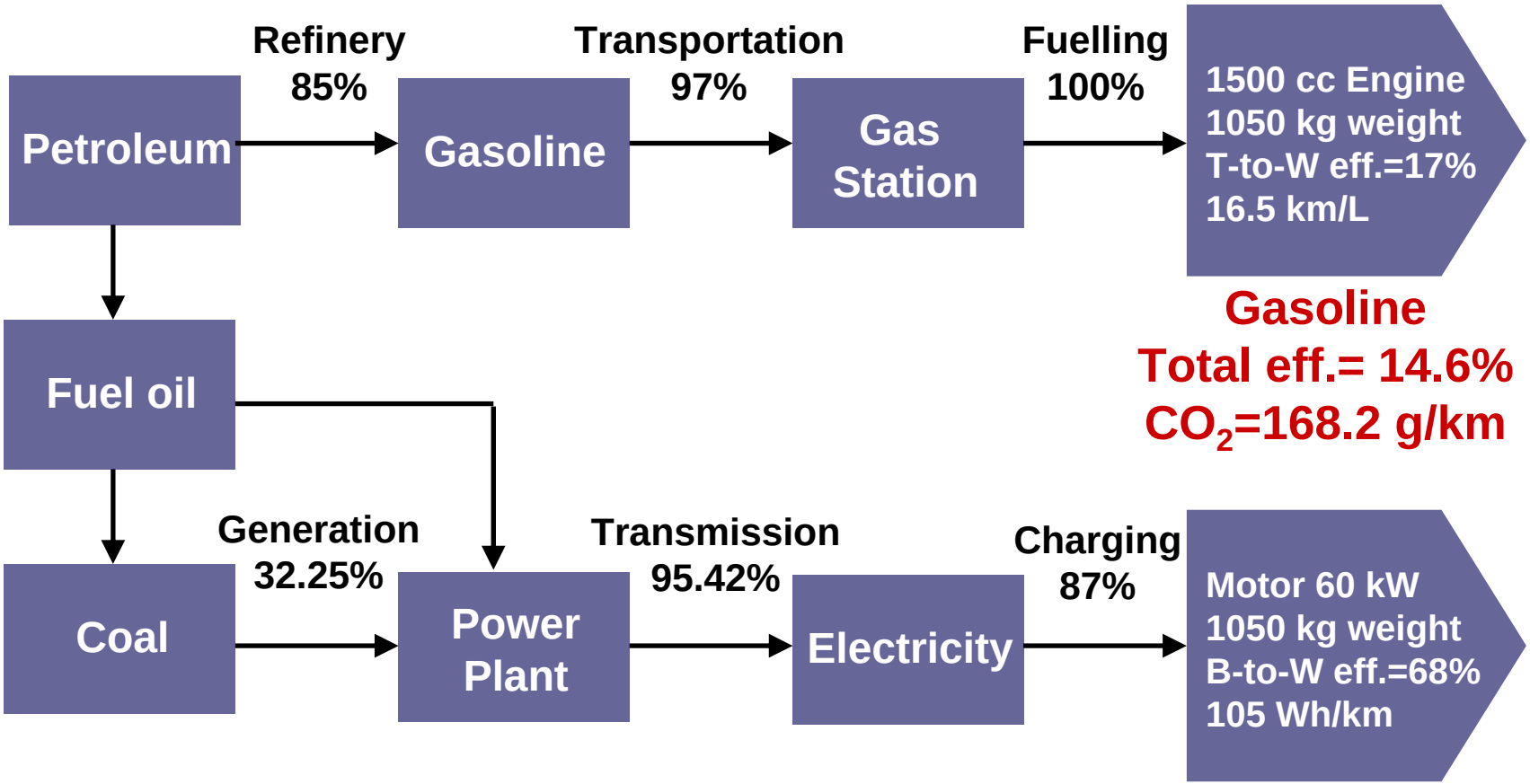
Pihsiang LEV

(Cooperated with French MicroCar)

Photos: Luxgen; Pihsiang (2011)

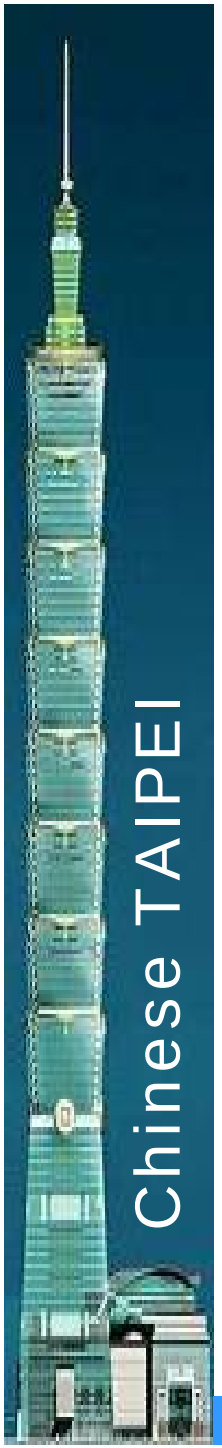


Gasoline Vehicle vs. Electric Vehicle in Chinese Taipei



Comparison of Energy Efficiency

Source: MOEA (2010)



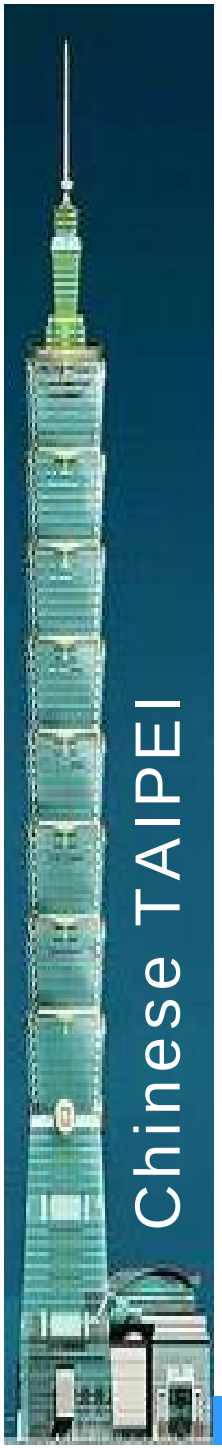
Solar-powered Boats in Chinese Taipei

Asian largest solar-powered tourist boat fleet (Sep., 2010)

- Operated by Kaohsiung City Shipping Co., Ltd.
- 5 solar boats for sightseeing and local transportation
- Fueled by 18 solar power panels supplying power to two sets of 12 lithium batteries per boat
- Seating 36 passengers and able to reach a maximum speed of nine knots (1 knot = 1.852 km/h)
- Continuous voyage time is 9 hours at 3 knots

Solar boats on Love River in Kaohsiung City

Photo: Kaohsiung City Government (2010)



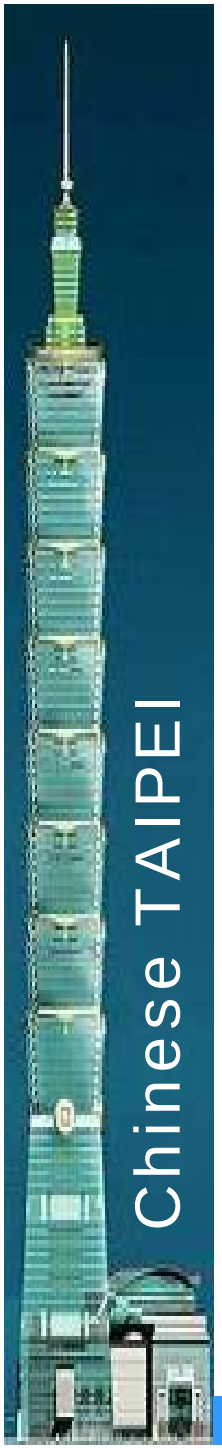
Solar-powered Boats in Chinese Taipei

First solar-powered guard boat in Chinese Taipei (Feb., 2011)

Sun Moon Lake No. 2
Solar-powered Guard Boat

- Operated by Sun Moon Lake National Scenic Area Administration
- Runs on a combination of 43 kWh lithium-ion batteries and 1,000 W solar power
- Seating 12 passengers and able to reach a maximum speed of 10 knots (1 knot = 1.852 km/h)
- Continuous voyage time is 6 hours at 6 knots

Photo: Independence Daily News (2011)

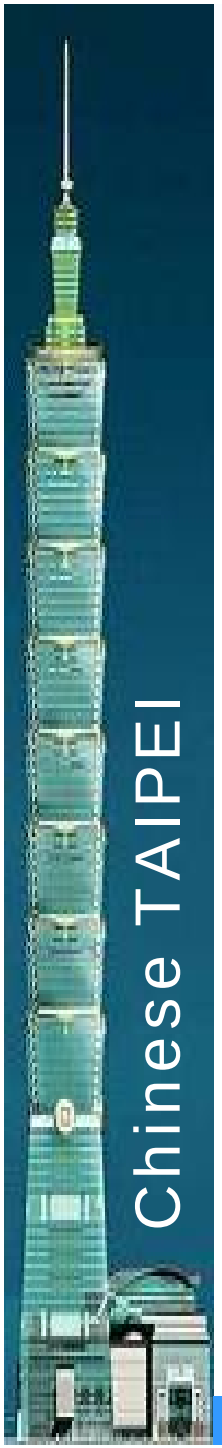


Current Production of Green Energy Industry in Chinese Taipei

Green Energy Industry	Investment (US$ million)		Product (US$ million)		Employee (1,000)	
YEAR	2009	Nov. 2010	2009	Nov. 2010	2009	Nov. 2010
Solar PV	1120.00	1596.67	3523.33	5930.00	10.06	21.8
LED	920.00	943.33	1966.67	4980.00	21.01	29.87
Wind power	46.00	61.23	153.33	141.67	0.29	0.5
Biofuels	6.33	4.67	28.00	42.80	0.45	0.50
Energy IT	4.67	10.67	300.00	300.00	2.25	2.50
H2 energy & fuel cell	15.00	12.67	10.00	9.20	0.50	0.59
Electric vehicle	16.67	183.33	12.67	333.33	2.50	2.10
Total	2128.67	2812.57	5994.00	11737.00	37.06	57.86

(US$ 1 = NT$ 30)

Source: MOEA (2010)



Concluding Remarks

1. Developing distributed conversion technologies using multi-feedstock, e.g., biomass/waste pyrolysis bio-oil, algae oil, cellulosic ethanol, etc. should be the next stage to enhance the biofuel production in Chinese Taipei.

2. The future of SEV and solar-powered boat industry in Chinese Taipei is expected to be prosperous.

3. Foreign investments are heartily welcomed for the mutual development of Chinese Taipei green-energy industry.

Cruise with solar boats on Love River in Kaohsiung City, Chinese Taipei

Thank you for your attention.

Photo: Kaohsiung City Government (2010)