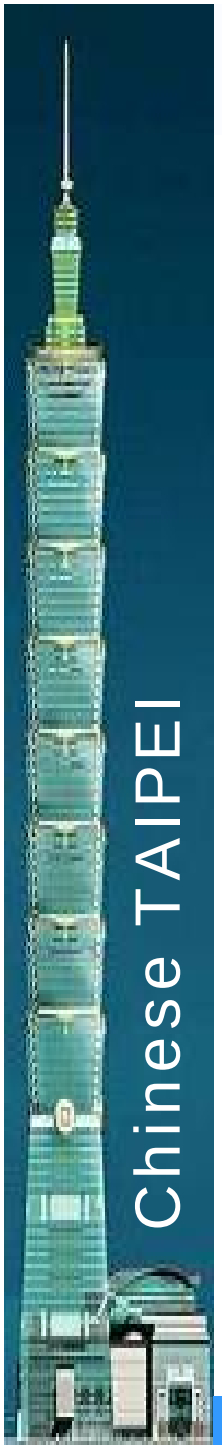

39th APEC EGNRET Meeting

Applying Distributed Renewable Energy in a Low Carbon Island: Penghu, Chinese Taipei

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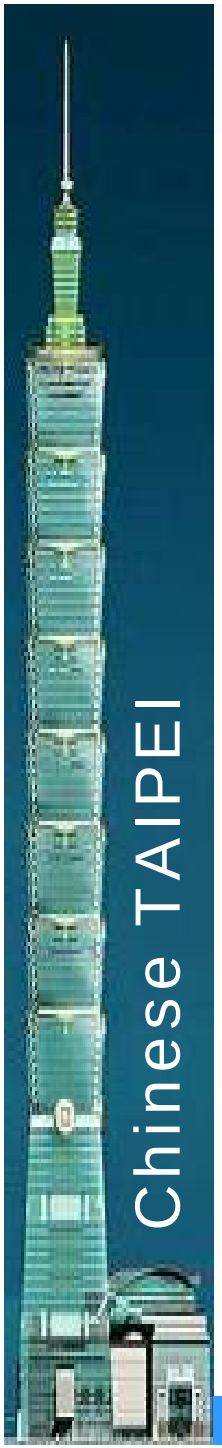
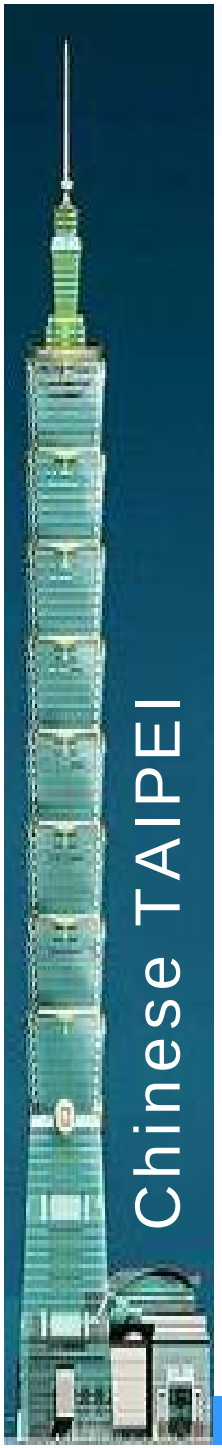
11 December, 2012 Shanghai, China



Outline

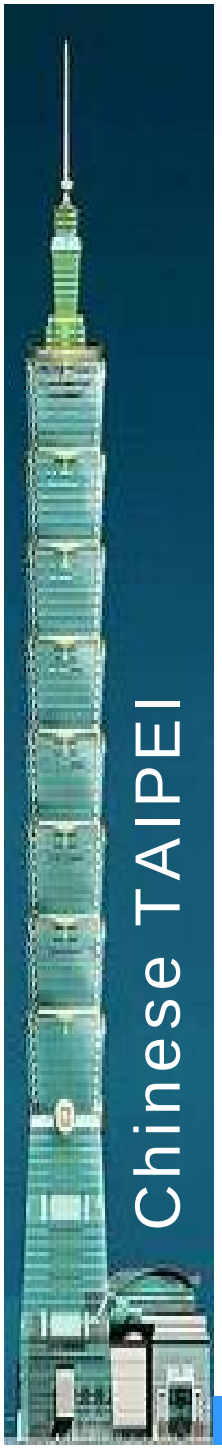
- Background
- Penghu Islands and Its Energy Supply
- Penghu Low Carbon Island Project
- Benefits



Background

- Conclusions of 2009 National Energy Conference
  - Building Chinese Taipei as a low-carbon society (55% energy supplied by renewable energy)
  - Reducing CO_2 emissions to 2005 levels by 2020, and further to 2000 levels by 2025.
- In 2009, Penghu County proposed a Penghu Low-carbon Island Project as a demo site to study how to achieve low carbon society
- On March 4, 2010 Penghu Low carbon Island Project was approved in Master Plan on Energy Conservation and Emission Reduction as one of the 35 benchmark plans

Source: BOE (2012)



Penghu Islands

- **Geography: 90 isles scattered between north latitude 23°12‘ to 23° 47' and east longitude 119°19' to 119°43'**
- **Land: 127,9636 km²**
- **Population: 93,308**
- **Administrative division: 5 townships and 1 city**

Source: MOTC (2012)

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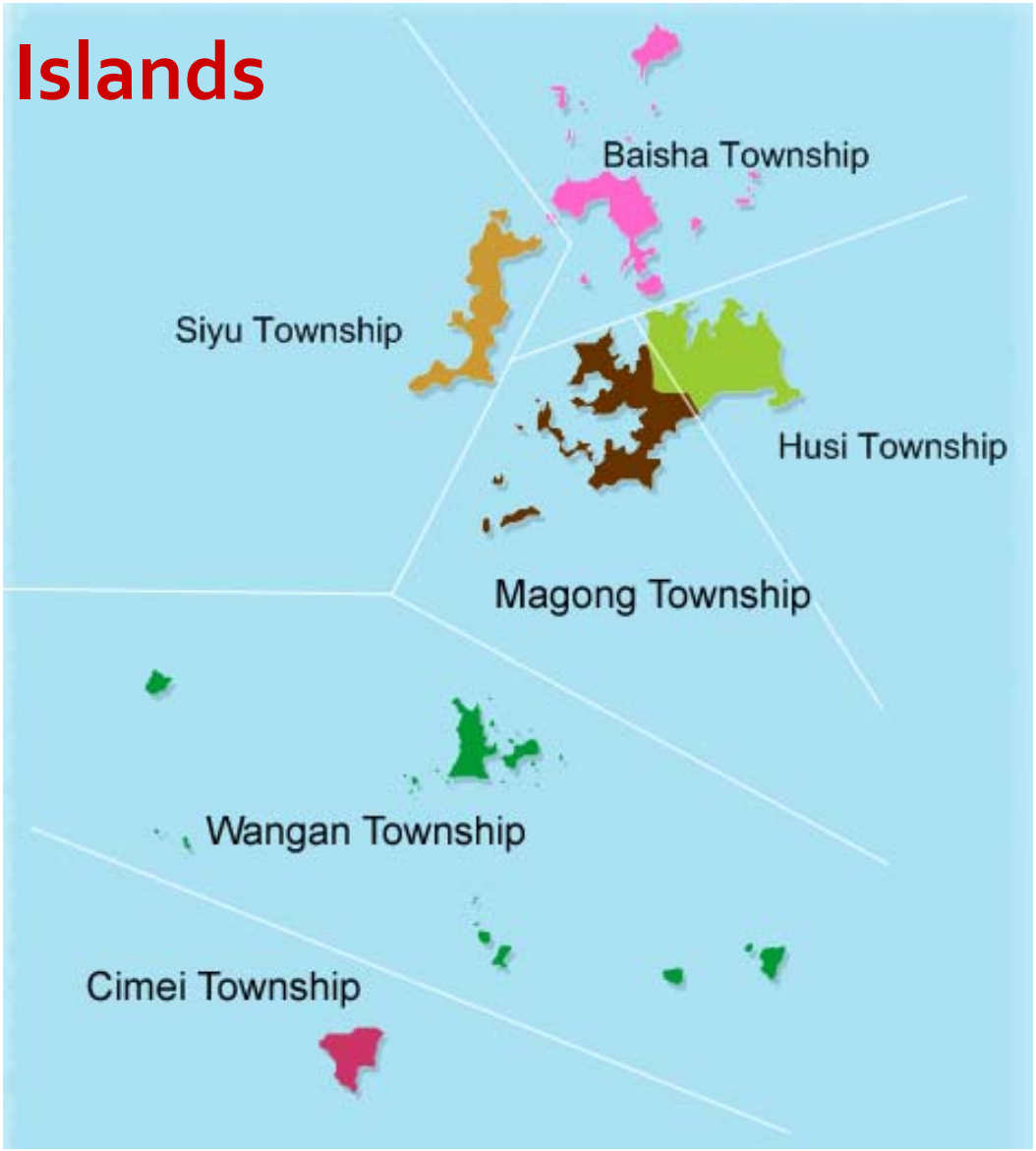
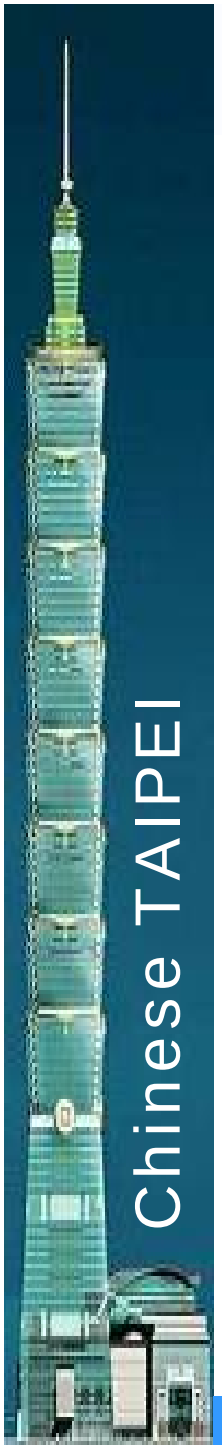
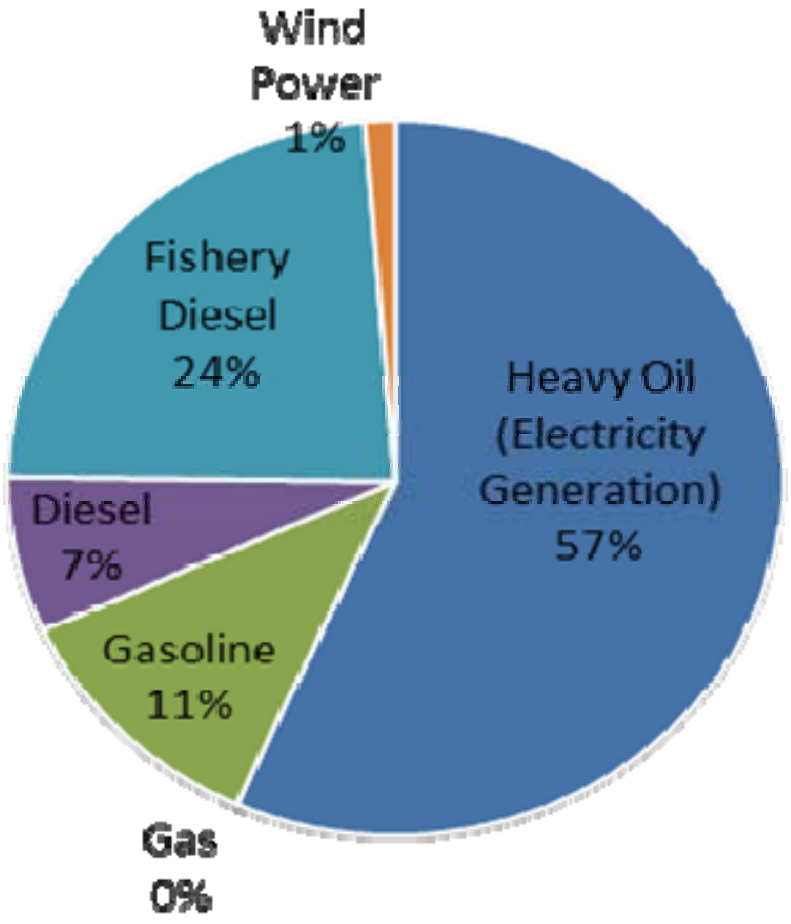
Beautiful Penghu Islands



Source: MOTC (2012)



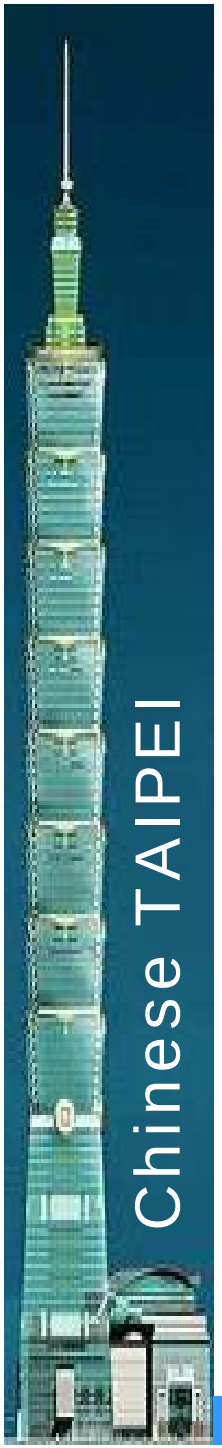
Energy Supply in Penghu (2009)



Energy Supply	
Electricity	12 Diesel Engine 91 MW + Wind turbines 10.2 MW
Oil	37.2 million L

GHG Emissions	
Power Generation	45.0 %
Transportation	50.7%

Source: BOE (2012)

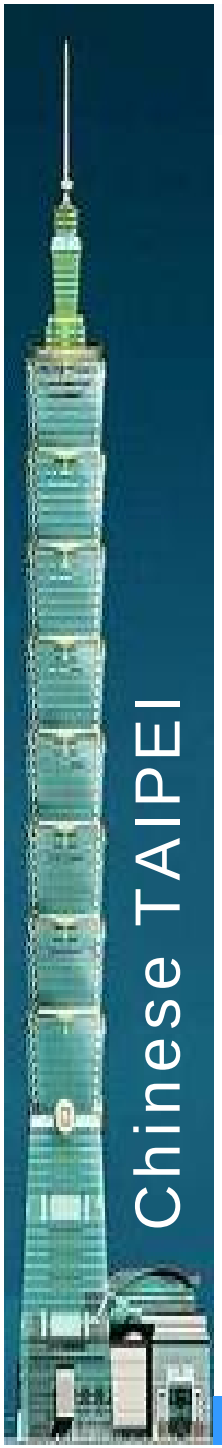


Visions of Penghu Low Carbon Island Project

Making Penghu a world-leading low-carbon island

IMAGE	A pilot low-carbon sightseeing island
ENERGY SUPPLY	>55% renewable energy
ENERGY SAVING	Widely use energy saving (ES) equipments and advocate the concepts of ES strategies to common households
RESOURCE	Efficient use of water, and wastes should be reduced and recycled
INDUSTRIES	Promote sightseeing business with green energy infrastructures to boost local economy
LIFE	Sustainably use local resources and construct a low-carbon LOHAS of environment

Source: BOE (2012)



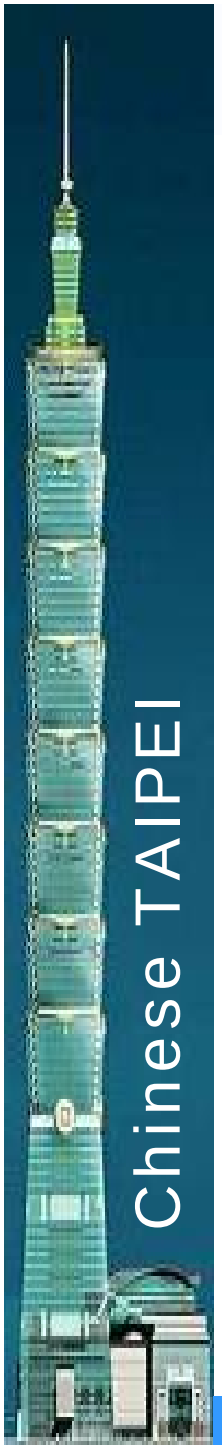
Targets of Penghu Low Carbon Island Project

Total Budget: US$ 270 million (by 2015)

Renewable Energy	• Large wind turbines 96 MW • PV 1.5 MW • Solar water heater 6,400m2
Energy Saving	• 2,106 smart meters • 4,000 LED streetlights • 14,000 energy-saving domestic appliance
Green Transportation	• 6,000 electric motorcycles • B2 bio-diesel on the island
Low Carbon Building	• 100% green building for all new public buildings and main private investments
Forestation	• 200 ha green spaces
Resource Recycling	• Reduce water leakage rate from 32% to 25% • Reduce 2,070 tons/day water supply • Zero waste
Low Carbon Life	• Promote low-carbon community • Public participation • Carbon labels and energy management • Zero carbon pilot islands
Low Carbon Education	• Promote low-carbon education

Distributed Energy

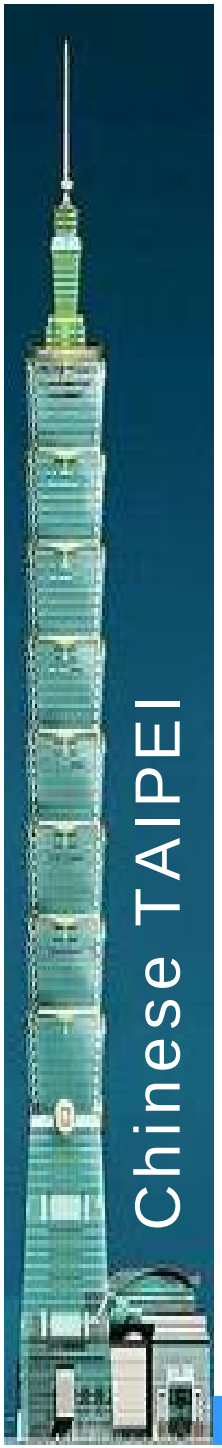
Source: BOE (2012)



Distributed Renewable Energy in Penghu – Wind Power

- **Average wind speed**
  - 9.6m/s for about 3,800 hrs
- **Existing large wind turbines**
  - Jhungtun: 4.8MW
  - Huxi: 5.4 MW
- **Potential wind power**
  - Inland: 128.5MW
  - Offshore: 147MW
- **Strategies (2015)**
  - Promote large wind turbines as main renewable energy sources:
    - 32 MW owned by Taipower Co.
    - 64 MW owned by the county government by corporation
  - Profit shared with the residents through joint investment
  - Small wind turbines: technologies demonstration

Source: BOE (2012)

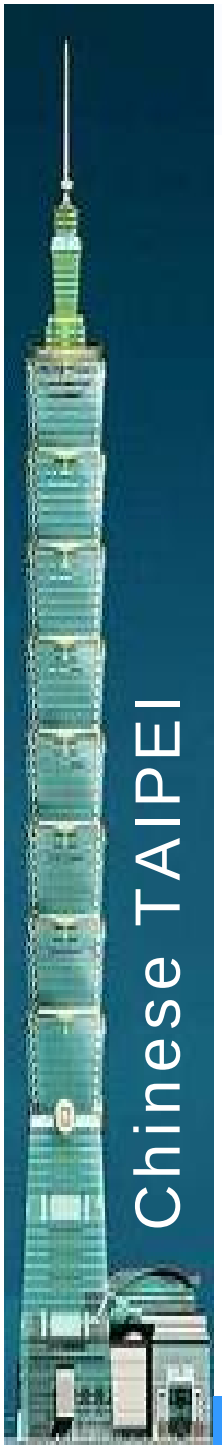


Distributed Renewable Energy in Penghu – Solar Power

- **Current Status**
  - 12 existing systems: 68.1 kWp in total
  - On public buildings, schools, and disaster prevention infrastructures
- **Install 1.5 MW (completed in 2012)**
  - 1,200 kWh/yr /kWp PV installed
- **Strategies**
  - Build iconic photovoltaic buildings with local features
  - Include harbors in new commercial circles
  - Incorporate relevant technologies in sightseeing and leisure activities
  - Install PV in schools on Hujing, Chimei isles
  - Encourage the public to install PV

BIPV in the airport (under construction)

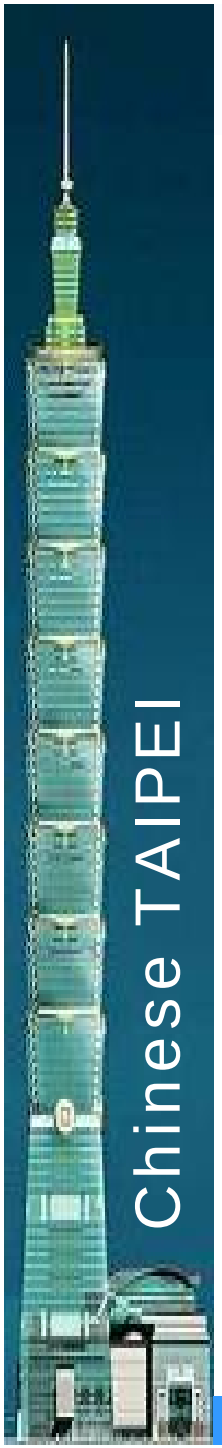
Source: BOE (2012)



Distributed Renewable Energy in Penghu – Solar Water Heater

- **Current Status**
  - 258 units installed in 2009 (2,579 m²)
- **Installation Potential**
  - Increase to 1,020 units in 2015 (6,400 m²)
- **Strategies**
  - Raise current subsidy to 50%
  - Install in existing residential houses & new small buildings (2015): 5,000 m² (1,000 small buildings)
  - Large systems (hotel/dormitory/swimming pool) (2015) : 1,400 m² (20 hotels)

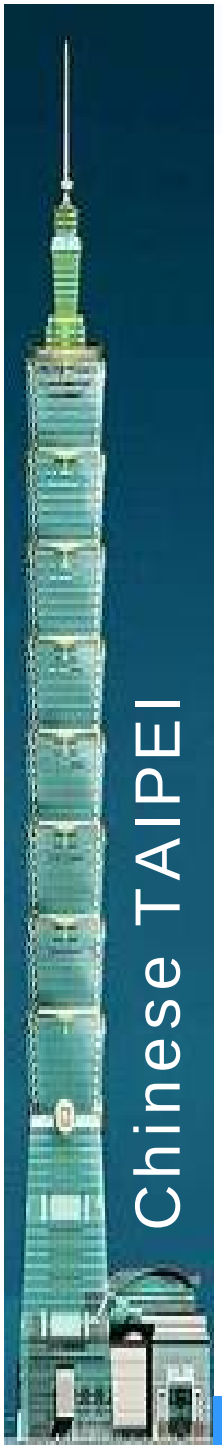
Source: BOE (2012)



Energy Conservation in Penghu

- **Energy-Saving Appliances (2102)**
  - Subsidize 3,000 NTD for each appliance
  - Up to 4,000 appliances in 2012
- **LED Streetlights (2014)**
  - Install 1,310 LED streetlights in all major streets
- **AMI (Smart Meters) (2015)**
  - 106 high voltage AMI will be deployed

Source: BOE (2012)

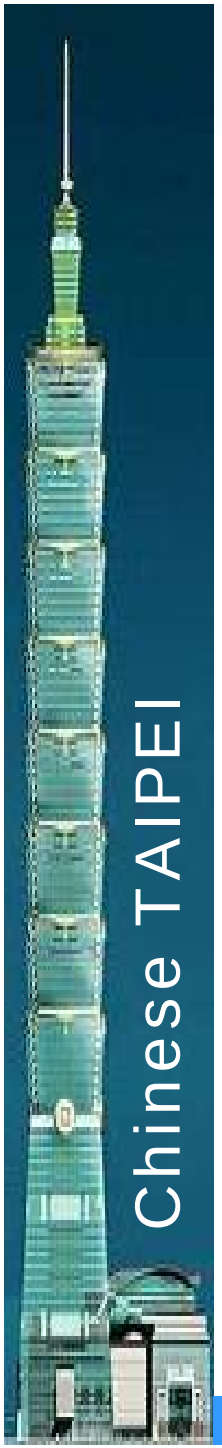


Green Transportation in Penghu

- **Current status**
  - 15,217 light motorcycles (50CC)
  - 47,170 heavy motorcycles
  - 20,210 sedans (265 Taxi)
  - 61 public buses, 99 tour buses
  - 1,833 fishing boats

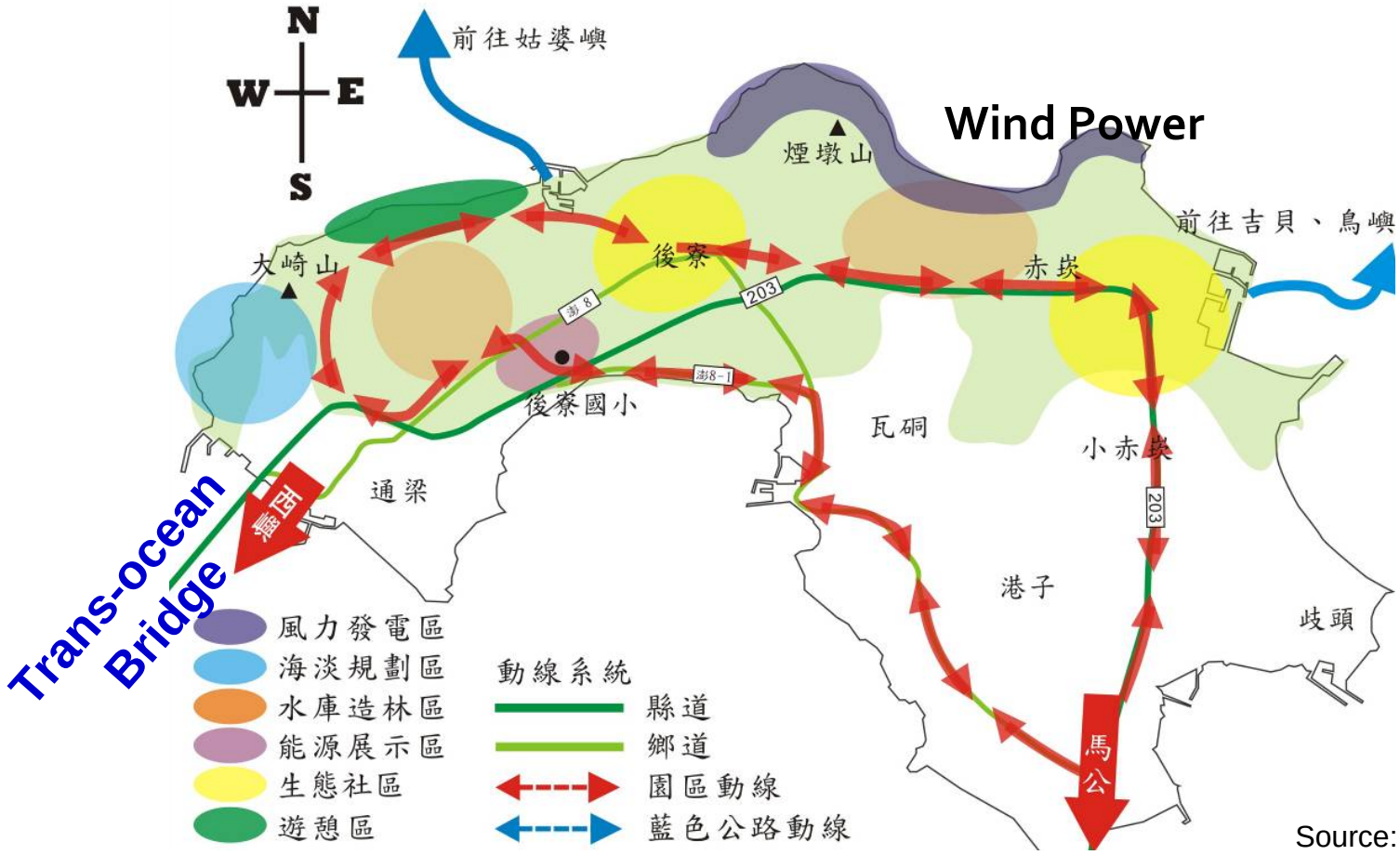
- **2015 Targets**
  - Replace 6,000 motorcycles with E-Scooters (about 10%)
  - Demonstration of electronic vehicles
  - B2 bio-diesel

Source: BOE (2012)

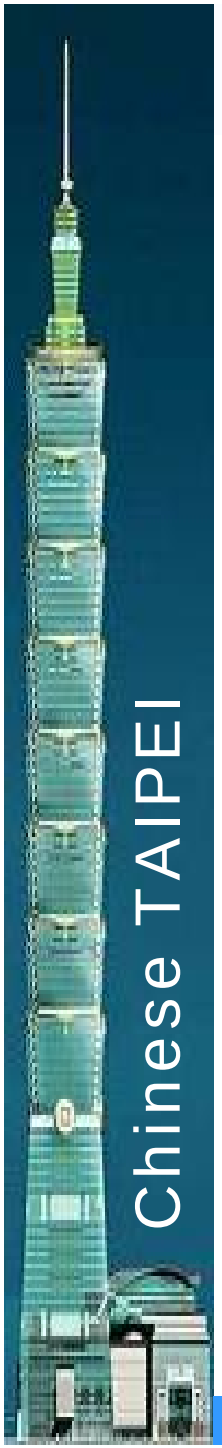


Houliau Renewable Energy Park

- Pilot Plan: Build current power generation system at the Kuahai Bridge
- Operated by National Penghu University of Science and Technology

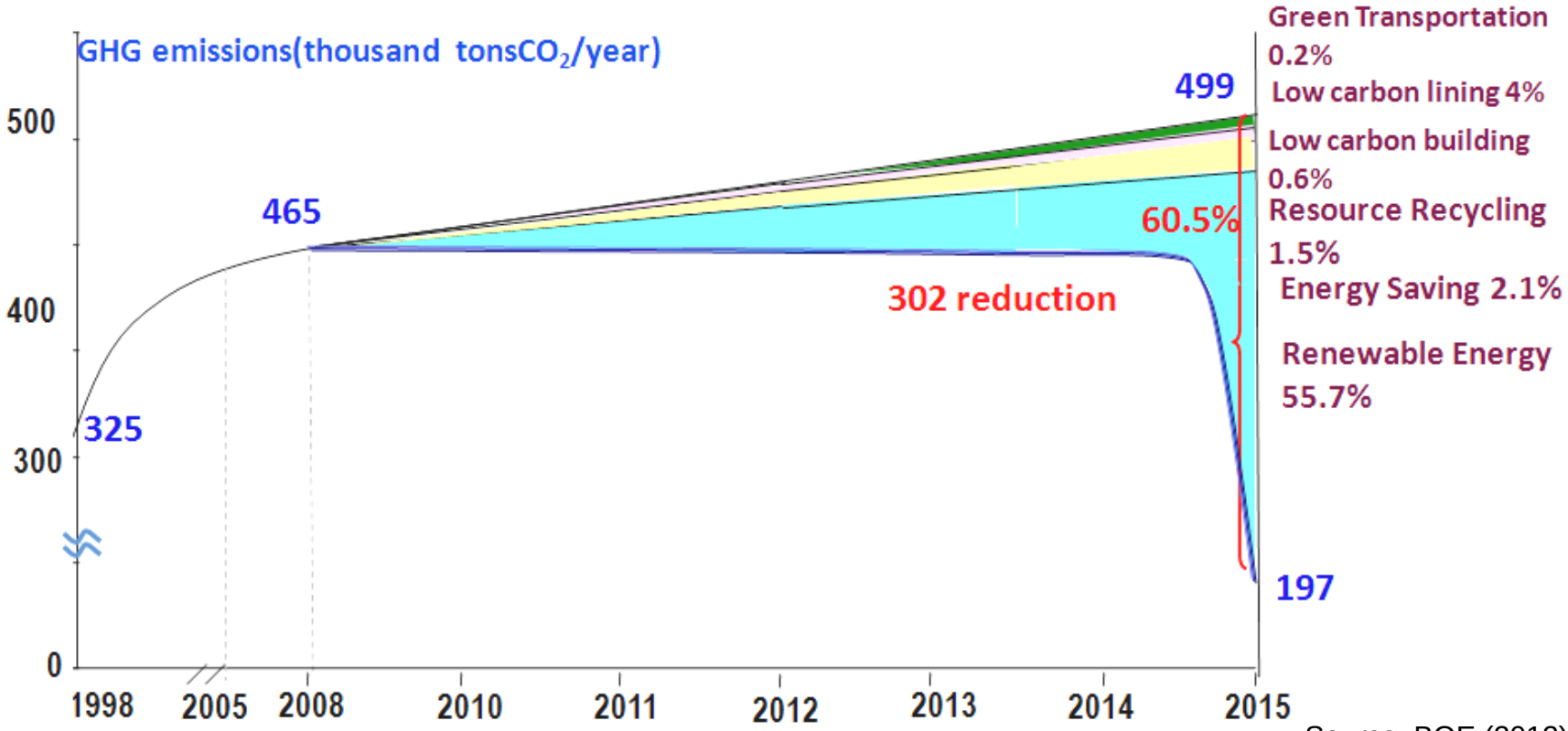


Source: BOE (2012)

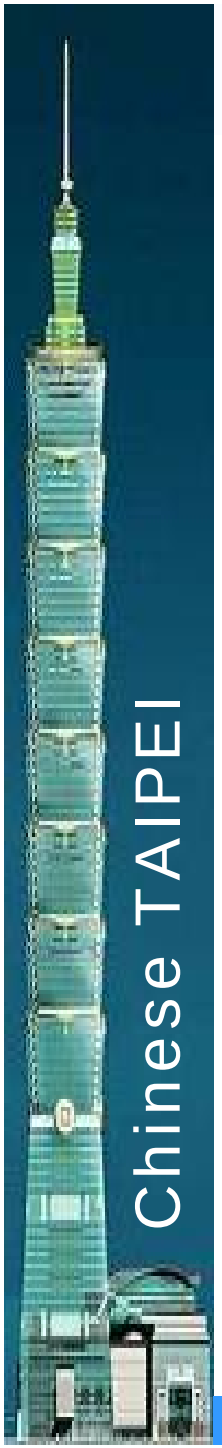


Benefits of Low Carbon Penghu (1)

- Carbon emission will be reduced by 60% compared to BAU in 2015, and reduced to about 50% compared to emission in 2005.



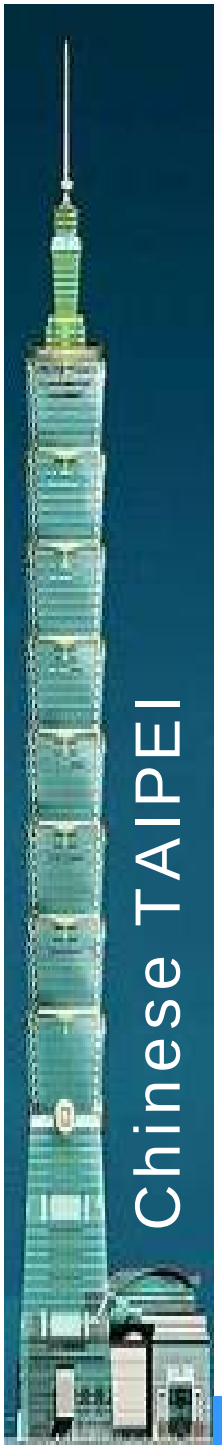
Source: BOE (2012)



Benefits of Low Carbon Penghu (2)

- Renewable energy supplies 56% of total energy consumption in 2015.
- Reduce CO_2 emission from 5.4 t/cap-yr (2008) to 2.1 t/cap-yr (2015).
- Annual cost: US$ 35.33 millions; payback period: 6.8 years
- Boost sightseeing industry

Source: BOE (2012)



Penghu – Top 10% World-Class Low Carbon Islands

International Cities/Islands Carbon Reduction Goals (*selected*)

Type	City	Base Year	Achieving Year	Reduction Goal
Island	Samso, Denmark	1997	2003	100%
	Penghu, Chinese Taipei	**2005**	**2015**	**50%**
	Cheju, Korea	2005	2020	50%
City	Masdar City, Abu Dhabi	New town	2018	100%
	Kyoto, Japan	1990	2030	40%
	Berlin, Germany	1990	2010	25%
			2020	40%
	Minamata, Japan	2005	2020	32%
	Yokohama, Japan	2004	2025	30%
	Kyushu, Japan	2005	2030	30%
	Tokyo, Japan	1990	2020	25%
	Munich, Germany	1990	2010	20%
	London, UK	1990	2015	20%
	Bangkok, Thailand	2007	2012	15%
	Geneva, Switzerland	1990	2012	10%

Source: BOE (2012)

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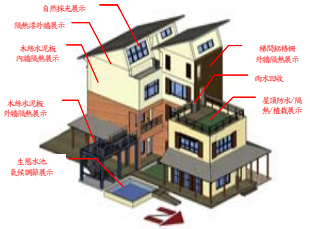
Future Scene of Penghu Low Carbon Island

Water Saving and Recycling

Large-scale Wind Turbine

Green Buildings

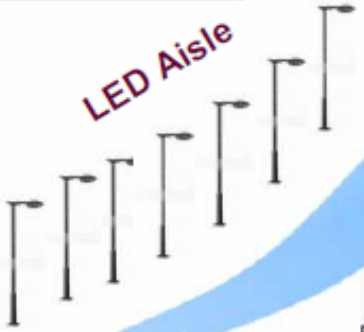


Photovoltaics (MW-level Parkiong lot)

Entrance of the Airport

Guest House Solar Water Heater

LED Aisle



Bridge with Photovoltaics

Hybrid Power Bus

PV Bus Shelter

PV Spotlight/Cafe

Magong City

PV for EV& Charge Station

Greening

Source: BOE (2012)

http://www.re.org.tw/penghu/index.aspx

Thank you for your attention

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