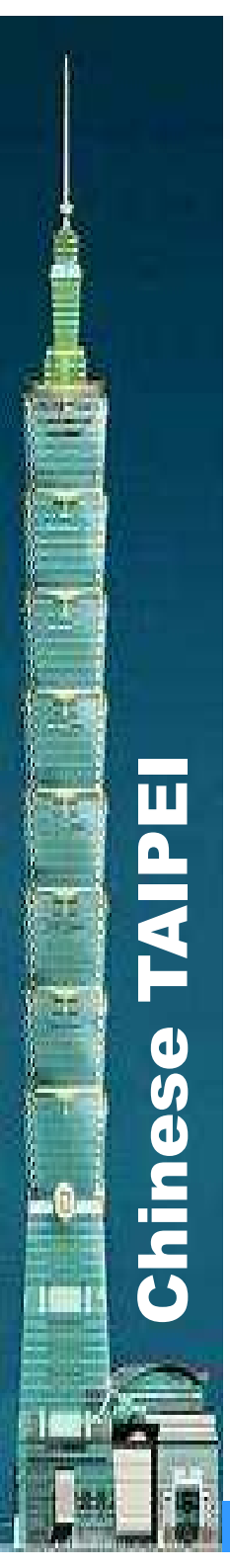


44th APEC EGNRET Meeting

Strategy and Roadmap for PV Systems in Chinese Taipei

Bureau of Energy
Ministry of Economic Affairs
Chinese Taipei

14 April, 2014 Laoag, Ilocos Norte, The Philippines

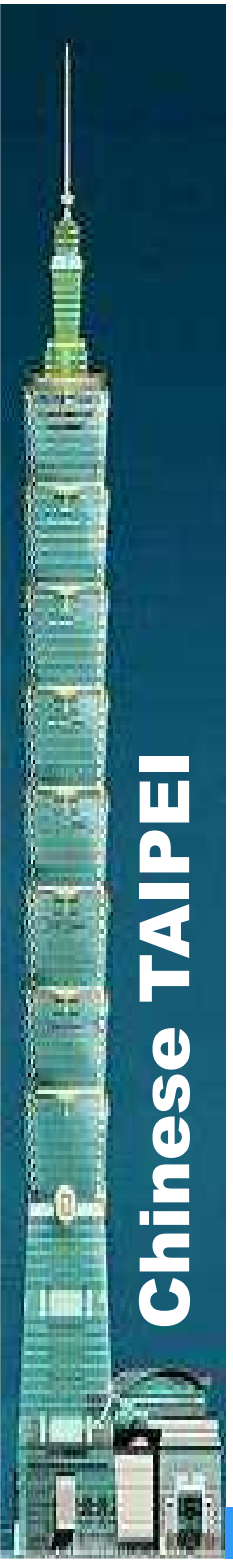
Outline

- New Energy Policy of Chinese Taipei
- Renewable Energy Targets in Chinese Taipei
- PV Industry Chain in Chinese Taipei
- Financial Mechanisms for Promoting PV in Chinese Taipei
  - Mechanism of Feed-in Tariffs
  - PV Bidding Mechanism
  - PV ESCO Mechanism
- Million Solar Rooftop PVs Program
- PV Promotion Progress in Chinese Taipei
- Best Practices for PV Installation in Chinese Taipei
- Concluding Remarks

New Energy Policy of Chinese Taipei

Chronology of Energy Policy Development

2015.01.15-16	Held the 4th National Energy Conference
2011.11.03	President Ma announced New Energy Policy to "Steadily Reduce Nuclear Dependency, Gradually Move Towards a Nuclear-free Homeland, and Create a Low-carbon Green Energy Environment"
2010.05	Approval of the National Master Plan on Energy Conservation and Emission Reduction
2010.01	Establishment of the Committee on Energy Conservation and Emission Reduction
2009.07.08	Promulgation of Renewable Energy Development Act Amendment of Energy Management Law
2009.04.15-16	Held the 3rd National Energy Conference
2008.06.05	Launched Framework of Sustainable Energy Policy



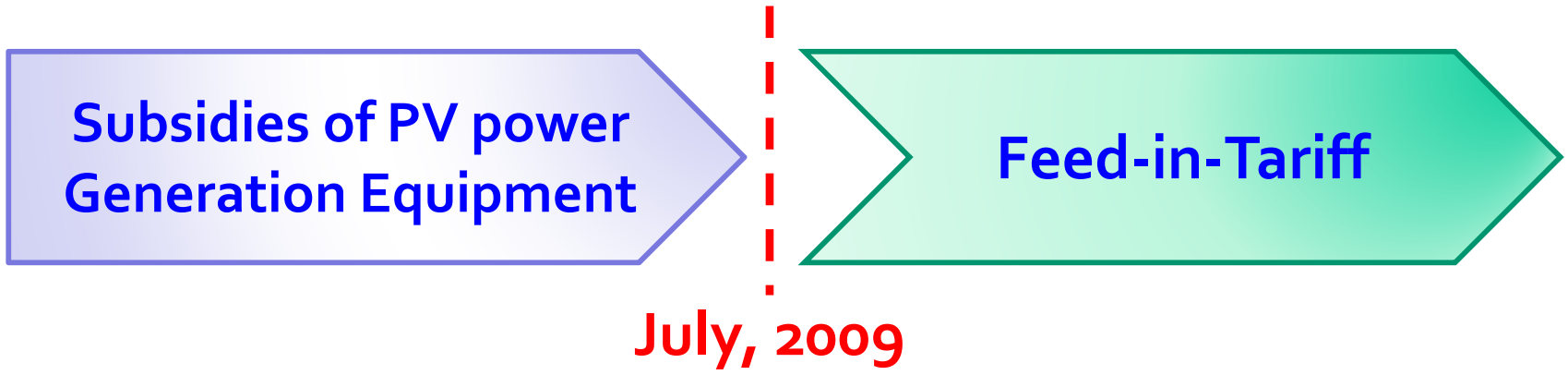
Renewable Energy Development Act

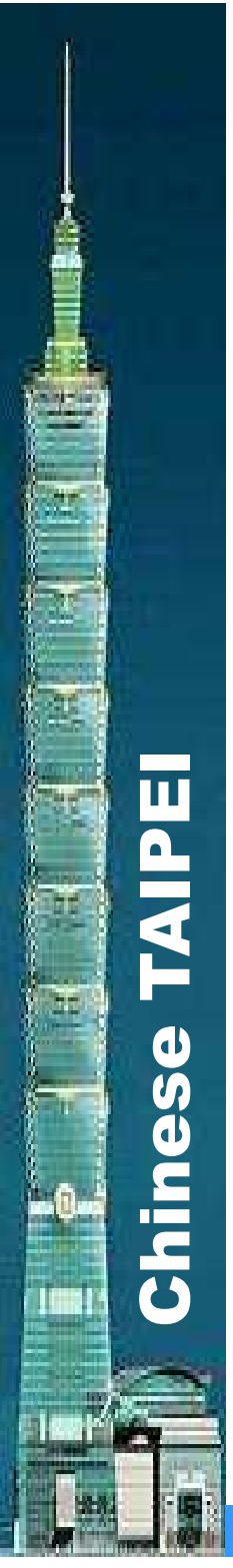
The Renewable Energy Development Act is the major watershed in the domestic photovoltaic power promotion policy.

1) Before promulgation of Renewable Energy Development Act, subsidy of PV generation power equipment was the main driving instrument to promote the PV power.

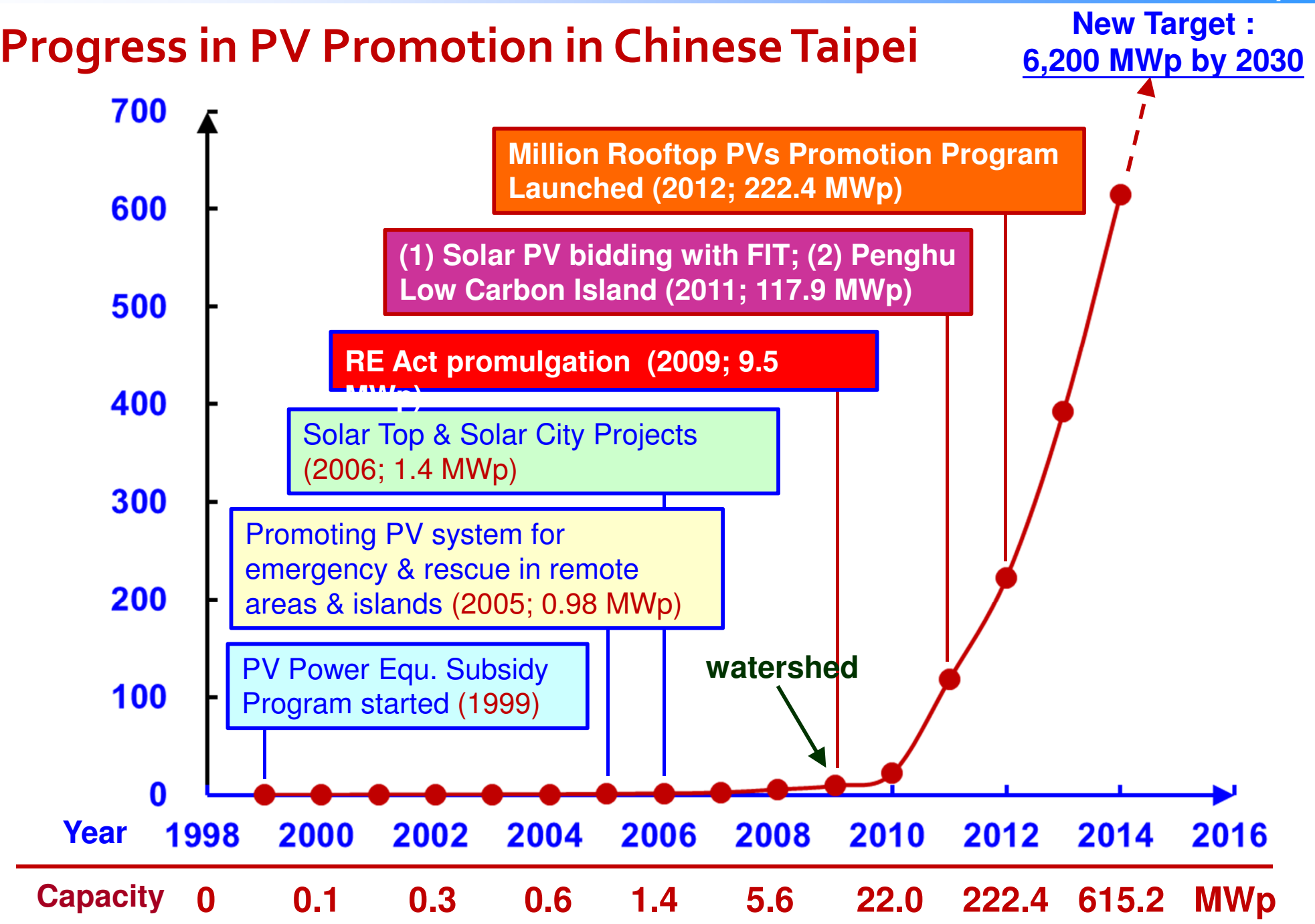
2) After Renewable Energy Development Act became effective, the Feed-in-Tariff (FIT) incentive plays the important role for the expansion of the PV power.

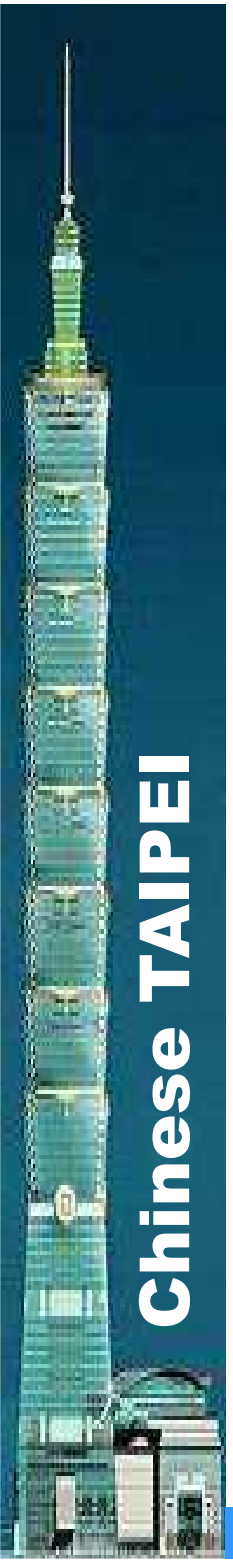
Renewable Energy Development Act





Progress in PV Promotion in Chinese Taipei





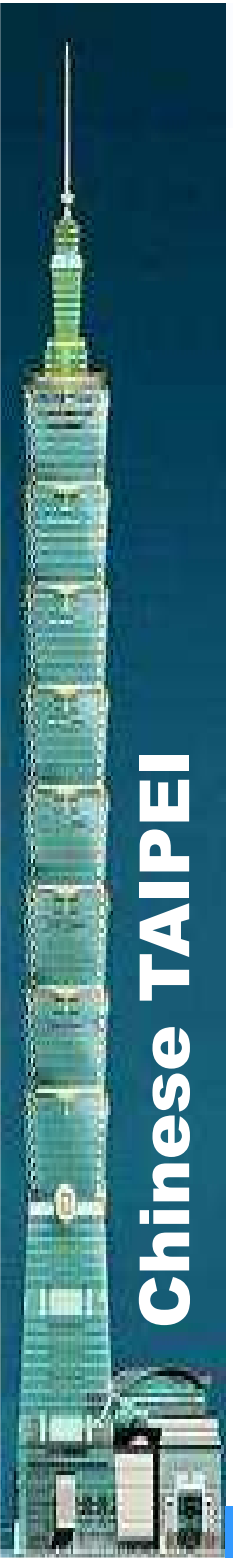
Aggressive RE Installation Capacity Targets

To prompt solar PV and offshore wind power, Million Solar Rooftop PVs and Thousand Wind Turbines promotion programs were approved in 2012.

- PV: 6,200 MW systems by 2030
- Wind: 1,000 turbines (450 onshore and 600 offshore) by 2030

Unit: MW

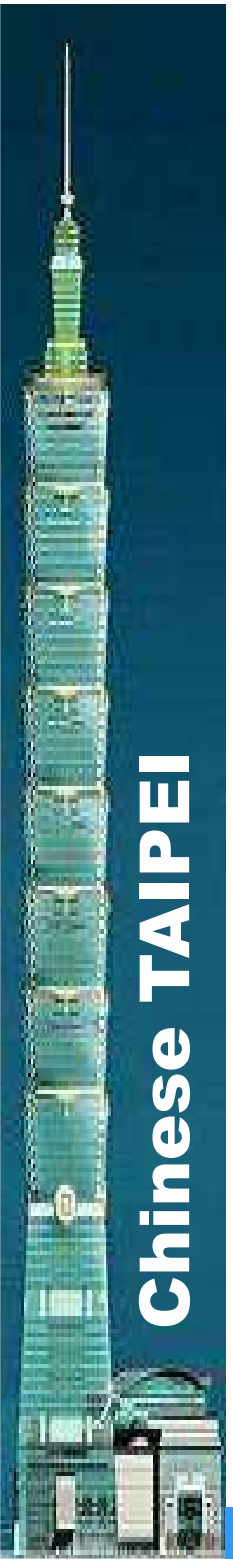
Year	2013	2014	2015	2020	2025	2030
On-shore Wind	614	637	814	1,200	1,200	1,200
Off-shore Wind	0	0	15	320	1,520	3,000
Hydro Power	2,081	2,081	2,089	2,100	2,150	2,200
Solar PV	333	615	847	2,120	4,100	6,200
Geothermal	0	0	4	66	150	200
Biomass	741	741	745	768	813	950
Total	3,769	4,074	4,514	6,574	9,933	13,750



PV Industry Chain in Chinese Taipei

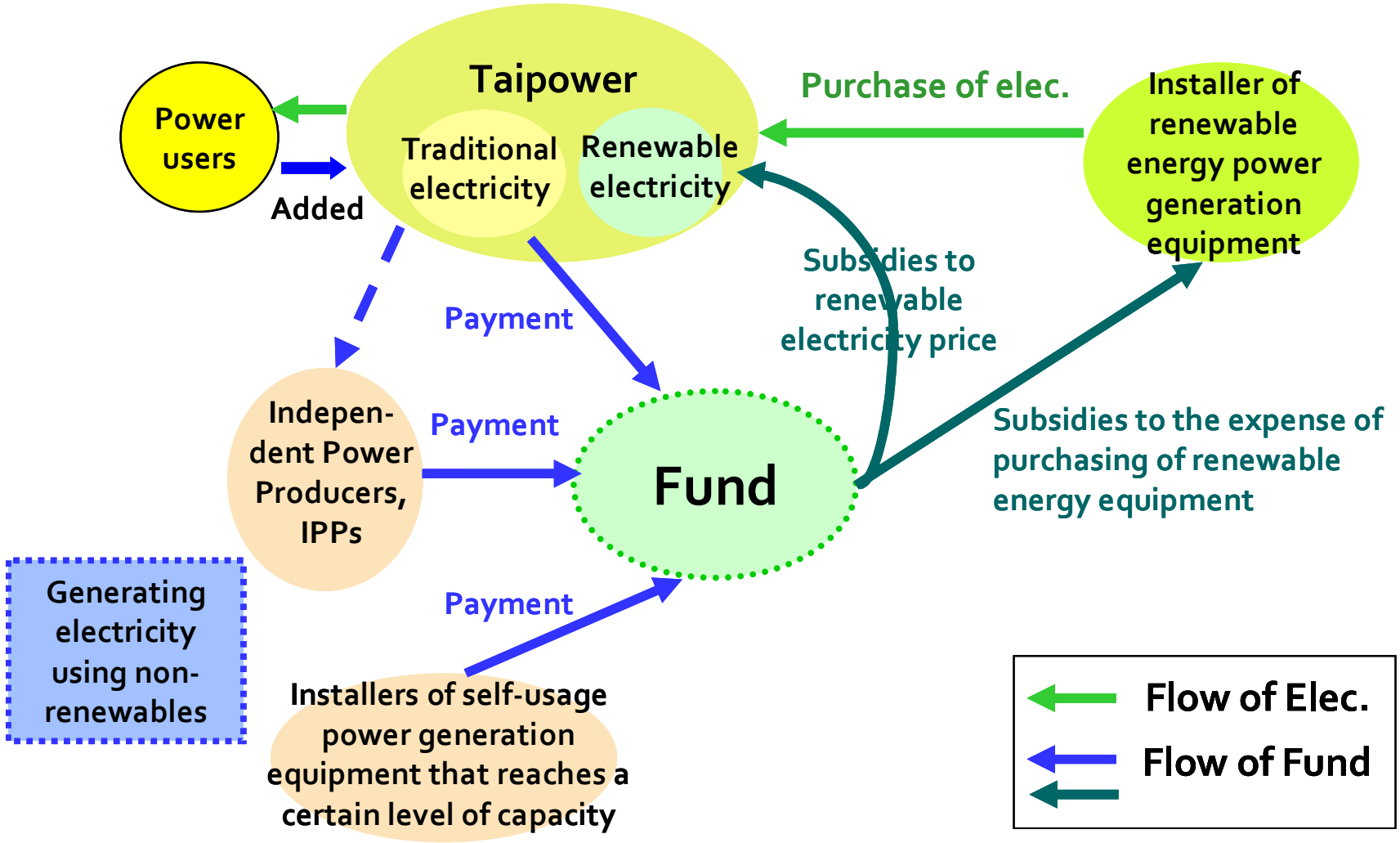
- Over 250 companies in PV industry in 2014
- A complete PV Supply Chain
- 2nd largest solar cell production in the world (~10 GW in 2014)

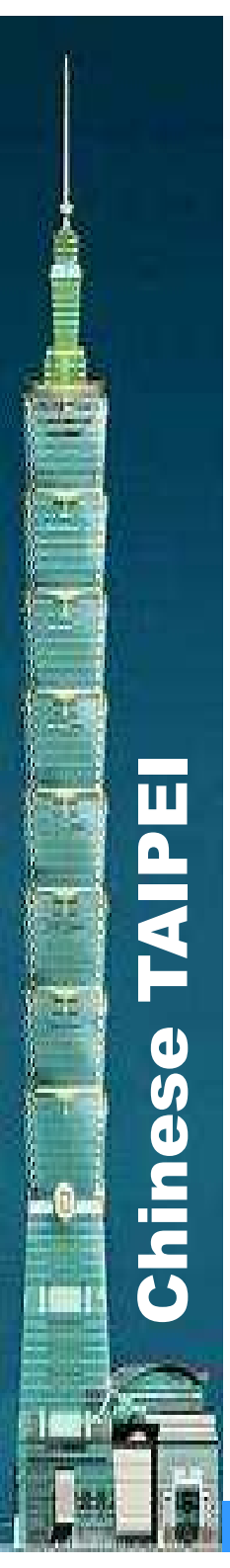
Poly-Si	Ingot	Wafer	Solar Cell	Module +System +Components
1 company	Ingot / Wafer: 10 companies		> 50 companies	> 200 companies



Renewable Energy Development Fund

Income based on expected expenses to balance revenue and expenditure





Million Rooftop PVs Promotion Program

Mission

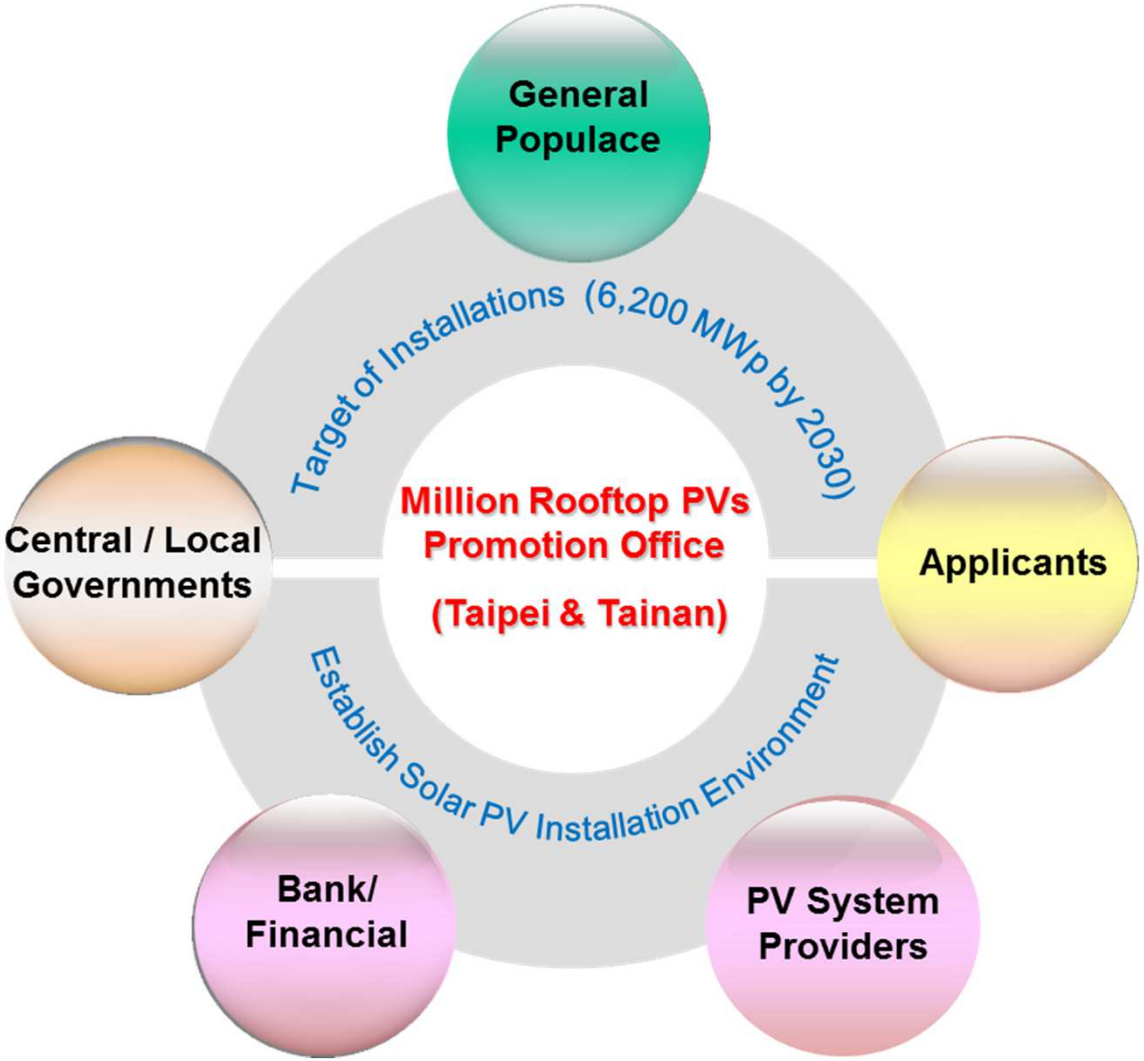
(1) Promote with local governments

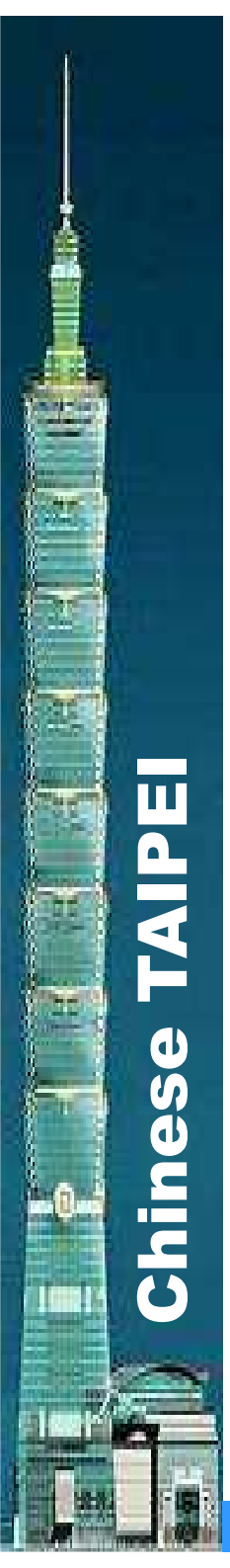
(2) Strengthen PV System financing

(3) Public PV Promotion & Provision of advisory services

(4) Solve problems of the system installations

(5) Simplify installation processes and relative regulations





Million Rooftop PVs Promotion Program

➢ Goal

- **6,200 MW developed by 2030**
  - **A. Roof-top (3,000 MW)**
  - **B. Ground (3,200 MW)**

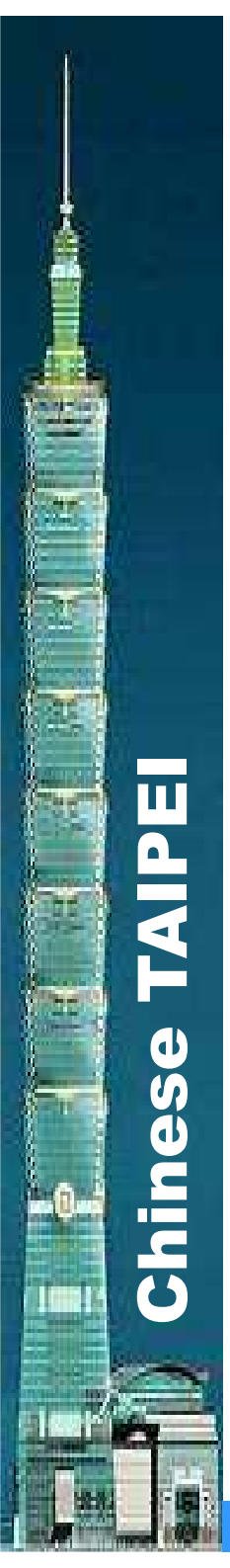
    Priority placed to contaminated agricultural farmlands and severe land subsidence areas, with 4% open to PV installation as the current target

➢ Strategy

- **The Feed-in Tariff as a strategy to achieve annual targets for roof-top and ground installations**
- **A cap quota is decided annually, while expecting large scale expansion after grid-parity is reached**

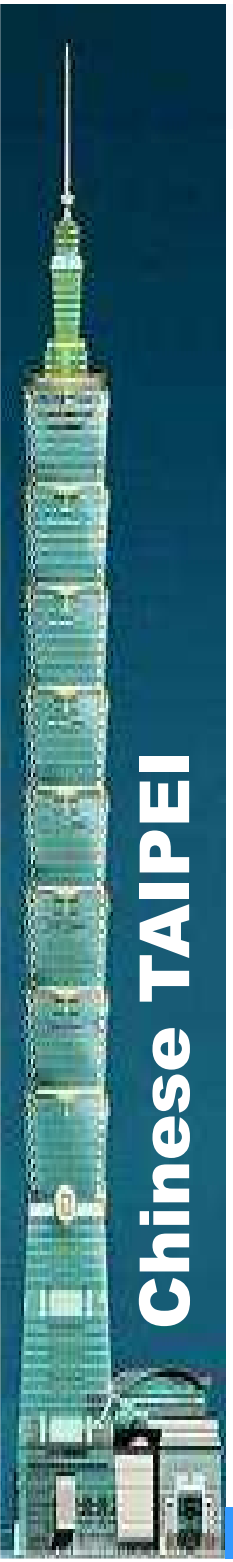
➢ Deployment Target

Year	2015	2020	2025	2030
Total	885 MW	2,120 MW	4,100 MW	6,200 MW



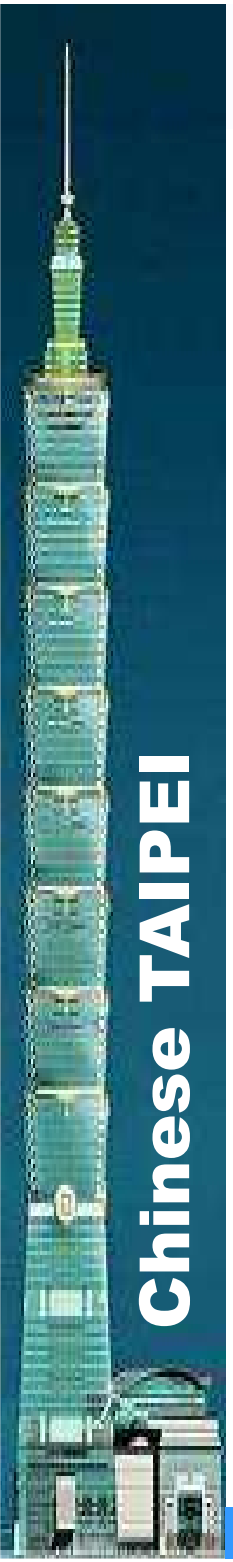
Financial Mechanisms for Promoting PV in Chinese Taipei

- Feed-in Tariffs
- PV Bidding
- PV ESCO



Mechanism of Feed-in Tariffs

- Tariff rates should be reviewed annually by referring to technical advancement, cost variation, goal achievement status, etc.
- **Tariffs shall not be lower than the average cost for fossil-fired power of domestic power utilities.**
- Currently only Solar PV tariff rates are set on the date when generating equipment installations are completed. The tariff rates for other RE technologies are set on the Power Purchasing Agreement (PPA) signing date.
  ➡ **Applied for 20 years**
- BOE announces PV capacity quota every year. **PV systems > 50 kW are subject to a bidding procedure** to decide the tariffs. Developers proposing higher discount rates receive the priority to acquire the quota.



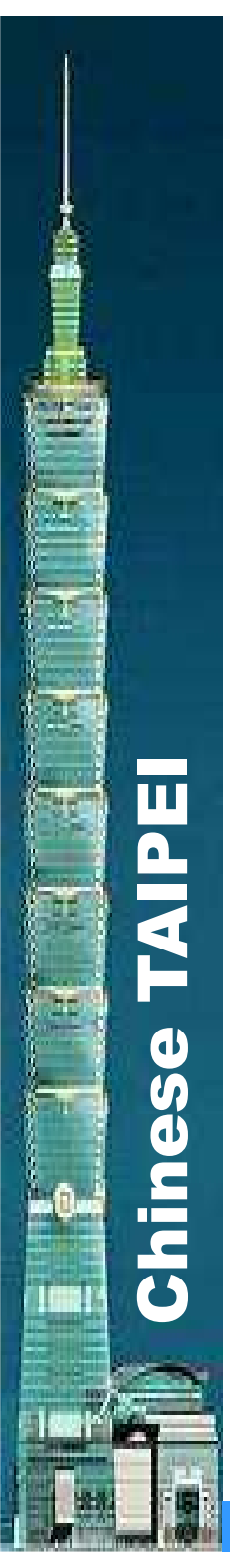
FIT Rate for PV in 2015

Solar PV tariff rates **applied for 20 years** are set on the date **when generating equipment installations are completed**.

Effective from 1 Jan. 2015 to 31 Dec. 2015

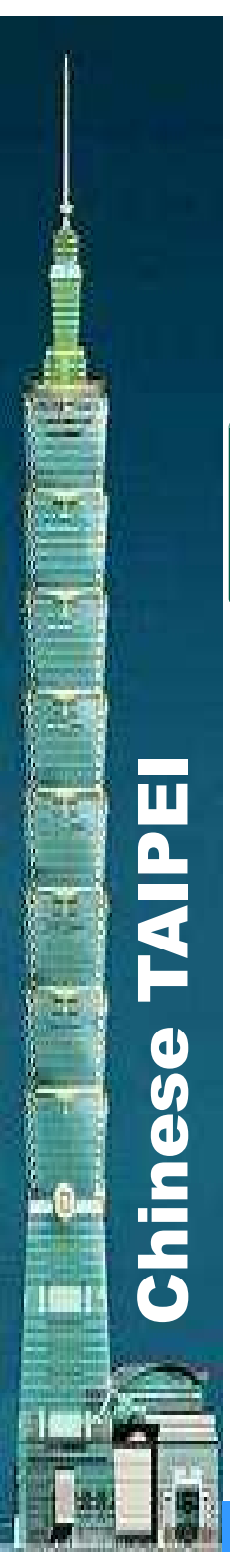
Type	Capacity (kW)	2015 Tariff Rates (US¢ /kWh)	
		Period 1	Period 2
Roof-top	≧1 ~ < 20	21.79	21.18
	≧ 20 ~ < 100	18.22	17.70
	≧ 100 ~ < 500	17.02	16.56
	≧ 500	16.49	16.04
Ground	≧1	15.51	15.09

(USD 1 ~ NTD 31.5)



Solar PV Bidding Mechanism

- Currently the **feed-in tariff** of solar PV remains relatively **high**.
- To relieve the financial pressure from the Renewable Energy Development Fund, only through the **competitive market**, the contract rate would be decreased resulting in **less expenditure from the Fund.**
- With the rapid improvement of PV technology, **PV installation prices have fallen precipitously**. The domestic demand of the PV equipment is greater than that of the deployment target.
- As a result, introducing the **bidding system** can ensure applicants **to participate fairly**. Therefore, it would **reveal the actual market value and cost**.



Solar PV Bidding Mechanism

Solar PV Bidding

- Installation cost evaluation
- Bidding discount rate

Fair

Reasonable

Effective

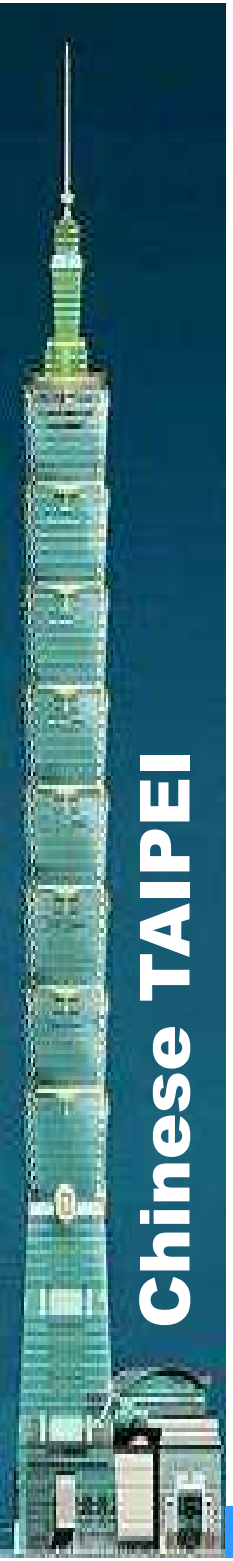
Reasonable FIT Rate

- Cost transparency
- Market value reflection

Bidding Capacity expects to increase.

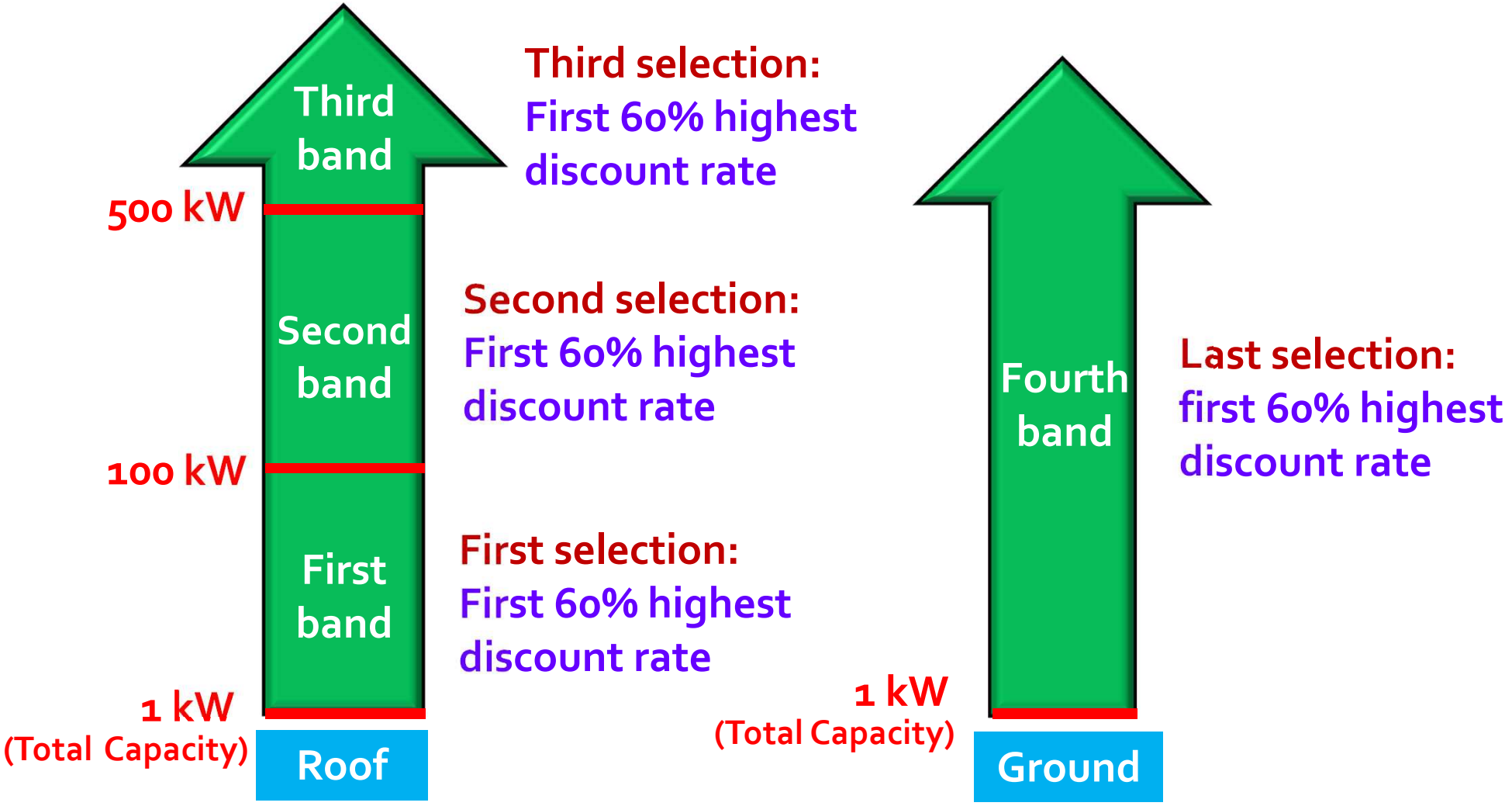
Unit: MW

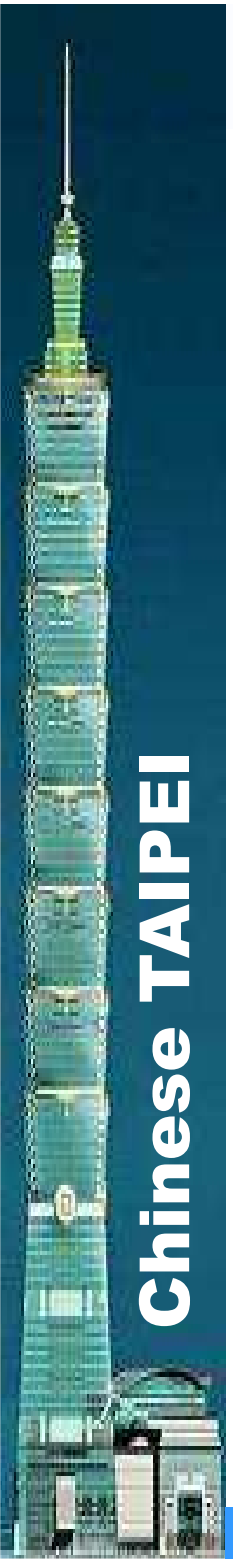
Deployment Target	2011	2012	2013	2014	2015
	70	100	175	240	270
Bidding	40	83	135	150	180
Non-bidding	30	17	40	90	90



PV Bidding Operational Process & Conditions

Bidding Operational Process

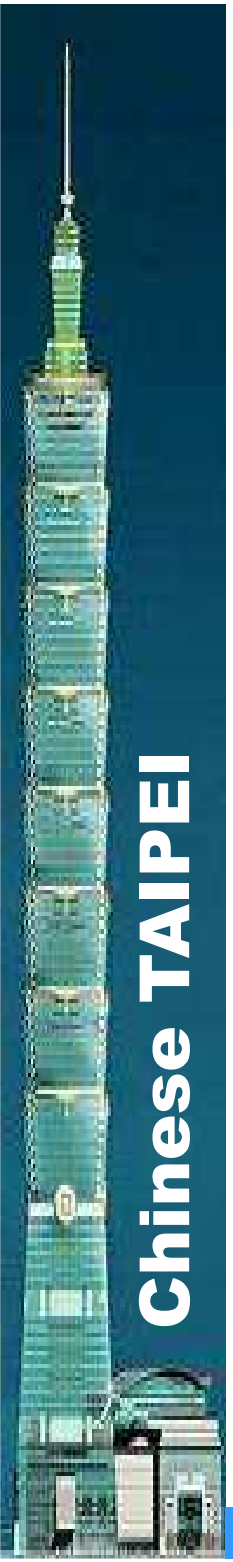




PV Bidding Operational Process & Conditions

Non-bidding Conditions

1. Roof-top equipment (1kW~50kW)
2. Buildings belongs to the government or public schools
3. Buildings belongs to government or public schools rent by private installers with grants by county governments.
4. Government-owned enterprises
5. Residential buildings (1kW~ 100 kW on roof)
6. Remote islands
7. Building-integrated photovoltaics equipment
8. Land subsidence areas
9. Roof-top equipment regulated by the municipal and county (city) governments under the self-government regulations

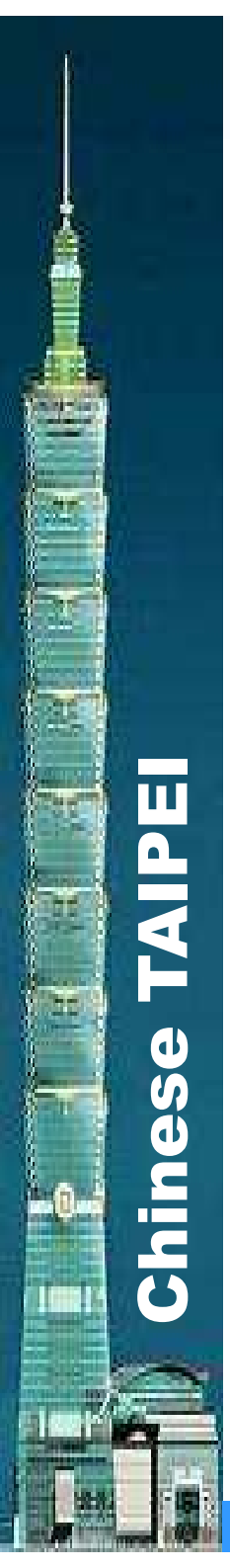


Cost-benefits of Solar PV bidding

1. From 2011 to 2014, the total bidding capacity was 403 MW, resulting in less expenditure from the Fund.
2. The total savings were USD 8.83 million in 2011, 17.82 million in 2012, 80.62 million in 2013, and 74.60 million in 2014, respectively.

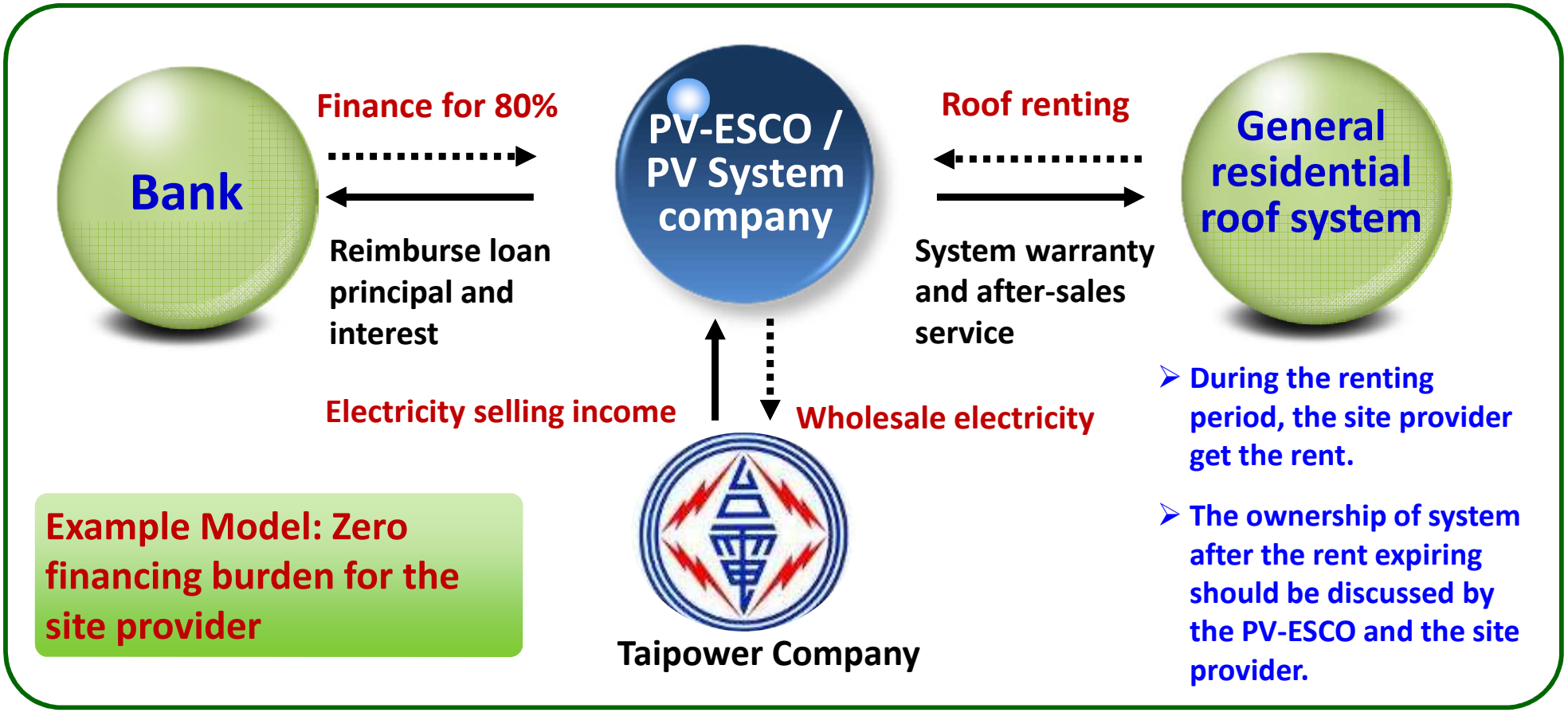
Year	Tender(s)	Bids	Capacity (MW)	Ratio (%)	Average discount rate (%)	Savings from the Fund (million USD)
2011	3	352	35.048	88.38	3.21	8.83
2012	7	335	83.080	60.11	3.29	17.82
2013	4	539	135.167	52.38	10.29	80.62
2014	3	588	150.060	60.12	10.08	74.60
Total			403.355			181.87

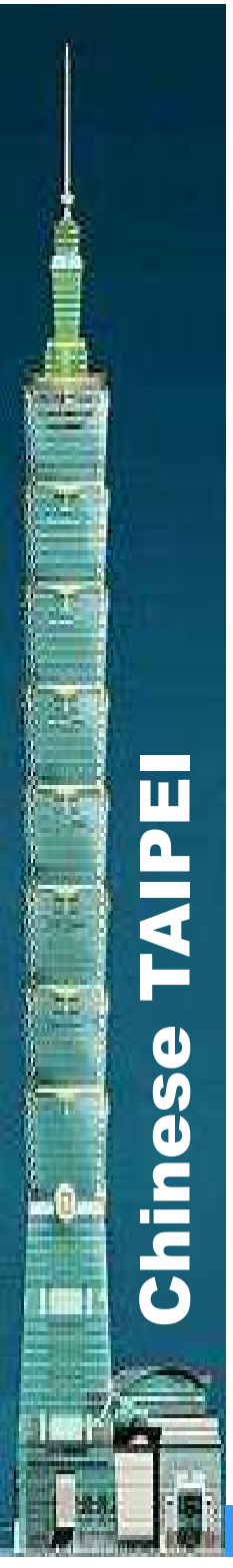
(USD 1 ~ NTD 31.5)



Establishment of PV-ESCO Mechanism

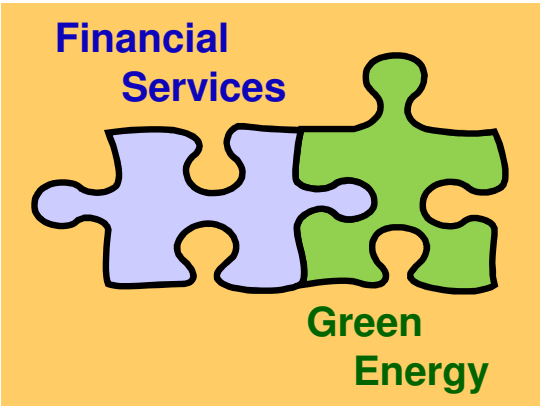
Encouraging banks to participate in project financing and to provide soft loans to PV-ESCO players

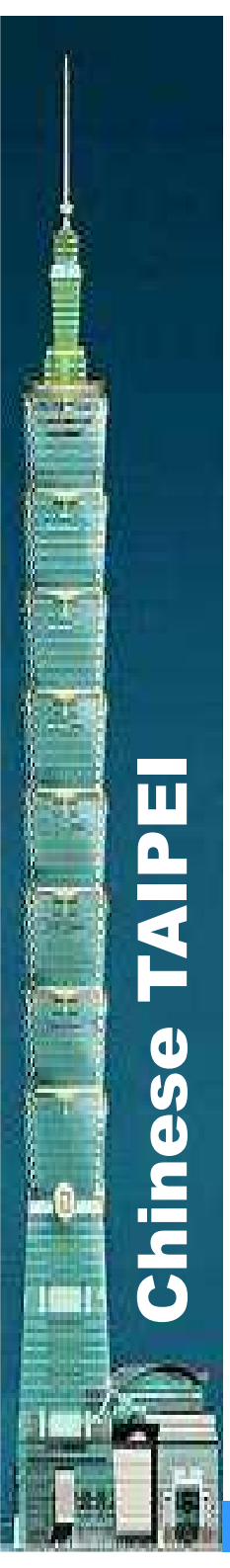




Achievements of PV-ESCO: Green Financing

- 16 banks now provide PV system financing support, green energy investment funds grows from USD 1.6 to 222 million from 2011 to 2013.
- USD 222 million funds could generate USD 317 million in system installation value, about 170 MW of domestic demand, and create more than USD 0.5 billion in industry chain value.
- PV-ESCO assists in installations for all buildings including solar community, public roof, solar farm, solar terminal, solar factory, solar rail, solar MRT, solar campus, etc.
- ESCO model plays an important role in Chinese Taipei PV installation. PV capacity ratio increase from 48% (2012), 63% (2013), and up to 80% (2014).





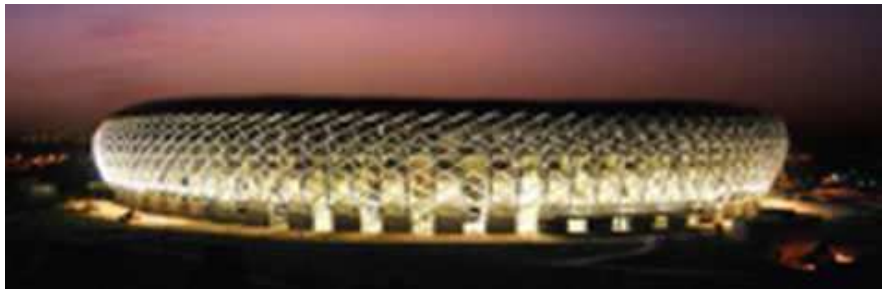
Best Practices for PV Installation in Chinese Taipei

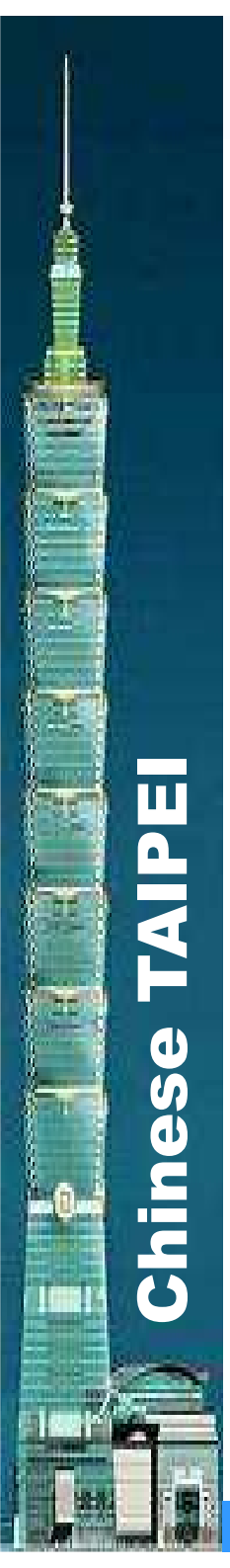
The World's first whale-shaped BIPV

Pingtung National Museum of Marine: 104 kWp

The World's first spiral BIPV

Kaohsiung National Stadium: 1 MWp





Best Practices for PV Installation in Chinese Taipei

Solar Top Classic Building

Solar Wall of Lights
National Museum of Taiwan History
195 kWp

Umbrella-shaped Solar Top
Pingtung LiuDui Hakka Cultural Park
75 kWp

Best Practices for PV Installation in Chinese Taipei

Utility Scale

Chinese TAIPEI

Best Practices for PV Installation in Chinese Taipei

Commercial

Location: Tainan City
Capacity : 1.3 MWp
Type: Grid-tie
Installation on Ground

Location: Pingtung County
Capacity : 1.6 MWp
Type: Grid-tie
Installation on factory rooftop

Best Practices for PV Installation in Chinese Taipei

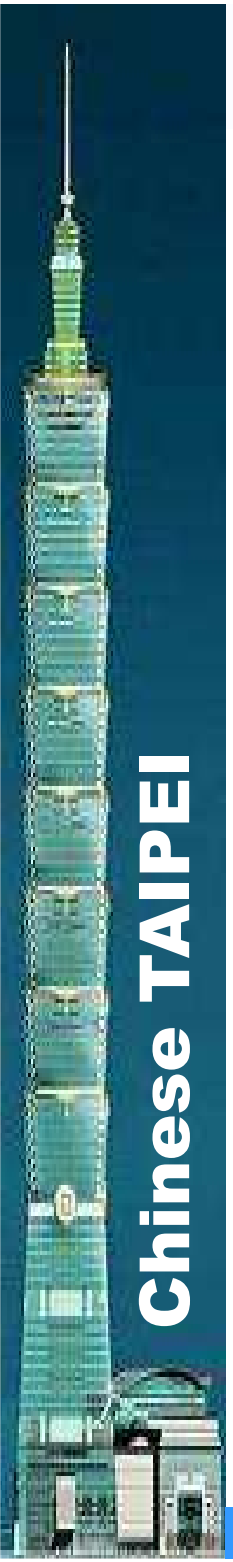
Stand Alone (off-grid)

PV system for emergency application

Best Practices for PV Installation in Chinese Taipei

Green Miracle

- Transform the destroyed fish-farming and orchards into solar power generation after hit by the deadliest Typhoon, Morakot in 2009.
- A **23.4 MW** PV farm project, including the largest solar power plant in Chinese Taipei, has regenerated the devastated flood-hit area.



Concluding Remarks

- The promulgation of Renewable Energy Development Act and related regulations has paved the way for a sustainable long-term development of PV in Chinese Taipei.
- Various incentives have been issued to encourage the investment in PV in Chinese Taipei.
- The development of PV is expected to be prosperous in Chinese Taipei.
- Chinese Taipei will devote itself for the continuous growth of PV and other REs, and welcomes the international cooperation to foster the development of PV together in the global society.

Chinese Taipei, Your Best Partner !

LIGHT YOUR FUTURE

Our Global PV Projects Are Second to None.

Thank you for your attention

Contact: Dr. Chung-Hsien Chen (ctchen2@moea.gov.tw)