

Topic 5: Green Energy Industry

Presentation: Green Energy Industry Program Overview

**Ministry of Economic Affairs
November 4, 2009**



Outline

I. Preface

II. Current International Energy Situation

III. Global Trend of the Green Energy Industry

IV. Taiwan's Green Energy Industry Assessment & Promotion Plan

V. Low-carbon Island (Peng-Hu) Demonstration Promotion



I. Preface

(I) In the face of global climate change, de-carbonization and energy-saving trends, many countries are actively involved in the promotion of renewable energy and energy conservation industries. Taiwan should act promptly to be a part of the global supply chain of these promising new industries.

(II) In an interview with *Global View* magazine, New York Times columnist Thomas Friedman expressed his view for Taiwan “Although a small country, Taiwan has great innovative and manufacturing capabilities. Taiwan can declare itself to be a major player in the field of clean energy technologies for the next decade. Whether on solar or biomass energy, Taiwan should not only be involved in industrial development but also develop into an energy science & technology state. ”

(III) The financial crisis has led to global industrial restructuring. Taiwan must take this opportunity to adjust the direction of its industrial development and goals, accelerate the penetration and upgrading of technology, and enhance the value of its industries in order to exploit the high value of low-carbon technology. As the financial turbulence subsides, the country shall be ready to take off again.

(I) Outlook for world's primary energy demand

- A. Average annual growth rate of energy demand from 2004 to 2030 is 1.8%.
- B. Coal has the highest growth rate of 2.2%. Hydro & renewable energy and natural gas are at 1.9%, and oil and nuclear energy will grow by 1.4%.
- C. In 2030, energy demand from fossil fuels will be 86.72% of the total demand.

Unit: Million tons of petroleum equivalent

Type of Energy	Forecast						Avg. ann. growth 2004 - 2030
	2004	2010	2015	2020	2025	2030	
Petroleum	4257.47	4654.87	5001.65	5330.70	5672.41	6047.03	1.4%
	37.65%	35.98%	35.32%	34.70%	34.28%	34.05%	
Natural gas	2617.26	3052.62	3399.40	3720.86	4011.95	4313.16	1.9%
	23.15%	23.60%	24.01%	24.22%	24.25%	24.29%	
Coal	2898.22	3452.55	3837.29	4232.16	4629.56	5039.61	2.2 %
	25.63%	26.69%	27.10%	27.55%	27.98%	28.38%	
Nuclear energy	696.08	754.30	822.64	903.64	964.39	1004.89	1.4 %
	6.16%	5.83%	5.81%	5.88%	5.83%	5.66%	
Hydro & Renewable energy	840.36	1022.60	1098.54	1177.01	1268.13	1354.19	1.9 %
	7.43%	7.90%	7.76%	7.66%	7.66%	7.63%	
Total	11306.86	12936.95	14159.52	15364.37	16546.43	17758.88	1.8 %

Source: *International Energy Outlook 2007*, EIA

(II) Gradual depletion of primary energy reserves

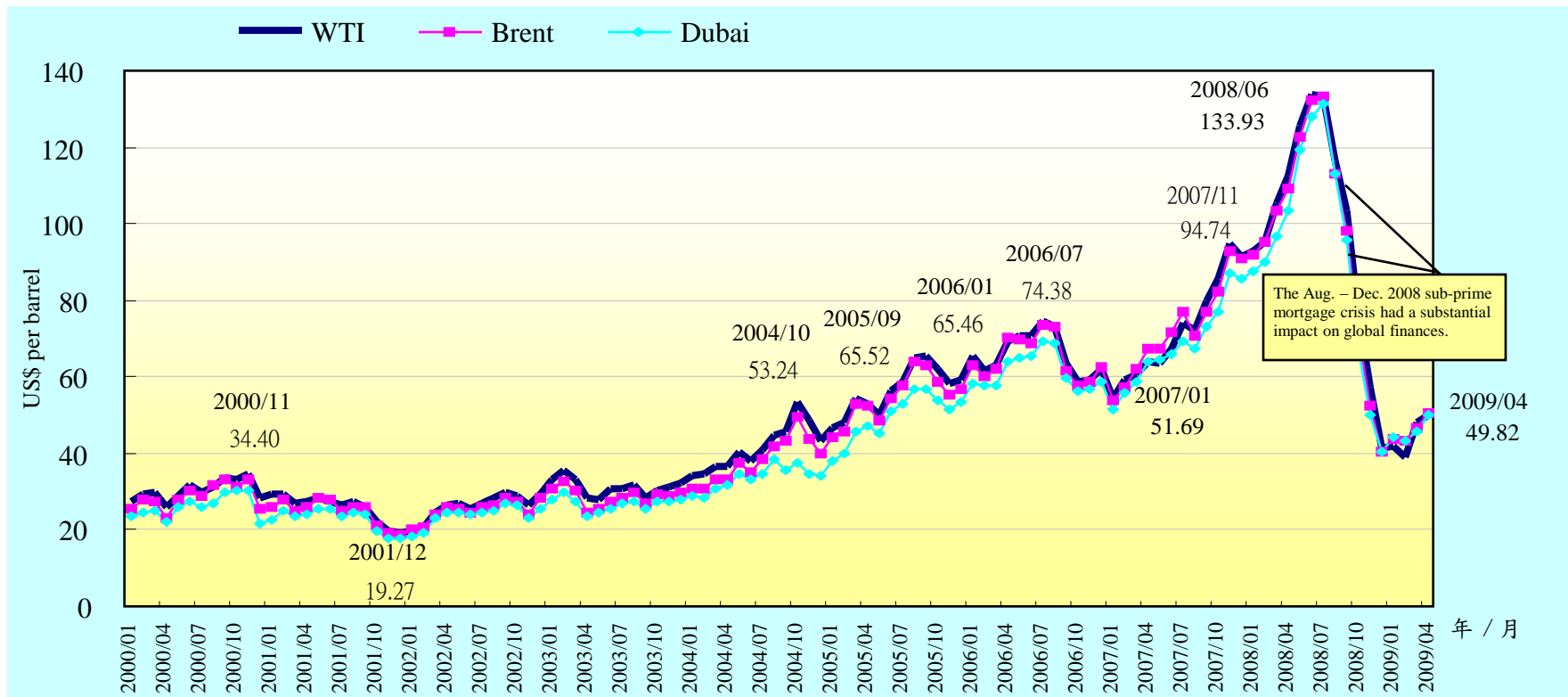
- A. Remaining storage of the world's primary energy reserves: coal can serve the longest, while petroleum depletion is the most serious
- B. In order to reduce reliance on fossil fuels, countries around the world are actively involved in the development of renewable energy sources (e.g. the EU has set a goal to achieve renewable power generation of 20.1% of the total electricity production by 2010.)

Type of Energy Item	Petroleum	Natural gas	Coal
Total reserve (as of end of 2007)	1,237.9 billion barrels	177 trillion cubic meters	847.5 million metric tons
Production Capacity (2007)	29.8 billion barrels	2.9 trillion cubic meters	6.3 billion metric tons
Availability (years)	42 years	60 years	133 years

Source: BP statistical review of world energy June 2008

(III) Fluctuations in international crude oil prices

- A. International crude oil price hikes: due to market speculations and geopolitical factors in mid-2008, the spot prices of Dubai crude oil averaged US\$131.27/barrel in July. However, the sub-prime mortgage crisis and the resulting contraction in oil demand caused Dubai oil prices to fall rapidly to US\$50/barrel in April 2009.
- B. The main causes for fluctuations in prices:
 1. Global financial turmoil resulted in the withdrawal of speculative funds, which in turn caused international oil prices to fall sharply.
 2. As the sub-prime crisis swept throughout the world, even OPEC production cuts were unable to offset the substantial reduction in demand.

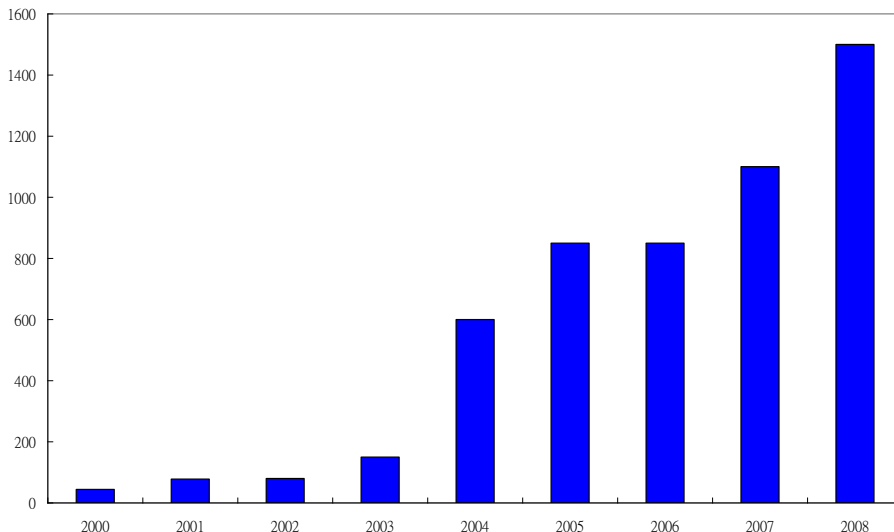


(I) Global Development in Photovoltaics

A. Germany

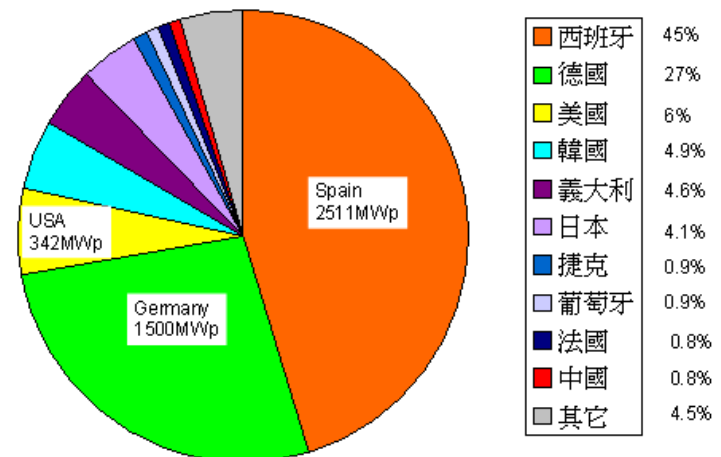
1. German solar photovoltaics promotion began in 1990 with the launch of the “1,000 Solar Roofs Project.” From 1999 to 2003 the “100,000 Solar Roofs Project” was carried out; in April 2004, Germany passed the EEG amendments, expanding public support with low-interest loans and preferential purchase of electricity.
2. In terms of installation, Germany replaced Japan as the world’s largest solar photovoltaics market in 2004, but with the spectacular Spanish market growth in 2008, Germany retreated to second place, with 1,500 MWp in installation.
3. In terms of production, Germany was the world’s second largest solar cell producer in 2008.

Growth of PV market in Germany



Source: EPIA; compiled by Photovoltaic Technology Center, ITRI (July 2009)

World’s Top Ten in PV Installation, 2008

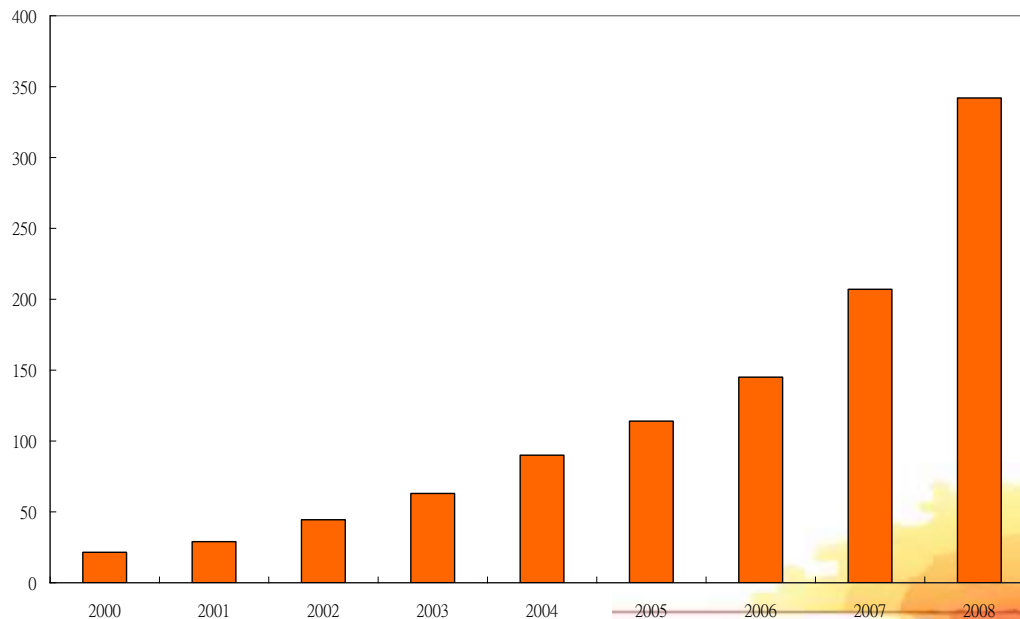


Source: EPIA; compiled by Photovoltaic Technology Center, ITRI (June 2009) 7

B. United States

1. In the U.S., the promotion of photovoltaic technology began in 1997 when the U.S. government unveiled the “Million Solar Roofs Project.” In 2007 the million solar homes program was introduced in California, where incentives and subsidies were provided to help families and enterprises install photovoltaics systems.
2. In terms of installation, the U.S. market has enjoyed a steady growth. In 2008 it was the world’s third largest market with 342MWp in installations.
3. In terms of production, the U.S. was the world's fifth-largest solar cell producer in 2008.
4. In January 2009 the U.S. government proposed the “New Energy for America” project, in which US\$150 billion will be invested in renewable energy-related industries in the next decade.

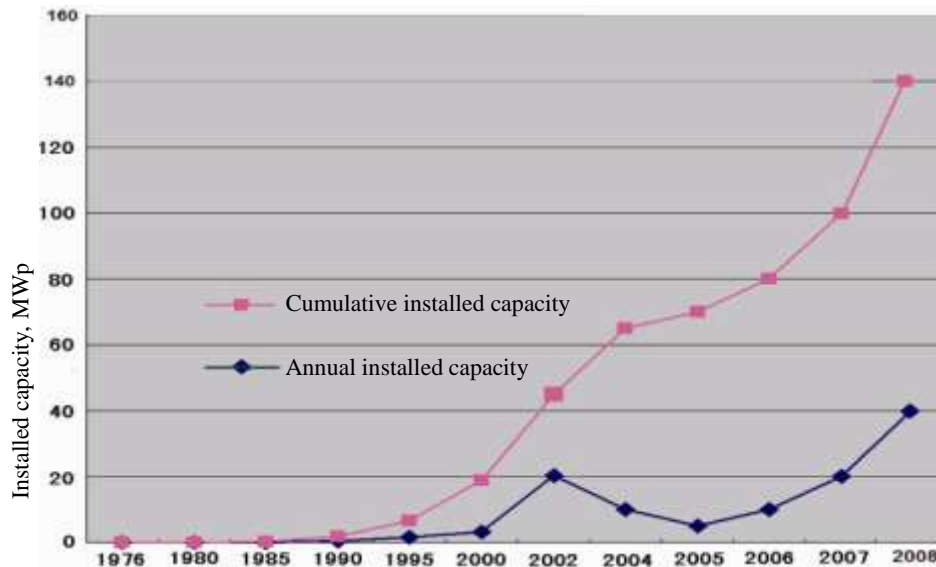
Growth of PV market in the U.S.



C. China

1. With the adoption of the Renewable Energy Law on February 28, 2005, which was put into effect on January 1, 2006, China launched the adoption of the “Long-term Renewable Energy Development Plan.”
2. In terms of installation, China’s photovoltaic power generation system is mostly used to supply electricity in rural areas, with an annual installation of about 10 - 20MWp. In 2008, installation reached 40MWp, making China the world’s 10th largest market.
3. In terms of production, Chinese manufacturers invested substantially in 2008 and the country ranked number one in solar cell production.
4. In order to promote the growth of the strategic and emerging photovoltaics industry, China’s Ministry of Finance, Ministry of Science & Technology and the National Energy Administration began planning the “Golden Sun Capital Management Demonstration Project-Interim Measures for Financial Subsidy” in July 2009, making grants available to provinces and cities for the installation of PV systems.

Growth of PV market in China

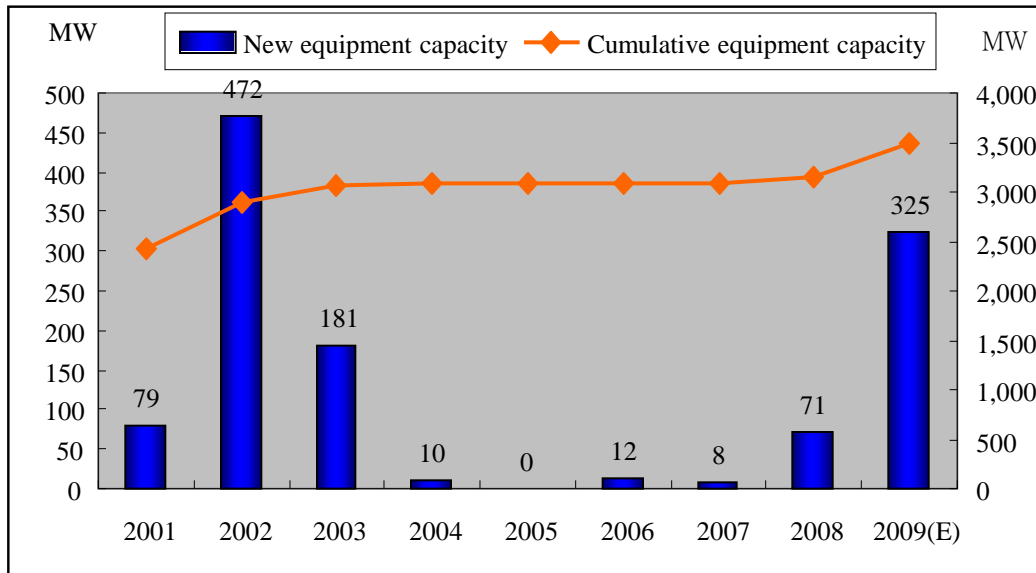


(II) Global Wind Power Development

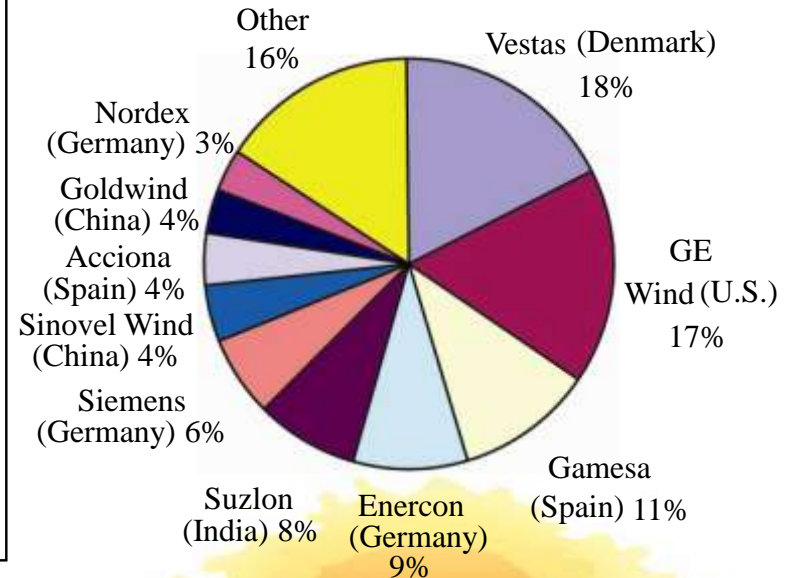
A. Denmark

1. In the 1980's and 1990's, the majority of wind turbines in Denmark were set up by private or collective funding. After 2000 large electrical power conglomerates became the leading wind farm developers and the level of participation by local residents was reduced. Currently the amended renewable energy law requires that 20% of each wind farm development project be owned by local residents.
2. At present wind power accounts for 20% of Denmark's total electrical power supply. After 2000, the on-shore market in the country became saturated, and the industry began to export.

After 2000 growth of domestic installations in Denmark stagnated

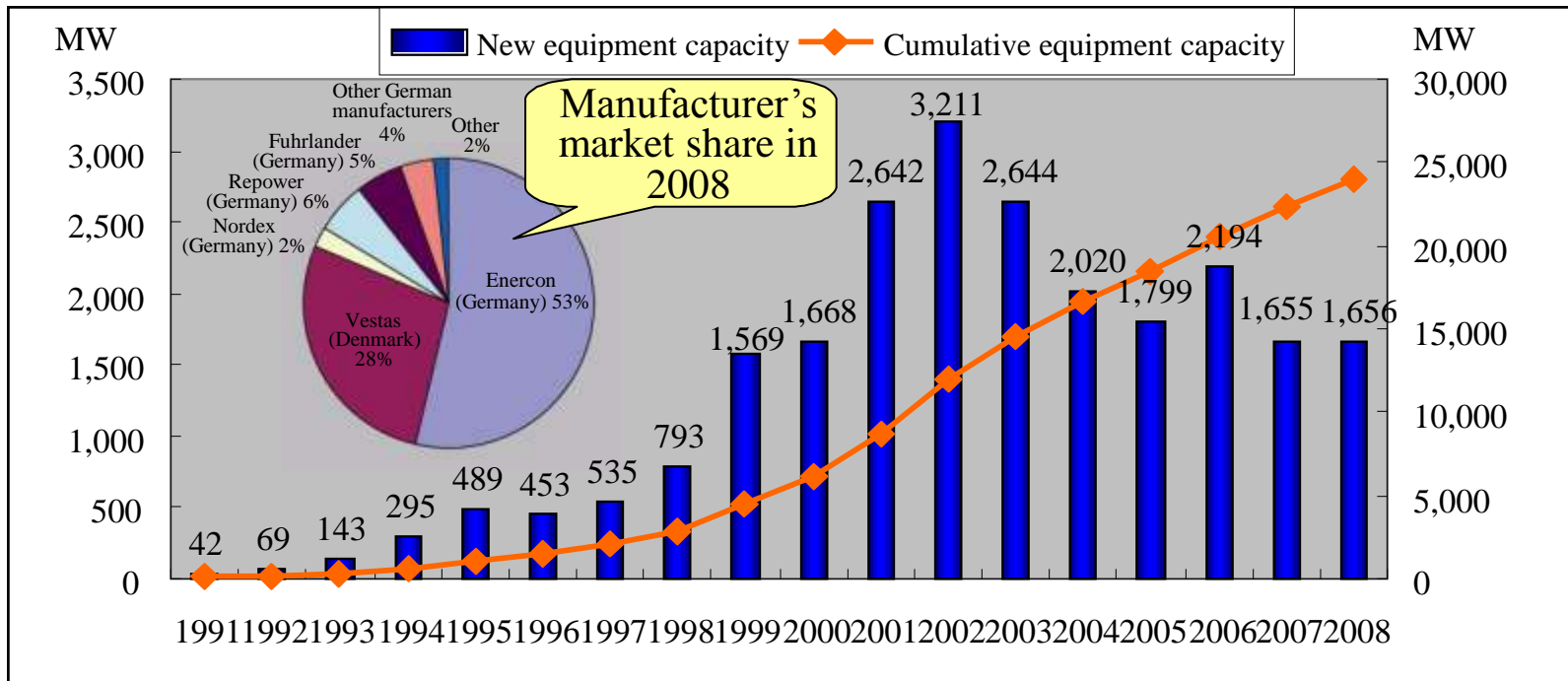


Market share of top ten manufacturers in 2008



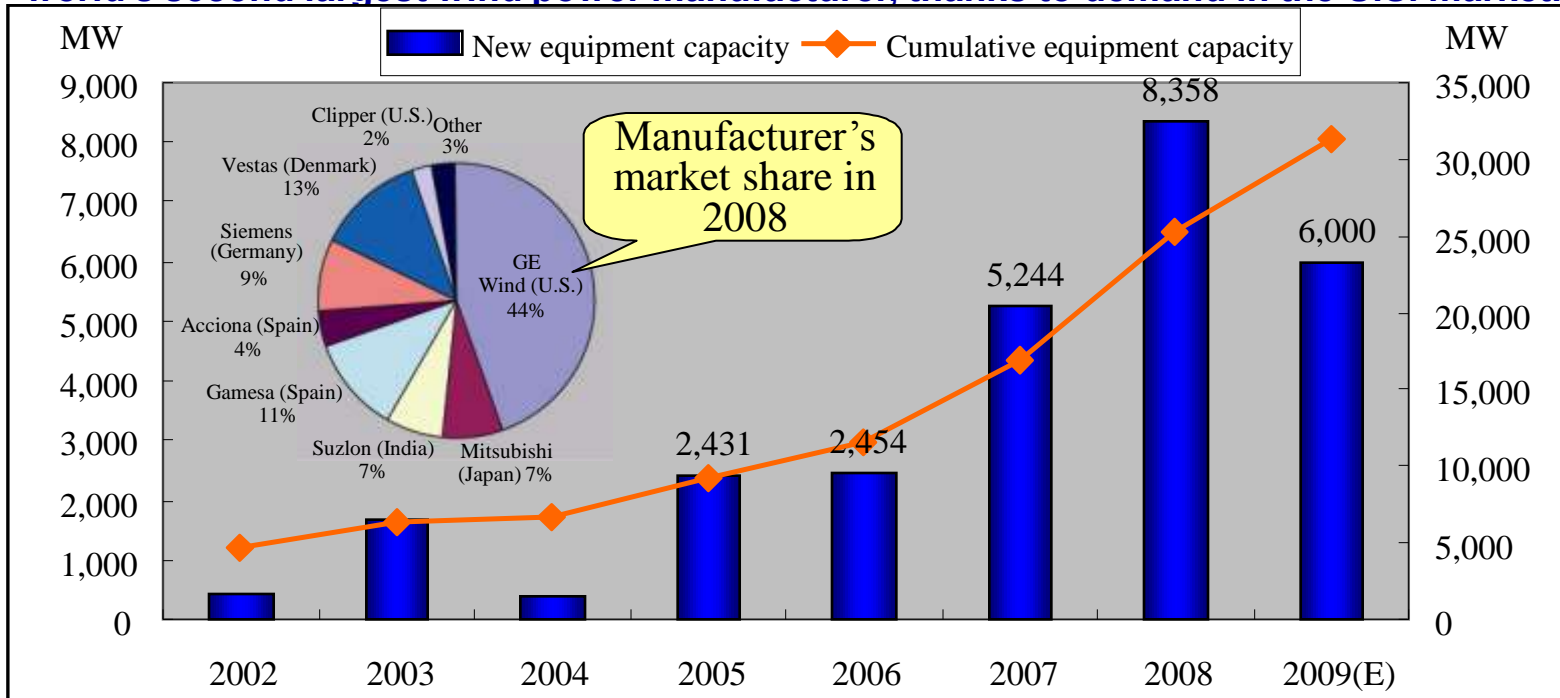
B. Germany

1. From 1991 to 2002, the German wind power installed capacity grew rapidly, which contributed to the growth of the country's wind power industry;
2. On-shore wind power deployment in Germany has become saturated in recent years. The industry is actively seeking overseas markets and the German government provides preferential loans to encourage the industry to expand overseas;
3. In January 2009 the German Government implemented a new renewable energy bill to substantially increase offshore wind power purchase prices in order to promote offshore wind power development.



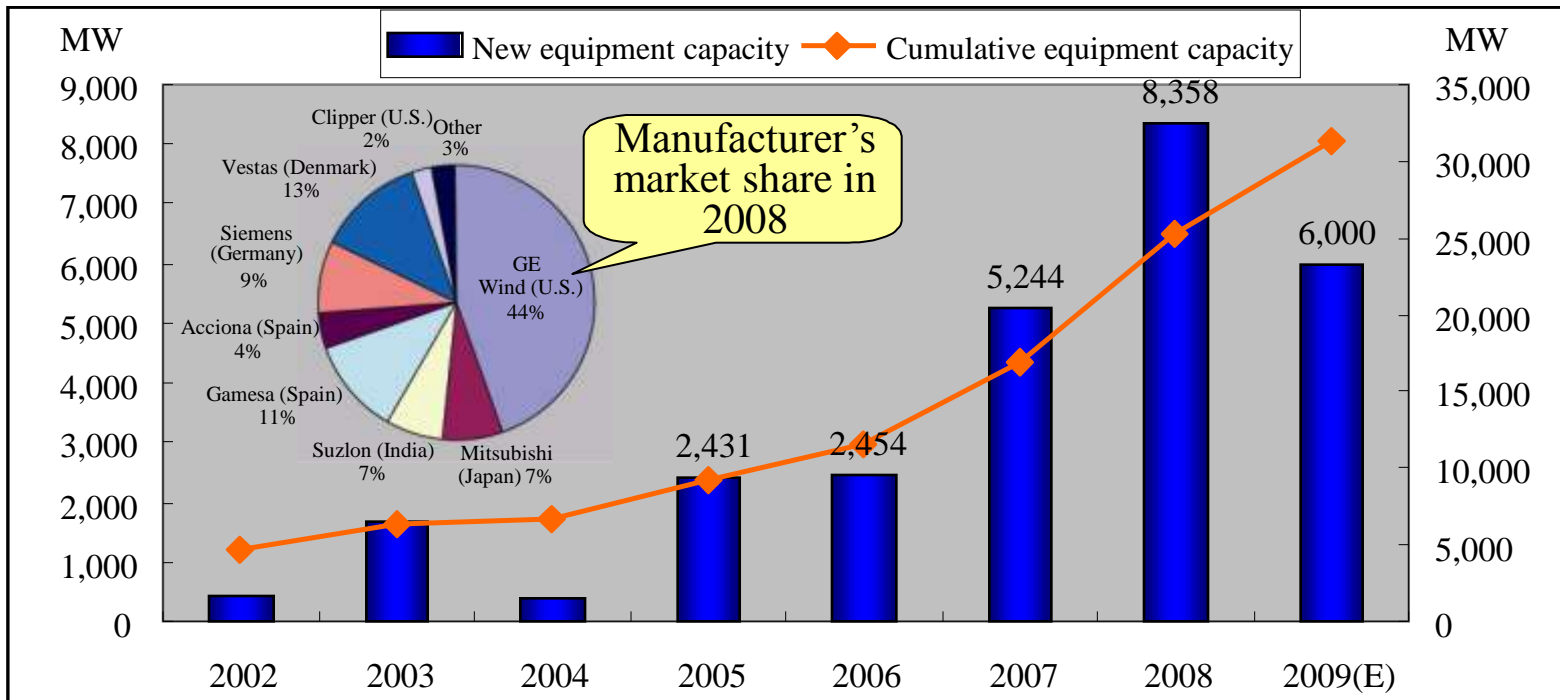
C. United States

1. After the renewable energy incentive policy stabilized after 2005, there has been a rapid increase in wind power installed capacity. In 2008, 8,358 MW was installed and the U.S. became the world's largest market.
2. Due to the financial crisis, it has been difficult for wind farms to obtain financing. It is expected that the installed capacity for the U.S. market in 2009 will be reduced. However, the economic stimulus bill announced in February 2009 is expected to result in a growth of 11,000 MW installed capacity in 2010, and the country will retain its position as the world's largest market.
3. In 2002, GE entered the wind power industry through acquisition and quickly became the world's second largest wind power manufacturer, thanks to demand in the U.S. market.



D. China

1. With the renewable energy law passed in 2006, China's market has entered a period of rapid growth. In 2008, newly installed capacity was 6,246 MW, making China the world's second largest market. In 2009, a "New Energy Industry Revitalization Plan" has been proposed, increasing the target wind power installations to 30GW for 2010. A target of 150GW installed capacity in the year 2020 has also been proposed.
2. The development of China's wind power industry has been mainly driven by the need to transform local mechanical, electrical and other traditional industries. Manufacturers entering the wind power market in 2004 have been growing rapidly, although the quality of the products is less mature than that of their foreign counterparts. However, with the policy objective of developing the local industry, domestic products are the mainstream in this market.

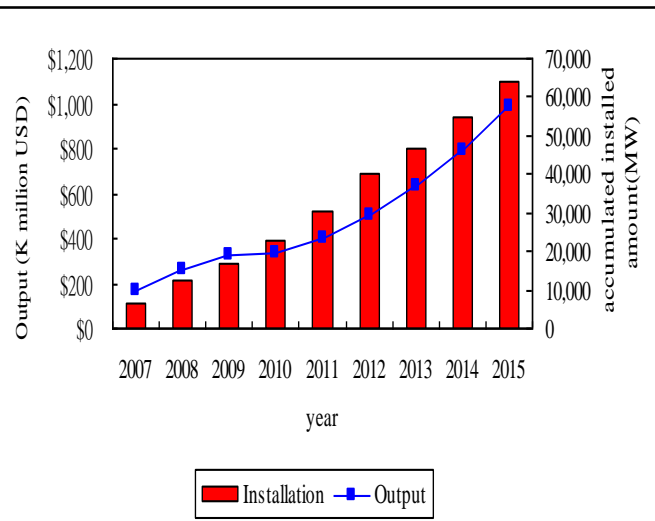


(II) The Growth of Major Global Green Energy Industry

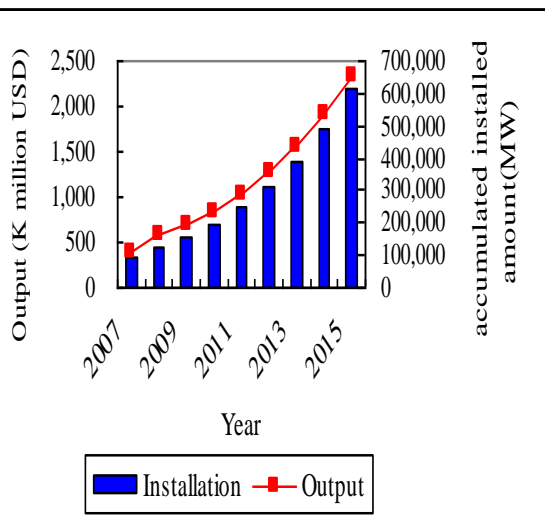
Increasing Green Energy Demand Stimulates the Industry Growth

- A. Photovoltaics:** accumulated installation 12GWp in 2008, with an industry output of US\$26.3 billion; expected accumulated installation in 2015 reaching 65GWp, an output over US\$100 billion
- B. Wind Energy:** accumulated installation 120 GW and an industry output of US\$58.8 billion in 2008; estimated accumulated installation reaching 600GW for an output over US\$200 billion in 2015.
- C. LED lighting:** output of US\$4.2 billion in 2008, reaching US\$40 billion in 2015

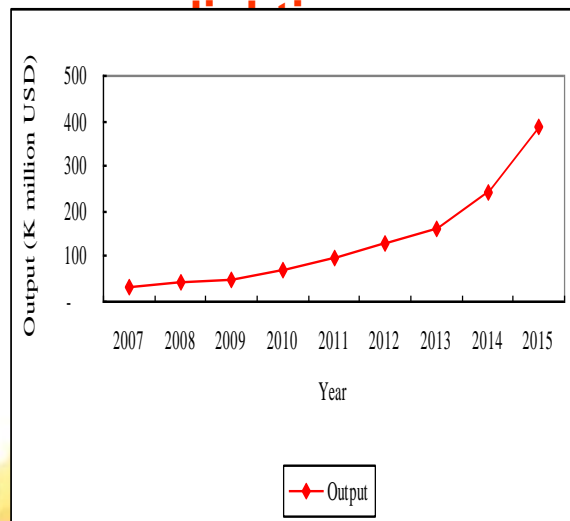
Photovoltaic



Wind Energy



LED

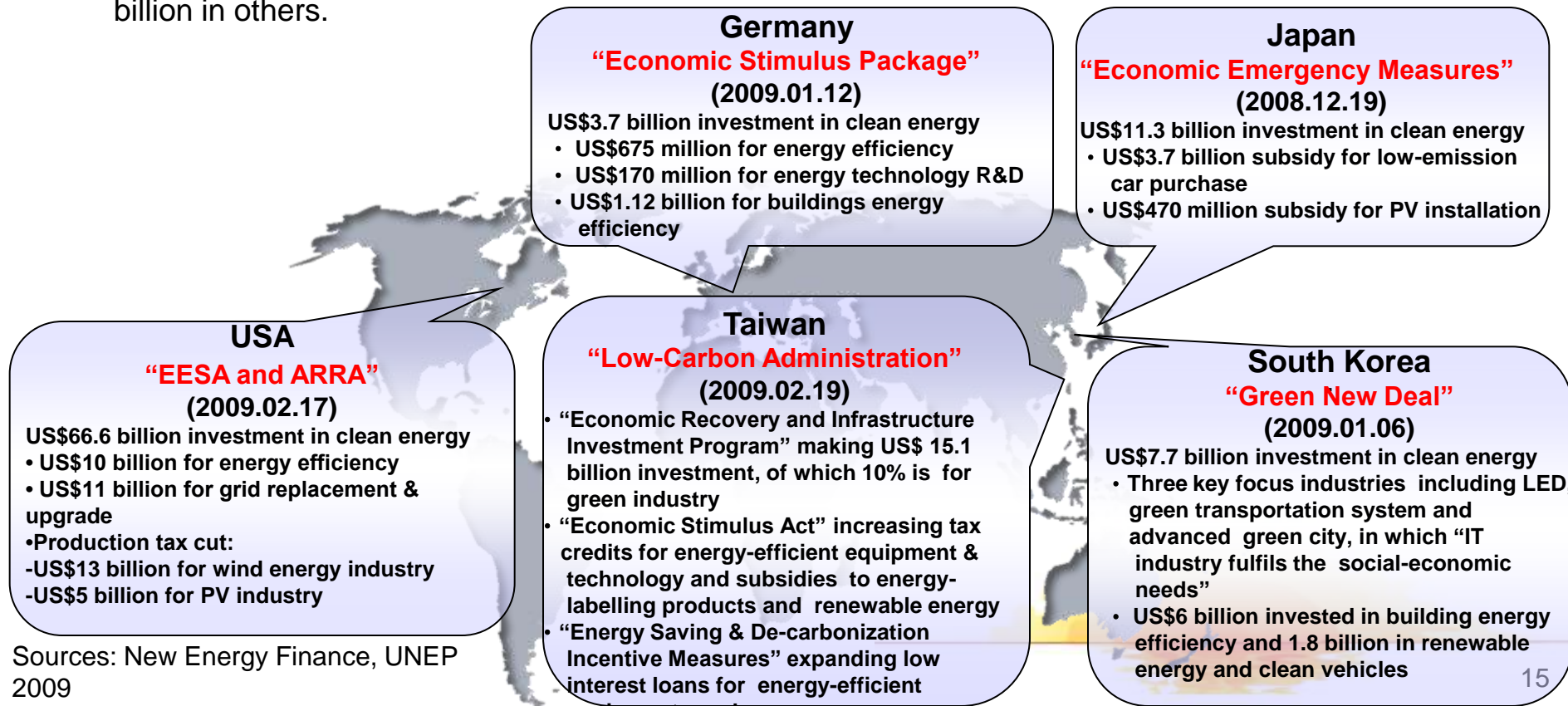


(IV) “Global Green New Deal”

The global “green new deal” policies will accelerate the growth of the green energy industry. Taiwan should act promptly to take a competitive position in the global supply chain of this promising new industry.

● Estimated Investment from the Global Green New Deals

USA, Japan, China, UK, Germany, and Korea invested a total of US\$184.9 billion in clean energy, including US\$65.7 billion in energy efficiency, US\$35.3 billion in renewable energy, US\$48.6 billion in smart grid, US\$22.1 billion in research and development, US\$4.8 billion in transportation, and US\$8.4 billion in others.



(I) Opportunities for energy conservation and renewable energy

With the passage of the Renewable Energy Development Act by the Legislative Yuan on June 12, 2009, President Ma's policy to promote "energy conservation and carbon emissions reduction" would be implemented. The law's passage has laid a foundation for the long-term development of Taiwan's renewable energy resources. In addition to increasing indigenous energy production, enhancing energy diversification, and lowering greenhouse gas emissions, the law will also drive the the development of energy conservation and renewable energy industries.

A. PV systems installation expected to grow significantly

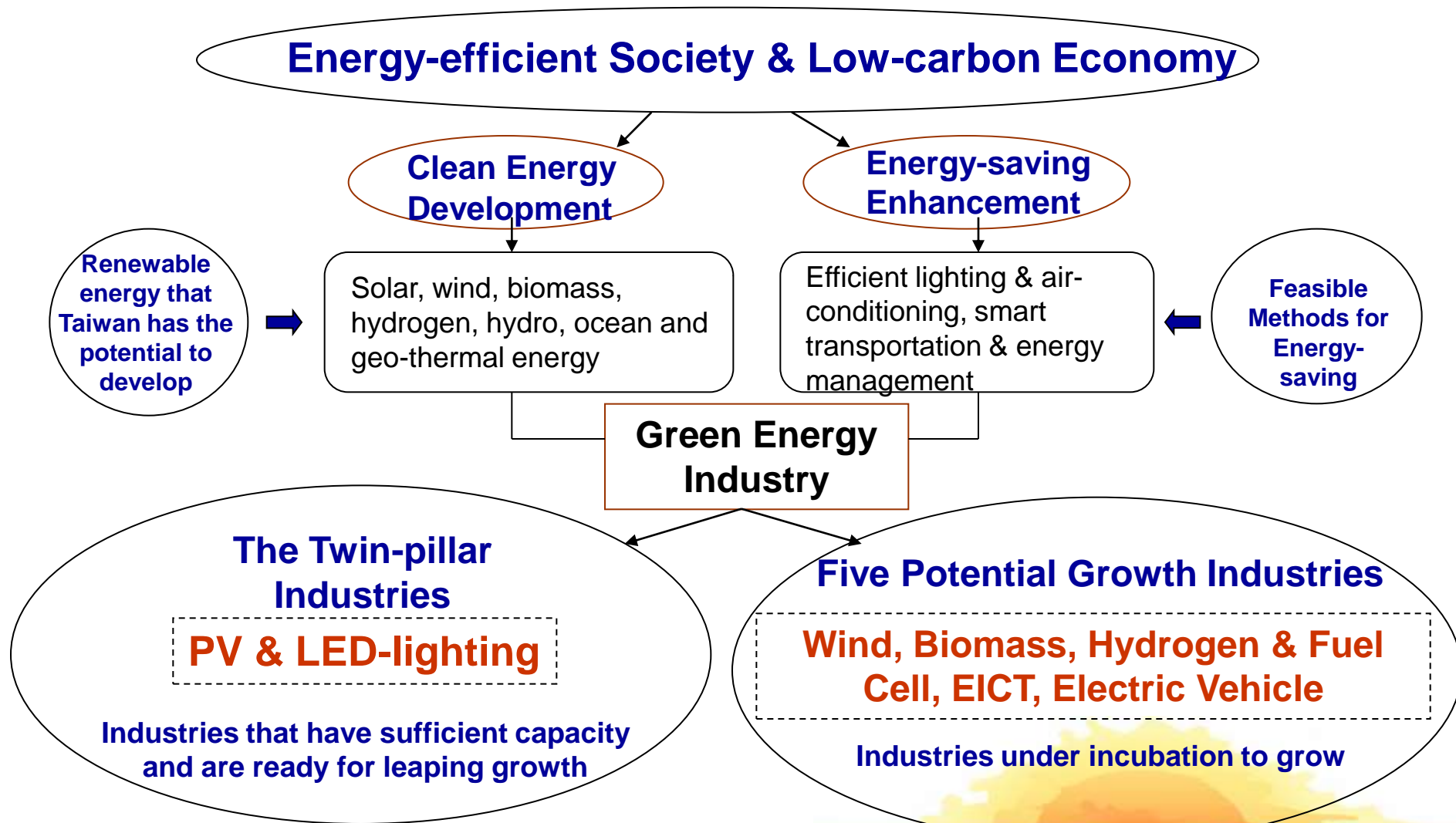
1. Solar Community: to be promoted in residential communities
2. Encourage the installation of PV systems in public buildings
3. Large-scale photovoltaics power plants, such as the Taiwan Power Co. 4 MW power plant project
4. Carry out the 100,000 PV Roofs project

B. Low-carbon urban planning and LED lighting project

1. Low-carbon city promotion program: two low-carbon model communities in the next two years in every city/county; six low-carbon cities in the next 5 years; four major low-carbon metropolises by 2020.
2. The LED light post demonstration project and LEDs for traffic lights, emergency exit signs in all government agencies, and fire alarm lamps.

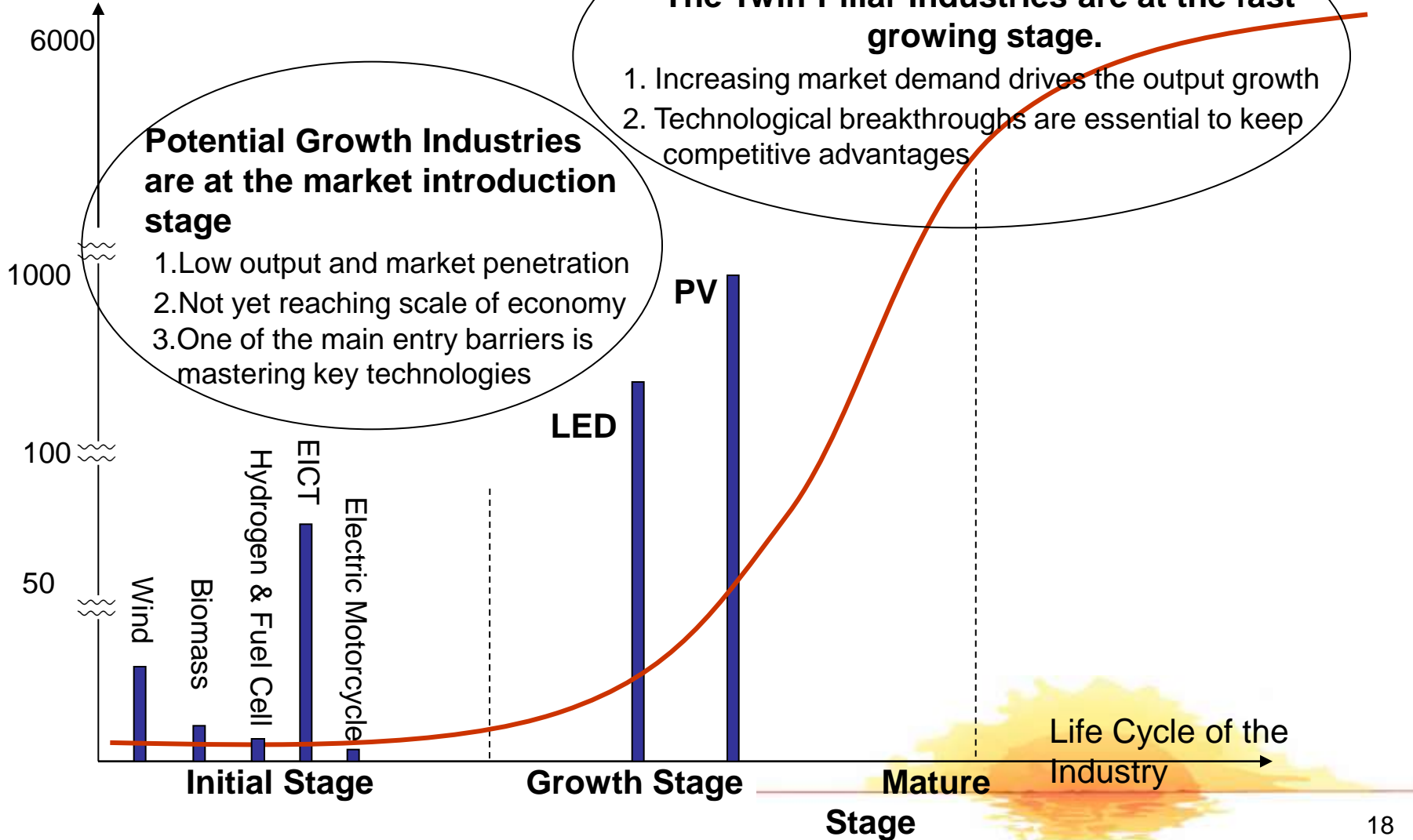


(II) Key Industries for Development



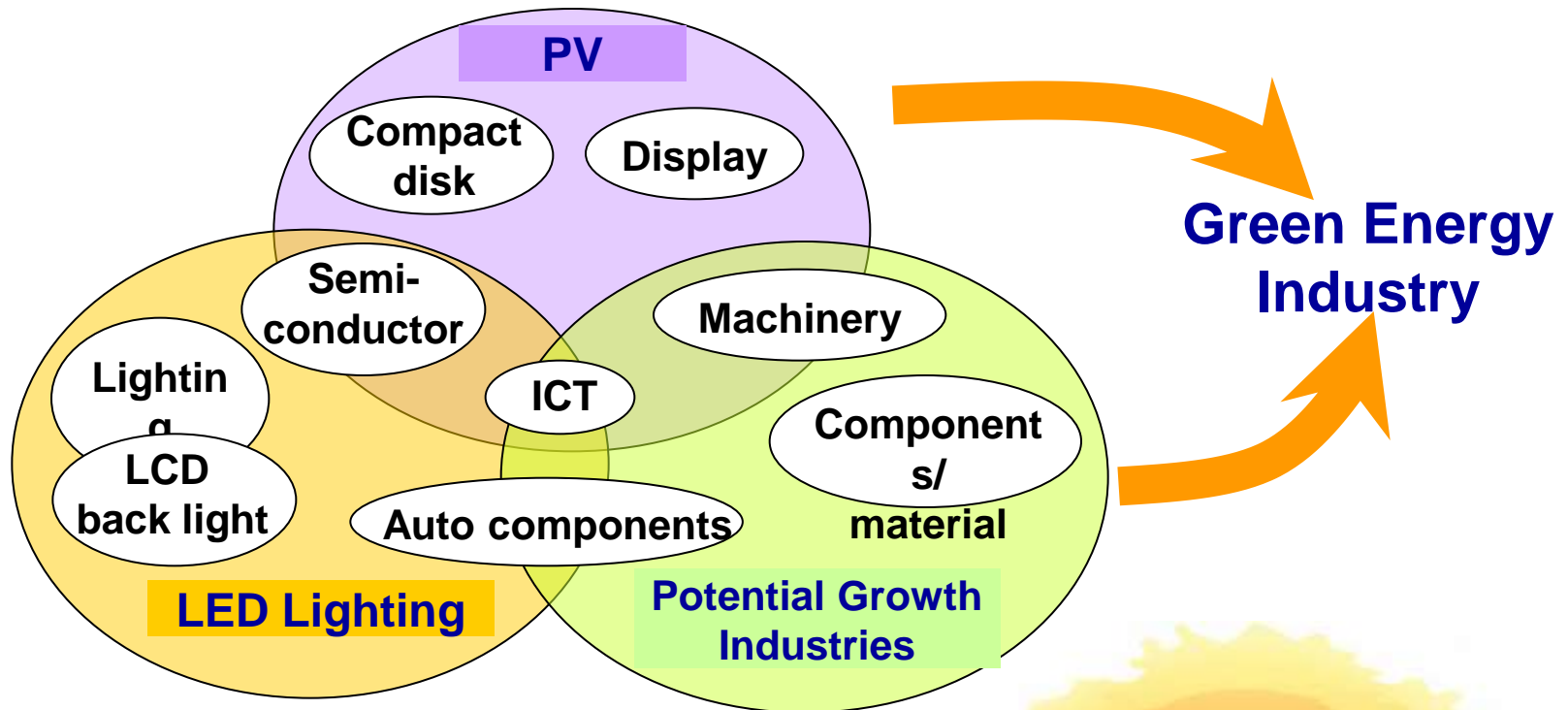
(III) Current Statuses of the Key Industries

Output of 2008
(in hundred million USD)



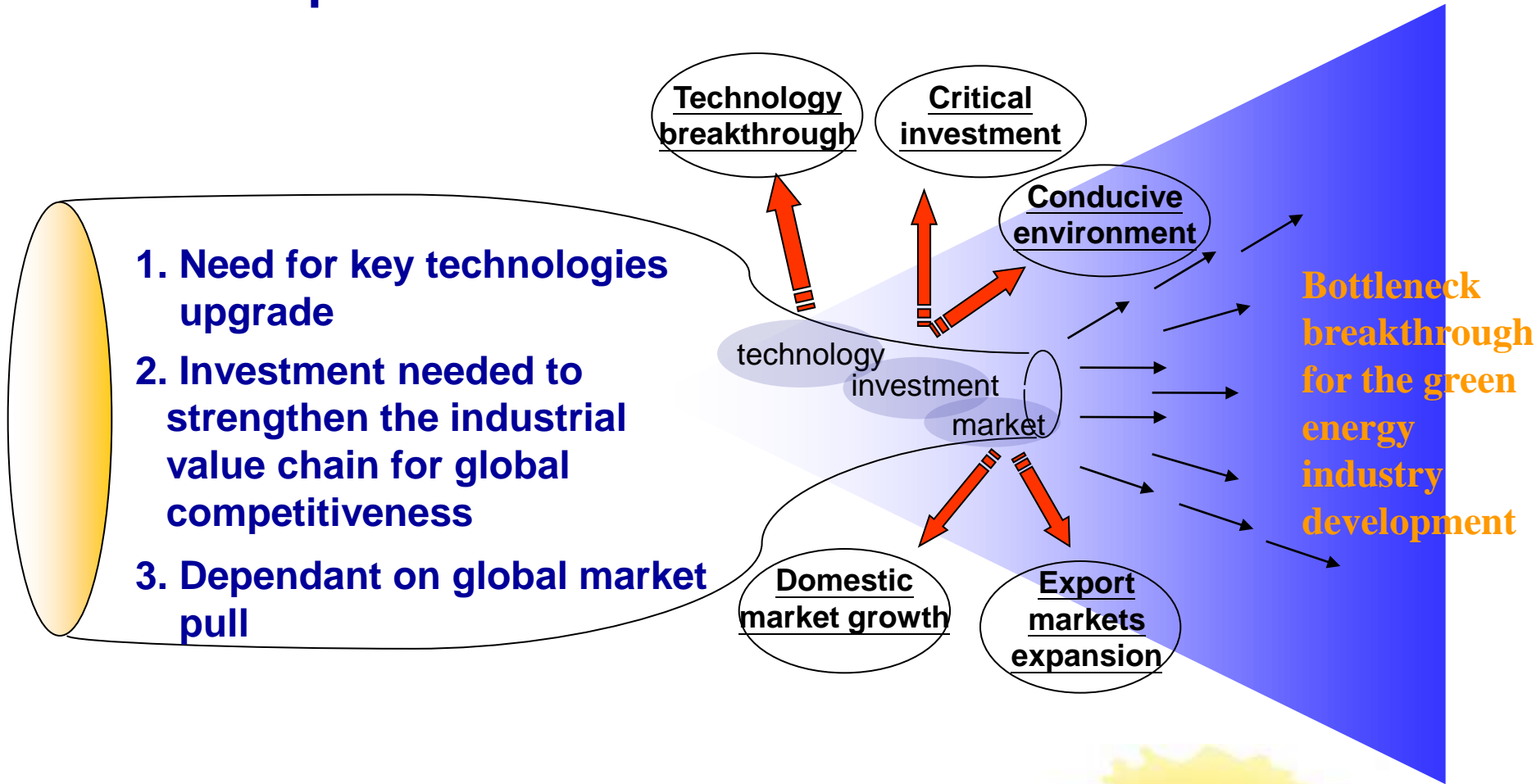
(IV) Taiwan's Competitive Advantages in Developing Green Energy Industry

- Taiwan's major advantages:**
- 1.Strong & competitive IT industry base and skilled manufacturing process management
 - 2.Well-developed manufacturing capacity and human resources in conventional industries, such as electro-mechanical, metal products, composite material, and electronic control
 - 3.Excellent talent pool in semiconductor and TFT-LCD industries easily transferable to green energy industry



Leveraging the strengths of existing competitive industries to make Taiwan a leader in the global green energy Industry

(V) The Unbottling of Taiwan's Green Energy Industry Development Bottleneck



(VI) Five Driving Forces in Green Energy Industry Development

Major Player in Global Green Energy Industry

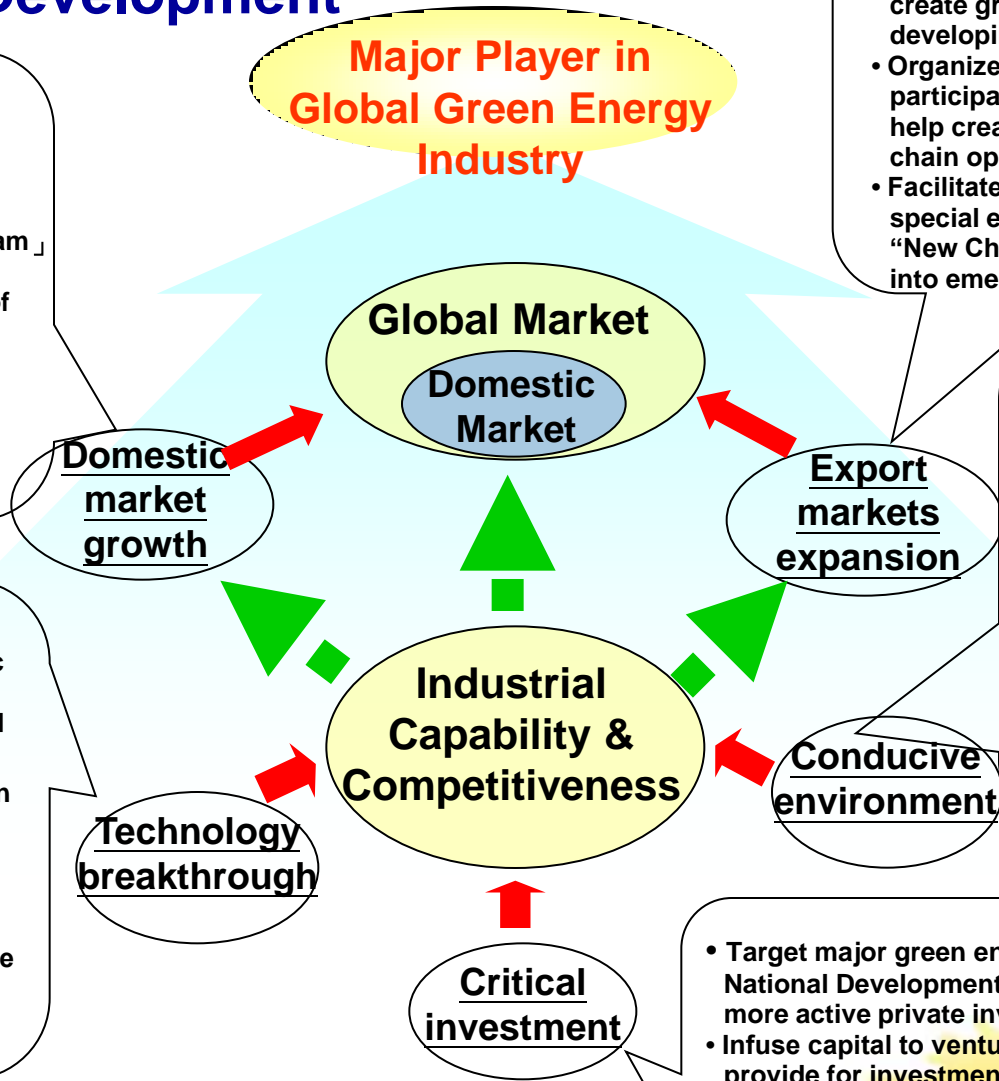
- Enactment of the “Renewable Energy Development Act” to create a 6.5GW domestic market
- 10% budget allocation of the 「Economic Recovery and Infrastructure Investment Program」 for green contents
- Subsidy for the demonstration of green energy products
- Investment of US\$758 million in five years to promote the installation of renewable energy and using energy-efficient products

- Leverage China’s industry base and market as a part of global strategy; create green product business by developing demonstration sites
- Organize overseas trade shows participation and promotion tours to help create international supply chain opportunities
- Facilitate the utilization of the special export loan and insurance in “New Cheng Ho” program to expand into emerging markets

- Connect with the National Energy R&D Program for basic green energy science & technology breakthroughs and HR development.
- R&D funding of US\$606 million in five years to improve the domestic technological capability and encourage independent innovation
- Set up the “Technology Service Team” to help and work with the green energy industry in technology improvement

- Ensure “Renewable Energy Development Bill” to be approved into law ASAP
- Promulgate renewable energy and energy efficiency regulations with standards and testing facilities in conformance with international standards
- Establish “Green Energy Product Certification Laboratory” to facilitate international trade
- Set up demo & testing sites for green energy technology to validate reliability

- Target major green energy investments as priority National Development Fund projects, to encourage more active private investments
- Infuse capital to venture capital investment funds to provide for investment liquidity
- Set up “Green Energy Industry Service Task Force” to mitigate investment barriers



 Policy push
 Market pull

(VII) Projected Benefits

(I) A New Growth Engine of Taiwan Industry

A low carbon and high value-added transformation of Taiwan industry. The output is estimated to grow from US\$4.86 billion in 2008 (1.2% of the total manufacturing sector) to US\$35 billion in 2015 (~6.6% of the total manufacturing sector).

(II) A Major Player of the Global Energy Industry

With a R&D investment of US\$606 million in the next five years, it is anticipated to induce US\$6.06 billion more private investment so that the total output of the green energy industry is expected to reach more than US\$35 billion in 2015.

(III) New Era of Energy-efficient and Low-carbon Taiwan

An investment of US\$758 million in the next 5 years in renewable energy and energy-efficient equipment installation will be a significant thrust toward a low carbon society for Taiwan.



(VIII) Current status of overall project implementation

- (1) The action plan for the “Green Energy Industry Program” (a total of 94 items) has been established, which will translate into concrete actions and goals to facilitate industry development.**

- (2) The Renewable Energy Development Act was officially promulgated on July 8, 2009, by the President. Currently 15 other subordinate laws, including equipment purchase subsidies and electricity buy-back prices, are being developed, which will provide reasonable incentives and encourage the development of mature and economical domestic renewable energy sources and technologies.**

- (3) Establish a intra-Ministry level “Green Energy Industry Development Meeting”, which is held every 3 months to report and review the progress of the action plan’s implementation.**

- (4) A “Green Energy Industry Development Project Office” has already been set up. It is responsible for the integration and coordination of operations. Staff from the green energy industry technology and industry service teams will work with the industry directly to gauge the industry-market dynamics and help resolve issues concurrently. As of the end of September 2009, approximately 61 manufacturers had scheduled visits. Business consulting, marketing information, financing, business opportunities match-making, assistance in certification, land search, government subsidies and resources assistance and other services are also provided.**

(I) Background

A. Consensus of the National Energy Conference-establishing low-carbon homeland

1. Promote low-carbon communities/cities and metropolises.
2. Renewable energy life style demonstration (over 50% of energy supply from renewable energy).

B. Executive Yuan Directive (July 18, 2009)

Make Penghu Island a low-carbon model community for the country's future development of low-carbon cities.

(II) Current planning status

A. Planning status (refer to attached diagram next page)

B. Through the establishment of a low-carbon island:

1. Expanding the market of energy conservation products and renewable energy to facilitate the industrial development.
2. Gradual transition from low-carbon communities into a low-carbon homeland.
3. Making Penghu a show-case community for Taiwan's energy-saving & de-carbonization technology/equipment, living experiments, as well as research and development.

- **Renewable energy > 50%**

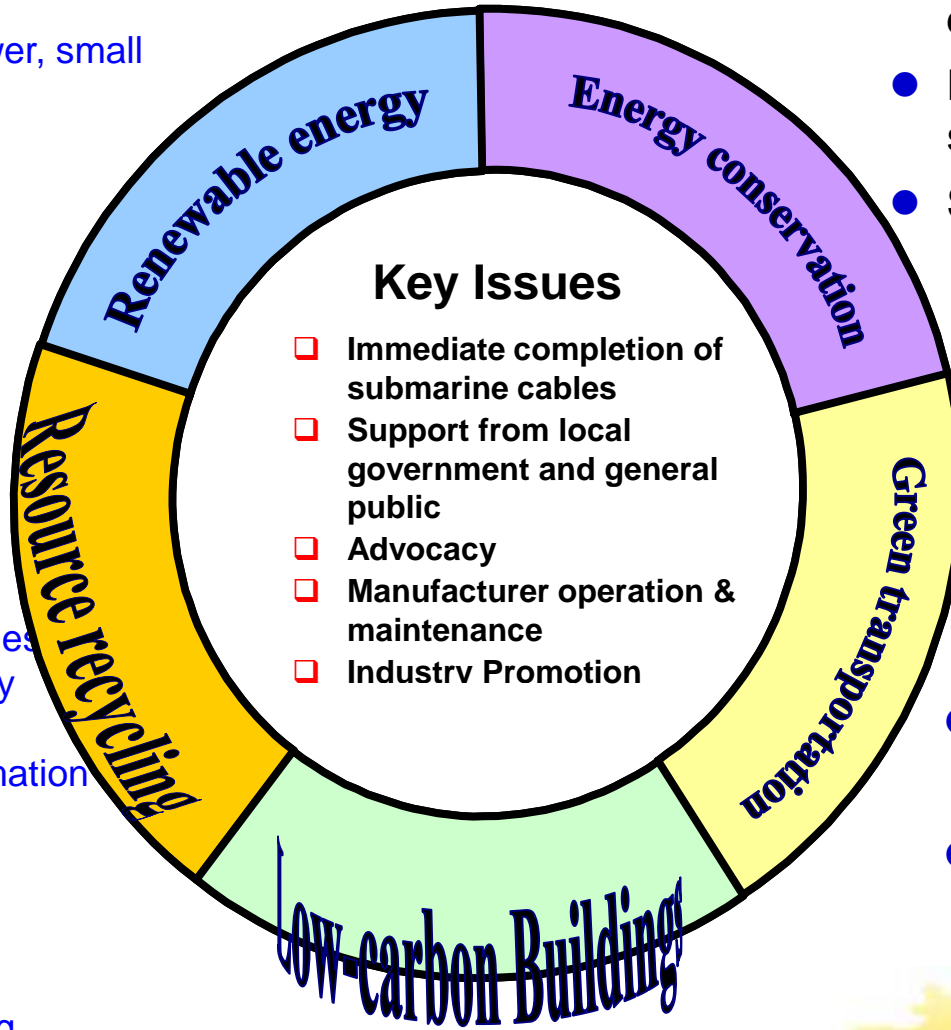
- Large-scale wind power, small wind turbine
- Photovoltaics
- Solar Water Heaters
- Renewable Energy Demonstration Park

- **Water supply management and recycling**

- Water-saving facilities
- Rainwater Recovery System
- Waste water reclamation system

- **Zero waste**

- Green production / consumption
- Reduction / recycling



- Energy-saving appliances & energy efficiency improvement
- LED lighting / energy-saving light bulbs
- Smart Meter

- Bicycle Route Network
- Low-carbon transport

- **Green buildings and sustainable landscaping**





THANK YOU!

