



Taiwan Solar Energy Corporation: Opportunity of Taiwan's Solar Industry



December 7, 2017

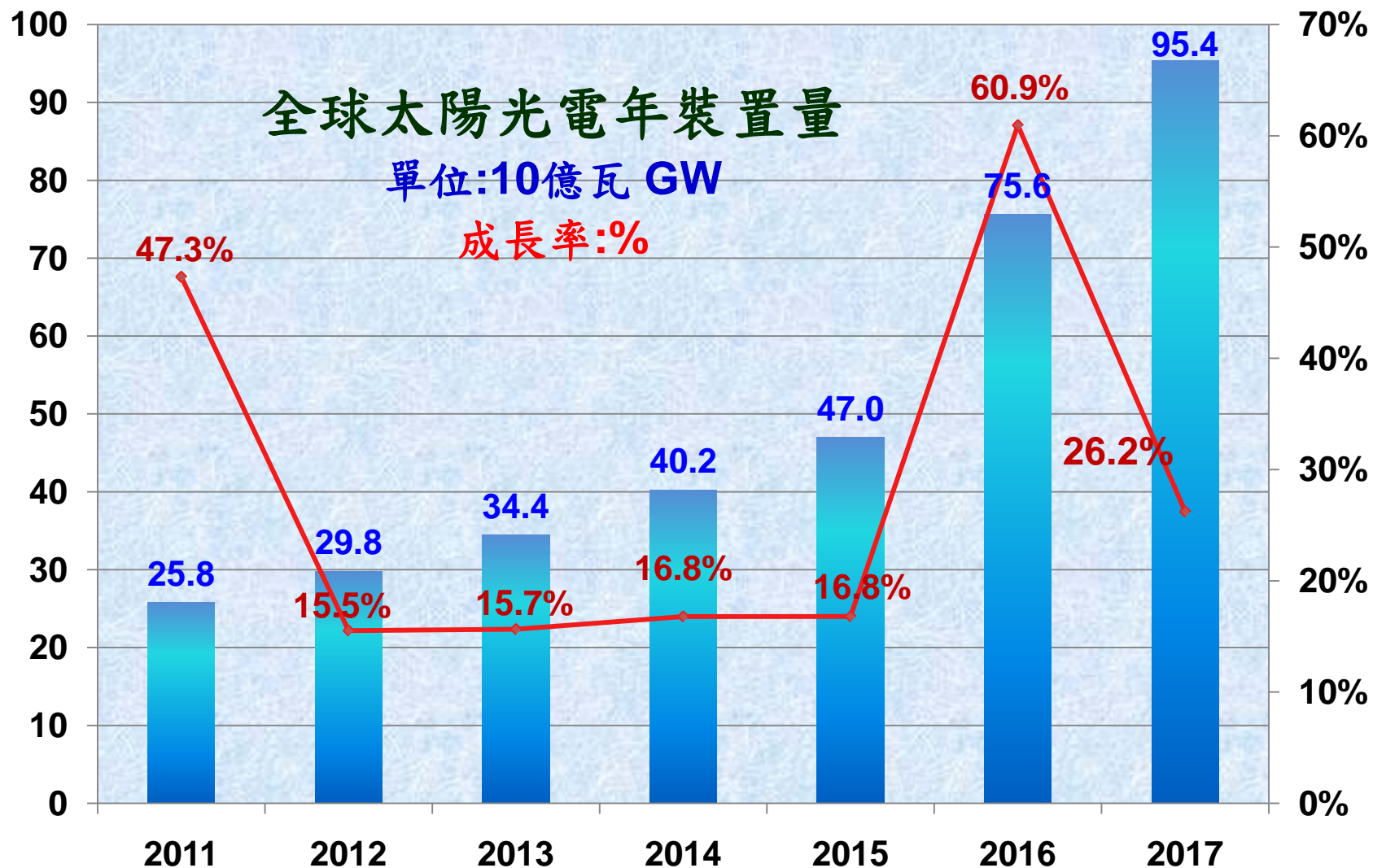


Agenda

1. Global Market Outlook
2. Opportunity from Government's Policy
3. TSEC's World Class Solar Module Plant
4. To Become Taiwan Solar Energy Leader
5. Development of PV System in TSEC and Formosa Sun Energy

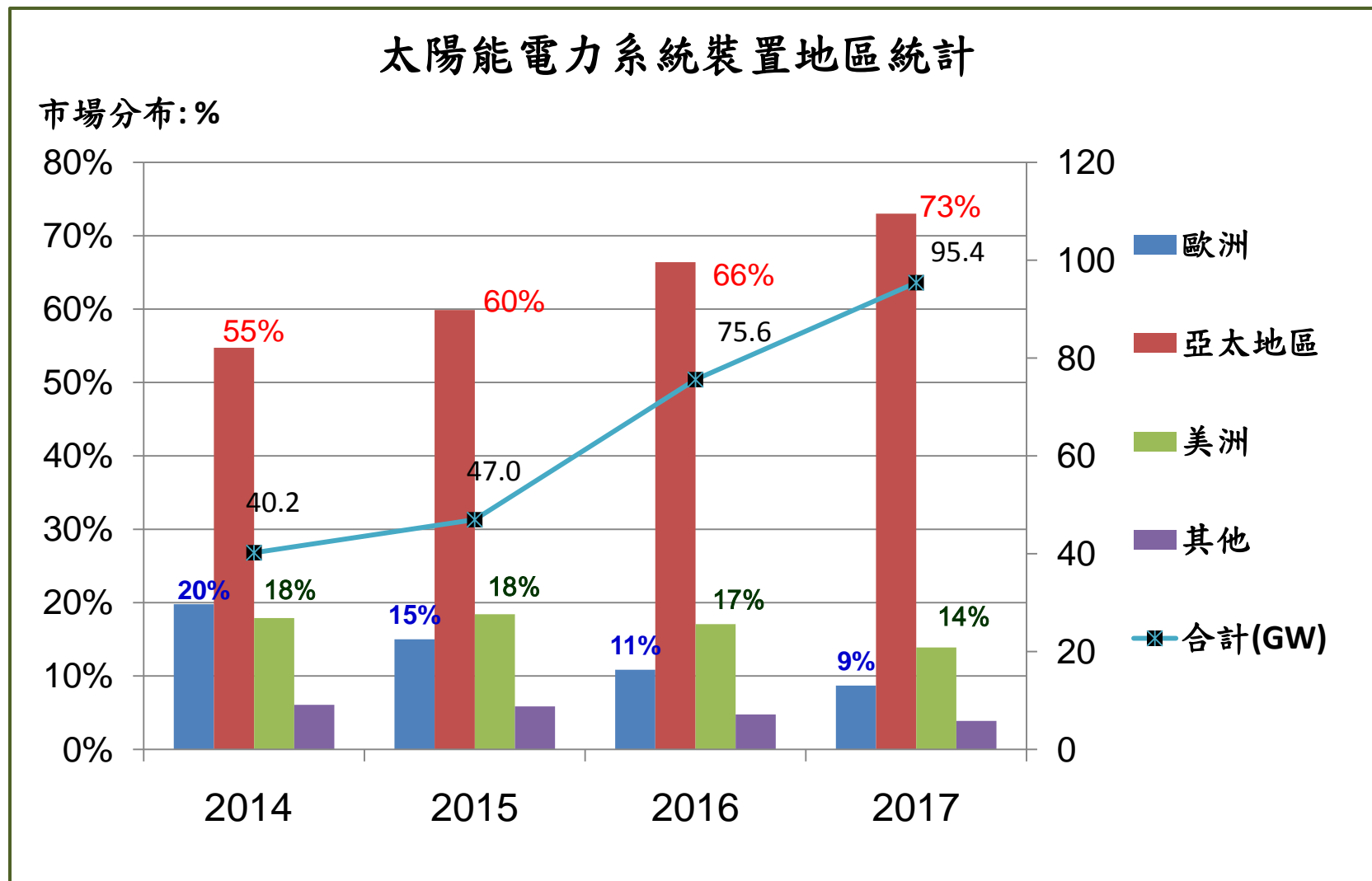


1. Global Market Outlook





Asia Becomes the Largest Market

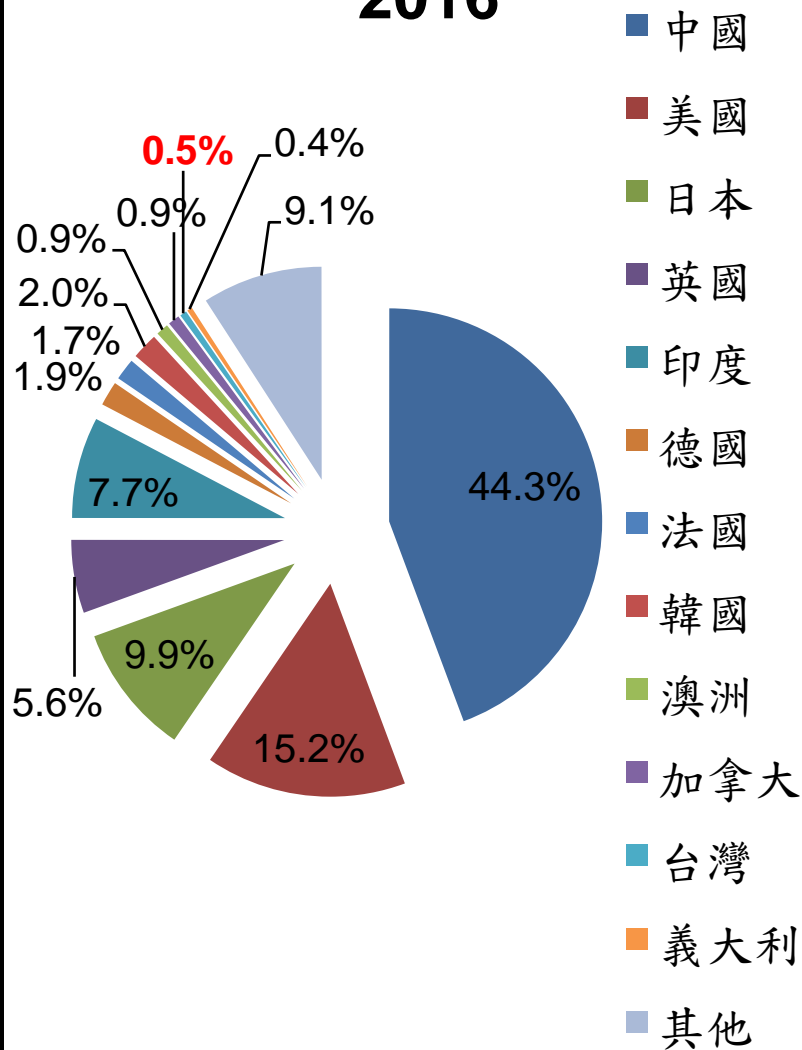


資料來源: 本公司業務部門參考產業資訊統計

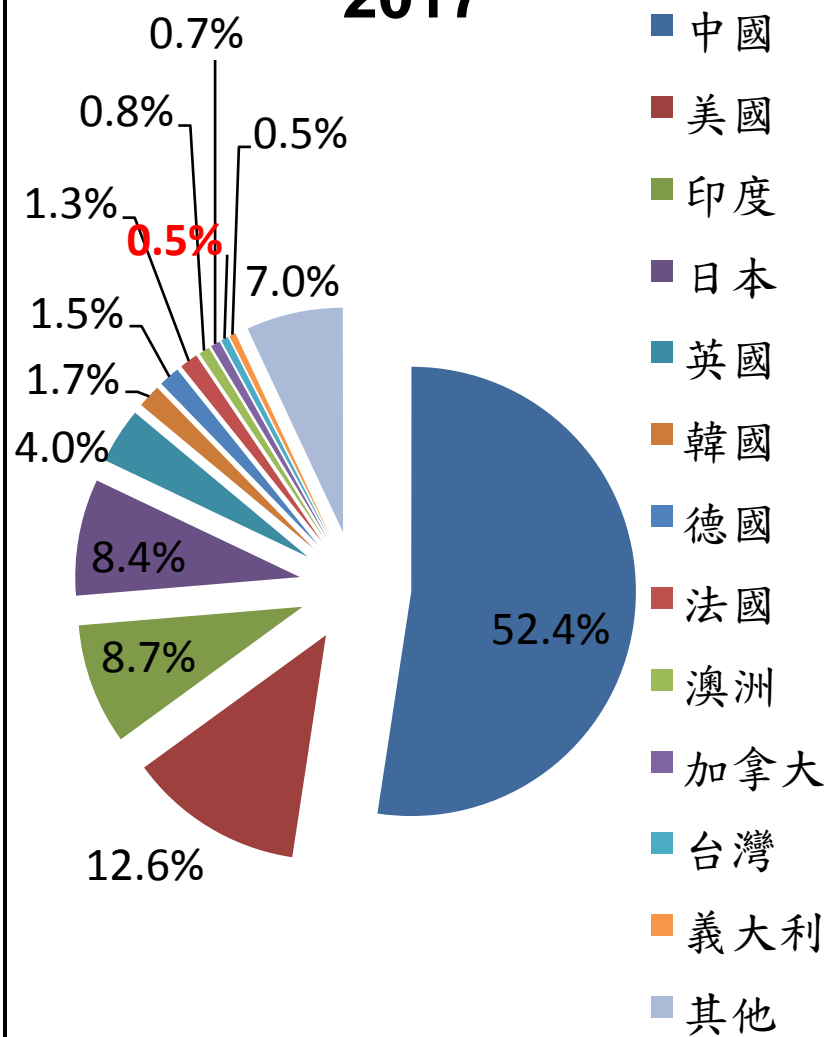


Major Installation Countries

2016



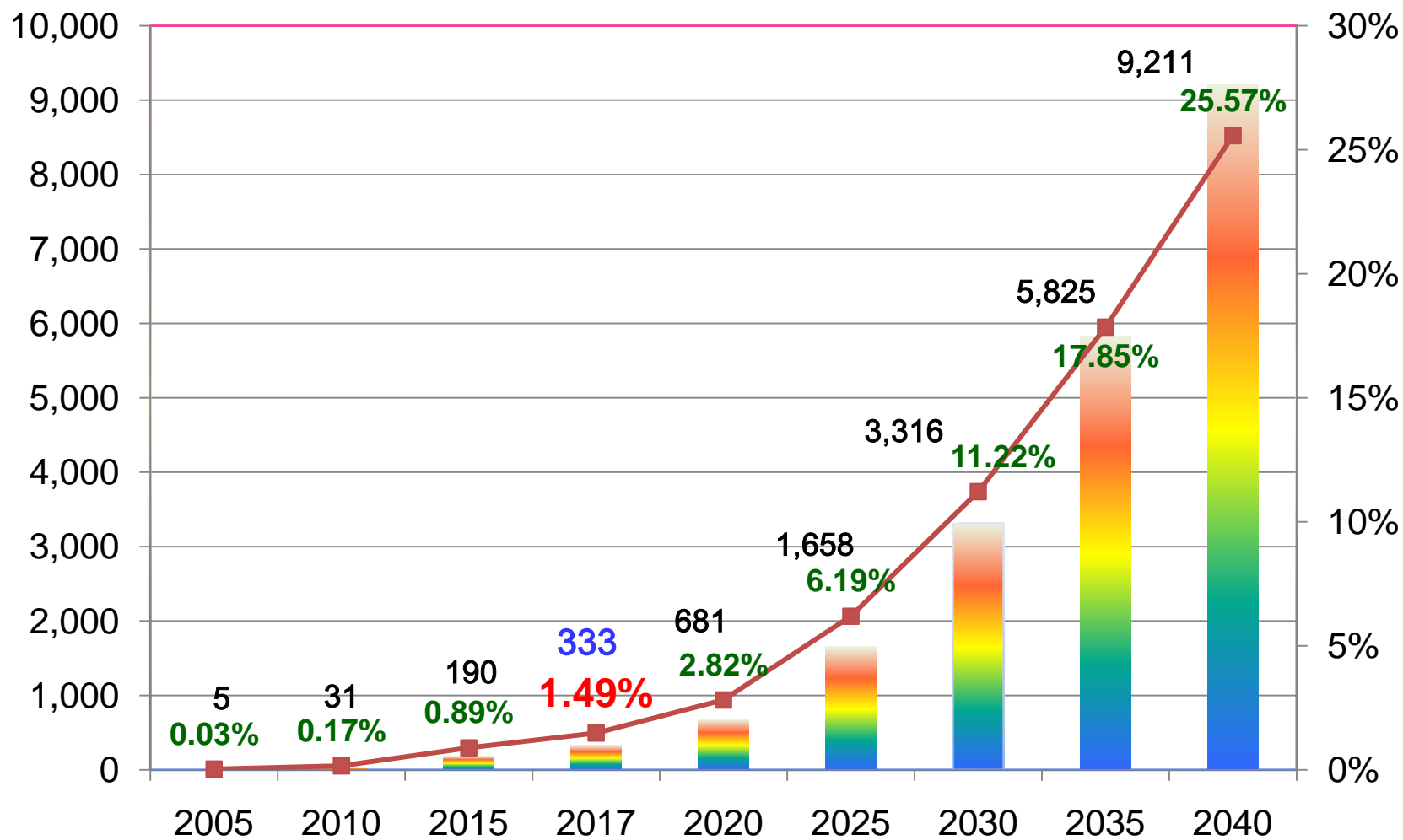
2017





Electricity form Solar only

1.49% Globally



☀️ 太陽能每年發電量(單位:10億度) ■ 太陽能發電佔全球用電比重%



Taiwan is the Second Largest PV Manufacturing Country

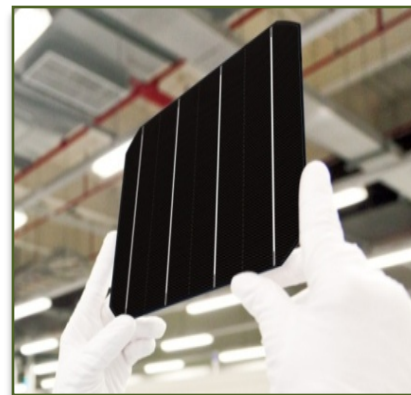
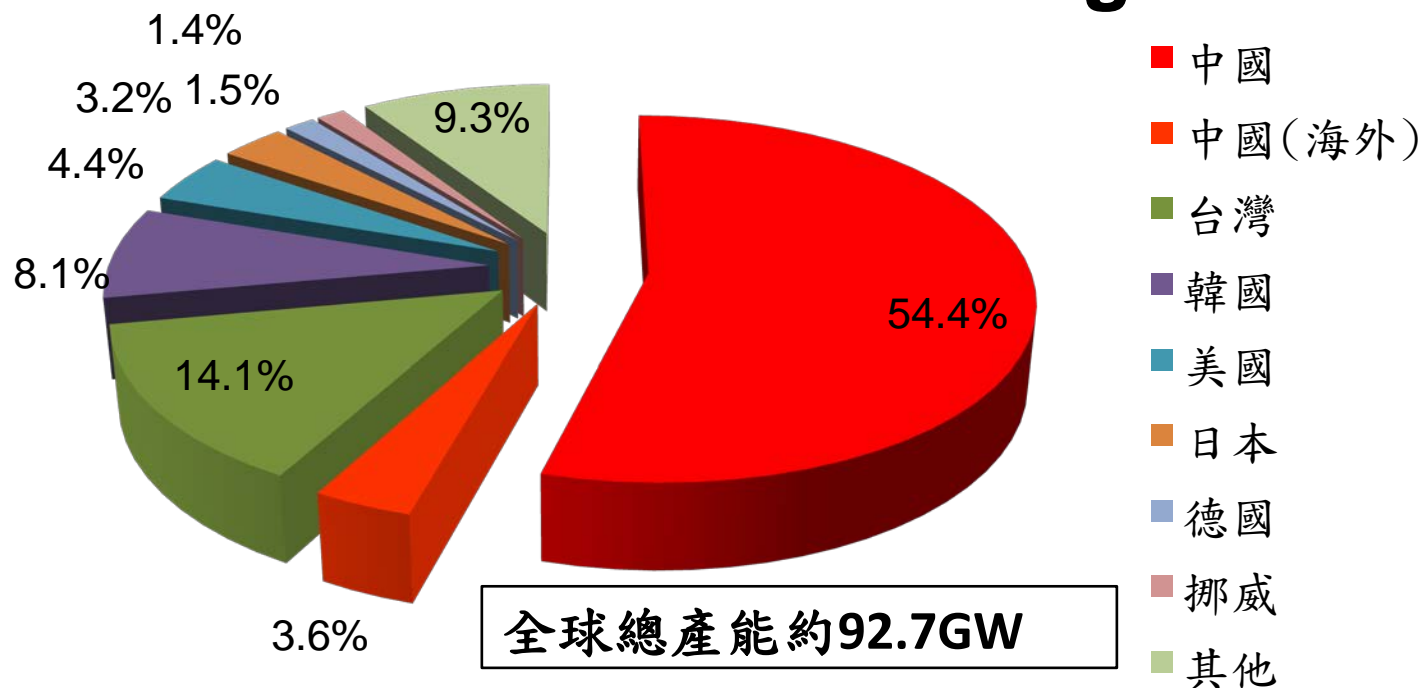


Capacity: Wafer 5GW Cell 12GW Module 1.5GW

Note: Taiwan's PERC capacity is 3.6GW. TSEC's percentage is 24% .



Taiwan is the Second Largest Cell Manufacturing Country





Top 20 Solar Cell Producers in the World

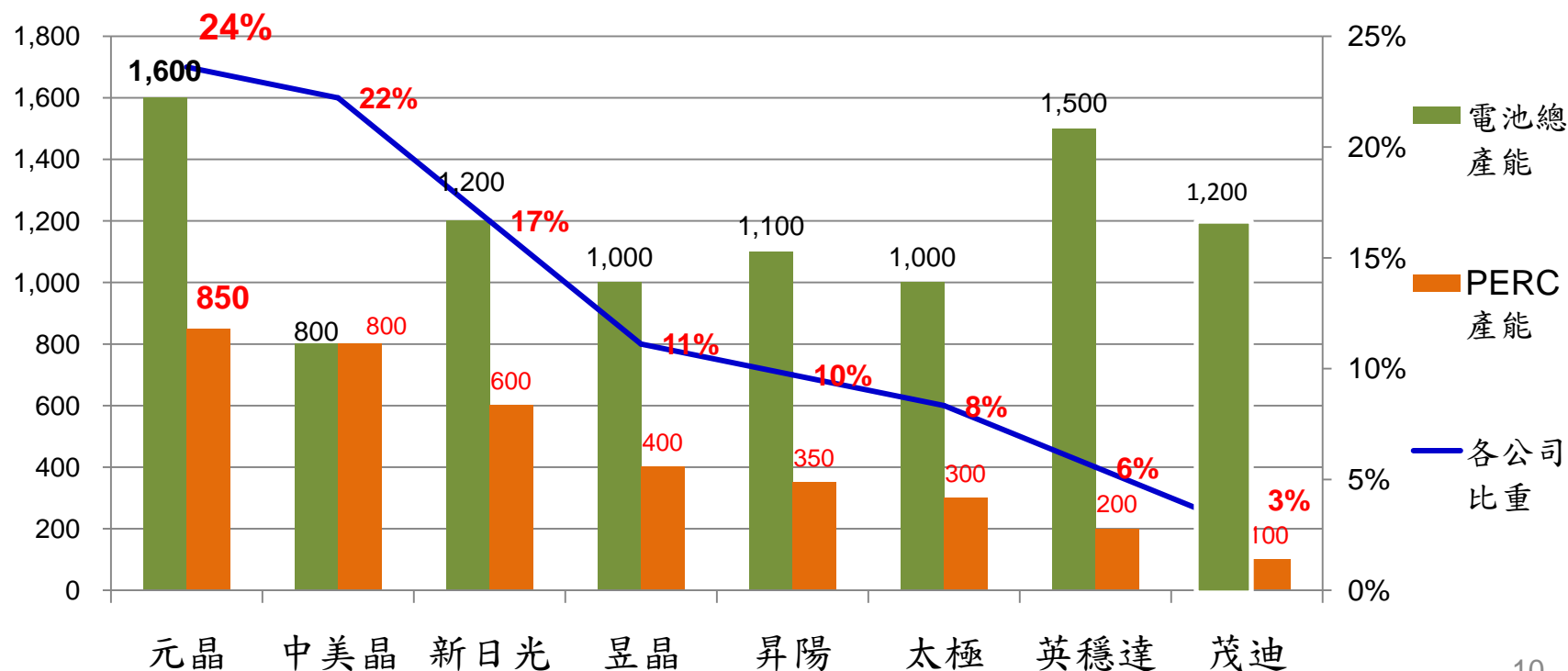
產能排名	國家	英文名稱	中文名稱	產能
1	China	JA Solar	晶澳	6,000
2	Korea	Hanwha SolarOne	韓華	5,500
3	China	Trina Solar	天合	4,800
4	China	Canadian Solar	阿特斯	4,500
5	China	Jinko Solar	晶科	4,000
6	Taiwan	Motech + Topcell	茂迪 + 聯景	2,900
7	China	Tongwei	江西通威	2,800
8	China	Yingli	英利	2,500
9	China	GCL	協鑫	2,500
10	Taiwan	Gintech	昱晶	1,800
11	China	Hareon Solar	海潤	1,600
12	Taiwan	TSEC	元晶	1,600
13	Taiwan	InventecSolar	英穩達	1,400
14	China	Lerri	樂業光伏	1,200
15	Norway	REC		1,300
16	China	Shunfeng	順風光電	1,300
17	Japan	Kyocera	京瓷	1,250
18	China	Suntech	尚德	1,200
19	Taiwan	Neo Solar Power	新日光	1,200
20	Taiwan	Solartech	昇陽科	1,100

TSEC's PERC Capacity is Taiwan's Leader

Capacity and Percentage of Cell's Manufactured in Taiwan

source: Estimate from TSEC

單位: MW	元晶	中美晶	新日光	昱晶	昇陽	太極	英穩達	茂迪	合計
台灣電池總產能	1,600	800	1,200	1,000	1,100	1,000	1,500	1,200	9,400
PERC產能	850	800	600	400	350	300	200	100	3,600
各公司比重	24%	22%	17%	11%	10%	8%	6%	3%	100%



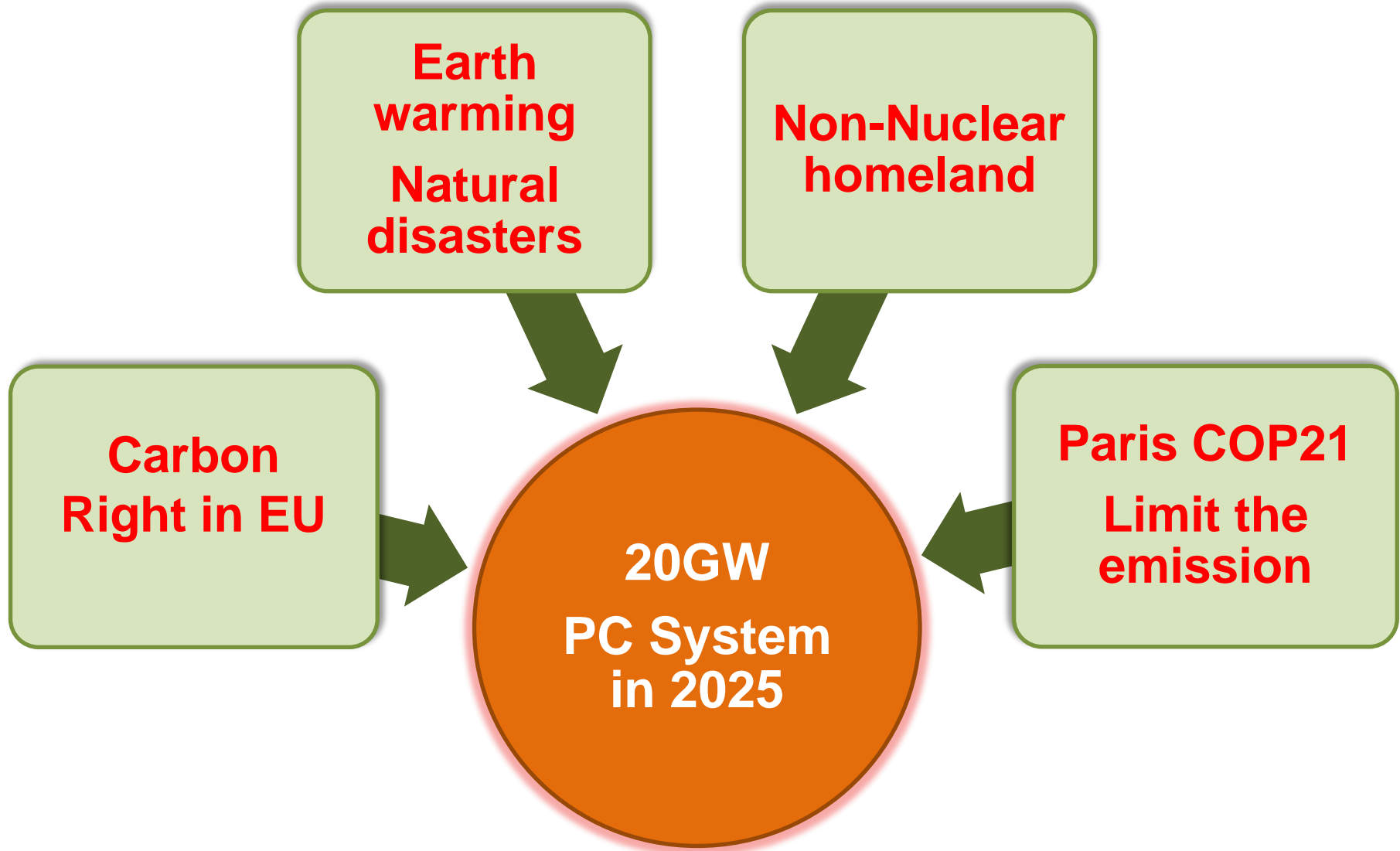


「Growth Paradox」 in Taiwan's Solar Industry

The reasons of loss in Taiwan's solar industry under the high growth in global market in 2016 and 2017:

1. Heavily rely on China market. U.S. is the second largest market and because of the anti-Dumping tax, Taiwan companies is difficult to export cells to U.S..
2. China solar companies control the price. The global module market is controlled by China companies.
3. Taiwan market is too small. Without Taiwan market, Taiwan solar wafer and cell producers become part of the China market supply chain. China solar producers almost control the solar module market.

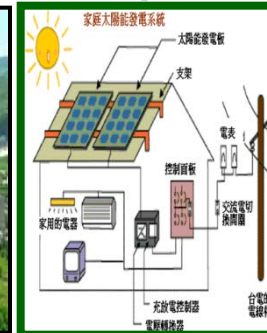
2. Opportunity from Government's Policy





Taiwan's Power System is Heavily Relies on Thermal Power

Taiwan's demand of electricity is 225.8 billion kw/h in 2016.



coal	natural gas	oil	cogeneration	nuclear	solar	water/wind
36.9%	36.0%	4.4%	2.6%	13.5%	0.51%	4.59%



Thermal power will generate a lot **CO₂**
and then cause green house effect

In Taiwan, 79.5% of electricity is from thermal power.
Emission of CO₂ is 0.11 billion tons, which is 40% of
green house effect gas, per year.



Bureau of Energy, Ministry of Economic Affairs, R. O. C.
discloses that thermal power plant will generate **0.638**
Kg per Kw/h.



Carbon Reduction Target in 2030: 20%

In COP21 meeting in Paris in 2015, Taiwan promised United National to decrease 20% emission of green house effect gas (based on 2005). Taiwan's emission of CO₂ will decrease 40 million tons and reach 0.216 billion tons in the next 15 years.





Non-Nuclear Homeland in 2025

There is three nuclear power plants, which generate 39 billion Kw/h per year. In 2015 the output is 35.1 billion Kw/h, which is 16.04% of total demand in Taiwan.

To accomplish nuclear-free homeland and decrease of CO₂ emission, Taiwan government plans to build 20 GW solar power stations before 2025, which will generate 25 billion Kw/h per year. The shortage will be replaced by other green energies.

Carbon Reduction



Non-Nuclear



Solar





Green Energy Building before 2025 in Taiwan

Accumulation

unit : MW

	2015	2016	2020	2025
Solar	842	1,342	8,776	20,000
Onshore wind power	647	747	1,200	1,200
Offshore wind power	0	8	520	3,000
Geological energy	0	1	150	200
Biomass Energy	741	742	768	813
Water	2,089	2,089	2,100	2,150

Source: provided by Bureau of Energy and organized by Energy Trend



Business of 20GW PV System

- 20GW capital expenditure is about NT \$900 billion :
 - Solar module: 256 billion
 - AC and DC reverse power equipment: 63 billion
 - Civil engineering/scaffold: 390 billion
 - Mechanical and electrical engineering: 73 billion
 - Transmission and distribution system: 60 billion
 - Renting land: 9 billion / year
- This investment affects a large number of industries, including farm land owners ◦
- After the completion in 2025, 25 billion Kw/h can be provided in one year, accounting for about 10.8% of the total demand of electricity. The cost per Kw/h is about \$3.5~\$4.0.
- 17 million tons of CO2 emissions can be reduced and create more than \$40 billion carbon rights in one year.



3. TSEC's World Class Solar Module Plant

- A. Taiwan existing module capacity are out of date. There is no competitive advantage of cost and quality.
- B. The government plans to complete the 20GW PV system in 2025. In the next eight years, the average annual installation is 2.3GW. Taiwan existing module production capacity is seriously insufficient, which can only supply 60% of demand.
- C. If insufficient capacity or uncompetitive cost and quality in domestic market makes the import of China, South Korea and Southeast Asia module, it will seriously affect the solar industry survival and the development of green energy industry and also reduce the effect of economic development.
- D. Silicon materials, wafers, and cell in the solar photovoltaic industry are only intermediate products and do not have brand value. The module is the final product of the industrial chain. Only the module has the market brand, and the establishment of world-class module factory can create brand value.
- E. The global market demand is modules. Most of Taiwan's products are wafers or cells, which results in over 70% of the wafer and cell are being sold directly or indirectly to China and then make modules by China companies. Because of excessive reliance on the red supply chain, the business crisis is obvious.



The basic conditions of the world-class module plant:

- It must be based on high efficacy and high-quality cell factory
- The annual capacity is at least 1GW or more
- Ability to lean and JIT Production
- Procurement of raw materials bargaining power
- Building an efficient marketing network

The total capacity of more than 10 module plants in Taiwan is only about 1.5GW. The production scale is too small, the machine is out of date and the level of automation is low. It is completely lack of competitive advantage.

The government is actively promoting the quality differentiation measures, encouraging the operators to build solar power systems with high-quality modules with a more favorable price of electricity purchase (+6%), so as to prevent foreign low-priced module dumping. Taiwan existing old production line is difficult to produce high-quality modules.²⁰



Investment plan summary

TSEC plans to build a world-class module plant in Taiwan, and actively expand domestic and foreign markets.

1. Build world-class module plant:

The world-class module factory is built by two phases. The first phase is to complete 500MW~750MW (500 million ~7.5 billion watts) annual capacity in December 2017. If the operation is good, the second phase annual capacity will be 1.5~2.0GW (2 billion watts) in 2020.



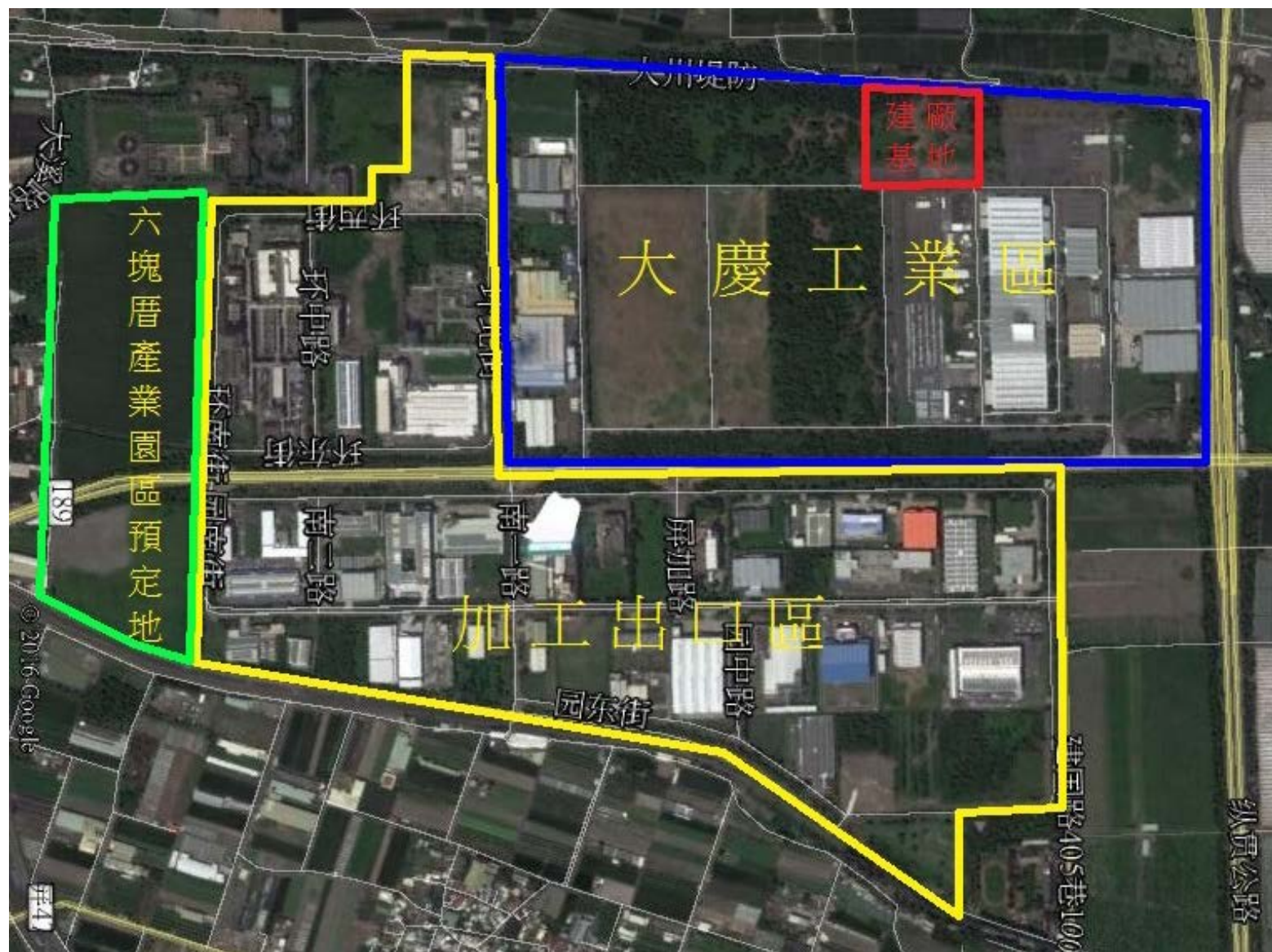
2. Production and marketing:

Our primary market is Taiwan in initial stage, expected to 70% of capacity for TSEC's PERC cell processing module, to dominate the Taiwan market. TSEC's overseas Subsidiary export Europe and The United States, Japan and Southeast Asia. The other 30% of capacity, TSEC cooperate with domestic and foreign manufacturers by OEM and sales to the world.

3. Plant location

In the Pingtung Daqing industrial area. Located near the Kao Ping Bridge at the border between Kaohsiung and Pingtung, it is close to the processing export area in Pingtung. From Pingtung station (Downtown) 7 km, 15 minutes by car; about 8 kilometers from Fengshan (about 20 minutes); 20 km away from Kaohsiung International Airport (about 30 minutes); from Zuoying HSR Station (about 45 minutes); 35 km from the port of Kaohsiung (about 50 minutes).

Location





4. Base Overview:

- Land area: about 47,328.6 square meters
- Land owners: Daqing Co., Ltd. (E United Group)
- Land: D-class construction land, building rate: 70%, volume rate: 300%.
- Road: The base is 12 meters in front of the road and the south side is 16 meters in front of the road.
- Infrastructure: tap water, electricity, domestic sewage discharge pipelines and other settings were completed, no wastewater treatment plant.

5. Land Price: NT \$ 45,000 per ping, total price of about NT \$ 645,393,915



6. Construction phase: To be divided into two phases to build the factory.

Phase 1: (Plant A), The area of land is about 24,750 square meters. And the area of plant is about 36,300 square meters.

1F plant : the area is about 17,160 square meters. for warehouse, restaurant and office.

2F plant : the area is about 17,160 square meters. for the module assembly line and office.

3F plant : the area is about 1,980 square meters. for staff dormitory and office.

Phase 2: depend on operating conditions and discuss. if we make the decision to expand production capacity. will build plant B, the area is about 52,800 square meters. And will purchase machine for increase 1 ~ 1.5GW production capacity.

TSEC The Factory Completed Simulation





Current Status



Production and marketing strategy

1. In addition to producing own brand modules, the Pingtung module plant is also the platform of Taiwan's cell and EPC. It helps them to obtain high quality and cost-effective modules by OEM.
2. According to the plan of the Bureau of Energy, the domestic market will be booming in 2017 and start to highly grow in 2021, which is shown below:

Years	New	Average	Accumulation
2017~2020	5.16GW	1.29GW	6.5GW
2021~2025	13.5GW	2.7GW	20GW



4. To Become Taiwan Solar Energy Leader

In order to improve competitive advantage, China government took the "Top Runner Program" in 2015. 30% of the new-installed PV systems must use the high-efficiency cell and high-performance modules.

In 2017, Taiwan has the same program. The electricity purchasing price will be added 6% by Using the highly efficient cells and modules, certified by BSMI.

The cell produced by the traditional process can not reach the standard "Top Runner Program" in Taiwan and China. Only the PERC technology can reach the standard .

PERC (Passivated Emitter Rear Contact) process is using backside passivation technology which helps to reduce carrier recombination rate and improve backside reflection to enhance photo-current. There are two major benefits of PERC cell -- 1) higher efficiency of electrical conversion, and 2) higher resistance of power degradation.



To Become Taiwan Solar Energy Leader

In the government's strong advocacy, Taiwan's solar energy development will reach high growth. Taiwan is the second largest manufacturer of the solar product in the world. All product can be installed in Taiwan's PV system is highly expected by all of the best cell and module company in Taiwan.

“The Solar Energy Leader” not only means the quality, capacity, technology and cost leaders, but also the love of the land and the forever promise. TSEC wish to become the solar energy leader in Taiwan. We use “TSEC” as our brand to market globally. TSEC has built PV systems on the rooftops of hundreds schools and government agencies.

“Better than the best” is our faith.



Business Performance

- Received **Golden Energy Awards** 「金能獎」 from the Energy Bureau of the Ministry of Economic Affairs in 2014 to 2016
- Allied with US DuPont, TSEC announced its latest PV Cells named **Lightning** in Tokyo PV Expo in February 2015, an extreme high PV convert efficiency of **+21.4%** surpassed the PV industry .
- In 2016, TSEC is the first corporation to received the highest quality solar modules Ministry of Economic Affairs VPC certification. To use TSEC's module, not only to get high power generation, but also more than 6% sales revenue from government.
- To become the 12th solar cell corporation after expansion in 2016.
The most biggest solar cell corporation on the brand “made in Taiwan”.
- Will to be the biggest solar module corporation in 2017.
- TSEC’s profitability leads the competitors in many years.



PROFITABILITY COMPARISON WITH COMPETITORS

2013 年	銷貨 毛利率	營業 淨利率	稅前 淨利率	股本 報酬率	淨值 報酬率	資產 報酬率
元晶	12.08%	5.26%	3.93%	6.87%	10.11%	4.11%
太極	8.38%	4.74%	4.08%	9.46%	6.49%	3.21%
茂迪	7.65%	2.15%	1.57%	5.48%	1.69%	0.81%
昇陽	5.36%	0.34%	-6.04%	-11.49%	-5.22%	-2.90%
昱晶	2.89%	-1.79%	-3.55%	-14.67%	-4.53%	-2.64%
新日光	8.51%	1.57%	2.49%	6.63%	2.68%	1.50%
元晶排名	1	1	2	2	1	1

2014 年	銷貨 毛利率	營業 淨利率	稅前 淨利率	股本 報酬率	淨值 報酬率	資產 報酬率
元晶	9.41%	3.64%	2.75%	4.91%	6.10%	3.55%
太極	6.85%	1.73%	2.67%	6.90%	4.47%	3.24%
茂迪	0.85%	-4.60%	-5.29%	-24.05%	-7.73%	-3.24%
昇陽	6.62%	1.99%	1.58%	4.39%	1.97%	1.56%
昱晶	3.78%	-0.69%	-2.43%	-9.33%	-2.93%	-1.24%
新日光	6.48%	0.90%	0.89%	2.99%	1.19%	1.25%
元晶排名	1	1	1	2	1	1

資料來源:公開資訊觀測站。



PROFITABILITY COMPARISON WITH COMPETITORS

2015 年	銷貨 毛利率	營業 淨利率	稅前 淨利率	股本 報酬率	淨值 報酬率	資產 報酬率
元晶	8.77%	2.82%	2.03%	5.01%	4.73%	2.36%
太極	8.03%	3.65%	4.26%	10.53%	6.25%	4.17%
茂迪	6.65%	0.55%	-0.69%	-12.94%	-4.34%	-1.88%
昇陽	3.39%	-3.41%	-3.19%	-8.99%	-4.35%	-2.61%
昱晶	4.84%	0.48%	-0.58%	-2.21%	-0.75%	-0.47%
新日光	2.82%	-5.85%	-6.99%	-17.93%	-7.56%	-3.93%
元晶排名	1	2	2	2	2	2

2016 年	銷貨 毛利率	營業 淨利率	稅前 淨利率	股本 報酬率	淨值 報酬率	資產 報酬率
元晶	6.07%	1.61%	0.23%	0.41%	0.38%	0.19%
太極	1.71%	-4.01%	-4.56%	-8.24%	-5.54%	-3.85%
茂迪	4.19%	-1.29%	-1.83%	-18.69%	-6.86%	-2.96%
昇陽	1.36%	-2.81%	-5.08%	-12.96%	-7.02%	-4.35%
昱晶	-10.36%	-15.37%	-15.41%	-50.13%	-20.33%	-12.84%
新日光	-11.56%	-38.40%	-38.80%	-62.98%	-38.42%	-17.39%
元晶排名	1	1	1	1	1	1

資料來源:公開資訊觀測站。



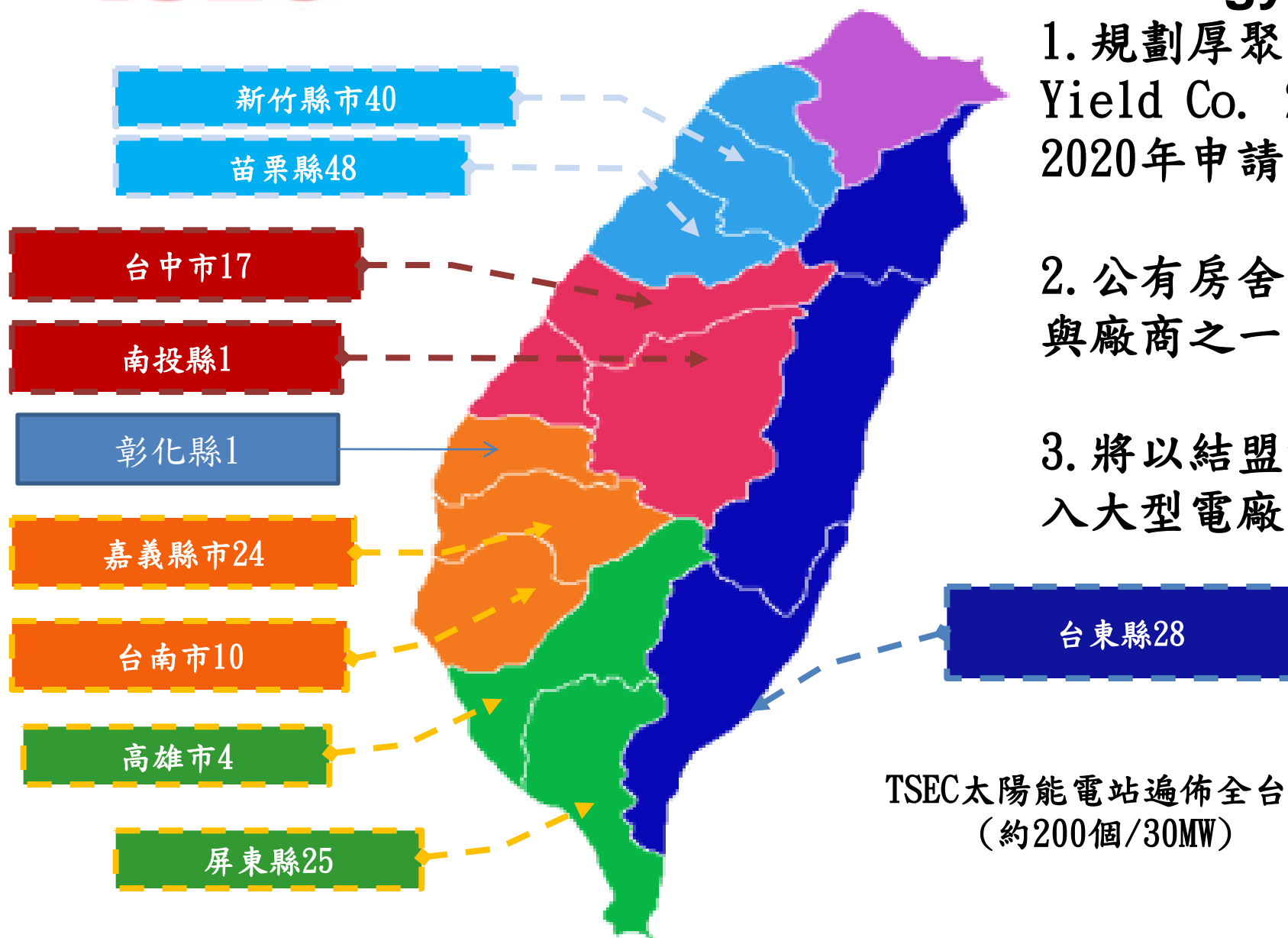
PROFITABILITY COMPARISON WITH COMPETITORS IN 2017Q1~Q3

項目 公司	2017年1~9月						
	銷貨毛利率	營業淨利率	稅前淨利率	稅後淨利率	股本報酬率	淨值報酬率	總資產報酬
元晶	-2.60%	-8.50%	-10.09%	-10.39%	-12.04%	-12.32%	-5.13%
昱晶	-5.26%	-9.76%	-10.75%	-10.74%	-21.41%	-9.98%	-6.52%
新日光	-26.12%	-46.82%	-51.65%	-51.85%	-34.84%	-27.66%	-10.12%
茂迪	-4.18%	-11.39%	-12.09%	-12.09%	-37.92%	-16.55%	-6.68%
昇陽	-7.90%	-14.24%	-15.77%	-15.80%	-20.61%	-11.35%	-6.75%
太極	-4.32%	-9.40%	-16.64%	-17.03%	-19.49%	-15.35%	-9.54%
益通	-12.36%	-19.67%	-13.82%	-13.82%	-5.70%	-8.27%	-6.83%
元晶排名	1	1	1	1	2	4	1

同業資料來源:公開資訊觀測站



5. Development of PV System in TSEC and Formosa Sun Energy



1. 規劃厚聚以 Yield Co. 2019-2020年申請IPO;

2. 公有房舍主要參與廠商之一;

3. 將以結盟型態投入大型電廠市場。

TSEC太陽能電站遍佈全台灣
(約200個/30MW)

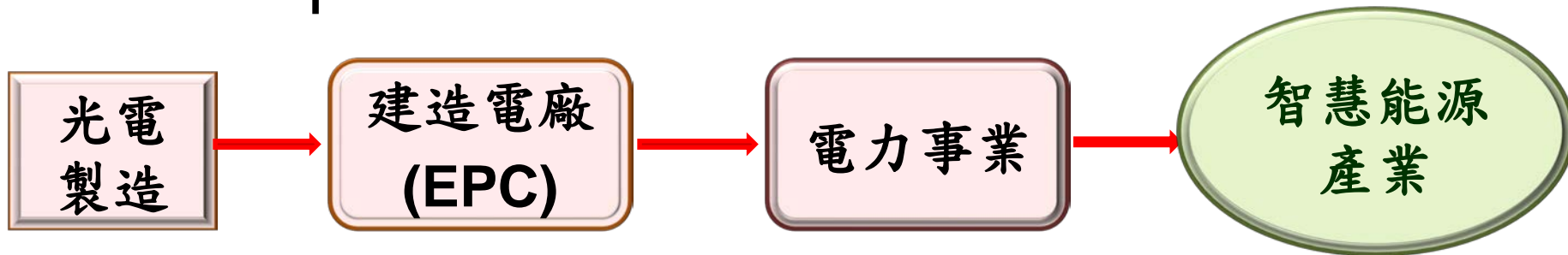


The Slogan in Wall street's Solar ETF

「 You can not trust the U.S. government's 20-year
Treasury bonds, but you can absolutely trust the sun, 4.5
billion years, not close every day! 」

厚聚進可以Yield Co. 進軍資本市場，
最保守也是良好的固定報酬投資。

➤ Market position



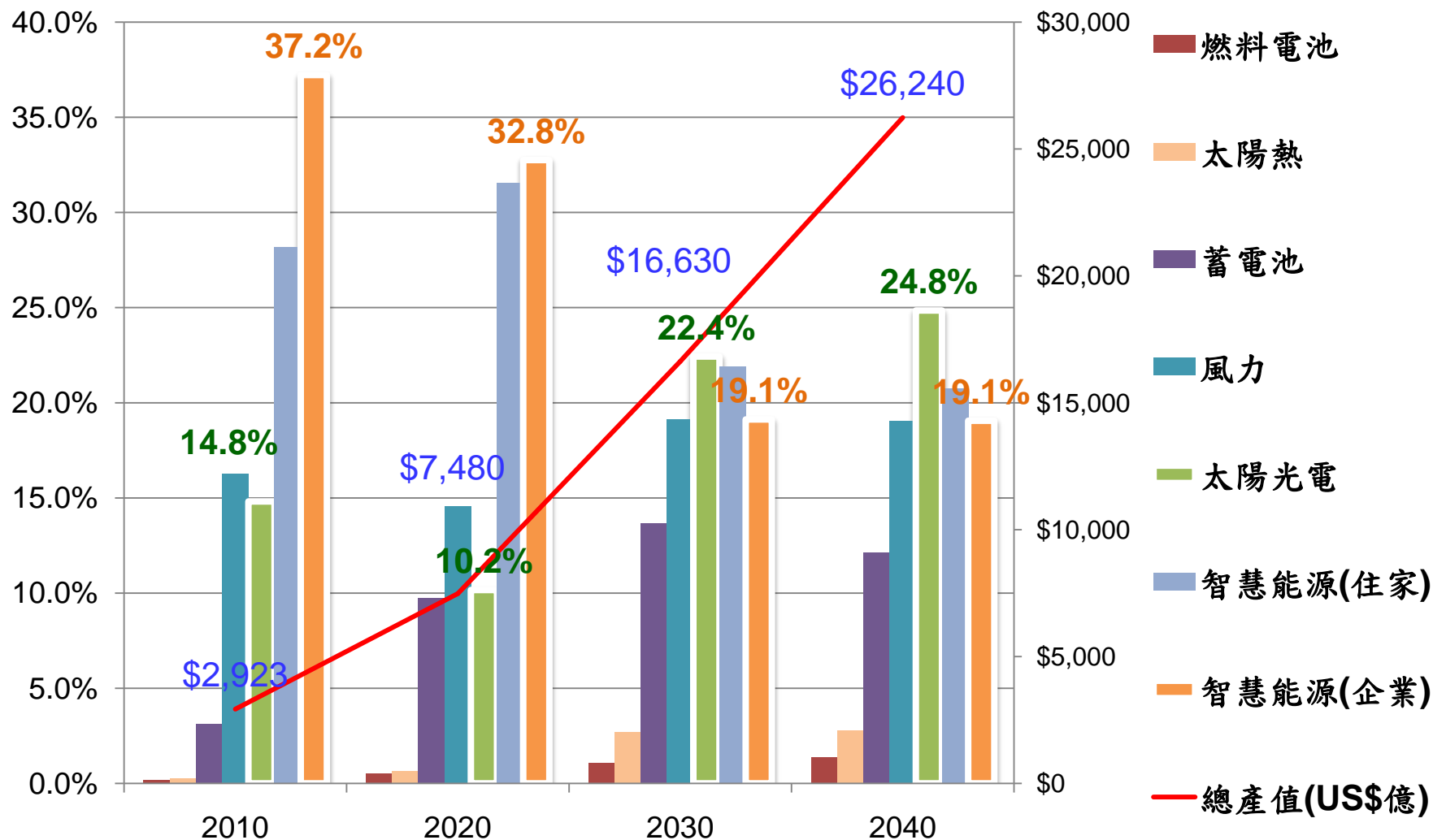
➤ Strategy

1. Will building the ground-mounted power plant in southern Taiwan. And set up a electricity company in 2018. Develop electricity and carbon right.
2. In combination with related industries in Taiwan, development of Smart Energy. such as Long-term care and Security System.



Green Energy Business Opportunity

Unit: %



TSEC TSEC's Core Philosophy

Solar Energy Innovation 創新科技拓展太陽能

The Sun is the ultimate source of energy for all creatures on Earth. Through the fast innovation in photovoltaic technology, we strongly believe that solar energy is the prime solution for reducing greenhouse effect and alleviating the depletion of energy resources to our planet. As a PV manufacturer, we set our corporate vision for an eternal prosperity of Earth and vow to protect our planet. (*TSEC Corporate Vision*)

