Green Productivity for Green, Inclusive Development:
A Commitment Today for a Greener Tomorrow

APO 3rd World Conference on Green Productivity
APO Center of Excellence on Green Productivity: Milestone of APO movement

APO COE on GP Model: Green Energy

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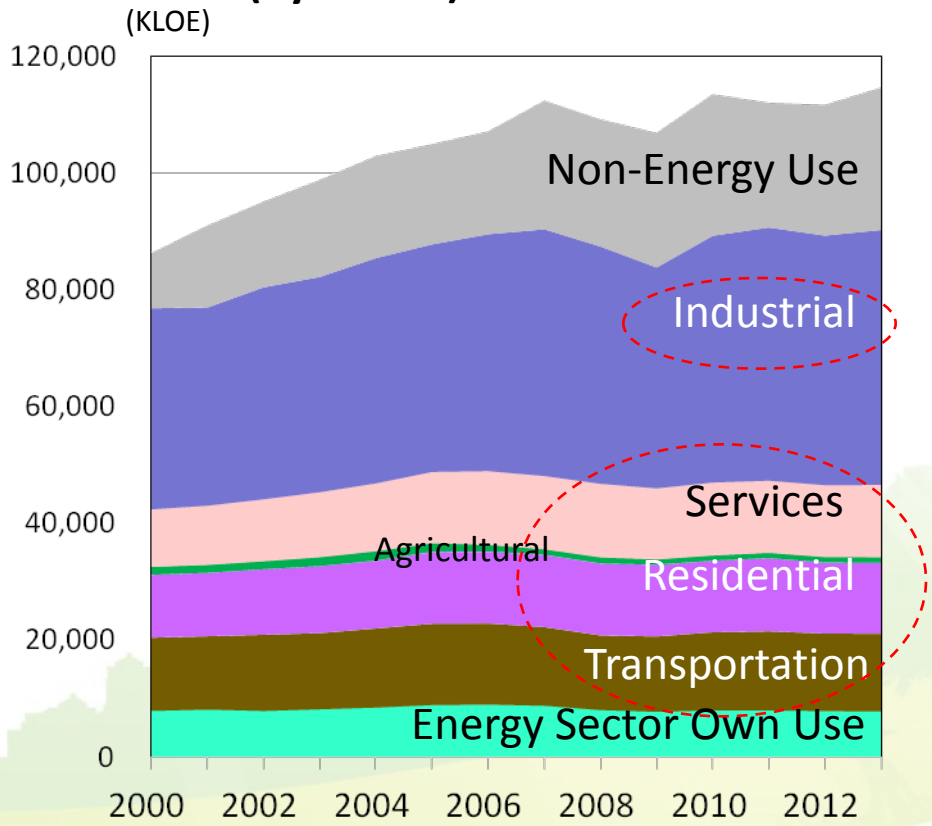
Presentation Outline

- Taiwan Green Energy Achievements
- Green Energy Technical Services
- Future Prospects of Green Productivity with the APO Platform

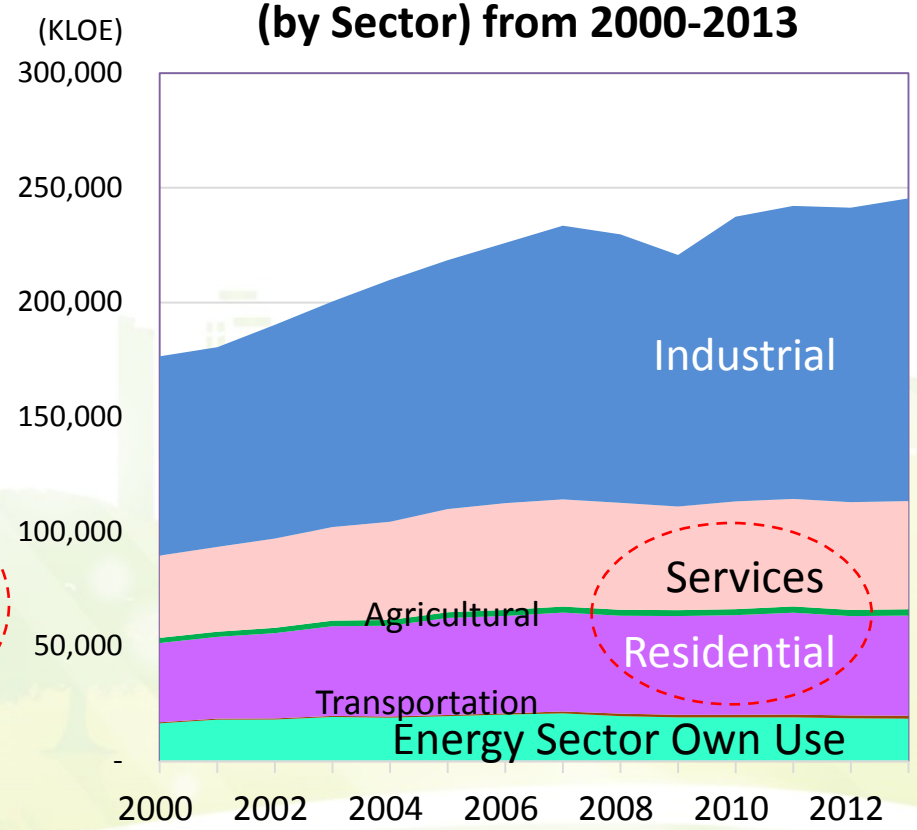
Energy Situation in Taiwan (1/3)

➢ Trend of Energy and Electricity Consumption

Domestic Energy Consumption (by Sector) from 2000-2013



Domestic Electricity Consumption (by Sector) from 2000-2013



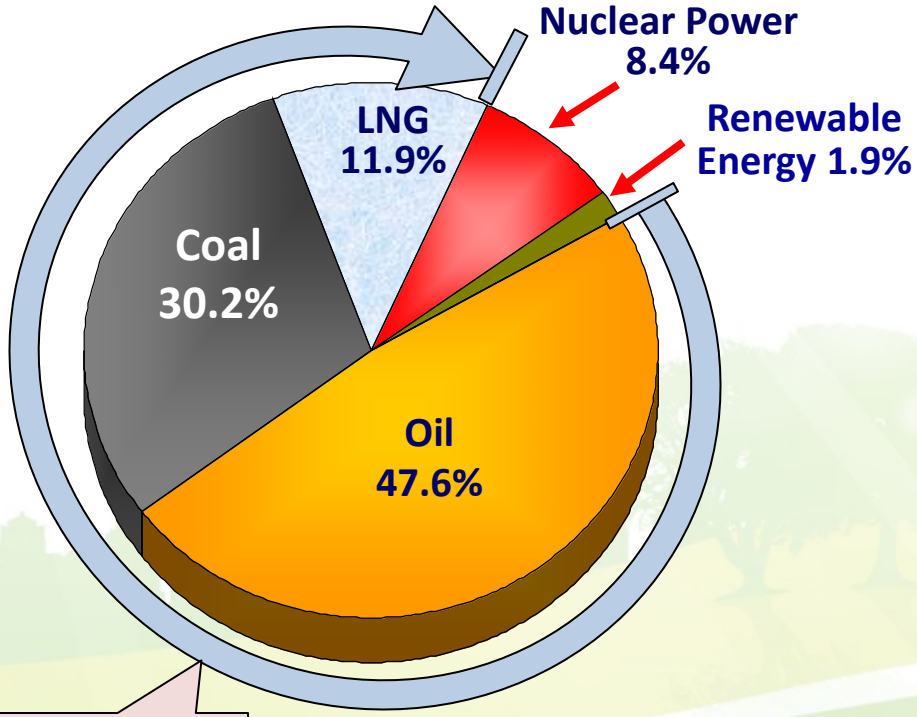
Industrial Sector　Services Sector　Residential Sector　Agricultural Sector
Transportation Sector　Energy Sector Own Use　Non-Energy Use

Source：Taiwan Energy Statistics 2014.

Energy Situation in Taiwan (2/3)

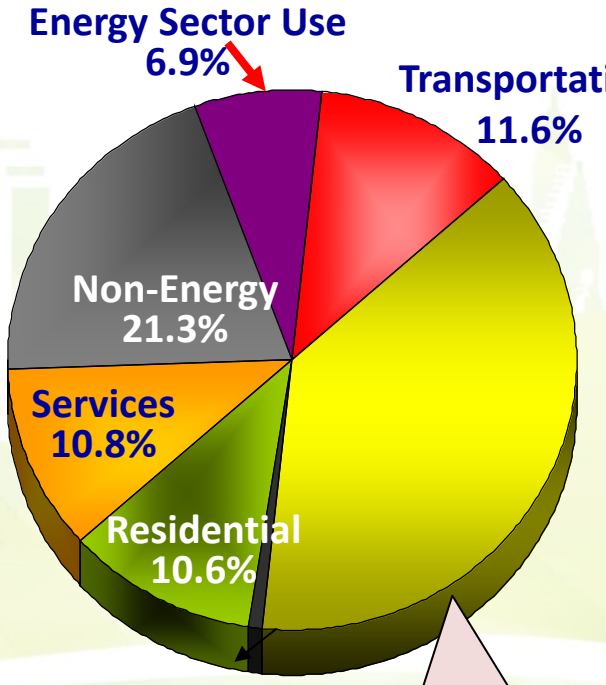
➢Structure of Energy Supply and Consumption

Energy Supply Structure in 2013
(143.13 MKLOE)



Fossil Energy
89.7%

Energy Consumption Structure by Sector in 2013
(114.47 MKLOE)



Industrial 38%

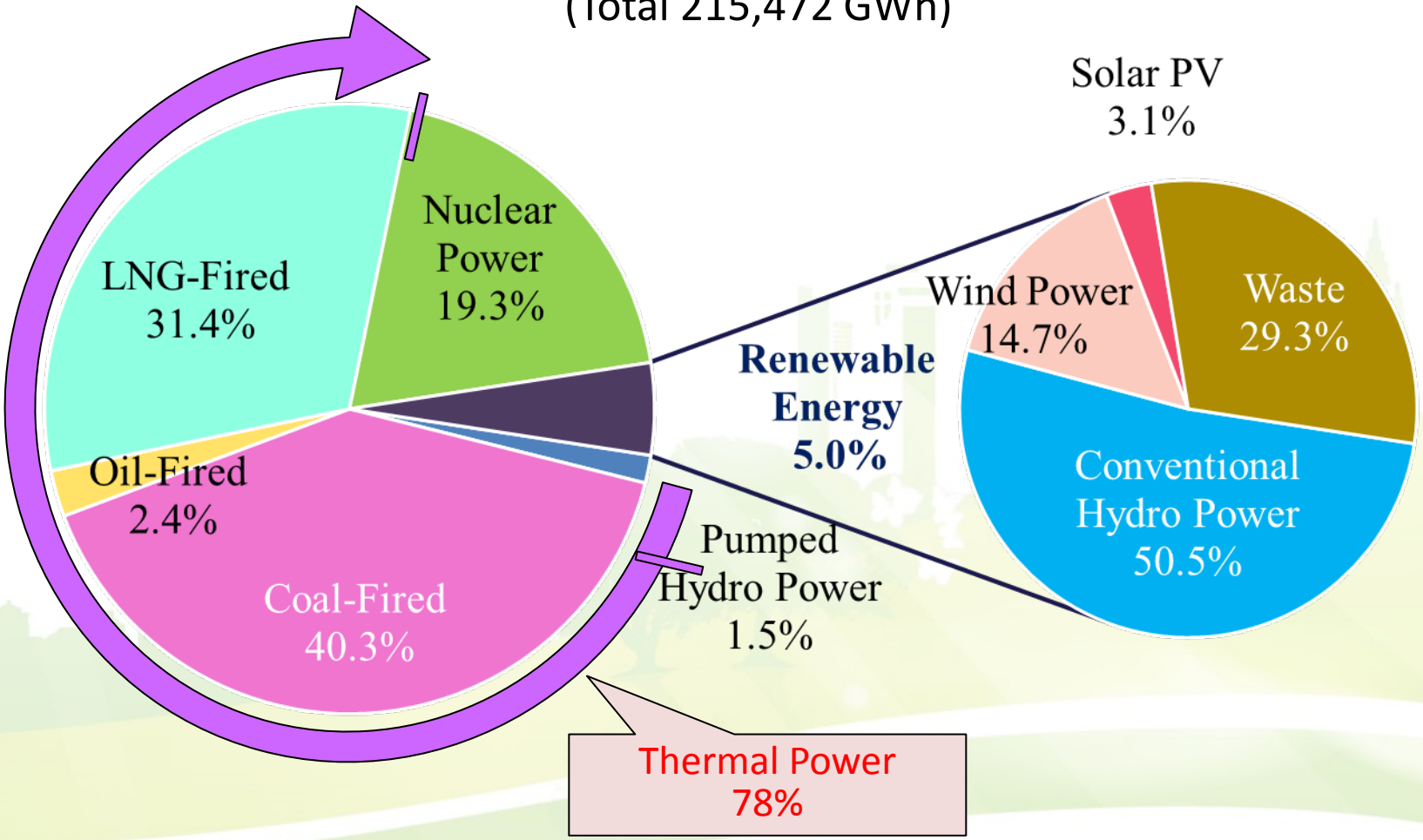
Agricultural
0.9%

Source：Taiwan Energy Statistics 2014.

Energy Situation in Taiwan (3/3)

➢ Structure of Electricity Generation in 2013

Structure of Electricity Generation (by Fuel) in 2013
(Total 215,472 GWh)



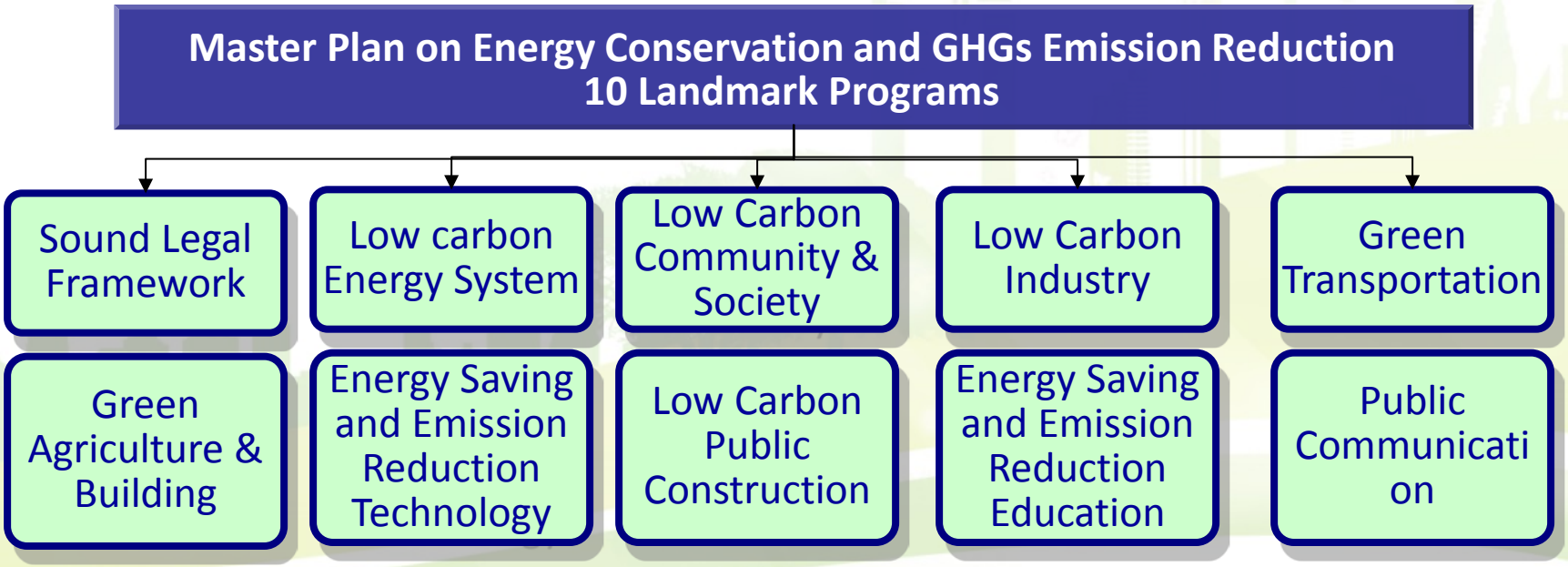
Source：Taiwan Energy Statistics 2014.

Energy Policy Framework

Master plan on Energy Conservation and GHGs Emission Reduction

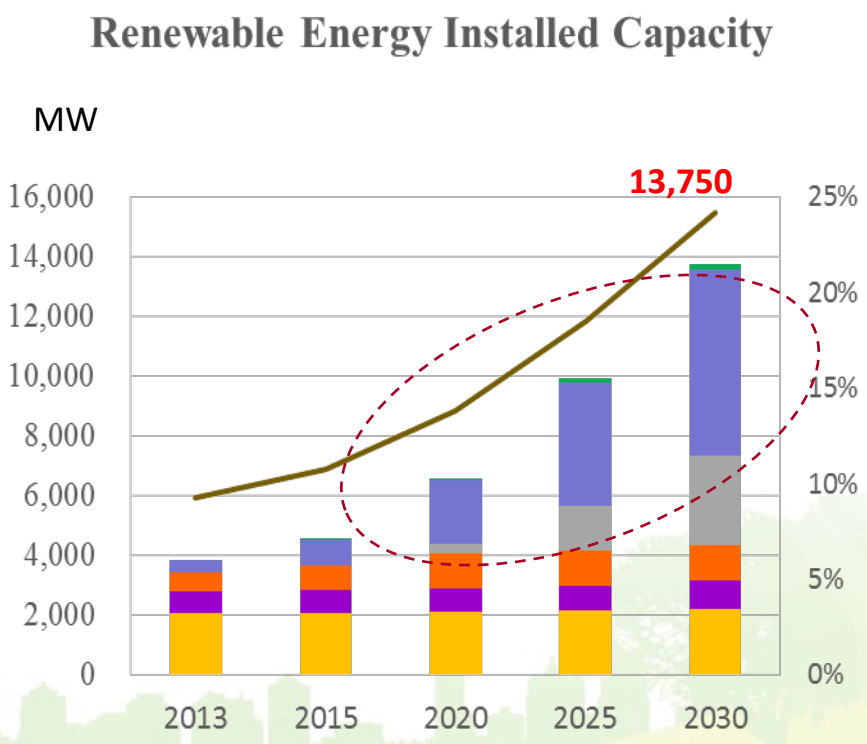
1. Energy Conservation Target:
Energy intensity must be reduced (baseline 2005) 20% by 2015 and 50% by 2025.

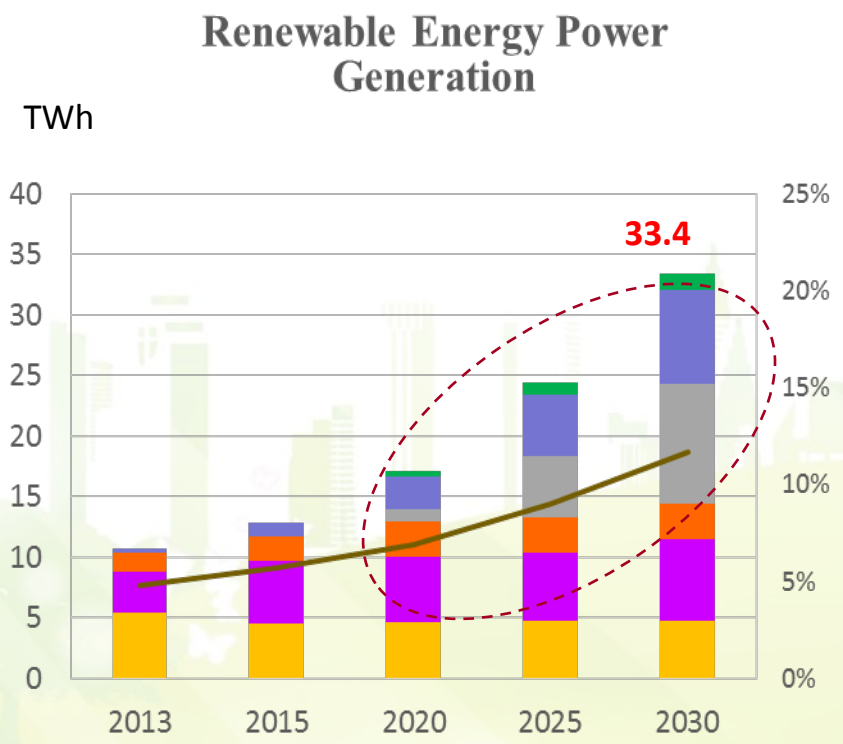
2. Carbon Emission Reduction Target:
Emission target for 2020 will be back to the level in 2005, and for 2025 is back to the level in 2000.



Renewable Energy Development Target

- "**Renewable Energy Development Act**" is approved in June, 2008.
- Renewable energy installed capacity target is set at **13,750** MW in 2030.





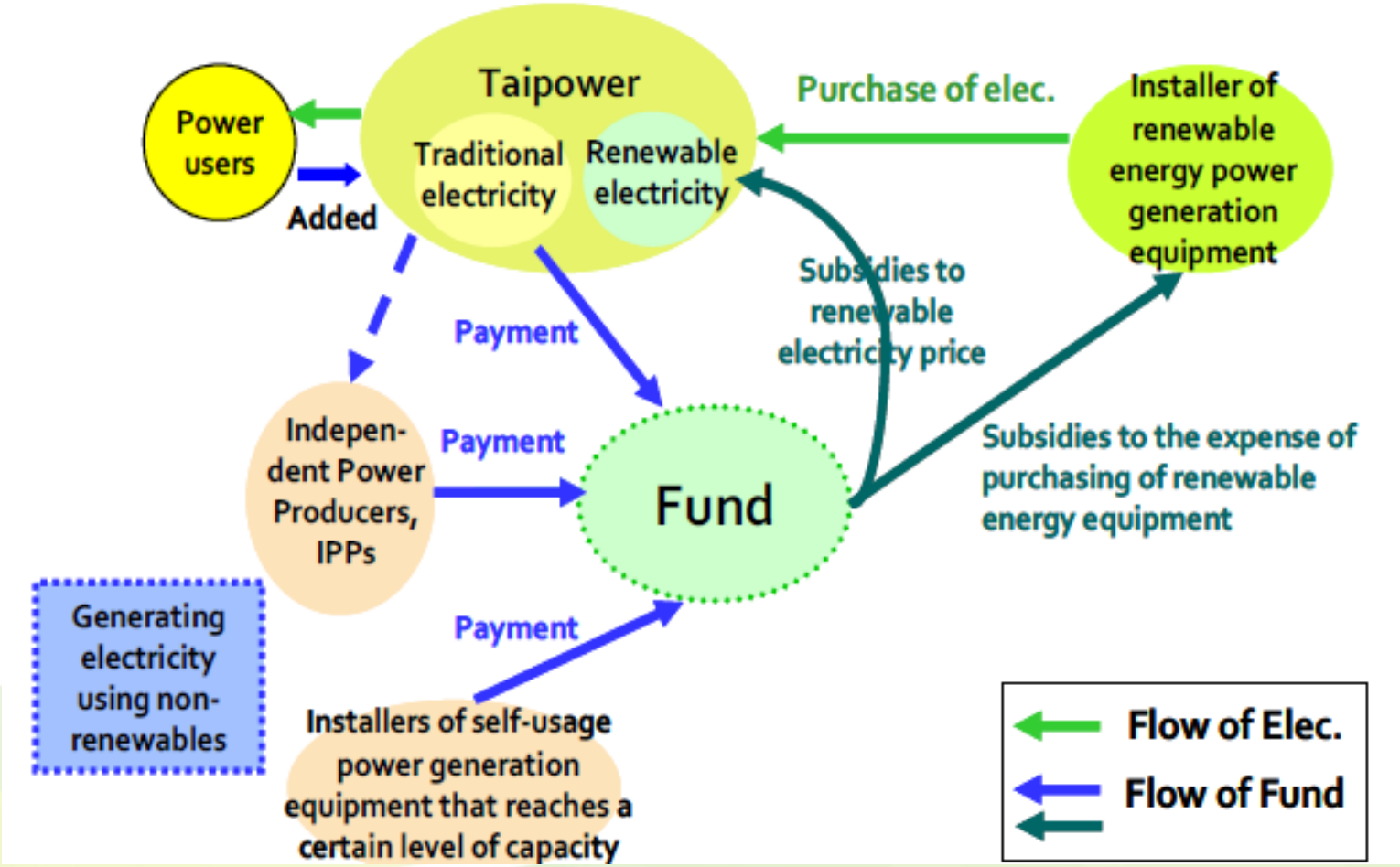
Proportion of electricity from renewable sources

Hydro Power | Biomass Power | Wind - on Land

Wind – Offshore | Photovoltaic | Geothermal power

Renewable Energy Development Fund

- **Income based on expected expenses to balance revenue and expenditure**

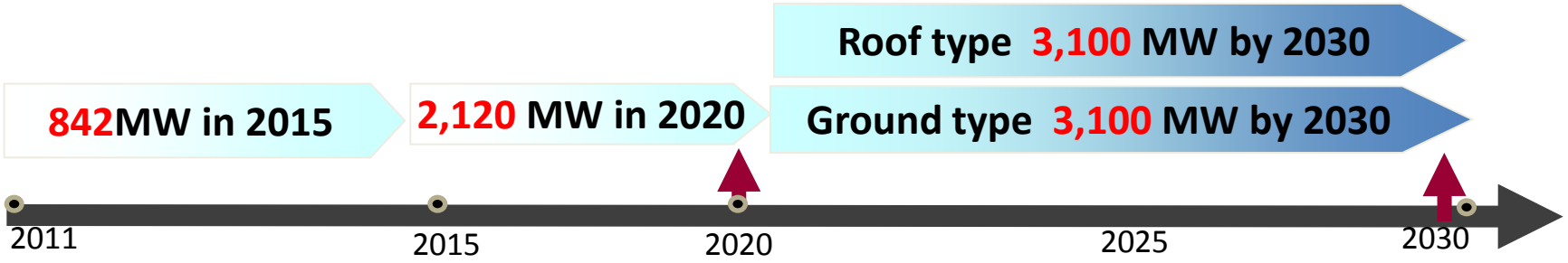


FIT for Renewables

- Feed-in-Tariffs are reviewed annually by referring to technical advancement, cost variation, etc.
- The Bureau of Energy announces PV capacity quota every year. PV systems over 30 kW are subject to bidding procedure to decide tariff rate.

Item	Type	Capacity (kW)	2013 Tariff Rates (US¢/kWh)		2012 Tariff Rates (US¢/kWh)		Variation	
			period 1	period 2	period 1	period 2	period 1	period 2
PV	Roof type	≧1 ~ <10	28.9555	28.2193	32.6362	31.9000	-11.28%	-11.54%
		≧ 10 ~ < 100	26.0110	25.2748	29.4462	28.7100	-11.67%	-11.97%
		≧ 100 ~ < 500	24.5386	23.8024	28.2193	27.4831	-13.04%	-13.39%
		≧ 500	21.8393	20.6124	25.2748	24.7838	-13.59%	-16.83%
	Ground type	≧1	20.6124	19.3855	23.8024	23.3117	-13.40%	-16.84%
Wind Power	Onshore	≧ 1 ~ < 10	25.3662		25.3662		0.00%	
		≧ 10	9.0545 (with LVRT)		9.1128 (with LVRT)		-0.64%	
	Offshore	--	19.1814		19.1814		0.00%	
Hydropower	Stream-Type	--	8.5007		8.0352		5.79%	
Geothermal	--	--	16.5652		16.5652		0.00%	
Biomass	No biogas eqip.	--	8.5007		8.0352		5.79%	
	With biogas eqip.	--	9.6600		9.3086		3.77%	
RDF	--	--	9.7379		9.7379		0.00%	
Others	--	--	8.5007		8.0352		5.79%	

Million Solar Roofs Project



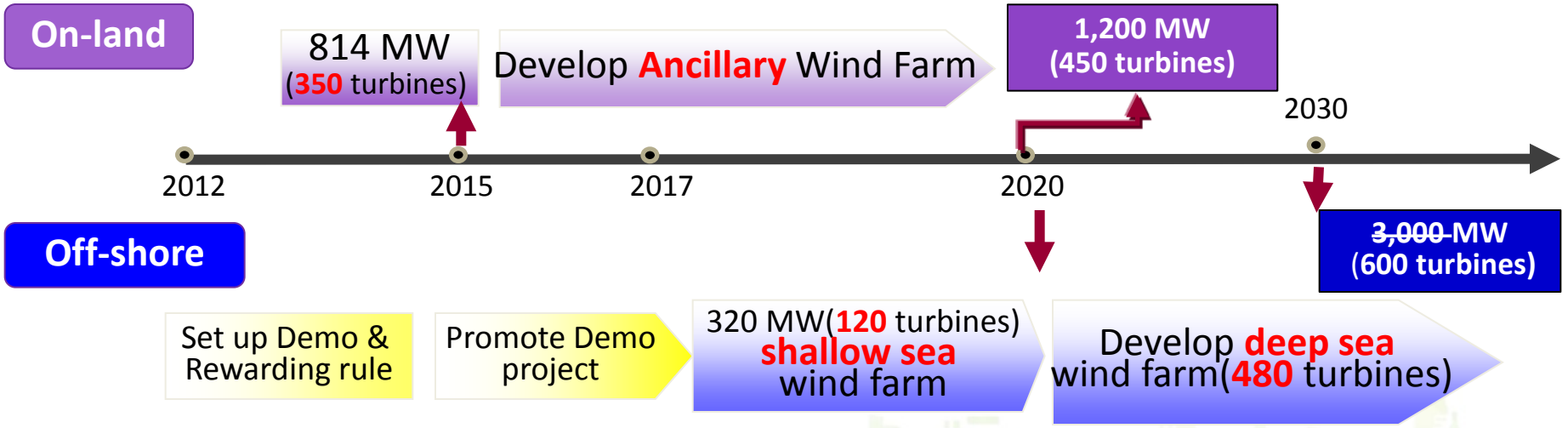
➢ **Deployment Strategy**

- First promoting **roof** type, then the **ground** type.
- Combining **local government** strength, **simplifying application** procedures.

■ **Key Measures**

1) Adoption of **FIT** and **bidding** approach.
2) Construct an **integrated information platform** and **promoting office** to provide comprehensive assistance.
3) Cooperating with **local government** to promote **public buildings** solar roof and **solar communities** exempted from bidding requirement.
4) Providing training for the **financial sector** and promoting **PV-ESCOs**

Thousand Wind Turbine Project



■Deployment Strategy

First Develop **Onshore** Wind Farm, then **Offshore** Wind Farm.

On-land : First Develop **Best Wind Farm**, then **Ancillary Wind Farm**.

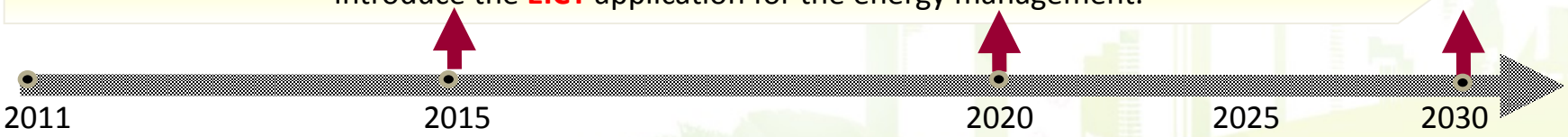
Off-shore: Develop **shallow sea** area first, then develop **deep water** area afterwards. Demonstration **incentives** for **offshore** wind farm, and establish **inter-ministerial** coordination mechanism.

Smart Grid Program

Demonstration (2011~2015)	Promotion & Deployment (2016~2020)	Overall Application (2021~2030)
Establish **AMI** System Solution	Develop AMI value-added Application and deployment **EMS**	Develop Virtual Application Technology for Power Plants
Complete **Peng-Hu Demo system**	Operate **Smart Grid Demo Program**	Promote Virtual Commercial Application for Power Plants

Install **6 million** smart meters. **Export** construction projects and technology.

- ✓ Increase the share of the **renewables energy** to **30%.**
- ✓ **Automatic** power distribution and substation.
- ✓ Introduce the **EICT** application for the energy management.



■ Key Measures

(1) Build up comprehensive environment from **6 aspects**:
Electricity **generation** and **dispatch**, **transmission**, **distribution**, **users**, **industry**, and **environment**.

(2) Develop **AMI** and profit-oriented **application technology**, for industrial, commercial and residential sectors.

(3) Plan large-scale **smart grid demo** area. Attract firms to make investment and establish tangible achievements.

Green Energy Industry (1/2)

Energy Conservation Society and Low Carbon Economy

Clean Energy

Solar Energy, Wind, Bio-fuel, FC & H2 Energy, Hydraulic Energy, Ocean, and Geothermal

Energy Conservation

Lighting, HVAC & R, Transportation, and Energy management

Rising Green-Energy Industry Program

Main Industries

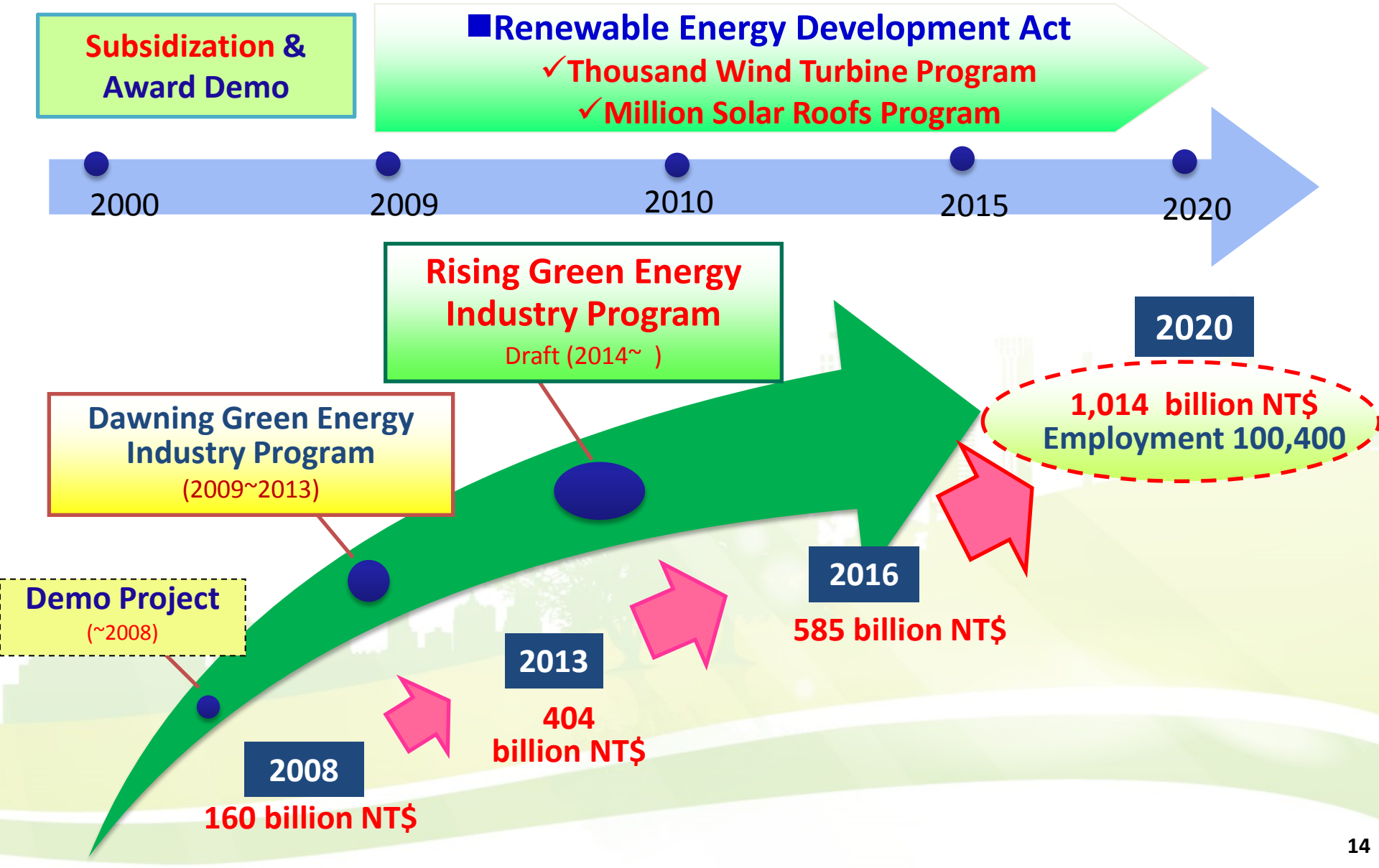
PV & LED-lighting

Potential Growth Industries

Wind Power, EICT,

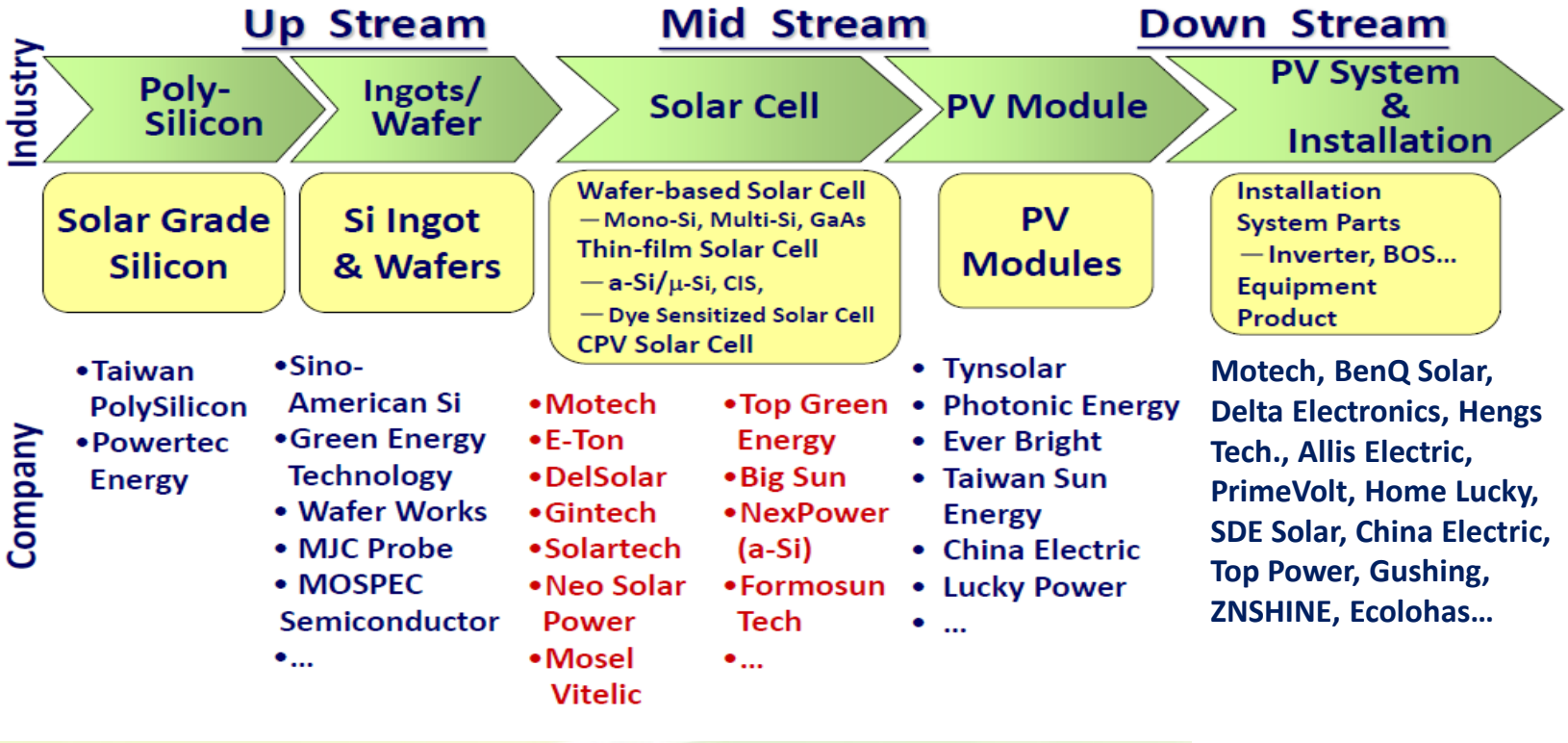
Biomass, Hydrogen & Fuel Cell, Electric Vehicle

Green Energy Industry (2/2)



Current Status of Taiwan Solar PV Industry

- **World's No.2 solar cell producer, with complete supply chain.**
- **PV products mainly export to China, Japan and the EU markets.**



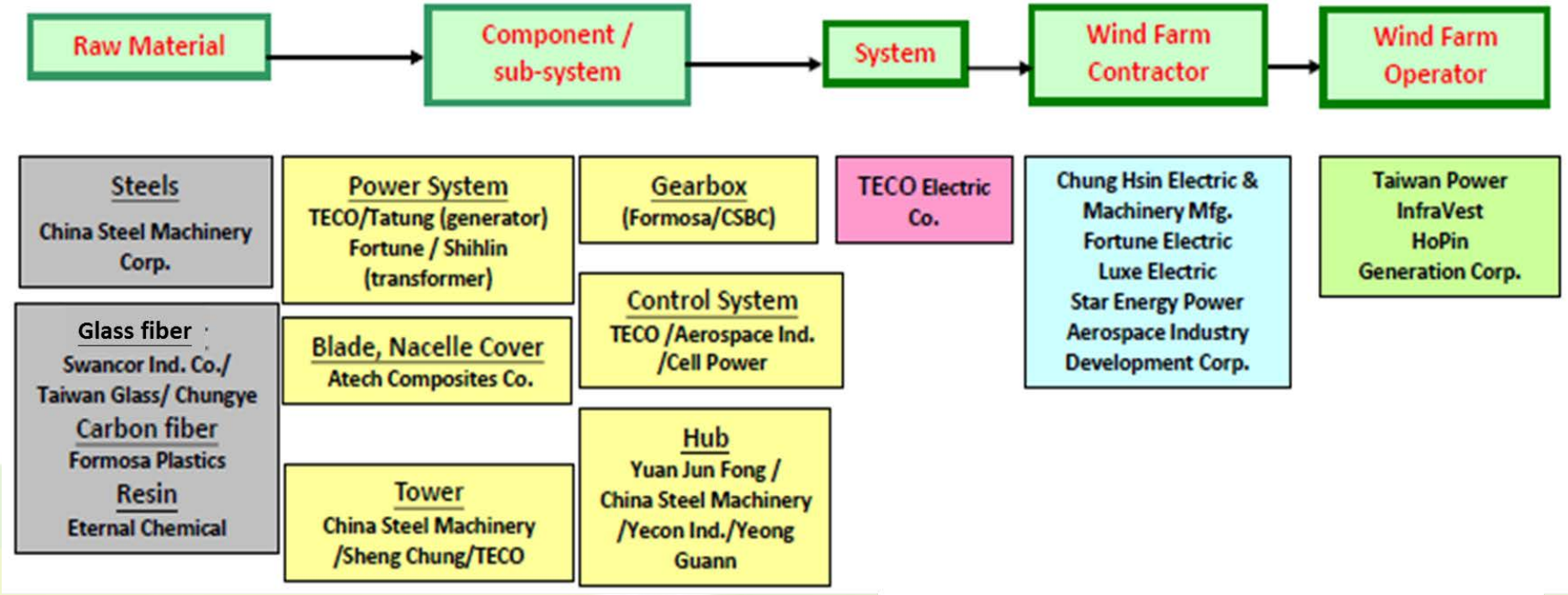
Current Status of Taiwan LED Industry

- **World's No.3 LED component producer, with complete supply chain.**
- **LEDs mainly export to China and Japan.**

Industry	Up Stream	Mid Stream	Down Stream
	Manufacturers of light source	Lighting module	Applications
Company	•EPISTAR •FOREPI •HUGA •TSMC •LEXTAR •OPTOTECH •TEKCORE •HUGA •TEKCORE •Lextar •Semileds •LITEON	• UNITY • KINGBRIGHT • EDISON • LEDTECH • WELLYPOWER • BRTLED • Lextar • LITEON • PARA • AOT • EDISON	• EVERLIGHT • TTIC • AOP • LITE-ON • DELTA • CooLED • Energyled • NYPI • QBAS • Trand • Lextar • LITEON • EDISON • Leadray • Jan Cheng • TJLight • TYC-TEC

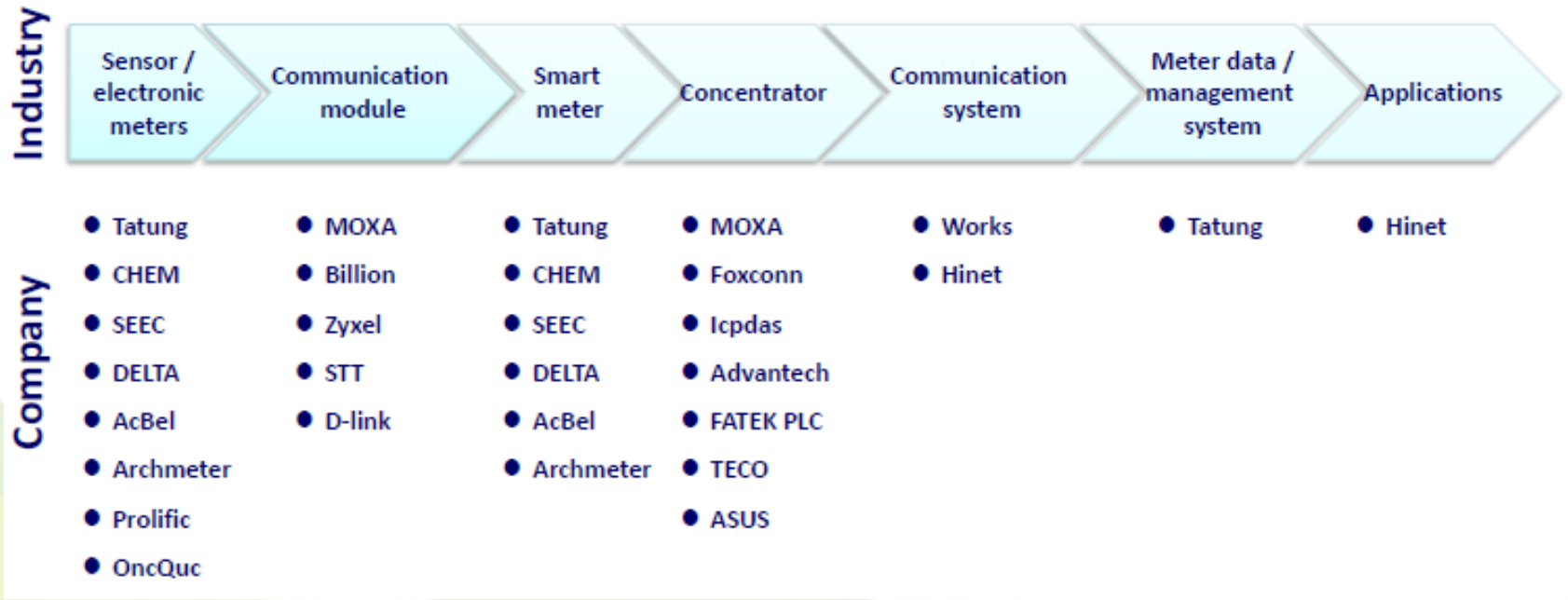
Taiwan Wind Power Value Chain

- **Complete wind turbine supply chain established, with competitive advantage in steel, glass fiber tower structure and other raw materials.**
- **TECO has own brand of 2 MW wind turbines in 2010.**



Taiwan Energy Information & Communication Technology (EICT) Value Chain

- **Capable of supporting the nation wide Advanced Metering Infrastructure (AMI) plan, as well as international deployment plans.**
- **Established on Taiwan's original industry advantages in information technology. Industry value is estimated to reach 2 billion USD by 2020.**



GREEN ENERGY TECHNICAL SERVICES

Technical Team Destinations (1/2)

Laos	Nov. 2-6
Cooperating Partners	• Institute of Renewable Energy Promotion, Ministry of Energy & Mines • SME Promotion Development Office (Laos NPO)
Pioneer Trip Observations	• Laos has abundant hydro power resources, and exports excess electricity to neighboring countries. However, green energy policies and infrastructure are still in development. • Laos is familiar with international assistance, but few projects involve green energy technical training .
Technical Team Core Activities	• Visit to energy related government departments • 2 day Renewable Energy and Energy Efficiency Training Course
Objectives	• Taiwan has expertise in green energy development. A Training Course is the most effective way to promote regional green productivity. • Speakers are recruited from Taiwan's most elite organizations and cooperations. • Through APO platform, Taiwan could offer green energy knowhow to Laos and jointly promote green productivity in Southeast Asia.

Technical Team Destinations (2/2)

Philippines	Nov. 10-14
Cooperating Partners	• Development Academy of the Philippines • Renewable Energy Association Philippines • Taipei Economic and Cultural Office
Pioneer Trip Observations	• Off-grid renewable energy systems could boost electrification for rural areas and reduce carbon emissions • Free energy market mechanism allow domestic and foreign entities to invest in the energy field. • Taiwan and Philippines have friendly business and cultural relations.
Technical Team Core Activities	• Visits to local green industries and Asian Development Bank • 2 Day Green Energy Forum – Sharing Best Practices in Policy, Technologies and Financing
Objectives	• The green energy forum policy sharing could benefit both countries in innovating effective plans for renewable energy development. • Renewable energy technology exchange during best practice sharing allow industries to interact and discuss future cooperation potential. • Encourage further interaction between Taiwan and Philippines green industry and energy departments, and boost Asia-Pacific cooperation.

Laos Training Course

Day 1

Time	Event	Speaker
Morning Session	Strategy of RE Development and Energy Improvement in Laos	IREP
	Green Energy Policies and Best Practices of ROC	ITRI
Afternoon Session	The Application and Installation of Solar Systems	Hengs
	Smart Grid and Its Applications	ITRI
	Discussion	Participants

Day 2

Time	Event	Speaker
Morning Session	Application of LED Lighting in Industrial, Commercial and Residential Sectors	Everlight
	Measures for Enhancing Efficiency in Industrial and Commercial Sectors and Best Practices	ChungHwa Telecom
Afternoon Session	Home Energy Management Systems	ITRI
	Discussion: Demand for Energy Efficiency and RE solutions in Laos and Potential Cooperation Between Laos and ROC	Participants
	Closing Session	Participants

Philippines Green Energy Forum – Day 1

Time	Event	Speaker
Morning Session	Opening Program & Welcome Remarks	
	ROC Policy Measures and Industry Best Practices in Promoting Green Energy	Taiwan Bureau of Energy
	ROC Policy Measures and Industry Best practices in Promoting Green Factory	Taiwan Industrial Development Bureau
	ROC Solar Energy Development Programs	ITRI
	Open Forum	
Afternoon Session	Philippine Energy Outlook	Philippines Department of Energy
	Philippine RE Presentations	Philippines DOE
	Government's Green Financing Program	Philippines Department of Finance
	Open Forum	

Philippines Green Energy Forum – Day 2

Time	Event	Speaker
Morning Session	PNOC Renewable Energy Program	PNOC
	Sustainable Community-based Solar Projects	Renewable Energy Association Philippines
	Promotion and Potential for Wind	Wind Energy Association Philippines
	Promotion of Energy Management System	Energy Efficiency Practitioners Association of the Philippines
	Green Building Initiatives	Green Building Council
	Open Forum	
	Sharing of CEPALCO	CEPALCO
	Best Practices from APO COE GP Green Energy Projects Session 1	Taiwan Company Representatives
Afternoon Session	Best Practices from APO COE GP Green Energy Projects Session 2	Taiwan Company Representatives
	Networking	

Prospects of Green Productivity with the APO Platform

- **With basis in semiconductor manufacturing, Taiwan has established a strong supply chain of green energy industries with many companies experienced in working with overseas partners.**
- **Through the APO platform, Taiwan could share our policy, technological, human, business resources with APO member countries, to help assess local green energy requirements and provide systematic consulting.**
- **Through APO Center of Excellence on Green Productivity, we hope to encourage cross-national cooperation on green energy projects and stimulate market opportunities for green energy industry, making regional green development a reality.**

Paradigm Shift towards Green Productivity for Asia-Pacific Region

Thank You

Center of Excellence on Green Productivity
Asian Productivity Organization
COE GP

ITRI
Industrial Technology Research Institute

Organized by Asian Productivity Organization

Supported by Ministry of Economic Affairs, R.O.C.

Industrial Development Bureau, Department of Industrial Technology, Bureau of Energy, Bureau of Foreign Trade

Ministry of Foreign Affairs, R.O.C.

Council of Agriculture, Executive Yuan, R.O.C. Environmental Protection Administration, Executive Yuan, R.O.C.

Managed by Center of Excellence on Green Productivity, Asian Productivity Organization China Productivity Center