



經濟部能源局

BUREAU OF ENERGY, MINISTRY OF ECONOMIC AFFAIRS



Renewable Energy Promotion Policies in Chinese Taipei

Bureau of Energy, Ministry of Economic Affairs
Chinese Taipei

November 12, 2014

Current Development of Renewables in Chinese Taipei



Current Development of Renewables (1/3)

□ Conventional Hydropower

- Total hydro power capacity of **2,081.3 MW**, of which the Public utilities (Taipower) accounted for 98% of large hydro power plants (2,042.2 MW), privately owned 39.1 MW only

□ Wind Power

- There are 318 onshore wind turbines commissioned, totalling **630.3 MW** in capacity, enough to power approximate 360 thousand households per year.



Tao-Yuan: 30 MW



Chuntung, Penhu: 4.8 MW

Current Development of Renewables (2/3)

□ PV: 426.0 MW installed

- Bureau of Energy, MOEA funds many ongoing deployment programs : Solar City, Solar Top, Solar Campus, Emergency Systems in Remote Areas or Isolated Islands, Demo Farms, Solar Communities, Bidding Procedure of Solar Power Equipment, etc.



BIPV demonstration system



The Main Stadium of The World Games 2009 Kaohsiung: 1 MW

Current Development of Renewables (3/3)

□ Biomass power: 740.5 MW

- Municipal Solid Waste Incineration: 624.4 MW (25 plants)
- Biogas: 19.1 MW (4 landfills)
- Waste from Industries and Agriculture: 97 MW
- Annual Power Generation: 3.36 TWh

□ Solar Water Heaters

- 1.45 million m² of heat collectors installed from years 2000 to 2013, effective households penetration rate 3.46% (around 286 thousand households)
- Ranked No. 5 globally for installed density (land area based)
- Annual Energy Production: 98 million litres oil equivalent

□ Biofuels

- Biodiesel: Mandatory B1 since July 2008, B2 on June 2010 (*temporarily suspended for policy review*)
- Bioethanol: E3 Gasohol Programme in Taipei and Kaohsiung Cities
- Annual Consumption: 100 thousand kilolitres of biodiesel, over 7 thousand kilolitres of bioethanol.

Chinese Taipei's New Renewable Energy Policy



Chinese Taipei's New Energy Policy

2011.11.03	<ul style="list-style-type: none">■ New Energy Policy announced: to “Steadily Reduce Nuclear Dependency, Gradually Move Towards a Nuclear-free Homeland, and Create a Low-carbon Green Energy Environment”
2010.05	<ul style="list-style-type: none">■ Approval of the “National Master Plan on Energy Conservation and Emission Reduction”
2010.01	<ul style="list-style-type: none">■ Establishment of the “Committee on Energy Conservation and Emission Reduction”
2009.07.08	<ul style="list-style-type: none">■ “Renewable Energy Development Act”■ Amendment of “Energy Management Law”
2009.04.15-16	<ul style="list-style-type: none">■ The 3rd “National Energy Conference”
2008.06.05	<ul style="list-style-type: none">■ “Framework of Sustainable Energy Policy”

Installation of Renewable Energy

- The installed capacity of renewable energy was **3,769 MW** at the end of 2013.
- Targeted renewable power generation capacity is **13.75 GW** by 2030.
→ Almost tripled compared to 2013 level

Energy Source	2013	2015	2020	2025	2030
On-shore Wind	614	814	1,200	1,200	1,200
Off-shore Wind	0	15	320	1,520	3,000
Hydro Power	2,081	2,089	2,100	2,150	2,200
Solar PV	333	847	2,120	4,100	6,200
Geothermal	0	4	66	150	200
Biomass	741	745	768	813	950
Total	3,769	4,514	6,574	9,933	13,750
Capacity (%)	9.3	10.8	13.8	18.5	24.2
Power Generation(%)	5.1	5.7	6.9	9.0	11.7

Mechanism of Feed-in Tariffs (1/2)

- In order to systematically promote renewable energy, in July of 2009, Chinese Taipei promulgated the ***Renewable Energy Development Act***. **The core strategy of the Act is a Feed-in-Tariff system.**
- A Committee is formed to decide the calculation formula and feed-in tariffs. Tariffs and formula should be **reviewed annually**, referring to **technical advancement, cost variation, goal achievement status**, etc.
→ **no degression system in place**
- Tariffs shall not be lower than the average cost for fossil-fired power of domestic power utilities.

Mechanism of Feed-in Tariffs (2/2)

- Current, only Solar PV tariff rates are set on date when generating equipment installations are completed. Other technologies have tariff rates set on the Power Purchasing Agreement (PPA) signing date.
 - ➔ **tariffs applied for 20 years**
 - ➔ **PPA being a very important credit for banks to provide project financing**
- **BOE announces PV capacity quota every year.** PV systems > 30 kW are subject to a bidding procedure to decide tariffs. Developers proposing higher discount rates receive the priority to get the quota.
- **The installed capacity of PV systems has been increased by more than 30 times in less than 4 years after the implementation of FIT.**

FIT for Renewables (2014)

- Applied for 20 years to electricity from renewables (except PV) whose owner signs PPA with power utility from **1 Jan. 2014 to 31 Dec. 2014**

Item	Type	Capacity (kW)	2014 Tariff Rates (US ¢/kWh)		2013 Tariff Rates (US ¢/kWh)	
			period 1	period 2	period 1	period 2
PV	Roof type	≥ 1 ~ <10	23.8673	23.8673	27.9903	27.2787
		≥ 10 ~ < 100	21.3967	21.3967	25.1439	24.4323
		≥ 100 ~ < 500	20.1493	20.1493	23.7207	23.0091
		≥ 500	17.4387	17.4387	21.1113	19.9253
	Ground type	≥ 1	16.4074	16.4074	19.9253	18.7393
Wind Power	Onshore	≥ 1 ~ < 10	27.2450		24.5207	
		≥ 10	8.7793 (with LVRT)		8.7527 (with LVRT)	
	Offshore	--	18.6920		18.5420	
Hydropower	Stream-Type	--	8.3510		8.2174	
Geothermal	--	--	16.4383		16.0130	
Biomass	No biogas equip.	--	8.3510		8.2174	
	With biogas equip.	--	10.8370		9.3380	
RDF	--	--	9.4133		9.4133	
Others	--	--	8.3510		8.2174	

* Exchange rate: USD 1 = NTD 30

Million Solar Rooftop PVs project (1/2)

- **Solar Energy Potential** ♦ Goal : 6,200 MW developed by 2030
 - A. Roof-top (3,000 MW) B. Ground (3,200 MW)
- **Strategy - Gradual expansion/ incentivizing roof-tops prior to ground installations**
 - ◆ Buildings will be installed with PV panels through the incentives of feed-in tariffs.
 - ◆ Restricted annual quota at present, while large scale expansion after grid-parity reached
 - ◆ To expand the PV power applications in the domestic market, the annual installation limit has been raised to 210MW in 2014, up from 70MW in 2011



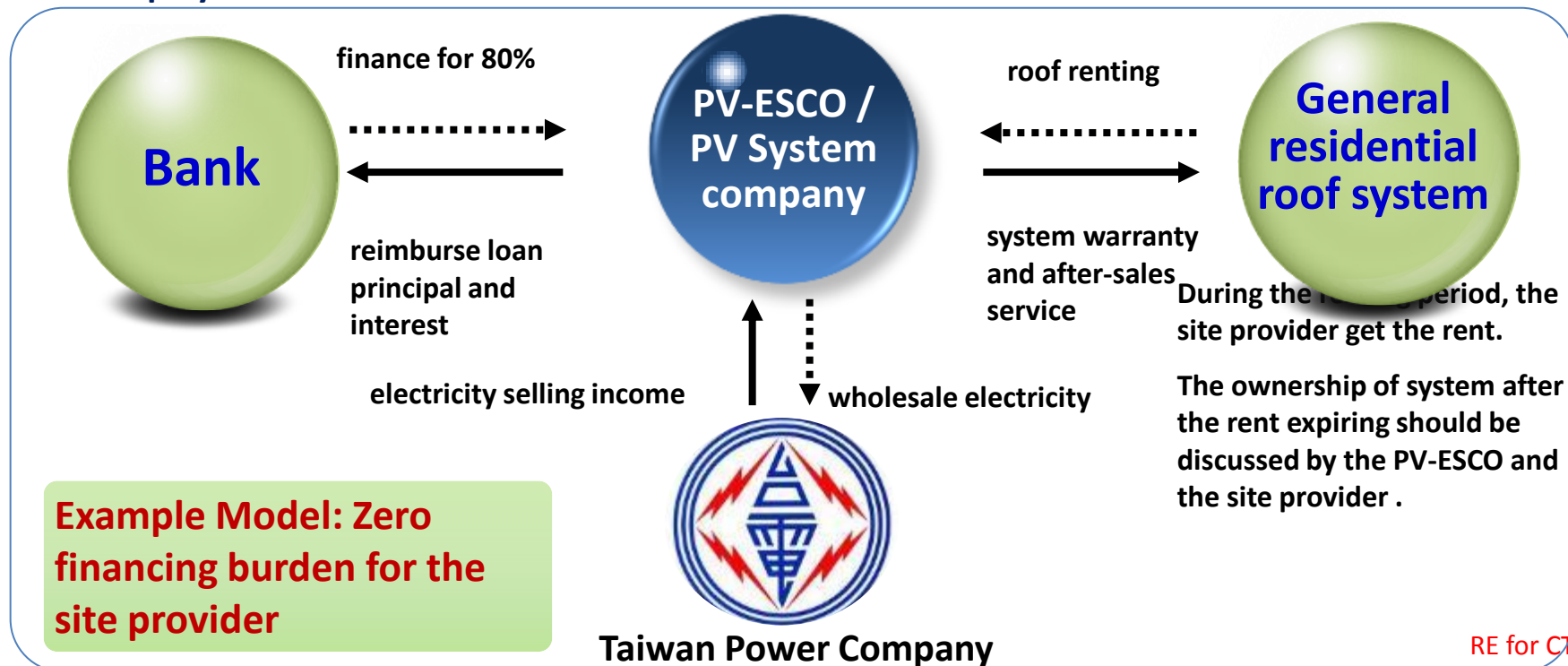
Million Solar Rooftop PVs project (2/2)

○ Encouraging participation from local governments

- ◆ Besides FIT, some local governments (e.g. Kaohsiung City) granting extra capital subsidy
- ◆ Encouraging public buildings and constructions equipped with PV
- ◆ BOE assisting local governments on Solar Roof-top Program and Solar Community Program to facilitate public participation

○ Establishment of PV-ESCO mechanism

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



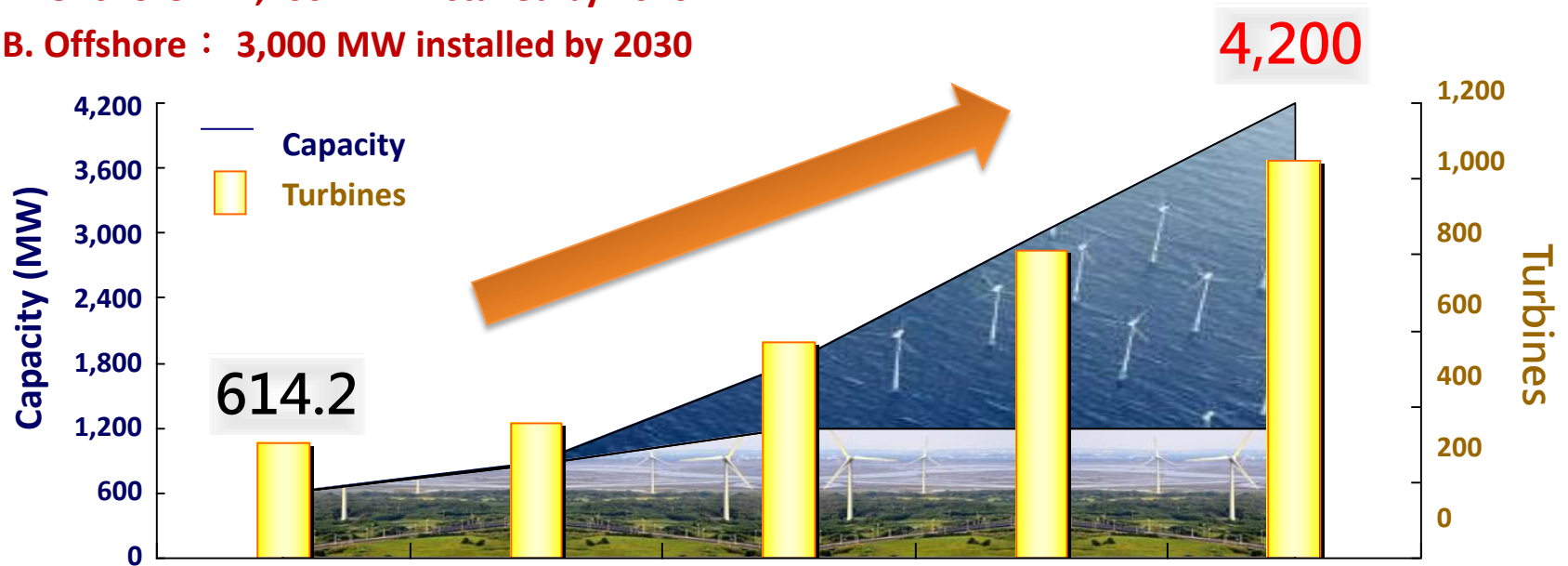
Thousand Wind Turbines Project (1/2)

Wind Power Generation Target

◆ Goal : 4,200 MW developed by 2030

A. Onshore : 1,200 MW installed by 2020

B. Offshore : 3,000 MW installed by 2030



Year	2012	2015	2020	2025	2030
Onshore(MW)	614.2	814	1,200	1,200	1,200 (450 turbines)
Offshore(MW)	0	15	320	1,520	3,000 (600 turbines)
Cumulative Installed Capacity (MW)	614.2 (311turbines)	829	1,800	3,000	4,200 (1,050 turbines)

Thousand Wind Turbines Project (2/2)

- **Strategy — Develop on- shore prior to off-shore wind farms**
 - ◆ **On-shore: develop areas with higher power generating potentials prior to 2015, then develop areas with less potential thereafter.**
 - Develop areas with higher power generating potentials prior to 2015 (estimated 800 MW)
 - Develop areas with less potential thereafter (400 MW), with total installed capacity reaching 1.2 GW by 2020
 - ◆ **Off-shore: develop among the shallow areas prior 2020 then develop in deep water offshore areas.**
 - Establish the first off-shore wind farm by 2015, and reach 320 MW installed capacity on shallow off-shore areas (approximately 100 turbines) by 2020.
 - Develop large wind-farms in areas possessing economic scalability between 2021-2030 (reaching 2,680 MW, which is approximately 500 wind turbines in 10 years)

Short-term~2015:

Offshore Wind Power Demonstration Program

Promote Demonstration Incentive Program

Mid-term~2020

Develop Demonstration Offshore Wind Farms

Optimizer circumstances and infrastructure

Long-term~2030

Develop Large-scale Wind Farms

Establish local industry of marine construction and wind turbines

Offshore Wind Power Demonstration Program

○ Demonstration Wind Farms

- ◆ In the ocean of 5 m isobaths or deeper, with total capacity above 100 MW but not exceeding 200 MW.

○ Demonstration Devices

- ◆ 2 offshore wind power systems of single capacity above 3 MW

Awarded Demonstration Projects

■ Fuhai @Changhua

- Capacity: 108 MW (30 turbines)
- Distance from Shore: 11 km
- Water Depth: 25-40 m

■ Formosa @Miaoli

- Capacity: 108 MW (30 turbines)
- Distance from Shore: 1-5 km
- Water Depth: 5-30 m

■ TPC @Changhua

- Capacity: approx.. 108 MW (22-36 turbines)
- Distance from Shore: 6-8 km
- Water Depth: 15-25 m



Hydro Power

□ Target :

- 2,200 MW by 2030

□ Visions and Strategies

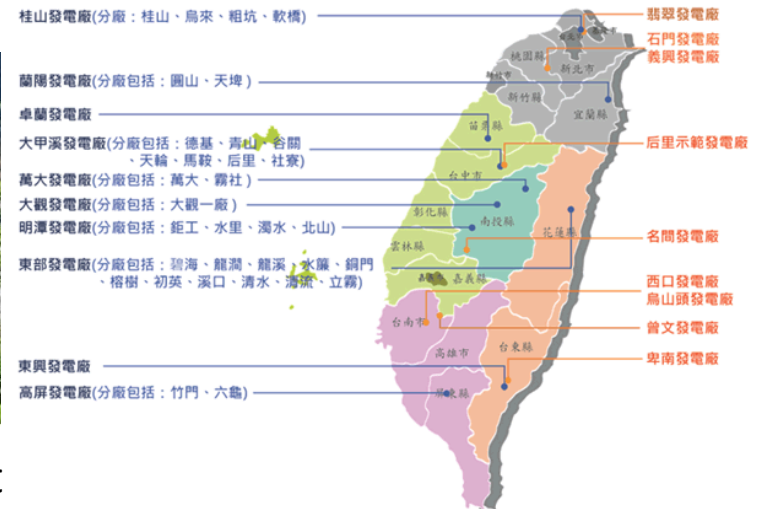
- almost all potential large hydro sites have been developed, small hydro sites are the future focuses
- encouraging the development of environmentally sound resources (small scale hydro)



Bihai Hydro Power Plant



Wanta Hydro Power Plant



Bio-Power

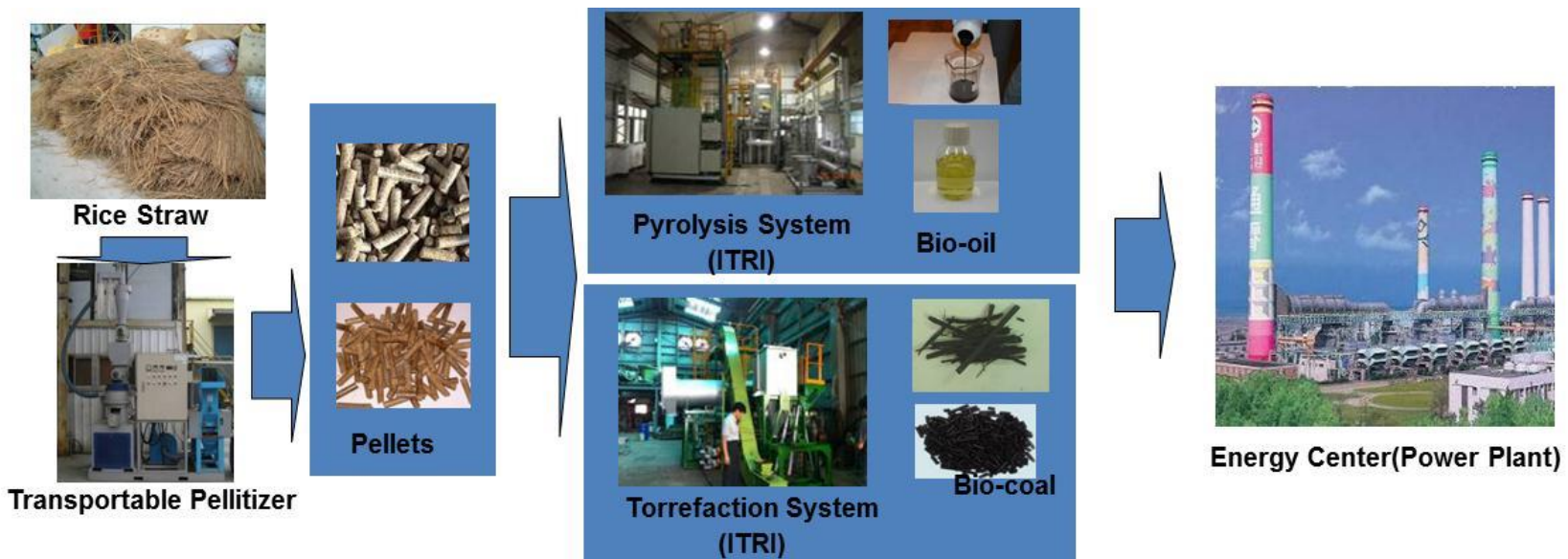
□ Target :

- 950 MW by 2030

□ Visions and Strategies

- biomass waste incineration transformed to Energy Center with advanced technology to increase power yield
- encouraging the development of biogas

Scheme combining distributed pretreatments and centralized generation



Geothermal Energy

□Target :

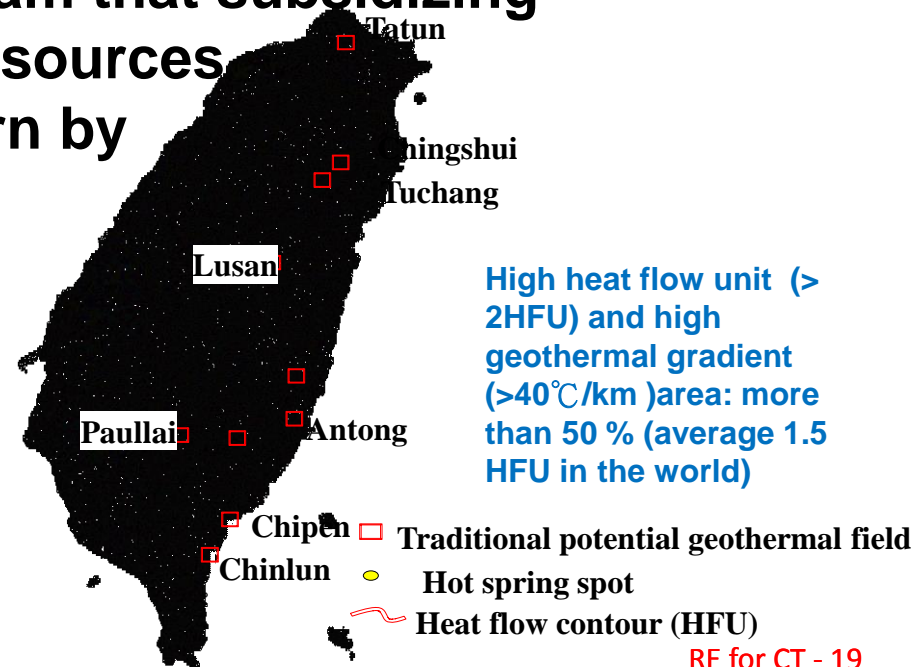
- 200 MW by 2030

□Visions and Strategies

- shallow natural geothermal reservoirs first, then EGS (enhanced geothermal systems)
- to introduce Incentive Program that subsidizing exploration of geothermal resources to lower investment cost born by private investors



Chingshui Geothermal Power Plant



Ocean Energy

□ Challenges :

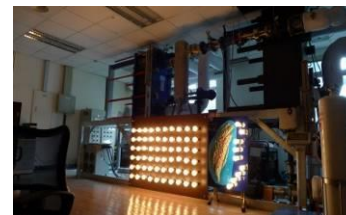
- Technology
- Reliability
- Maintenance
- Transmission
- Cost
- Ecologic issue
- Ocean Engineering Capability
- Extreme Conditions

□ Visions and Strategies

- accelerating R&D in OTEC, wave and ocean current power



kW WEC Point Absorber & Test



ORC System



OTEC System RE for CT - 20

Other Incentive Programs

- **Subsidy programs for advanced renewable technologies or for small scale applications**
 - ◆ **BIPV (building-integrated PV)**
 - ◆ **Biogas power generation**
 - ◆ **Small wind turbines demonstration**
 - ◆ **Geothermal power generation demonstration**

A central graphic of a green globe with a plant sprout growing from the top. The globe is rendered in a vibrant green color with white outlines of continents. The plant has several green leaves, some with small blue water droplets. The text "Thank You for Your Attention" is overlaid on the globe in a bold, blue, italicized font.

***Thank You for Your
Attention***