EGNRET 52nd Meeting

Waste to Energy in Urbanized Cities

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Outline

- Waste-to-Energy in Chinese Taipei
- RE Policies on WtE
- Incentives
- Concluding Remarks

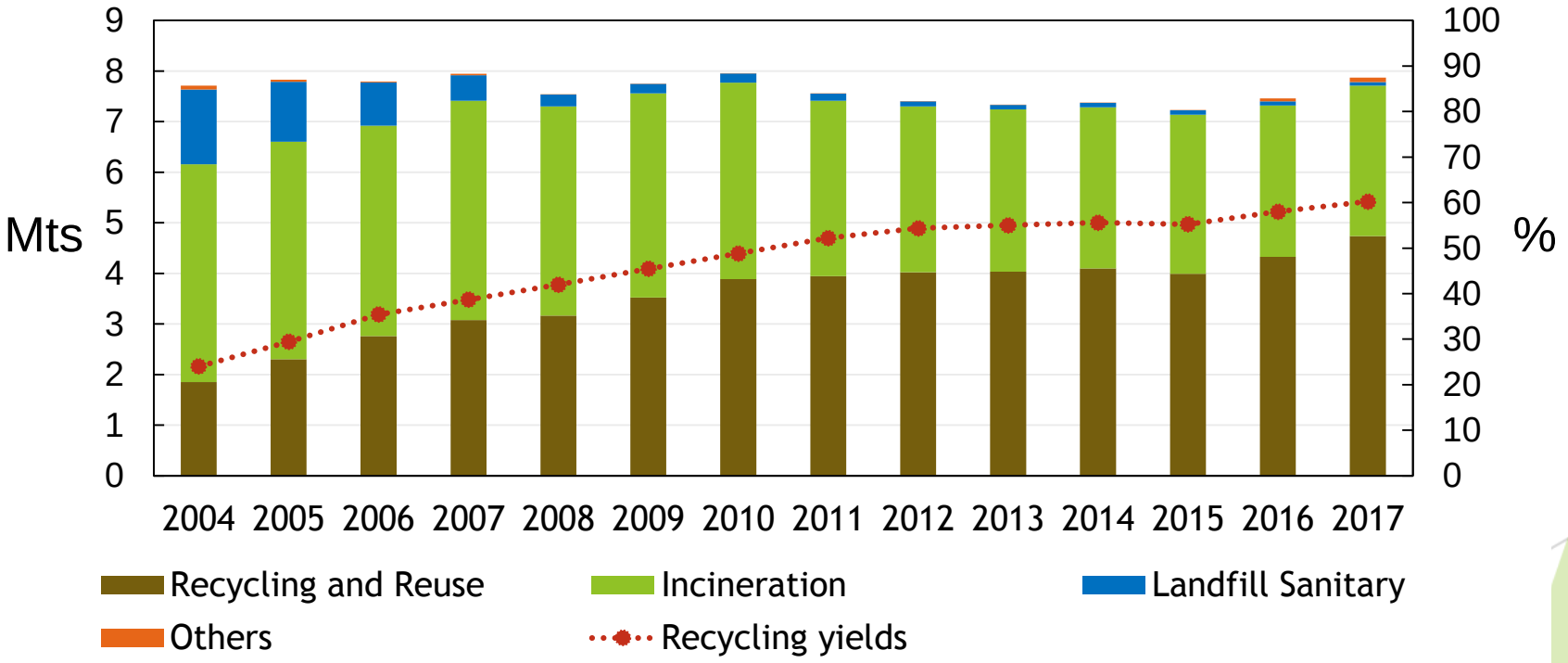
Waste-to-Energy in Chinese Taipei (1/3)

- **Demographics**
  - Area: 36,000km^2
  - Population: 23 millions
  - Population density: 649 people/km^2 (urbanization:78%)
- **Solid waste generation and disposal**
  - Total solid waste: ~26 Mts/y (Including MSW: ~7.5 Mts/y)

*MSW: Municipal Solid Waste

Waste-to-Energy in Chinese Taipei (2/3)

- One of the highest recycling rates in the world.
- Nearly 60% general waste disposal is recycled.
- 40% general waste goes to incinerators (624 MW, 3.4 TWh/y).



Source：Environmental Protection Administration, Chinese Taipei

Waste-to-Energy in Chinese Taipei (3/3)

- Chinese Taipei relies on imports for 98.7% of its energy.
- Bio-power target and planning

	2018.12: 726.6 MW (1.38% of total electricity installed capacity)	2025 : 813 MW
Waste	• MSW/Industrial Waste: 629 MW	• MSW/Industrial Waste: 656 MW
Biomass	• Biogas: 20.2 MW • Agricultural Waste: 77.3 MW	• Biogas: 34 MW • Agricultural Waste: 123 MW

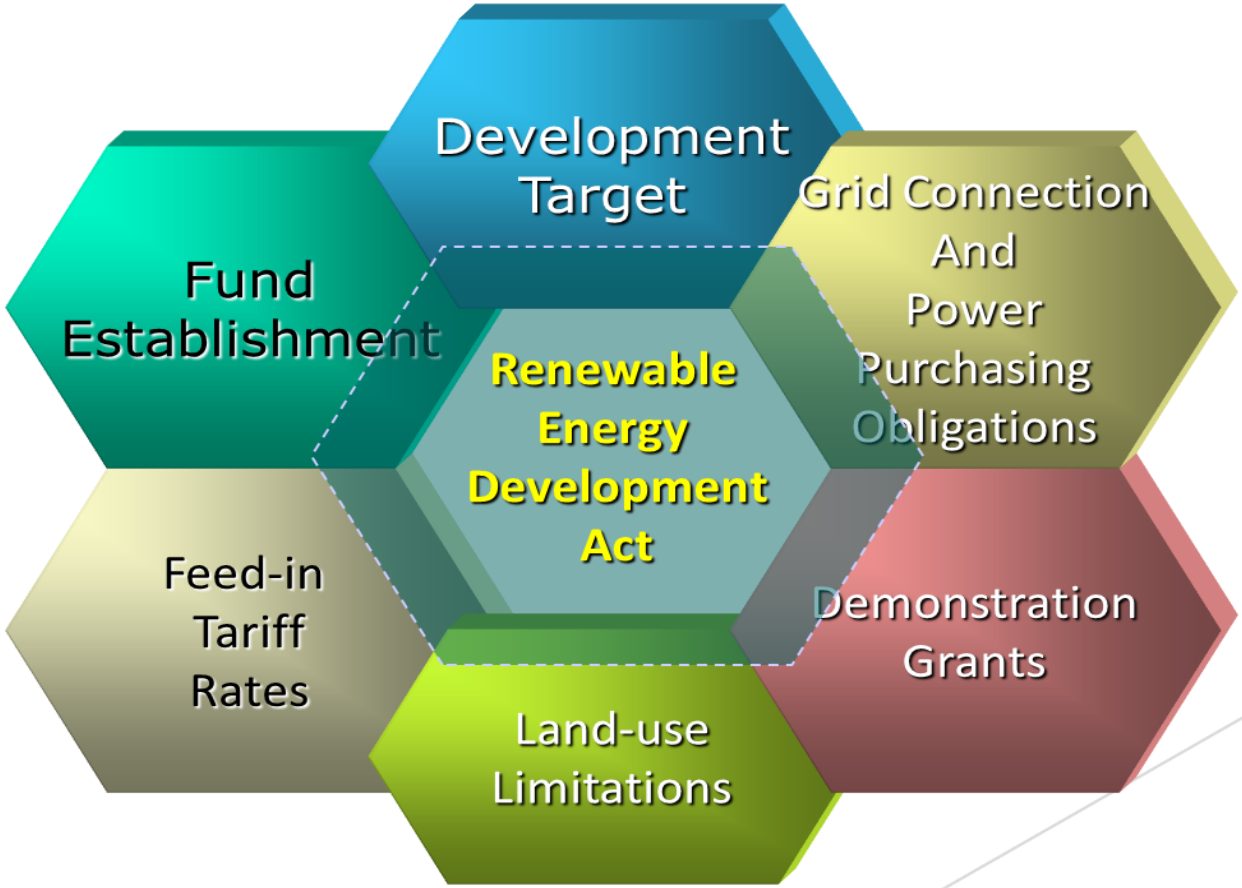
- Strategy
  - bio-fuels from agro-forestry wastes.
  - biomass energy in base-load power plant and co-generation system.
  - biogas from wastewater and animal manure

Biogas power plant, Municipal waste landfill, Taipei

RE Policies on WtE (1/3)

➢ Renewable Energy Development Act

- In July of 2009, Chinese Taipei promulgated the ***Renewable Energy Development Act***.
- **The core strategy of the Act is a Feed-in-Tariff system.**



RE Policies on WtE (2/3)

➢ Mechanism of Feed-in Tariffs

- 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.

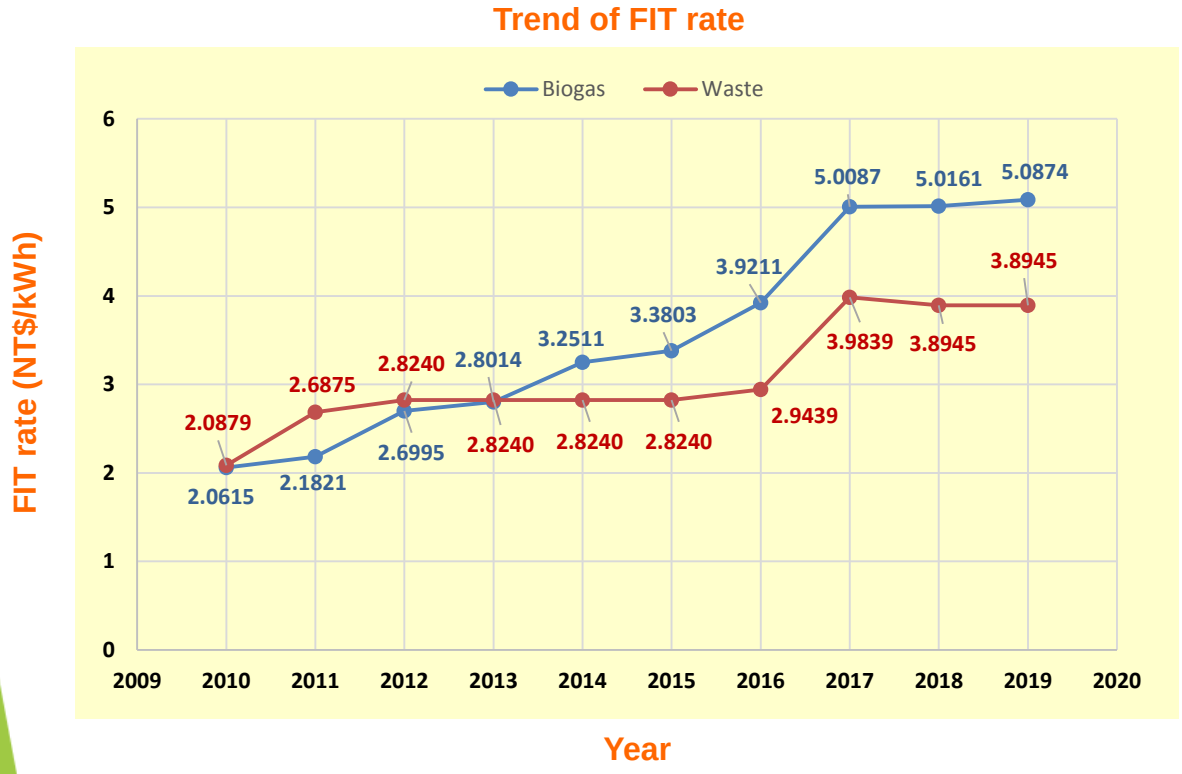
- Solar PV tariff rates are set on date when generating equipment installations are completed. Other technologies have tariff rates set on the Power Purchasing Agreement (PPA) signing date.

  - **tariffs applied for 20 years**
  - **PPA is a very important credit for banks to provide project financing**

RE Policies on WtE (3/3)

➢ Feed-in Tariff

- For Refuse-derived fuel (RDF) : 3.8945 NTD/kWh (@2019)
- For biomass energy (biogas) : 5.0874 NTD/kWh (@2019)



Kaohsiung, Chicken farm, biogas power, 400 $kW_e \times 2$ (feed-in grid)

1 USD = 30.85 NTD

Incentives (1/5)

➢ Biogas power promotion (by MOEA)

■ MOEA announced the "Direction of Subsidizing Program for Biogas Power Generation System" on January 22, 2013

- Requirement:

Installed capacity per application: 30 kW – 500 kW

- Subsidiary items:

(1) 1 million NTD for dissemination

(2) Installation subsidies up to 45,000 NTD per kW

(3) 600,000 NTD for a 3-year demonstrative operation

Year	Location	Capacity	Condition
2013	Pintung	195 kW	Operating
	Chunghua	195 kW	Operating
2014	Pintung	65 kW	Operating
2015	Yunlin	495 kW	Construction
2016	Chiayi	130 kW	Testing
	Chiayi	225 kW	Testing
	Tainan	260 kW	Testing
2018	Pintung	325 kW	Testing

1 USD = 30.85 NTD

Incentives (2/5)

➢ Biogas power promotion (by COA)

- According to "**Directions of Electricity-Generating Reward and Subsidy for Pig Farms**", different reward schemes and subsidies for pig farms based on various scales are on going.
- The COA has lowered the interest rate of **Policy-Oriented Special Agricultural Loan** to 1.04% while the loan limit increase from NT$10 million to NT$30 million.
- In addition, expert counseling group was set up to visit livestock farms and solve relevant issues.

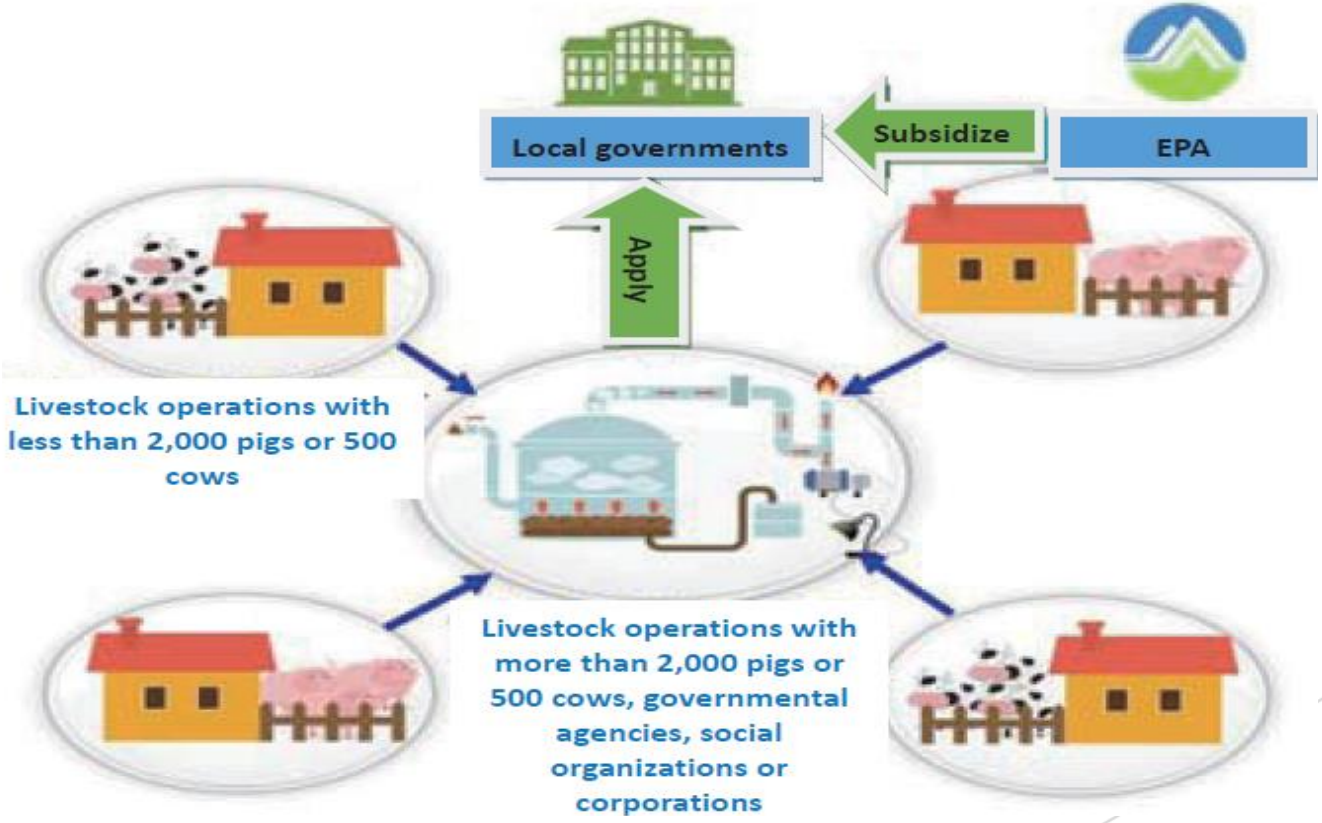
Expert Counseling

Source: Council of Agriculture (COA), Chinese Taipei

Incentives (3/5)

➢ Biogas power promotion (by EPA)

- **Subsidies to Expand Use of Animal Wastes for Power Generation**
  - Encourage large livestock operations to collect manure from small scale livestock operations

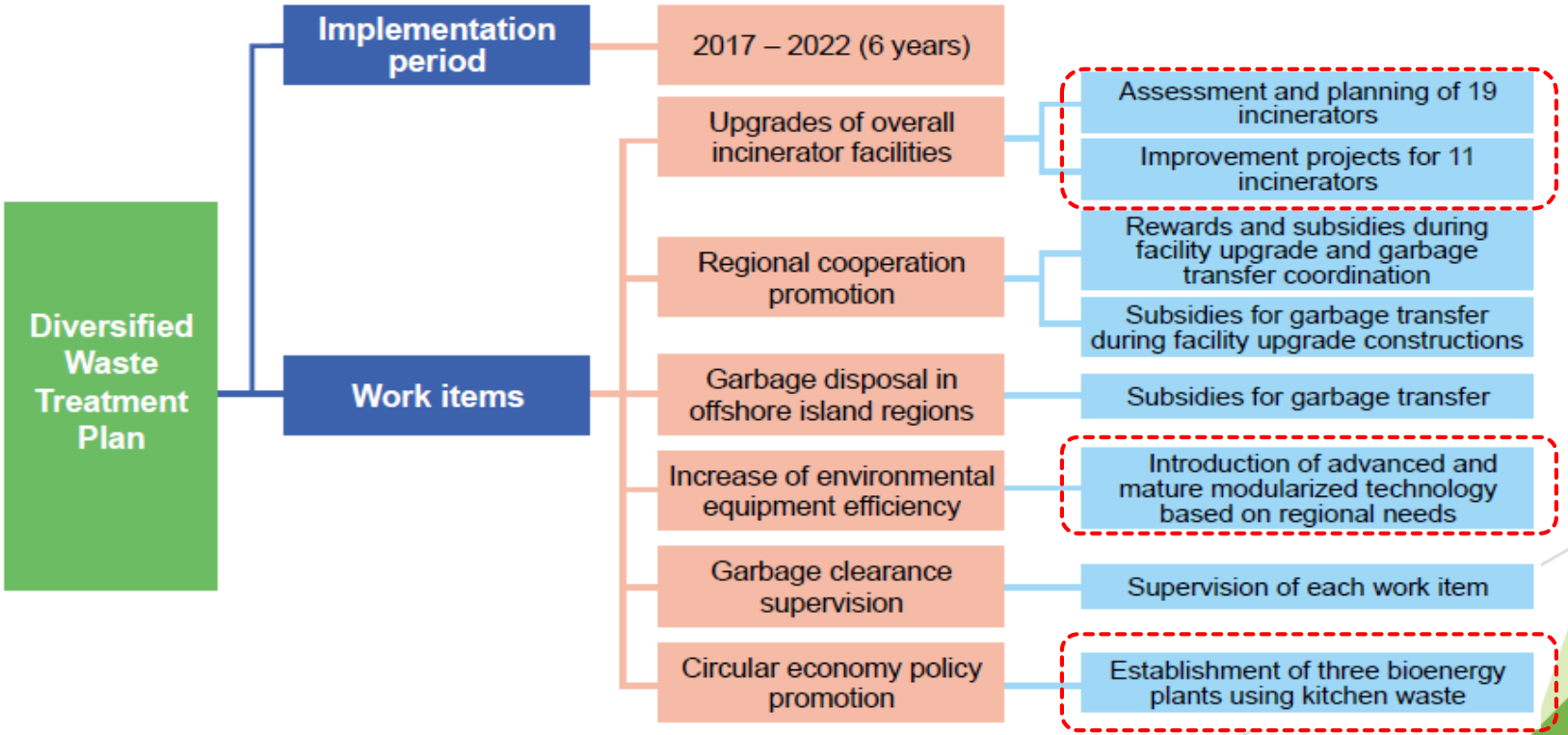


Source：Environmental Protection Administration, Chinese Taipei

Incentives (4/5)

➢ Diversified Waste Treatment Plan (by EPA)

- 24 incinerators, the first one was built in 1984, and 19 of them have been in operation for more than 15 years.
- the EPA provides economic incentives for waste treatment diversification
- Six focuses of the plan:



Diversified Waste Treatment Plan

Source：Environmental Protection Administration, Chinese Taipei

Incentives (5/5)

➢ Diversified Waste Treatment Plan (by EPA)

- Upgrading incinerators and related treatment facilities, and integrating overseas experiences
- Developing innovative technologies
- gradually building a circular economy, diversified waste utilization technology

Diversified Waste Treatment Strategy Flowchart

Source：Environmental Protection Administration, Chinese Taipei

Concluding Remarks

- A transition from conventional energy systems to one based on renewable resources is necessary.
- Waste to energy is one of the most ecological way of turning residual waste into energy.
- Chinese Taipei's effective waste management policy provides a good foundation for developing waste-to-energy.

Source：Bali Refuse Incineration Plant

Thank you for your attention.