



New and renewable energy application

and its future in Thailand

Miss Sutthasini Glawgitigul Scientist Department of Alternative Energy Development And Efficiency Ministry of Energy, Thailand

Expert Group Meeting on Sustainable Application of Waste-to-Energy in Asian Region in Busan, Republic



Content

Waste-to-energy Situation

Biomass-to-energy Situation

Alternative Energy Development Plan

Supporting Scheme for waste & biomass-toenergy

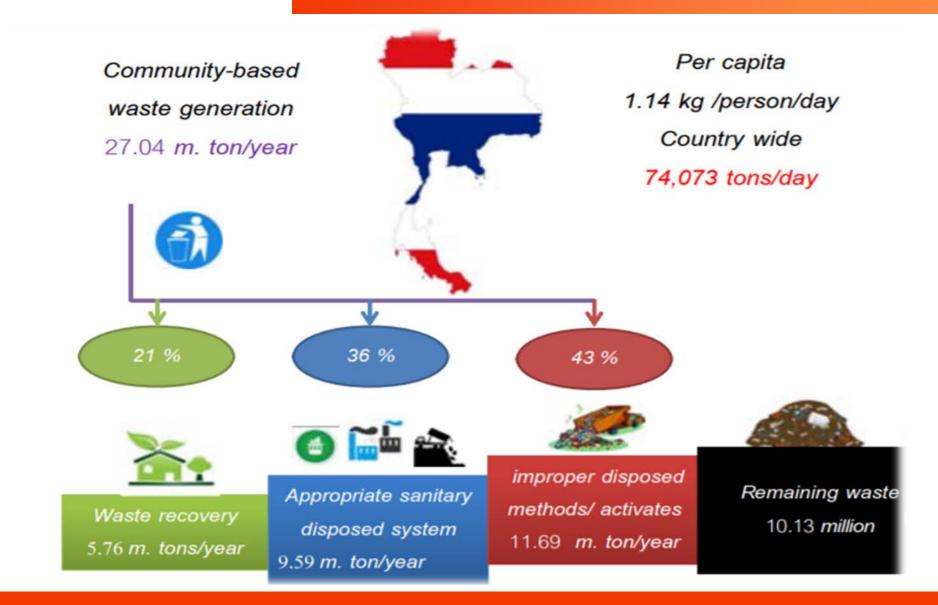


Content

Waste-to-energy Situation



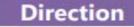
Situation of MSW management in Thailand



Source: PCD



National Waste Management Master Plan (2016-2021)



3R Principle: Reduce Reuse Recycle:

Appropriate management, waste centralization disposat, waste-to-energy



Public Participation & Social



Zero remaining waste 100 % by 2019

Zero infectious waste 100 % by 2020

Zero Industrial hazardous waste 100 % by 2020

Municipal hazardous waste reduction > 30 % by 2021

Waste separation at source > 50 % by 2021

Minimize municipal solid waste > 75 % by 2021

Solid waste and hazardous waste management measurement

- 1.Waste minimization at source
- Separation & recovery SCP concepts: environmental friendly
- production, consumption & services

2.Capacity Enhancement

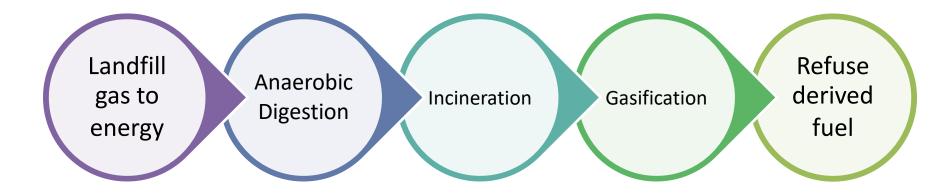


- Waste collection. transportation and disposal
- Solid waste disposal centre
- Waste collection and disposal site
- Law and regulation improvement
- Law enforcements
- 3. Management Promotion
 - Public awareness & consciousness
 - building
 - Knowledge enhancement
 - Treatment and disposal technology
- Databased development
- Management incentives & motivations

Source: PCD



WTE Technology in Thailand







WtE Projects

Incineration (MSW)

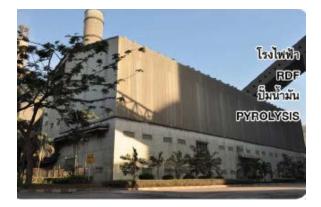


PJT, Phuket 14 MW C&G, Bangkok 9.8 MW Alliance Clean Power, Khonkaen 4.9 MW



WtE Projects

Incineration (RDF)







TPI, Saraburi 20 + 60 MW ETC, Saraburi 9.4 MW

R-EEP, Samut Prakarn 9.9 MW



WtE Projects

Landfill gas to Energy





Kamphaeng Saen West and East, Nakhonpatom 2x8 MW

Bantan, Chiang Mai 1 MW



WtE Projects

Electricity from pyrolysis oil



ACECO, Ayutthaya 3 MW



Use of RDF in cement kiln in 2016

Туре	Amount (ton)	Energy (ktoe)
RDF	94,456	43.28
Used tire	31,735	25.15
Total	126,191	68.43





Limited allocated budget for solid waste management

Lack of co-operation between local authorities

Lack of skill personnel in waste management practice

Opposition against waste disposal facilities from public/communities

Lack of public awareness/participation



Content







Biomass Opportunities

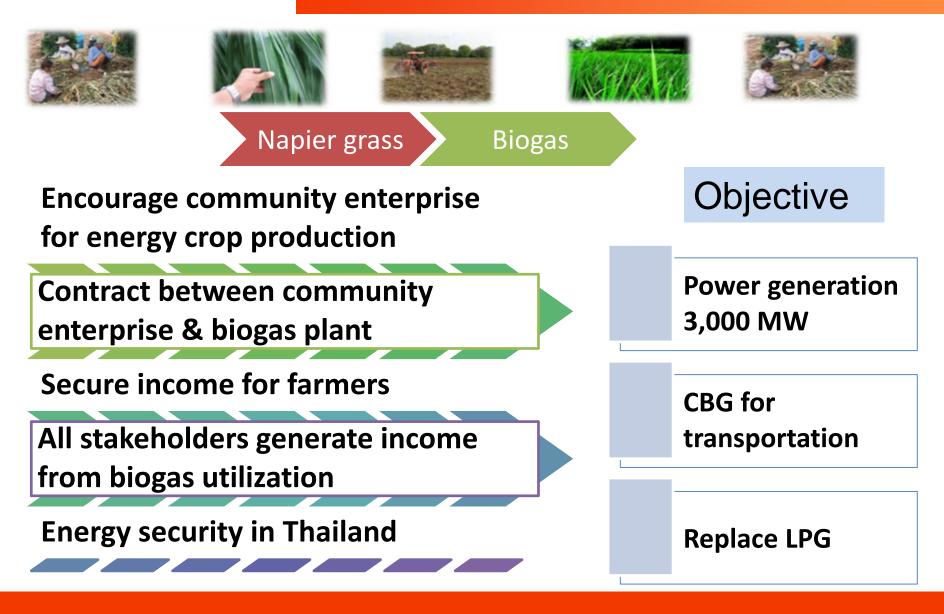
- 1. Promoting higher potential biomass
 - Rice straw
 - Sugarcane leaves
 - Cassava rhizome
 - Oil palm leaves and bunch
 - Corncob & stalk
 - Wood chips & Pellets
- 2. Promoting plantation of fast growing crops for power generation
- Bagasse, rice husk, palm, etc.
- Biomass Power plant -Community power plant
- Industrial: sugar cane, palm oil, paper, etc)
- Community (high-eff. stove)







Napier grass Project





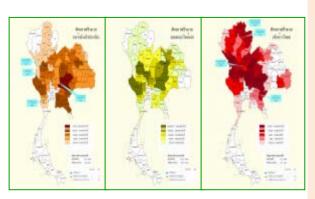
Biomass Plan under AEDP 2015

Encourage biomass utilization

- Replace fossil fuel using in local industry and in community
- Increase the utilization of unutilized biomass
- Improve the energy efficiency in agro industry (e.g. sugar mill, palm oil mill)







Promotion & Support

- Update and provide biomass potential map
- Develop biomass excellent center
- Financial support
- Develop the biomass collection and transportation system
- Conduct the correct understanding to people
- Reduce complicate permit procedures
- Solve the bottleneck problem of national grid
- Promote plantation of fast growing trees

<u>R&D</u>

- Encourage biomass transformation : pellet
- Biomass to liquid technology
- New biomass technology (e.g. hydrothermal gasification, torrefaction)





Biomass Power Plant





Thermal Power Plant

PHUKAEW BIO-ENERGY

CHAIYAPHUM PROVINCE

Technology	Thermal Power Plant				
Install Capacity	80.3 MW (Install) 45.2 MW (Sell to EGAT, PEA)				
Boiler	High Pressure Boiler 70 bar Eff. 90-92%				
Fuel	Bagasse, Rice Husk, Bark				
Generate Electricity	About 445,000,000 kWh/year				
COD	6 September 2004				



Biomass Power Plant

Thermal Power Plant

ROI ET GREEN

ROI ET PROVINCE

Technology	Thermal Power Plant
Install	9.9 MW (Install)
Capacity	8.8 MW (Sell to EGAT)
Fuel Consumption	Rice Husk 85,000 ton/year
Generated	58,600,000 kWh/year
PPA	21 year
COD	29 May 2003









Biomass Power Plant



Gasification System

SUPREME RENEWABLE ENERGY

CHIANG RAI PROVINCE

Technology	Fixed Bed Downdraft Gasification
Install Capacity	160 kW (Install) 130 kW (Sell to PEA)
Fuel	Corn Cob , Waste Wood
Generate Electricity	About 905,000 kWh/year
Gas Cleaning System	Wet Scrubber and Biomass Filter
Product	Biomass Ash (Fertilizer)
COD	18 August 2009



It is difficult to collect / transport / store.

Unpredictable the quantities of biomass.

Cost of biomass is not stable.

Cost of transport is high.

Protests by communities

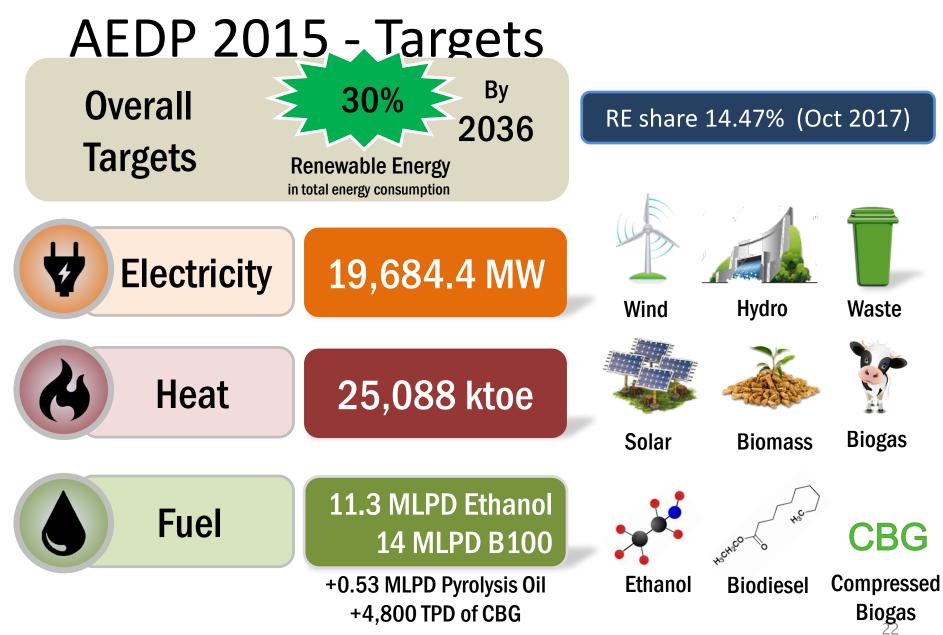


Content





Alternative Energy Development Plan





Economic

Benefit of AEDP 2015



- Decrease import energy
- Increase income from CO₂ trading



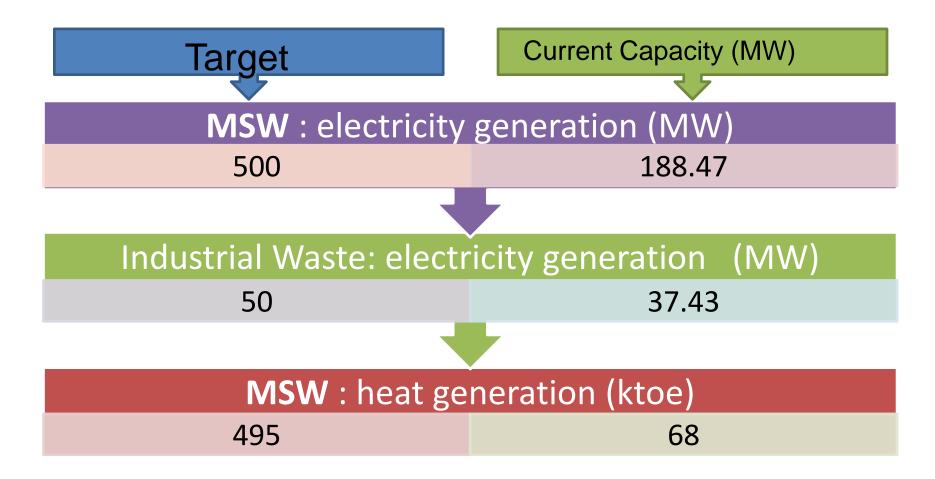
- Reduce CO2 emission
- Alleviate global worming



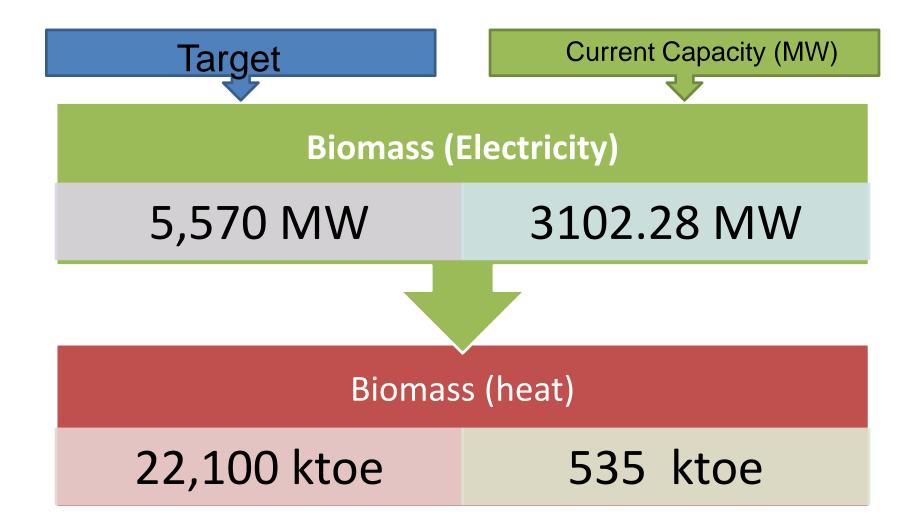
Society

- Increase employment
- Healthier society

Target & Current capacity from Waste under AEDP 2015



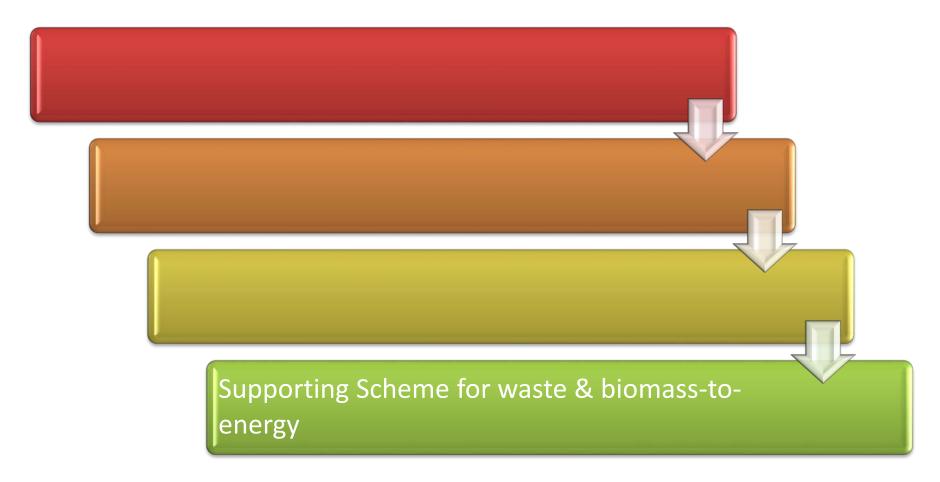
Target & Current capacity From Biomass under AEDP 2015



Data: DEDE, Nov. 2017

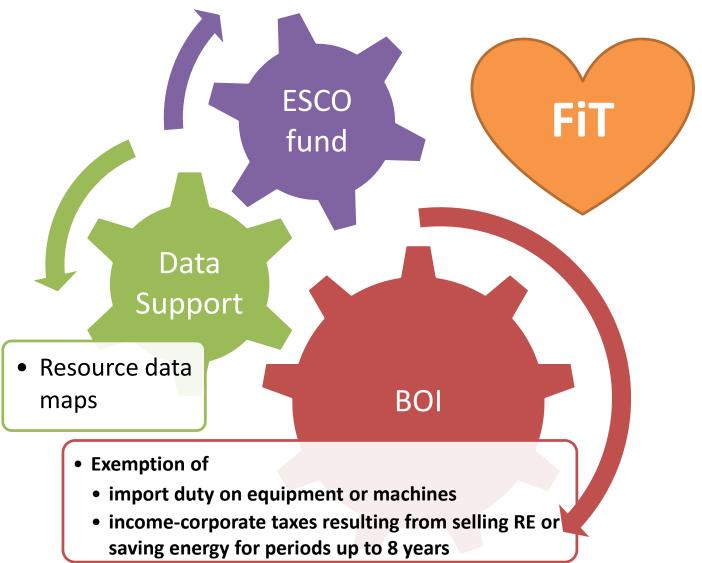


Content





Other Supporting Measures





Feed-in Tariff (FiT) for VSPP in 2015

	FiT (THB/kWh)				FiT Premium (THB/kWh)		
Installed Capacity (MW)	FiT_{E} (1) $FiT_{V,2560}$ FiT (voars)	Biobased Fuel (for the first 8 yrs)	special Southern zones ⁽²⁾ (for project lifetime)				
Waste-to-Energy							
≤ 1 MW	3.13	3.21	6.34	20	0.70	0.50	
> 1-3 MW	2.61	3.21	5.82	20	0.70	0.50	
> 3 MW	2.39	2.69	5.08	20	0.70	0.50	
Landfill organic waste	5.60	-	5.60	10	-	0.50	
Biomass							
≤ 1 MW	3.13	2.21	5.34	20	0.50	0.50	
> 1-3 MW	2.61	2.21	4.82	20	0.40	0.50	
> 3 MW	2.39	1.85	4.24	20	0.30	0.50	
Biogas from wastewater/manure	3.76	-	3.76	20	0.50	0.50	
Biogas from energy crops	2.79	2.55	5.34	20	0.50	0.50	

⁽¹⁾ FiT_V is subjected to be adjusted by core inflation

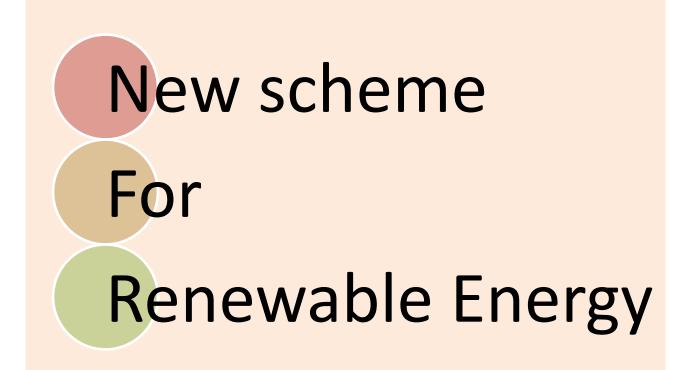
⁽²⁾ Includes 3 Southern provinces (Yala, Pattani, Narathiwas) and 4 districts in Songkhla province



FiT for Industrial waste								
FiT (Baht/kWh)				FiT Premium (Baht/kWh)				
FiT _F	FiT _{v,2560}	FiT ⁽¹⁾	Period (year)	For year 1-8	For 3 provinces in the south ⁽²⁾ (Whole period)			
3.39	2.69	6.08	20	0.70	0.50			
3.39	2.69	6.08	20	1.70	0.50			
-	FiT _F 3.39	FiT (Baht/kW FiT _F FiT _{V,2560} 3.39 2.69	FiT (Baht/kWh) FiT_F FiT_V,2560 FiT^(1) 3.39 2.69 6.08	FiT (Baht/kWh) FiT_F FiT_V,2560 FiT ⁽¹⁾ Period (year) 3.39 2.69 6.08 20	FiT (Baht/kWh) FiT Premiu FiT_F FiT_V,2560 FiT ⁽¹⁾ Period (year) For year 1-8 3.39 2.69 6.08 20 0.70			

- -7 projects have been accepted.
- PPAs 37.43 MW.
- SCOD: 31 December 2019
 - Note: (1) FiT rates will be used for projects that COD by 2017. After 2017, FiTv rates will continuously increase by core inflation.
 - (2) Projects in Yala, Pattani Naratiwat and 4 districts in Songkla; Chana, Tepa, Sabayoi, and Natawee







Power purchase programs

SPP Waste to Energy

SPP Hybrid Firm Program

VSPP Semi Firm Program

VSPP: Very Small Power Producer (less than 10 MW)

SPP: Small Power Producer (10-50 MW)

FiT for SPP project						
		Period				
Capacity (MW)	FiT _F	FiT _{v,2560}	FiT	(year)		
> 10 - 50 MW	1.81	1.85	3.66	20		

- Projects have to be approved by cabinet or Ministry of Interior.
- Contract of waste disposal with the municipalities
- Non-firm contract
- No competitive bidding
- Locate on municipality land area
- SCOD within 2020

FiT for SPP Hybrid Firm

MINISTRY OF ENERGY

Consider the initial cost of mixing various sources of RE (Hybrid)

	Fi	Period					
Installed capacity(MW)	FiT _F	FIT _F FIT _{V,2560} FIT ⁽¹⁾		(years)			
SPP Hybrid Firm							
Installed capacity >10-50 MW	1.81	1.85	3.66	20 years			

Note FiT rates will be applied for projects that COD within 2017. After that, FiTy rates will continuously increase by core inflation.

- All kinds of fuel types : Mix-sources (Hybrid) \geq 1 type(s)
- Contracted capacity: <10 50 MW ۲
- Firm all year (Peak 100% and Off-peak 65%) •
- Installation of Energy Storage System is allowed. •
- SCOD 2020-2021
- competitive bidding •
- Target: 300 MW



Department of Alternative Energy Development and Efficiency

MINISTRY OF ENERGY

FiT Rate for VSPP semi-firm

	FiT (THB/kWh)				FiT Premium (THB/kWh)					
Installed Capacity (MW)	FiT _F	FiT _{v,2560}	FiT ⁽¹⁾	Period (years)	Firm period not exceeding 6 months (<u>project</u> <u>lifetime</u>)	Projects in the southern border provinces ⁽²⁾ (<u>project</u> <u>lifetime</u>)				
1) Biomass	1) Biomass									
- Installed Capacity \leq 3 MW	2.61	2.21	4.82	20 years	0.40	0.50				
- Installed Capacity > 3 MW	2.39	1.85	4.24	20 years	0.30	0.50				
2) Biogas (sewage/waste)	3.76	-	3.76	20 years	0.50	0.50				
3) Biogas (energy crops)	2.79	2.55	5.34	20 years	0.50	0.50				

Note

 (1) FiT rates will be used for projects that COD within 2017. After 2017,
 FiT_v rates will continuously increase by core inflation.
 (2) Projects in province Yala, Pattani, Narathiwat and 4 districts in Songkhla, i.e. Chana, Tepa, Saba Yoi and Nathawee District

- Type: biomass or biogas (sewage/waste) or biogas (energy crops)
- Only 1 type of energy source; Installation of Energy Storage System is allowed.
- Contracted capacity: < 10 MW
- Firm (Peak 100% and Off-peak 65%) for 6 months (Covering Mar-Jun) Other 6 months are Non-firm.
- FiT rates by each type of fuel with competitive bidding
- FiT Premium only for Firm-duration
- Target: 269 MW

