

Feed in Tariffs

The Thai Government Approach to Investing in Renewable Energy

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Renewable Energy Target

Ministry of Energy target for RE was
20% in 15 years

Now its 25% in 10 years (current
installed capacity = 32.5 GW)



How to Achieve?



Government Incentives to Developers



Government Assistance/Incentives

- Technical Assistance
 - Providing knowledge, technology etc.
- Rules and Regulations
 - Example of replacement LFGE project in Green Belt
- Financial
 - Feed in Tariff



Feed in Tariff (Adder)

- RE project have a higher cost of production than fossil fuel projects
- Required to assist in offsetting financial cost of developing RE projects
- Decrease the risk in developing RE projects
 - Uncertainty of fuel supply (weather/seasonality/availability/cost)



Cost of Energy Production

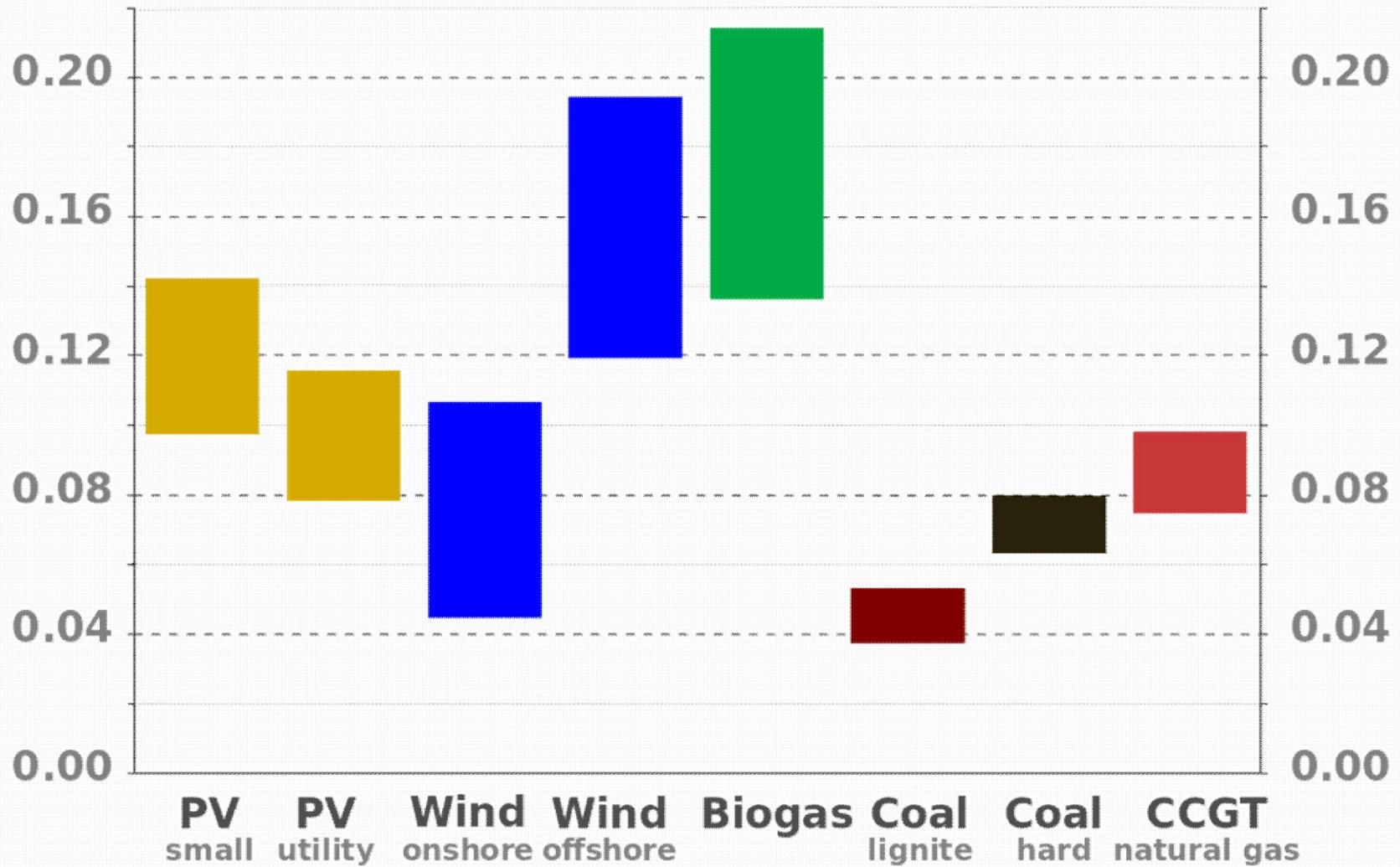
Power Plant Type	Cost \$/MW-hr
Coal	\$100-140
Natural Gas	\$70-130
Nuclear	\$100
Wind	\$80-200
Solar PV	\$130
Solar Thermal	\$240
Geothermal	\$50
Biomass	\$100
Hydro	\$80

<http://www.renewable-energysources.com/>



Levelized Cost of Electricity in € per kWh

Source: Fraunhofer ISE, Germany November 2013



Estimated Cost of New Generation Resources, 2019

Plant Type	U.S. Average Cost for Plants Entering Service in 2019 (2012 USD/MWh)				
	Capital Cost	Fixed O&M	O&M (including fuel)	Transmission Investment	Total System Cost
Conventional Coal	60.0	4.2	30.3	1.2	95.6
Integrated Coal-Gassification Combined Cycle (IGCC)	76.1	6.9	31.7	1.2	115.9
IGCC with CCS	97.8	9.8	38.6	1.2	147.4
Natural Gas Fired					
NG: Conventional Combined Cycle	14.3	1.7	49.1	1.2	66.3
NG: Advanced Combustion Turbine	27.3	2.7	70.3	3.4	103.8
Advanced Nuclear	71.4	11.8	11.8	1.1	96.1
Geothermal	34.2	12.2	0.0	1.4	47.9
Biomass	47.4	14.5	39.5	1.2	102.6
Wind	64.1	13.0	0.0	3.2	80.3
Wind - Offshore	175.4	22.8	0.0	5.8	204.1
Solar PV	114.5	11.4	0.0	4.1	130.0
Solar Thermal	195.0	42.1	0.0	6.0	243.1
Hydro	72.0	4.1	6.4	2.0	84.5

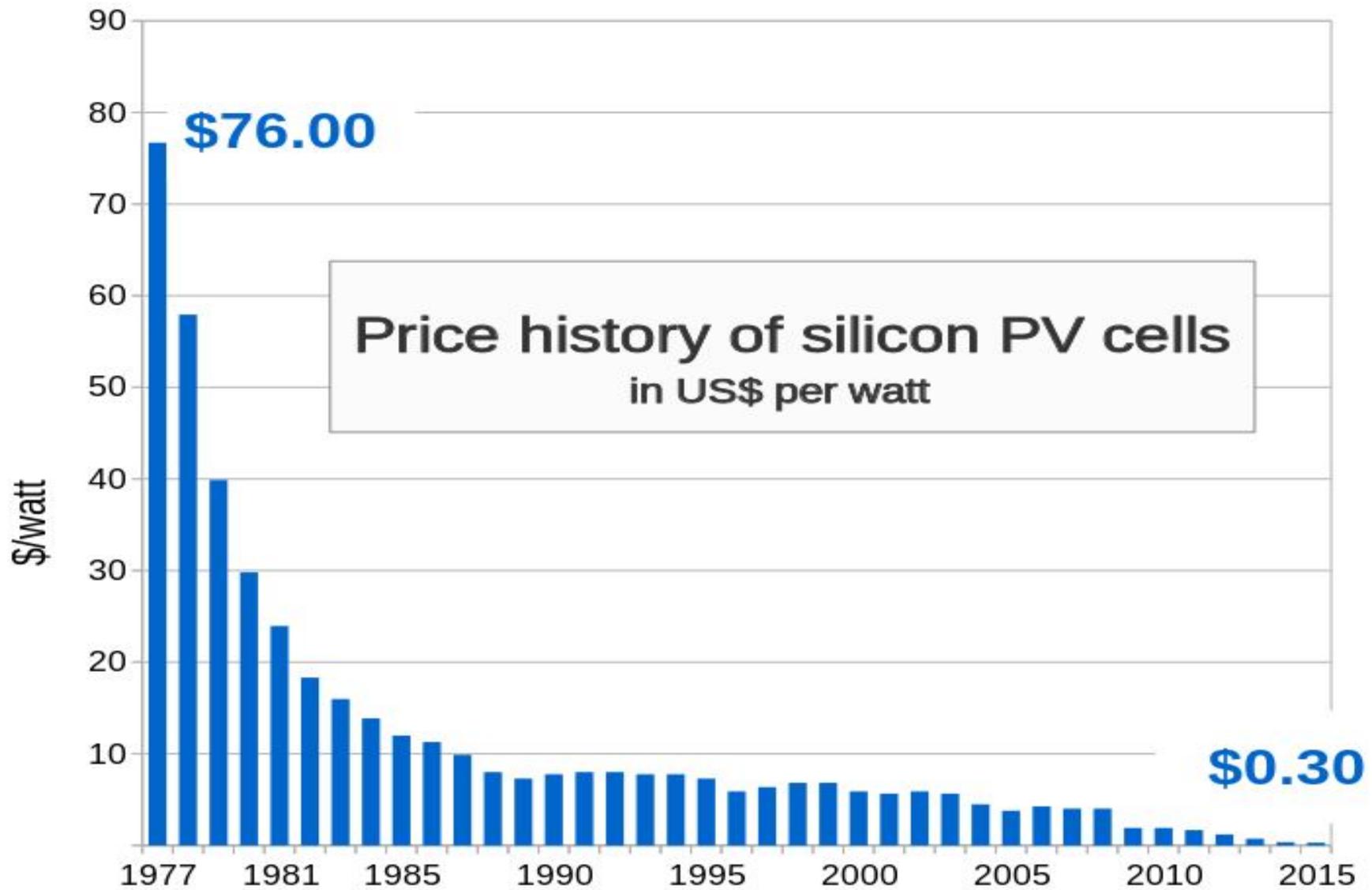


Renewable Energy vs. Conventional Energy Production Cost (USD)/MWH

Conventional		Renewable Energy	
– Mean	107	– Mean	152
– Min	66.3	– Min	80.3
– Max	147	– Max	243.1
		• Not include Geothermal or Hydro	

U.S. Average Cost for Plants Entering Service in 2019 (2012 USD/MWh)





Source: Bloomberg New Energy Finance & pv.energytrend.com



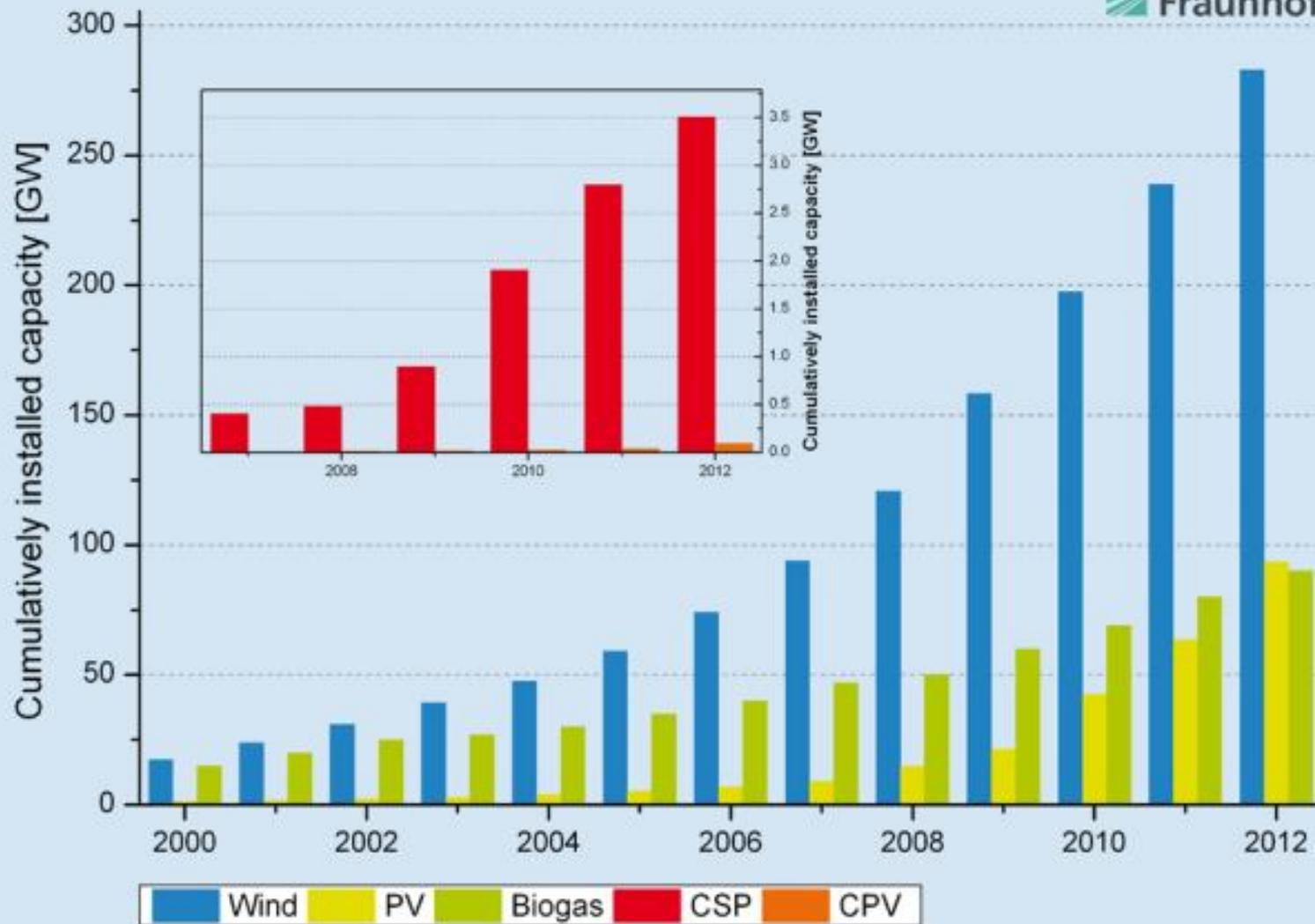


Figure 5: Global cumulatively installed capacity 2000-2012 of PV, CSP, wind power and CPV according to Fraunhofer ISE, GWEC 2013, Sarasin 2011, EPIA 2013.



Feed in Tariff (Adder)

Two types

1. Fixed

- fixed rate (payment) for x number of years

2. Premium

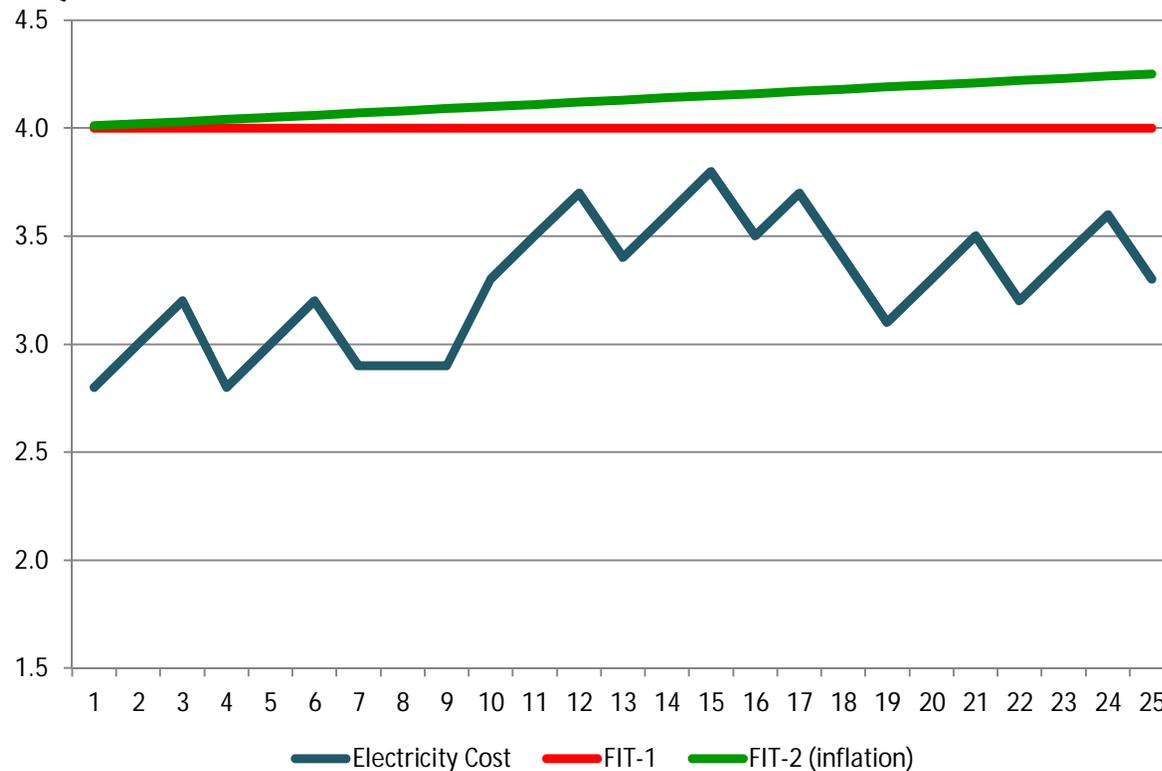
- Addition to the standard electricity rate
- Thailand began FIT subsidy in 2007



Feed in Tariff (Adder)

Fixed

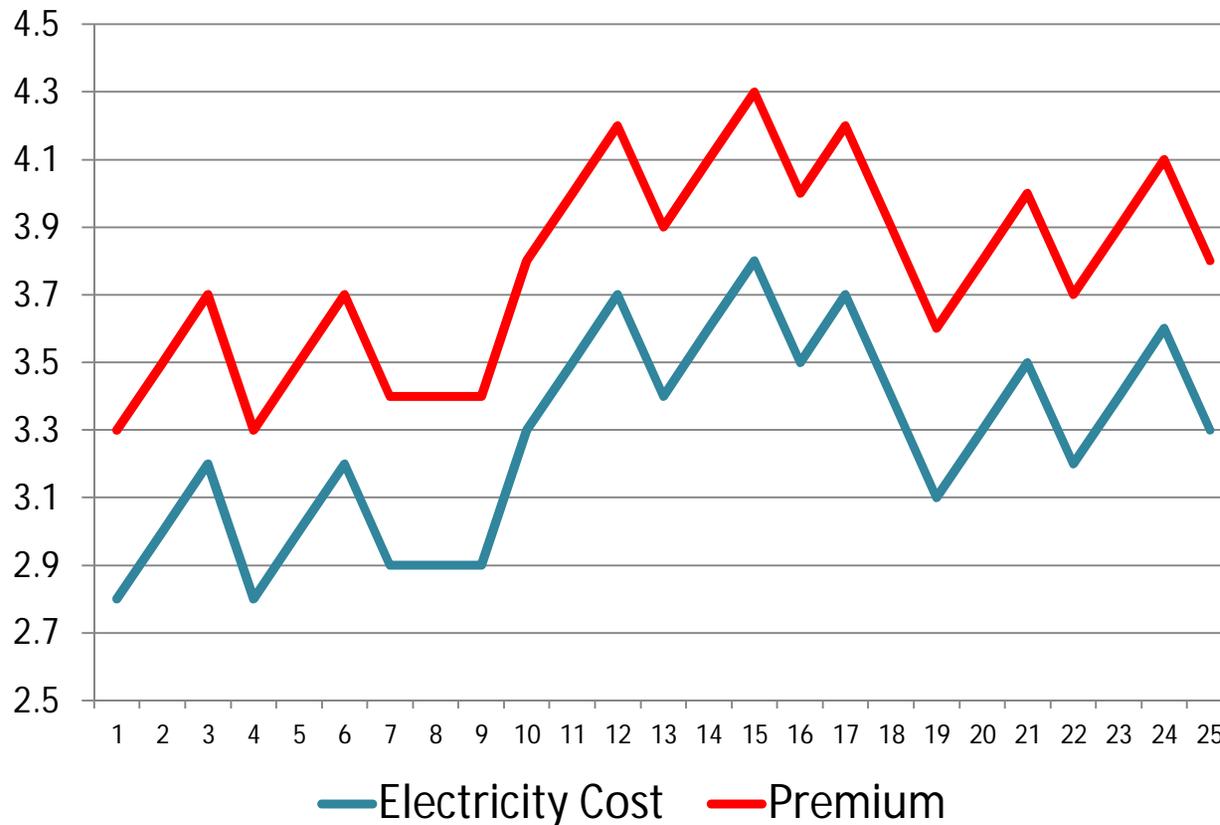
- Constant rate (may be varied according to inflation)



Feed in Tariff (Adder)

Premium

- Constant premium value over commercial rate





Thailand: New support for community-based biogas

“Distributed Green Generation for Community Enterprises“ programme published from energy crops. On February 4, 2013, a new support programme named “Distributed Green Generation for Community Enterprises” was passed by the National

With the new policy, a FIT of 4.5 Baht (11.24 €Cent) per kWh is granted to systems smaller than 1 MW in size. The FIT will be granted for the duration of 20 years and is expected to trigger great interest by investors. Before the announcement, biogas systems benefitted from the

The programme will also award a subsidy of 20% of the investment cost (not more than 20 million Baht (499,372 €) per project) to the first 10-12 biogas plants that will be chosen by the Ministry of Energy. The



Thailand's National Energy Policy Commission (NEPC) instituted a policy to help meet the country's goal for solar energy to 3 GW (2013)

Thailand PV Program 2013

- 100 MW (less than 10 kW size)-roof top
- 100 MW in 10 -250 kW and 250-1 MW
- 800 MW of ground mounted community system @ 1 MW/tambon

FIT

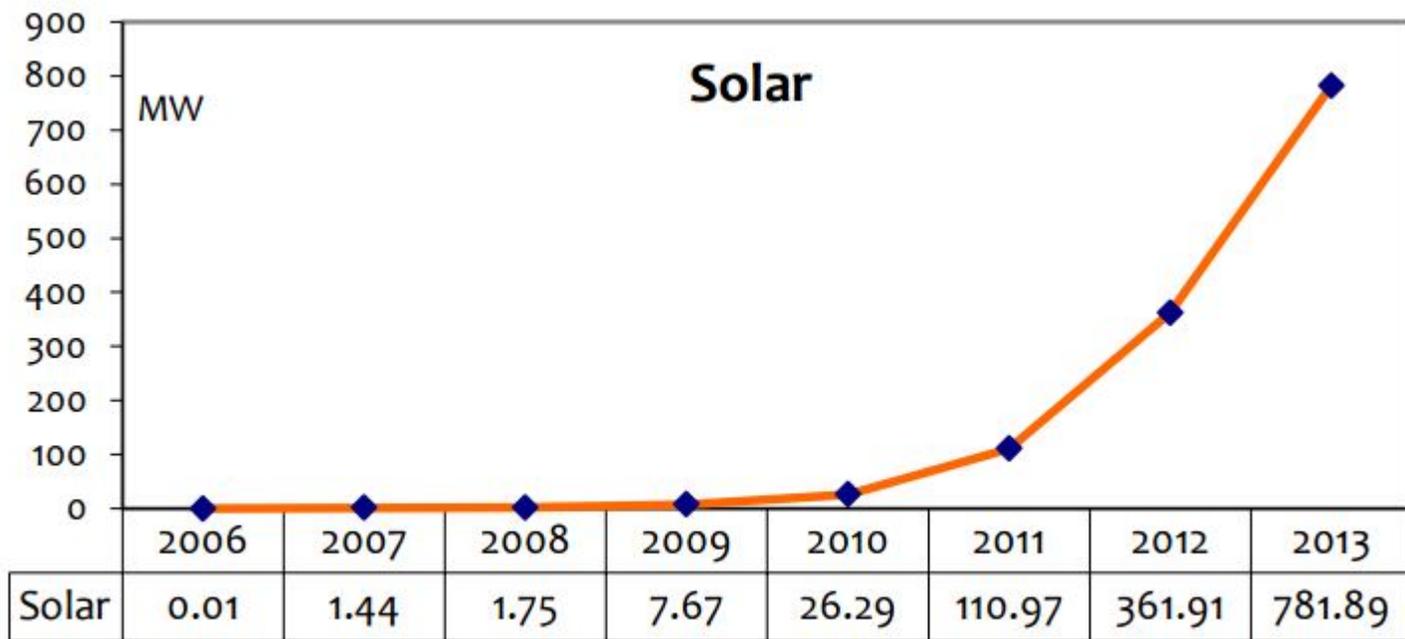
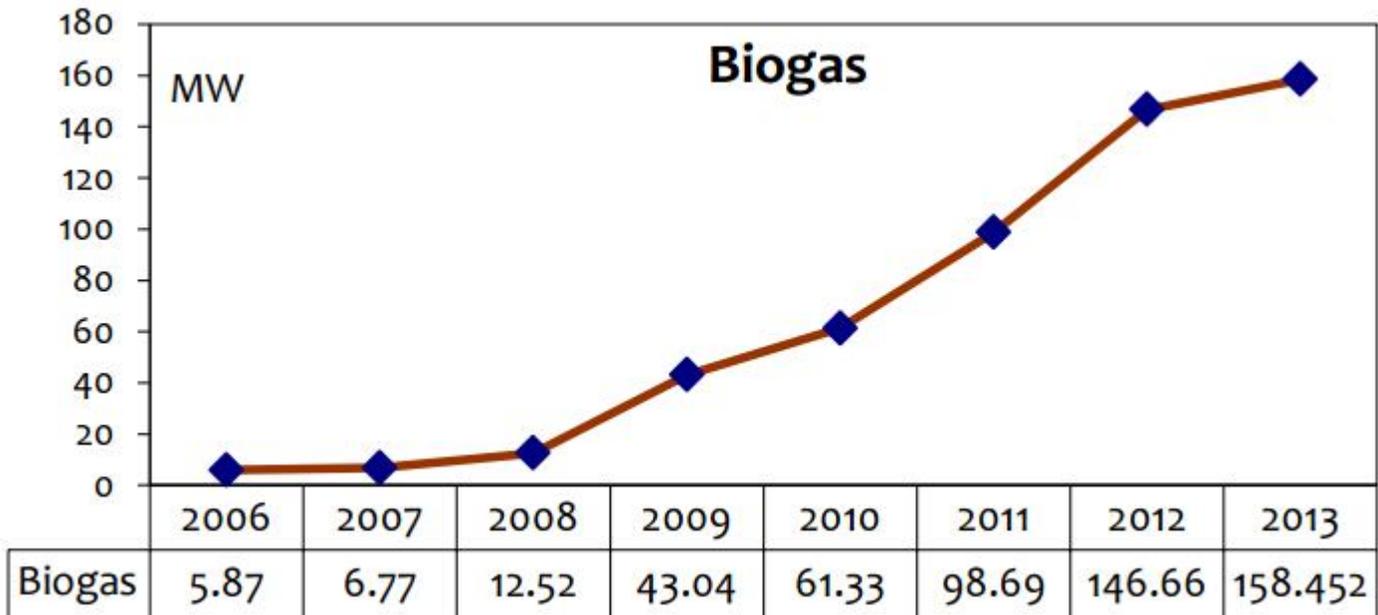
- <10 kW = 6.69 Bt/kwh for 25 years
- 10-250 kW = 6.55 Bt/kwh for 25 years
- 250kw-1 MW = 6.16 Bt/kwh for 25 yr
- community system
 - 9.75 Bt/kwh for yr 1-3
 - 6.5 Bt/kwh for yr 4-10
 - 4.5 Bt/kwh for yr 11-25

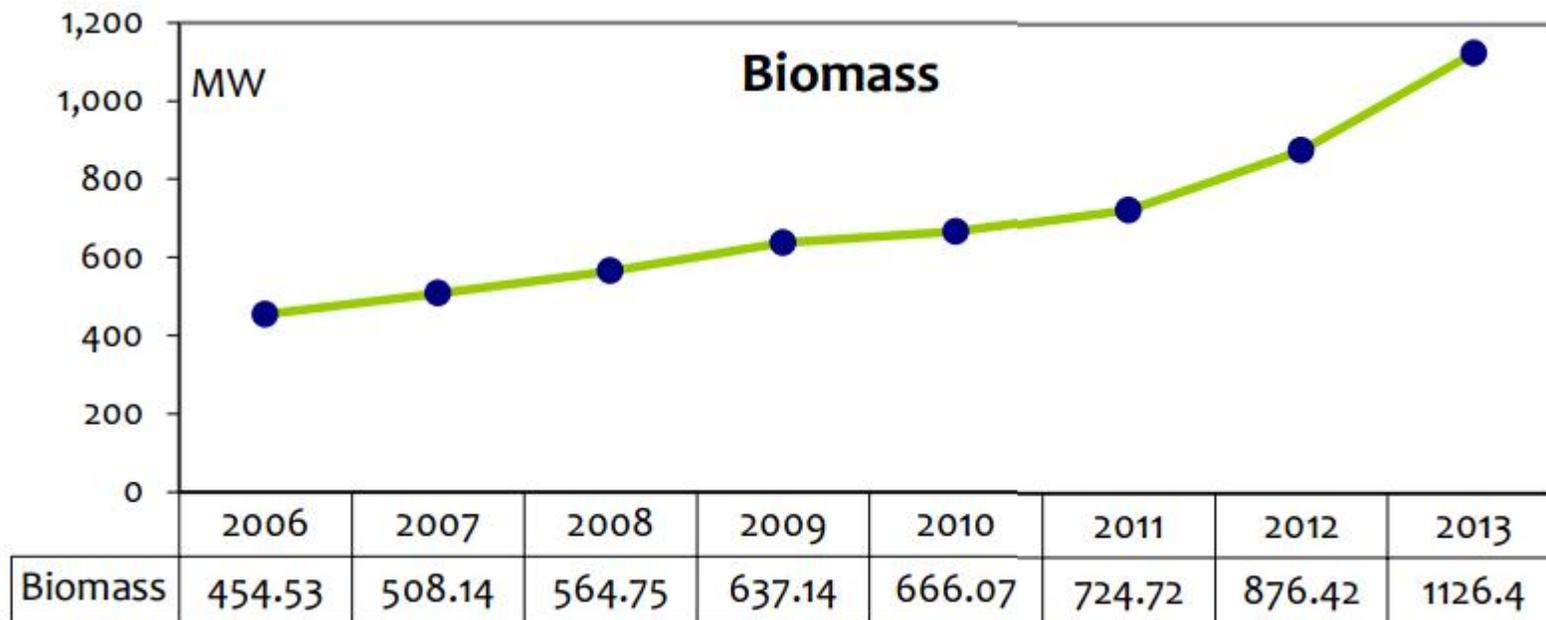
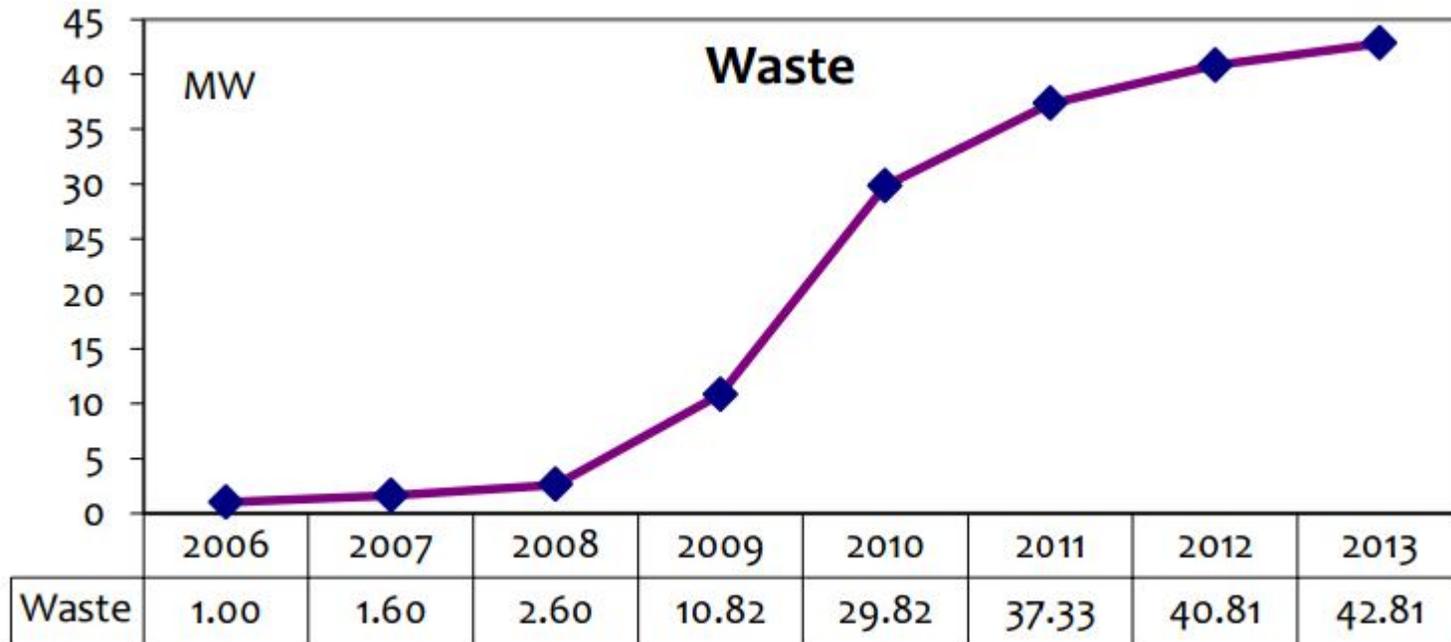


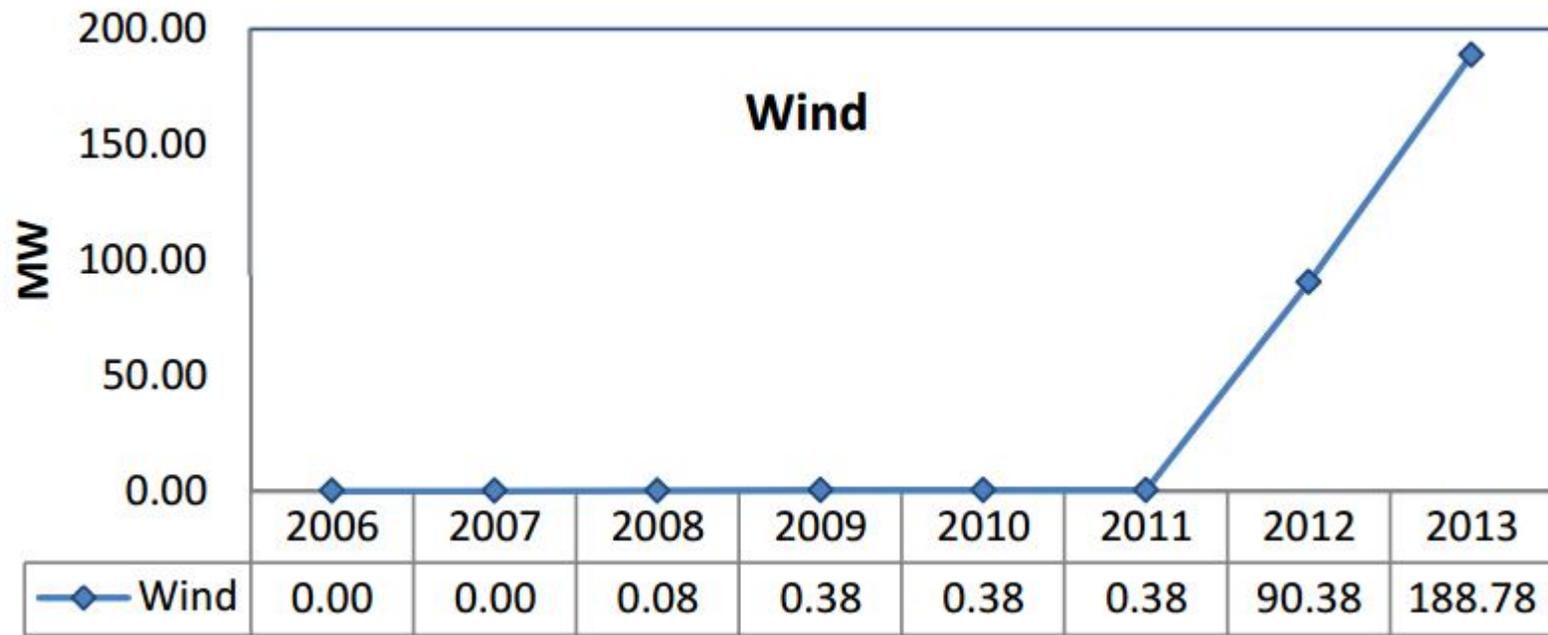
Thailand FIT Adder

Type	Size	Adder (Bt/kwh)	Years
Biomass	≤1MW	0.5	7
	>1MW	0.3	7
Biogas	≤1MW	0.5	7
	>1MW	0.3	7
Waste-LFG	all	2.5	7
Waste-thermal	all	3.5	7
Wind	≤ 50kW	4.5	10
	>50kW	3.5	10
Solar power	all	6.5	10
Green energy project (biogas from Napier gas)		4.5	20
Solar PV rooftop	10-250 kW		
Solar Community	1 MW	9.75 (year 1-3)	25
		6.5 (year 4-10)	
		4.5 (year 11-25)	









Alternative Energy Goals (MW)

Type	AEDP Goal (2022)	REP Goal (2021)	2013
Solar	3,000	500	782
Wind	1,800	800	189
Hydro	324	324	13
Biomass	4,800	3,700	1,126
Biogas	3,600	120	159
MSW	400	160	43
Hydrogen	1	3.5	?
Geothermal	1	-	?
Tidal	1	-	?
Total	13,927	5,607	2,312



Electricity Purchased by PEA/MEA (GWHr)

Type	2008	2009	2011	2012	2013
Biomass	911	928	1,334	1,744	2,149
Solar	8.17	19.4	7.1	320	1,017
Biogas	46.3	122	185	262	321
MSW	19.9	53.1	121	160	252
Small hydro	0.11	0.34	0.53	4.7	8.3
Wind	0.07	0.1	0.08	0.01	3.4

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Conclusions

- FIT has stimulated investment in renewable energy
- Disparity between conventional and renewable energy costs is decreasing
- FIT will not be needed in the future for some forms of renewable energy (solar and wind)

solar PV and wind energy both fall within the range of \$68-\$104 per MWh, making them competitive with baseload power from coal (\$65-\$145 per MWh), nuclear (\$86-\$122 per MWh), and integrated gasification combined cycle (\$95-\$154 per MWh)

Source <http://cleantechnica.com/2013/09/11/analysis-50-reduction-in-cost-of-renewable-energy-since-2008>

