

Competitive Biddings Renewable Energy Projects in Thailand

SPP Hybrid-Firm

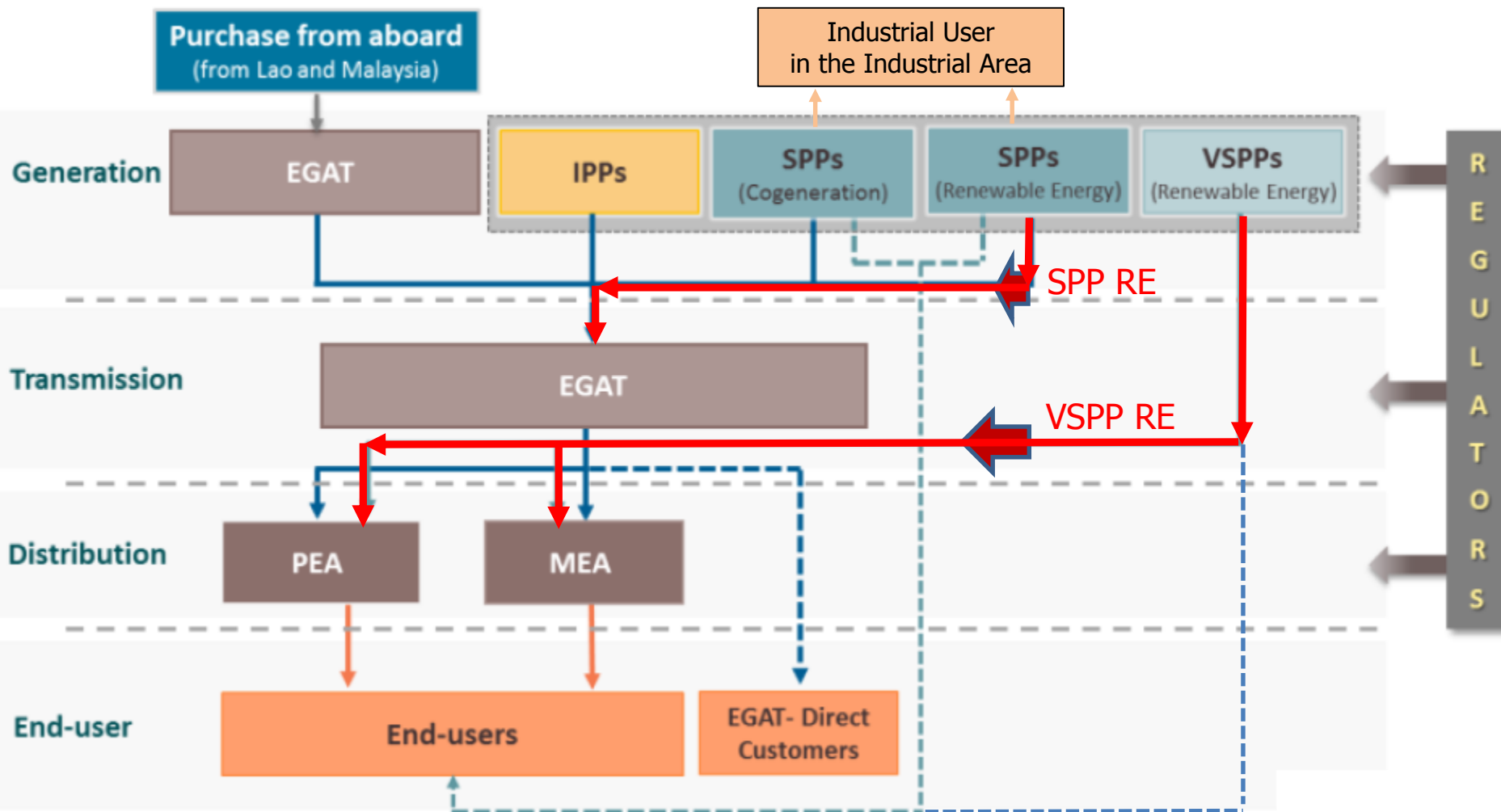
Asian Clean Energy Forum 2018 Manila, Philippines

June 8th, 2018
Khomgrich Tantravanich
Deputy Secretary General
The Office of the Energy Regulatory Commission, Thailand

- Backgrounds
 - Electricity Supply Industry Structure
 - RE Road Map (AEDP)
- RE Supports
 - Supportive Measure to RE Project
 - First-come, first-served to Competitive Bidding
- VSPP Bidding (Biogas, Biomass) - Non firm
- SPP Bidding Hybrid - Firm
 - Preparation for SPP Hybrid Firm
 - Bidding Results
 - Lesson Learn

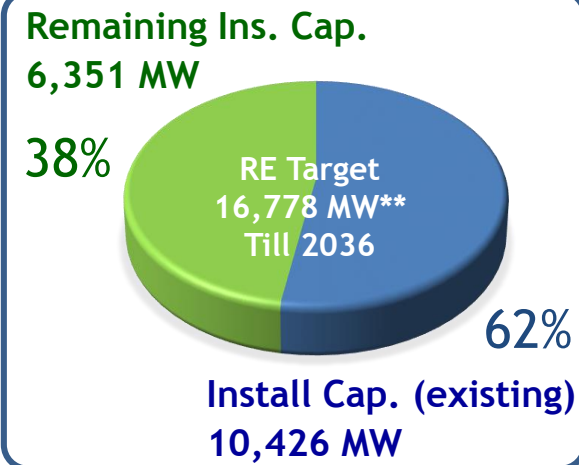
- Backgrounds
 - Electricity Supply Industry Structure
 - RE Road Map (AEDP)
- RE Supports
 - Supportive Measure to RE Project
 - First-come, first-served to Competitive Bidding
- VSPP Bidding (Biogas, Biomass) - Non firm
- SPP Bidding Hybrid - Firm
 - Preparation for SPP Hybrid Firm
 - Bidding Results
 - Lesson Learn

Thailand's Electricity Supply Industry Structure

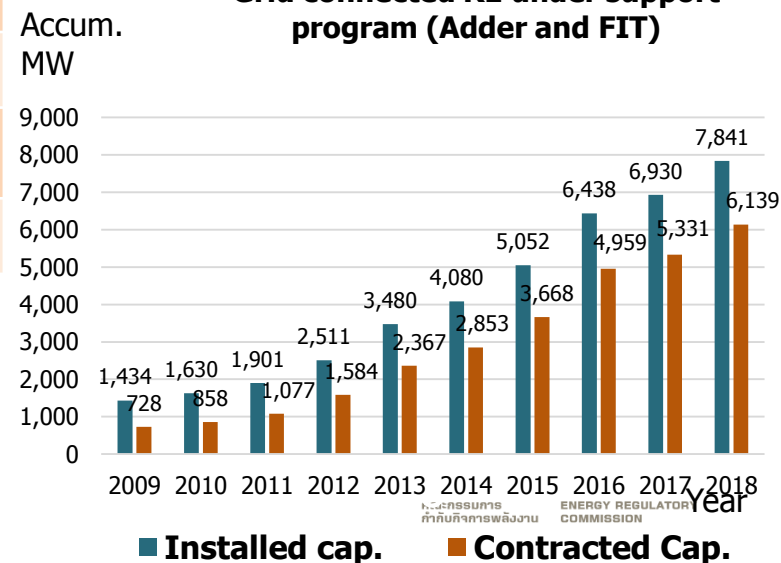


RE Target under AEDP 2015 and Current Status

Status as of February 2018



Grid connected RE under support program (Adder and FIT)

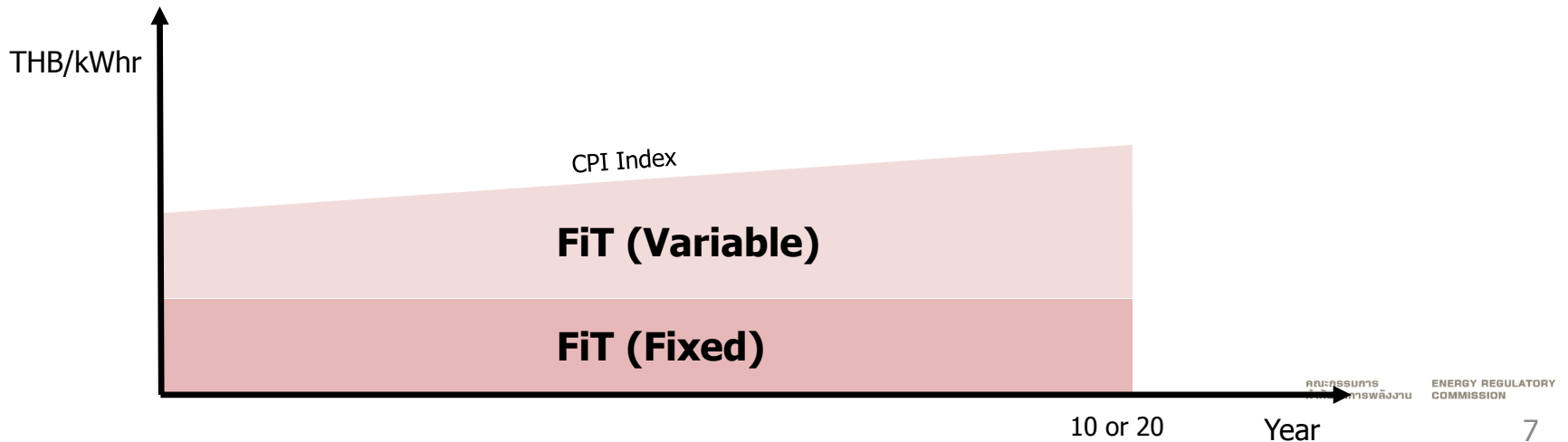
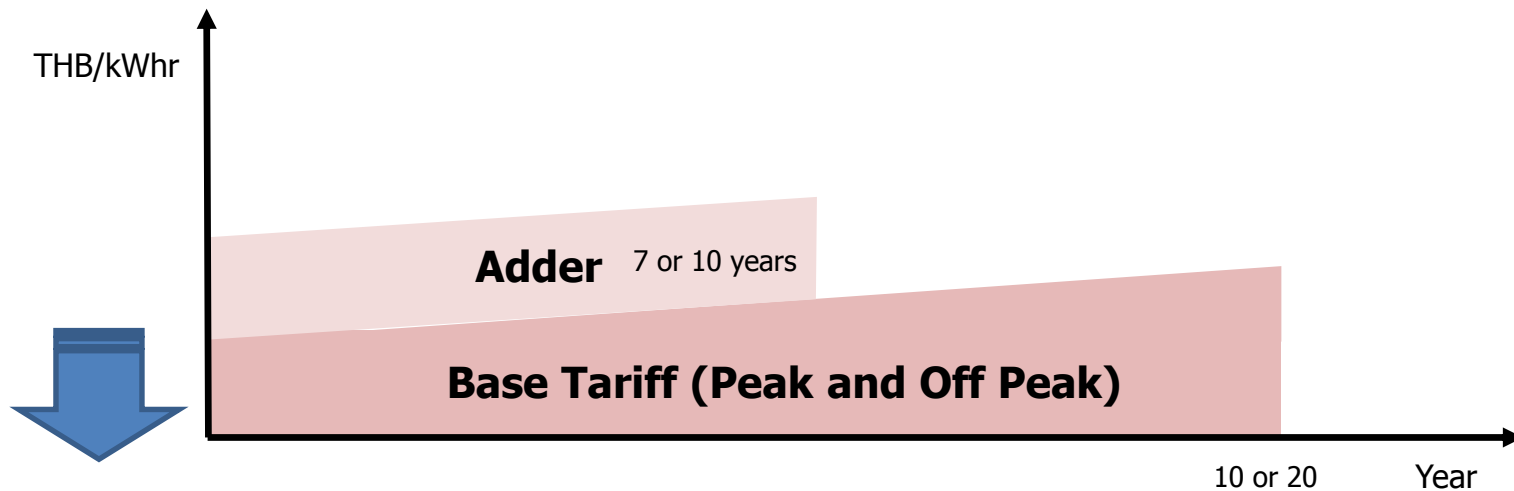


Type	Existing (to Grid)	Target (MW)*	IPS	Remaining (MW)
Waste-to-Energy	399	550	-	151
- MSW	361	500		139
- Industrial	38	50		13
Biomass	4,045	5,570	581	944
Biogas	455	1,280	48	777
- Waste		600		
- Energy Crop		680		
Mini Hydro	91	376	-	285
Wind	1,522	3,002	-	1,480
Solar	3,245	6,000	40	2,715
Total	9,757	16,778	669	6,351

- Backgrounds
 - Electricity Supply Industry Structure
 - RE Road Map (AEDP)
- RE Supports
 - Supportive Measure to RE Project
 - First-come, first-served to Competitive Bidding
- VSPP Bidding (Biogas, Biomass) - Non firm
- SPP Bidding Hybrid - Firm
 - Preparation for SPP Hybrid Firm
 - Bidding Results
 - Lesson Learn

Supportive measure to RE projects

From Adder to Fit



Supportive measure to RE projects

From Adder to FiT

FX: 33 THB/USD

Adder

Type/ Installed cap.	Adder (2007-2009) (US Cents/kWh)	Adder (2010-2014) (US Cents/kWh)	Additional for Diesel Substitution (US Cents/kWh)	Additional for RE generators in the most 3 southern provinces (US Cents/kWh)	Period (Years)
1. Biomass					
Installed Cap. <= 1 MW	0.91	1.52	3.03	3.03	7
Installed Cap. > 1 MW	0.91	0.91	3.03	3.03	7
2. Biogas (all sources)					
Installed Cap. <= 1 MW	0.91	1.52	3.03	3.03	7
Installed Cap. > 1 MW	0.91	0.91	3.03	3.03	7
3. Waste (MSW and non-toxic industrial waste)					
Fertilizer/Landfill	7.6	7.6	3.03	3.03	7
Thermal Process	7.6	10.6	3.03	3.03	7
4. Wind					
Installed Cap. <= 50 kW	10.61	13.64	4.55	4.55	10
Installed Cap. > 50 kW	10.61	10.61	4.55	4.55	10
5. Hydro (Mini/Micro Hydro)					
Installed Cap. 50 kW - <200 kW	1.21	2.42	3.03	3.03	7
Installed Cap. <50 kW	2.42	4.55	3.03	3.03	7
6. Solar					
	24.24	19.70	3.03-4.55	3.03-4.55	10

FiT

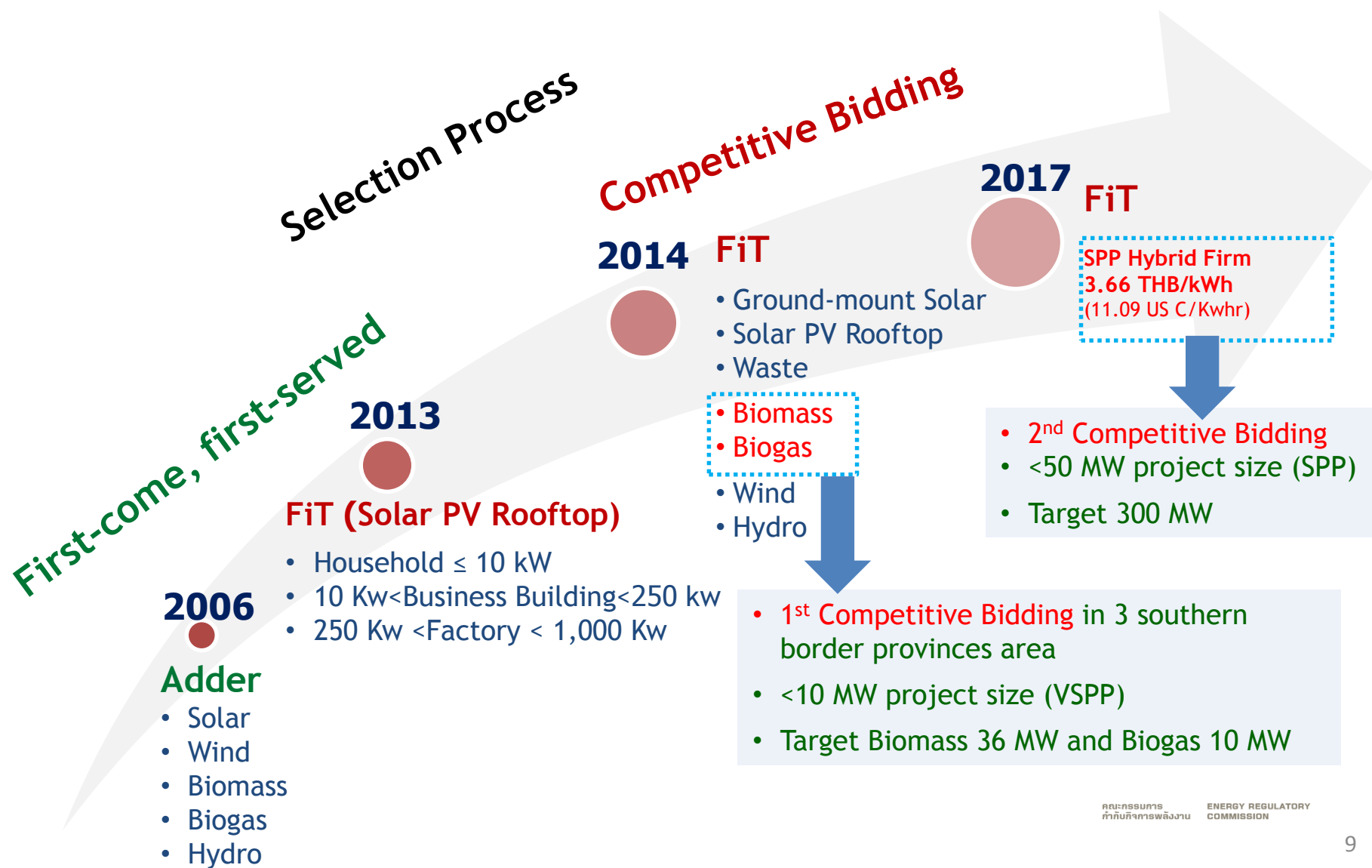
Type/ Installed cap.	FiT (US Cents/kWh)			Period (Years)	FiT _{Premium} (US Cents/kWh)	
	FiT _F	FiT _{V, 2017}	FiT ⁽¹⁾		Bio Project (for the 1 st 8 years)	Located in the most 3 southern provinces
1) Integrated Solid Waste Management						
Installed cap. ≤ 1 MW	9.48	9.73	19.21	20	2.12	1.52
Installed cap. > 1-3 MW	7.91	9.73	17.64	20	2.12	1.52
Installed cap. > 3 MW	7.24	8.15	15.39	20	2.12	1.52
2) Landfill Waste	16.97	-	16.97	10	-	1.52
3) Biomass						
Installed cap. ≤ 1 MW	9.48	6.70	16.18	20	1.52	1.52
Installed cap. > 1-3 MW	7.91	6.70	14.61	20	1.21	1.52
Installed cap. > 3 MW	7.24	5.61	12.85	20	0.91	1.52
4) Biogas (Liquid/Solid waste)	11.39	-	11.39	20	1.52	1.52
5) Biogas (Energy crop)	8.45	7.73	16.18	20	1.52	1.52
6) Hydro						
Installed cap. ≤ 200 kW	14.85	-	14.85	20	-	1.52
7) Wind	18.36	-	18.36	20	-	1.52

Remarks: ⁽¹⁾ FIT_V will be annually adjusted by core inflation after 2017

8) Solar

8.1) Solar Roof (2013)		Install Cap.	FIT (US C/Kwhr)
(1)	Residence	<10 kW _p	21.6
(2)	Small Commercial Bldg.	>10 < 250 kW _p	19.8
(3)	Large Commercial Bldg.	> 250 -1,000 kW _p	18.6
8.2) Solar farm		FIT (US C/Kwhr)	
(1)	2015		16.9
(2)	2017		12.4

Supportive measure to RE projects



- ENERGY REGULATORY

1st FiT Bidding

in 3 southern border provinces area



Biogas
(liquid/solid waste)

5.95 MW
awarded

Rank	MW	% discount	Year 1 - 8	Year 9 - 20
1	3.00	23.33	11.76	10.24
2	2.00	10.25	13.24	11.73
3	0.95	10.05	13.27	11.76

Avg. bid price

12.76

11.24

US cents /kWh

Biogas **10 MW**
(liquid/solid waste)

Biomass **36 MW**

FiT (Ceiling price)

Year 1-8

Year 9-20

14.42

12.91

15.27

14.36

US cents /kWh

FX: 33 THB/USD

1.67 US cents/kWh
lower than
ceiling price



Biomass

36 MW
awarded

Rank	MW	% discount	Year 1 - 8	Year 9 - 20
1	9.90	81.17	9.39	8.48
2	9.90	81.17	9.39	8.48
3	9.90	77.19	9.70	8.79
4	6.30	67.78	10.36	9.45

Avg. bid price

9.70

8.79

US cents /kWh

5.57 US Cents/kWh
lower than
ceiling price



Remarks: Biomass FiTv will be annually adjusted by core inflation

- Backgrounds
 - Electricity Supply Industry Structure
 - RE Road Map (AEDP)
- RE Supports
 - Supportive Measure to RE Project
 - First-come, first-served to Competitive Bidding
- VSPP Bidding (Biogas, Biomass) - Non firm
- SPP Bidding Hybrid - Firm
 - Preparation for SPP Hybrid Firm
 - Bidding Results
 - Lesson Learn

"SPP Hybrid Firm 2017" Policy Conditions

1 Tariff Ceiling:

Installed capacity (MW)	FiT (US Cents /kWh)			Period
	FiT _F	FiT _{V,2017}	Total FiT	
>10 MW up to 50 MW	5.48	5.61	11.09	20 years

Remark: FiT_{V,2017} will be annually adjusted by core inflation after 2017

Networks congestion: SPP to follow Grid Code and Network availability

2 Target 300 MW in total: Regional quotas

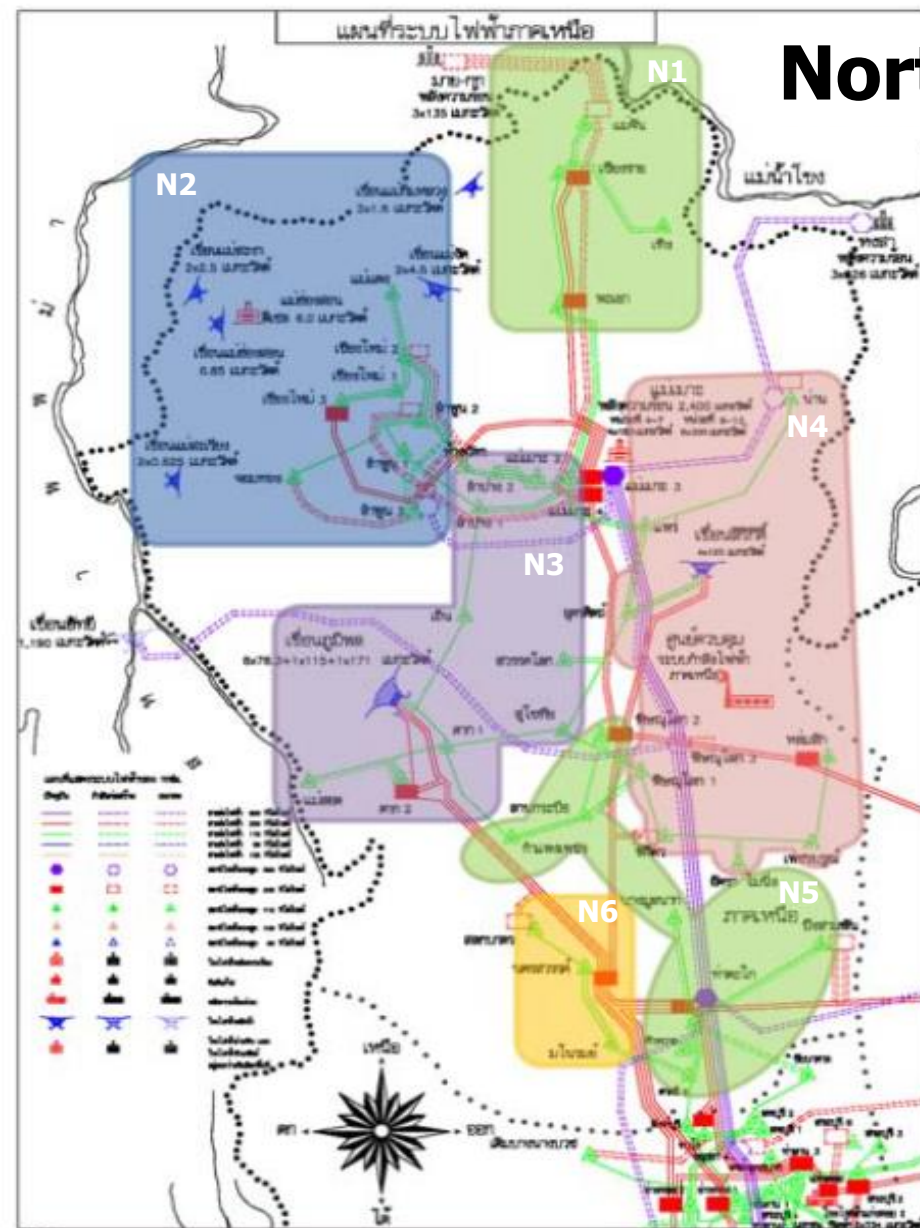
3 Selection: Price competitive (Bidding)

4 Specific Conditions for SPP Hybrid Firm 2017

- "Firm Operation" with penalty
- "Hybrid" for any type of RE with UMM
- "ESS" can be installed to support "Firm"
- "New generation"
- Fossil fuel allowed only for starting up
- 20% of Biomass supply required for energy crop plantation
- SCOD : 2020 -2021 upon TL Plan



North Area (Example)



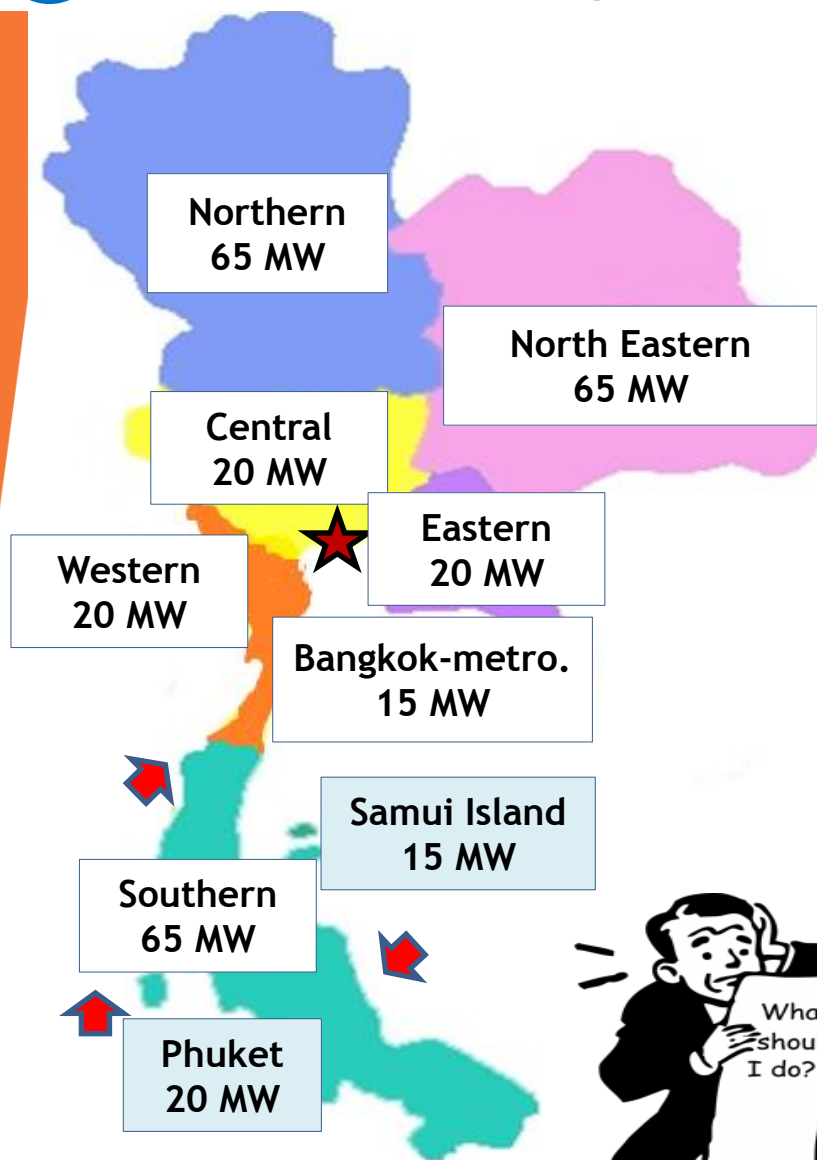
ข้อมูลศักยภาพระบบไฟฟ้าของ กฟผ. ณ ปี 2563 (รายการ) ณ วันที่ 13 กรกฎาคม 2560

(ในส่วนของการไฟฟ้าส่วนภูมิภาค)

ข้อมูลการรับซื้อ VSP ณ วันที่ 1 มิถุนายน 2560

ภาค	โซน	ศักยภาพ (MW)	สฟ. (ย่อ)	รายชื่อสถานีไฟฟ้าแรงสูงของ กฟผ.		กำลังผลิตติดตั้งสูงสุด (MW)
NORTH 257.64	N2	59.49	CM1	CHIANG MAI 1	เชียงใหม่ 1	150.0
			CM2	CHIANG MAI 2	เชียงใหม่ 2	150.0
			CM3	CHIANG MAI 3	เชียงใหม่ 3	150.0
			CTG	CHOM THONG	จอมทอง	150.0
			LN1	LAMPHUN 1	ลำพูน 1	150.0
			LN2	LAMPHUN 2	ลำพูน 2	150.0
			MTG	MAE TAENG	แม่แตง	150.0
	N3	13.29	LP1	LAMPANG 1	ลำปาง 1	150.0
			LP2	LAMPANG 2	ลำปาง 2	150.0
			MS	MAE SOT	แม่สอ	150.0
			SL	SAWANKHALOK	สวรรคโลก	150.0
			ST	SUKHOTHAI	สุโขทัย	150.0
			TA1	TAK 1	ตาก 1	150.0
			TE	THOEN	เถิน	150.0
	N4	111.36	LS	LOM SAK	หล่มสัก	150.0
			NA	NAN	น่าน	150.0
			PC	PHICHIT	พิจิตร	150.0
			PE	PHETCHABUN	เพชรบูรณ์	150.0
			PL1	PHITSANULOK 1	พิษณุโลก 1	150.0
			PR	PHRAE	แพร่	150.0
			UT	UTTARADIT	อุตรดิตถ์	150.0
	N5	60.19	BMN	BANG MUN NAK	บางมูลนาก	150.0
			KP	KAMPHAENG PHET	กำแพงเพชร	150.0
			LKB	LANKRABUE	ลำนคราบี	150.0
			TK2	TAKHLI 2	ตากสิน 2	150.0
			TTK	THA TAKO	ท่าตะโก	58.7
	N6	13.31	MR	MANOROM	มนารมย์	150.0
			NS	NAKHON SAWAN	นครสวรรค์	150.0
			SLB	SALOKBAT	สลกบาตร	150.0

2 Determine Regional Quotas



Policy : Quantity by 9 regions

- Firstly if the capacity in “Phuket” and “Samui” (2 provinces in South) not meet their target, the remaining will be given to “South”
- Secondly if the capacity in any regions not meet their target, the remaining will be accumulated and given to any regions under conditions “lower bidding price & Grid capacity”
- This won't be greater than 300 MW

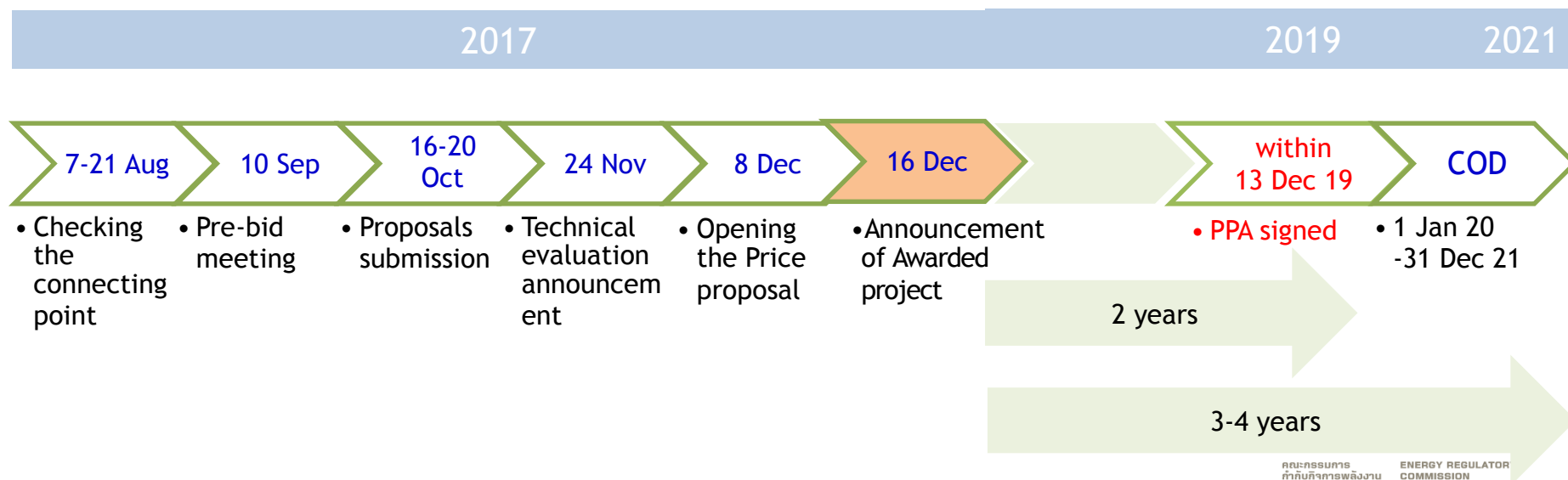


**It's kind of complicated !!
BUT to meet the 300 MW target**



3 Determine Selection Process

ERC Procurement Process



3 Determine Selection Process

Submission

General Conditions

Evaluation Process

Sealed Technical Proposal

not-pass

Not qualified

Basic Conditions

- Land right
- Technology
- Fuel supply agreement
- Financial Ability
- Connection Assessment

pass

Sealed Bid Price Proposal
(% Discount from FiT_F)

Specific Conditions

Appeal Filed

not granted


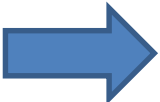
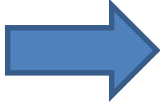
Not selected
(Bid security returned)

granted

Awarded

- ✓ Ranking by % discount of FiT_F (high to low)
- ✓ Grid capacity and quantity by region are necessary concerned
- ✓ In case of the same % discount proposed, then ranking by the time of proposal received

Specific Conditions

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> • “Firm Operation” with penalty • “Hybrid” for any type of RE with UMM • “ESS” can be installed to support “Firm” |  | <p>Peak 100%±2 and
Off-peak 65%±2
Penalty 20% of 5.48 US Cents/kWhr
(approx. 1.1 US Cents/kWhr)</p> |
| <ul style="list-style-type: none"> • “New generation” • Fossil fuel allowed only for starting up |  | <p>Never sell electricity to the Grid</p> |
| <ul style="list-style-type: none"> • 20% of Biomass supply required for energy crop plantation • SCOD : 2020 -2021 upon TL Plan |  | <p>Submit plantation plan (For biomass)</p> |



Conditions in PPA

Awarded SPP Hybrid-Firm Projects

Ceiling price

11.09
UD Cents /kWh

Bidding

Proposals received 85 1,644.25 MW

Technical qualified 42 755 MW 8.58 US Cents/kWh

Awarded 17 300 MW 7.39 US Cents/kWh

Avg. bid price

Rank	%	RE type	MW	Price (US Cents/kWh)
1	51.03	Biomass & Solar	13.31	8.30
2	43.65	Biomass	13.29	8.70
3	27.07	Biomass	21	9.61
4	15.60	Biomass	23.42	10.24
Total			71.02	

Rank	%	RE type	MW	Price (US Cents/kWh)
1	62	Solar	12	7.70

Northern
65 MW

North Eastern
65 MW

Central
20 MW

Eastern
20 MW

Western
20 MW

Rank	%	RE type	MW	Price (US Cents/kWh)
1	99.99	Biomass	27	5.61
2	99.99	Biomass	13.84	5.61
3	81.19	Biomass	16	6.64
4	79.56	Biomass	16	6.73
5	70	Biomass	11.29	7.24
Total			84.13	

Rank	%	RE type	MW	Price (US Cents/kWh)
1	43.12	Biogas & Solar	16	8.73

Rank	%	RE type	MW	Price (US Cents/kWh)
1	81.19	Biomass	16	6.64

Southern
100 MW

Rank	%	RE type	MW	Price (US Cents/kWh)
1	81.41	Biomass	21.50	6.64
2	81.41	Biomass	21.50	6.64
3	81.19	Biomass	24	6.64
4	80.85	Biomass	20	6.67
5	71.19	Biomass	13.85	7.18
Total			100.85	

- 14 projects : Biomass 258.69 MW
- 1 project : Biogas + Solar 16 MW
- 1 projects : Biomass + Solar 13.31 MW
- 1 project : Solar + ESS 12 MW

Remark:

- No awarded project in Bangkok-metro., Samui and Phuket
- Price : $FiT_F + FiT_V$
- FiT_V will be annually adjusted by core inflation

Experience from SPP Hybrid Firm Bidding

Hybrid is more flexible and more attractive then the average selected bid price is 1.22 THB/kWh (-33%) lower than ceiling price.

Quota or Zoning is a barrier to achieve lower price then more competitive in some areas (ex: South, Northeastern) and less competitive in some areas.

Most of rewarded projects are Biomass, bagasse & woodchip which means they can guarantee “Firm” operation and still abundant in Thailand

The lowest-price bidders (99.99% Discount) are sugarcane producers that have their own fuel supply threatened as by-product for power generation

Firm contract reduces the variation in intermittent energy sources.

THANK YOU



www.erc.or.th