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Current Status and Opportunity of Biogas Industries in Thailand

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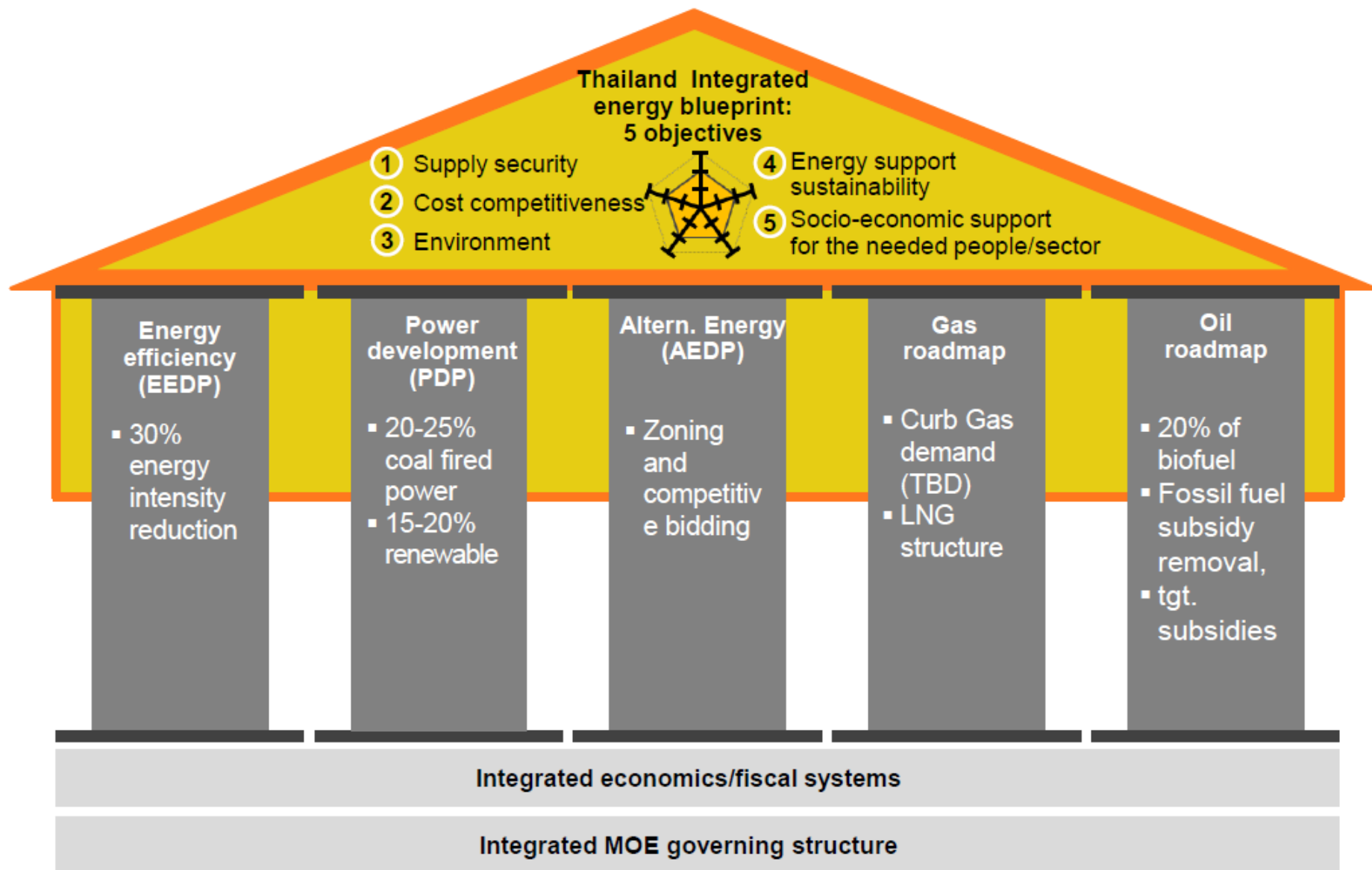


Thai German Technology Conference; Biogas
20 November 2017, Bangkok

Thailand Integrated Energy Blueprint



สำนักงานนโยบาย
และแผนพลังงาน
กระทรวงพลังงาน

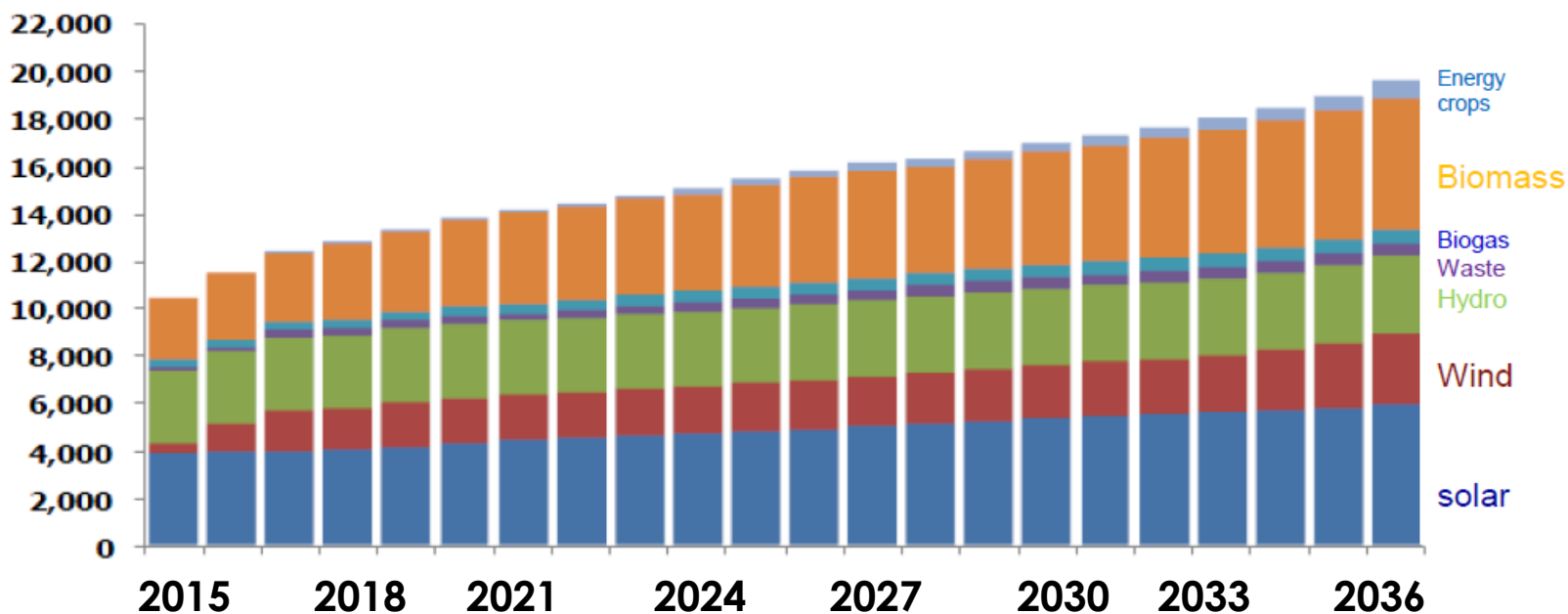


TIEB: AEDP Target

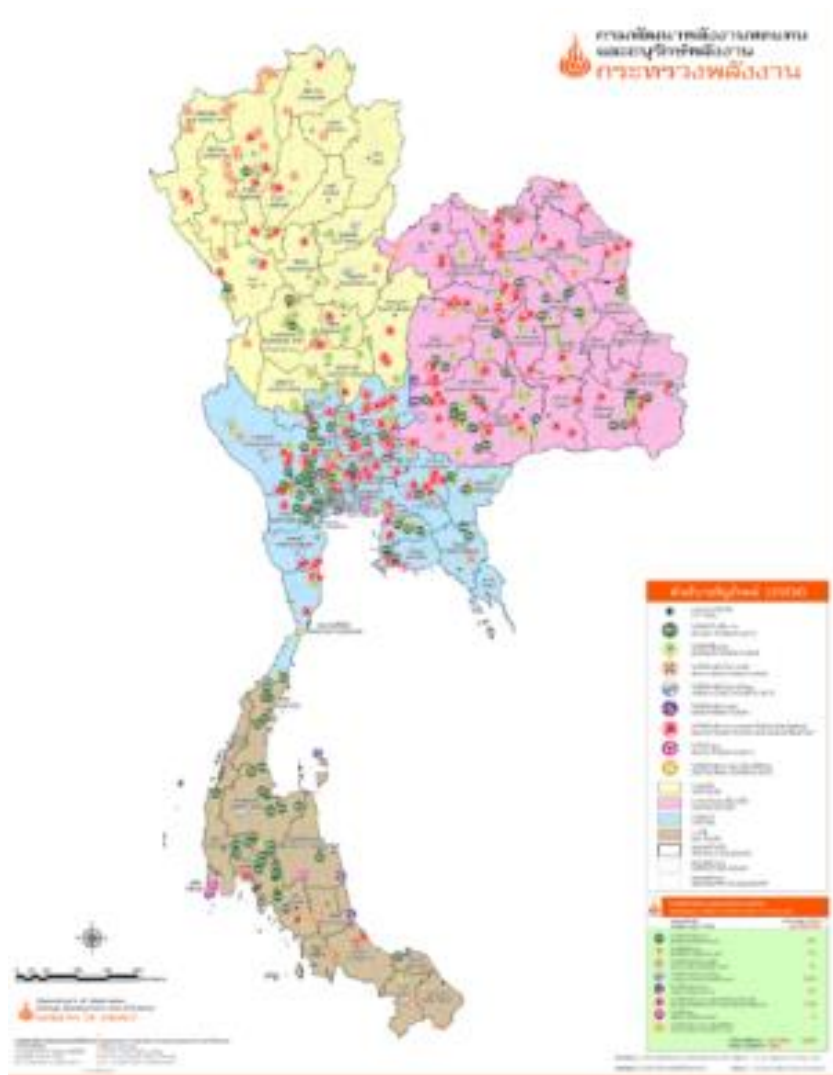
Target of Alternative Energy Development Plan (AEDP)

Type	Waste	Biomass	Biogas	Hydro	Wind	Solar	Energy crops	Total
Installed capacity 2014	48	2,199	226	3,016	220	1,570	-	<u>7,279</u>
Installed capacity 2036	501	5,570	600	3,282	3,002	6,000	680	<u>19,635</u>

Megawatt



Thailand Renewable Energy Situation

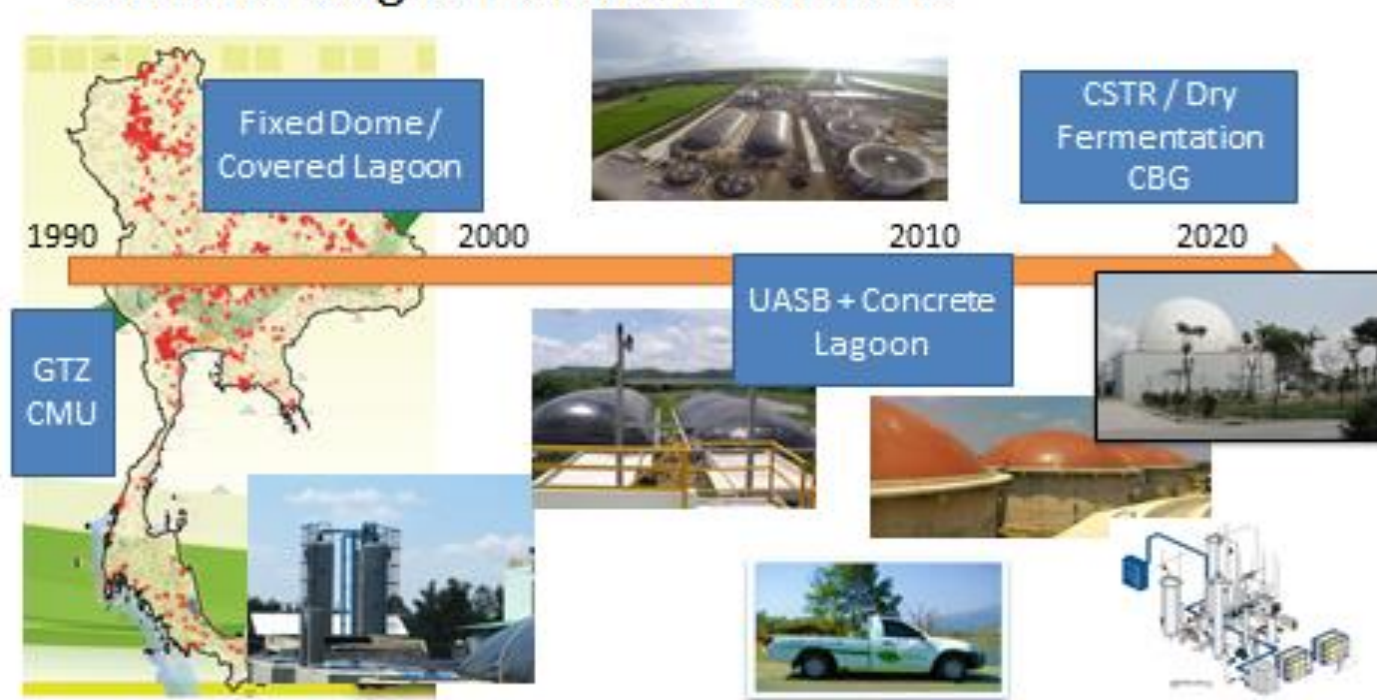


Type As of 2016	Installed Capacity MW
PV	1,679
Wind	255
Mini Hydro	190
Biomass	2,949
Biogas	375
MSW	187
CBG	6 tpd

Biogas Activities As of 2016	No. of Plant	Gas Production m3/year
POME	72	177.3
Ethanol	19	243.8
Starch	56	364.5
Others Ind.	80	126.6
Livestock	1,250	217.6

Research Funding and Biogas Technology Development in Thailand

Thailand Biogas Historical Timeline



R&D Funding Since 1990

- Upstream
- Technology
- Utilization
- Demonstration
- Continuous Dev.
- Bio-Economy
- Integrate w National Dev. Plan
- Market Research
- Policy Research
- And Suggestions





Lagoon Digester

- Livestock waste; Simplified and Economy



CSTR Digester

- Energy Crop
- Flexible and Effective

Hybrid Digester

- Industrial Waste;
- Efficient and Reliable



Dry Fermentation MSW



Bio-Methane Upgrader

- Vehicles
- Community / Industries

Thailand Great Leap in Biogas Development Technology



1990's Technical R&D

- Small scale implementations
- Large scale demo
- Public acceptance



2000's Standard setup

- Regulation and social pressure strengthened
- Livestock Subsidizing program



2010's Industrial Push

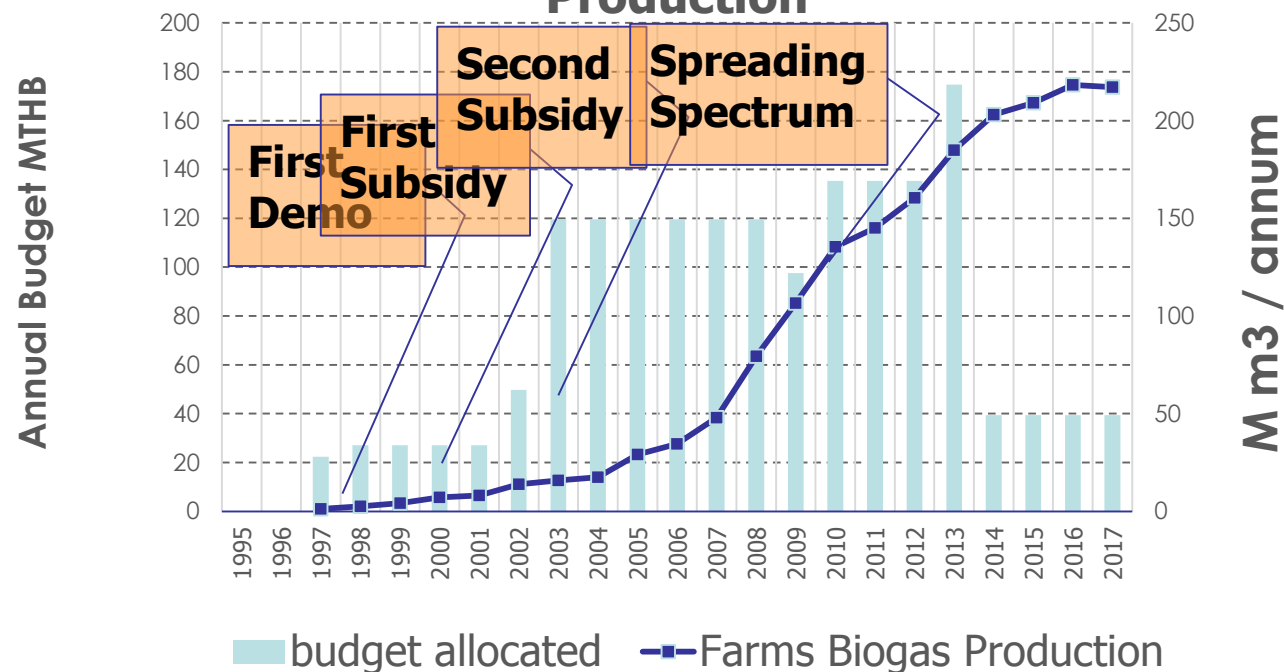
- Reliability and profitability focus
- Industrial subsidizing program
- Feed-in-tariff

Next Challenges 2020

- Solid Waste and Energy Crop Biogas
- RE Firming / Hybrid

Farm Sector Response to Subsidy Program

Farm Sector Biogas Promotion vs. Production



Total Budget 1670 MTHB injected into farm sector to promote biogas through 20 yr

1,250 Systems installed total biogas production 217 Mm3/annual

- 850 digesters of 100 – 1,000 m3 DV
- 770 digester of 1,000 – 10,000 m3 DV
- 50 digesters larger than 10,000 m3 DV

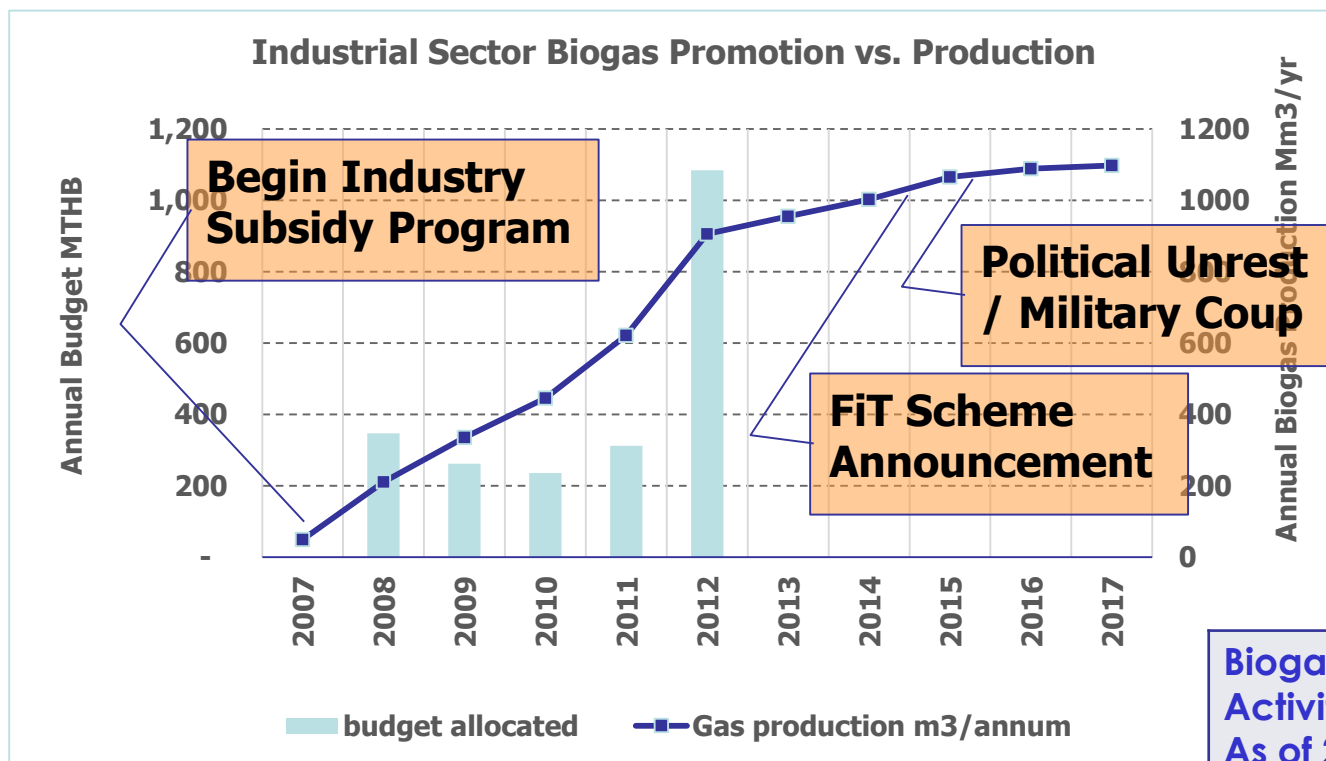
Investment 7,000 MTHB

Energy Value 3,300

MTHB / year

CO2 Reduc. 2 Mton/yr

Agro Industries Sector Response to Subsidy Program

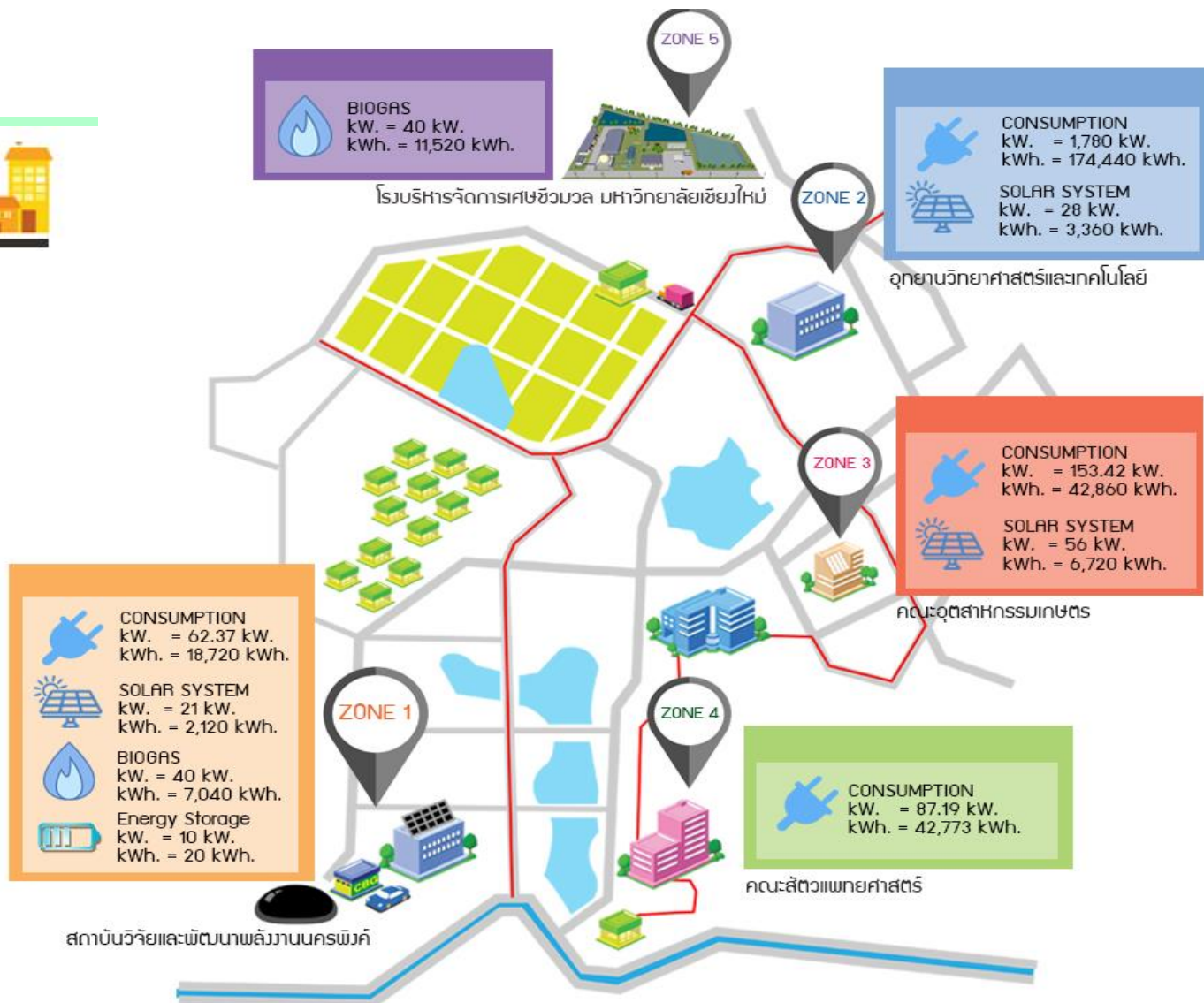


Total Budget 2,200 MTHB injected into industrial sector to promote biogas in 7 year

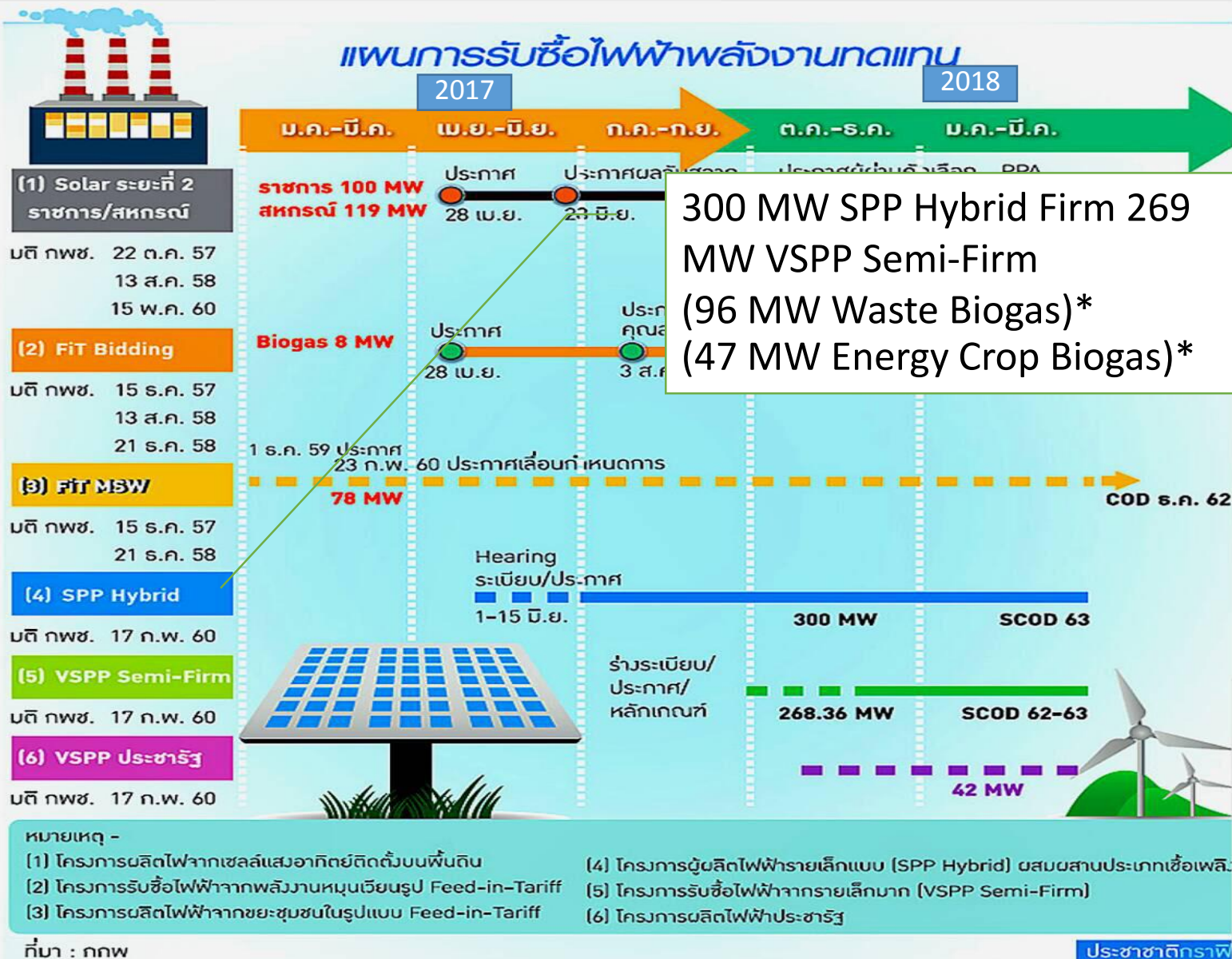
- 1,097 Mm3/annual biogas production
- CO2 reduction 10 Mton CO2 eq / year
- 10,000 MTHB investment

Biogas Activities As of 2016	No. of Plant	Gas Production m3/year
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Future Biogas Trend: Biogas Integration as Energy Storage for Smart Micro Grid



Opportunity: 2017-2018 FiT Bidding Road Map



*unofficial estimation

Announced by Energy Policy and Planning Office, MoE.

	SPP Hybrid – Firm	VSPP – Semi Firm
Condition of participation	Only new power plants, all kind of fuel type	Only new power plants, Type of biomass, biogas (sewage/waste) and biogas (energy crops)
Contracted capacity	10 – 50 MW	< 10 MW
Firm model	Firm all year* (*In Accordance to ERC's definition)	Semi Firm for 6 months (Covering Mar-Jun) Other 6 months are Non-firm
Characteristic of Firm-model	Peak 100% and Off-peak 65%* (*In accordance to ERC's definition)	Peak 100% and Off-peak 65%* (*In accordance to ERC's definition)
Mix-sources (Hybrid)	≥ 1 type(s) Trading at the same meter / UMM required (fossil fuel supplement is allowed only for start-up the power plant)	Only 1 type (fossil fuel supplement is allowed only for start-up the power plant)
proportion of Hybrid	No proportion determined	no Hybrid
Installation of ESS	Installation of ESS is allowed	Installation of ESS is allowed
SCOD	Within 2020	Within 2019-2020
Purchased price mechanism	single FiT rates for all kind of fuel type with competitive bidding mechanism	FiT rates by each type of fuel With competitive bidding mechanism (FiT Premium only for Firm-duration).
Fuel supply plan	There must be a plan to procure fuel, and energy crops must be involved, by defined proportion.	There must be a plan to procure fuel, and energy crops must be involved, by defined proportion.
Guarantee of Firm	✓	✓

FiT Rates

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

Installed Capacity (MW)	FiT (THB/kWh)			Period (years)	FiT Premium (THB/kWh)	
	FiT _F	FiT _{V,2560}	FiT ⁽¹⁾		Firm period not exceeding 6 months (<u>project lifetime</u>)	Projects in the southern border provinces ⁽²⁾ (<u>project lifetime</u>)
1) Biomass						
- Installed Capacity ≤ 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, Tapa, Saba Yoi and Nathawee District

Regulations regarding Energy Generation License

- ▶ FiT Bidding (ERC)
 - ▶ Bidding participation to obtain Power Purchasing Agreement PPA
- ▶ Involved Licenses:
 - ▶ Department of Industrial Works (พ.4)
 - ▶ 5 - <10 MW Environmental Safety Assessment: ESA
 - ▶ 10 MW+ Environment Impact Assessment: EIA
 - ▶ Energy Regulatory Committee : energy producer license
 - ▶ Public hearing
 - ▶ Controlled energy producer license
 - ▶ City planning clearance and construction license (Municipality)



ERC (draft) Biogas Code of Practice

Licensed Biogas Power Plant shall follow COP

Pre-construction:

- Requirements on engineering design
- Area selection and environmental measures

Construction

- Pollution protection measures
- Emergency measures

Operation

- Environmental monitoring and measures
- Maintenance plan

Decommission

- Pollution protection measures



URL Link to document
ERC Draft COP Biogas



URL Link to document
DIW Biogas Safety
Code

General Frameworks and Tenders

Project Owner may have many models of biogas tender

1. **Owner operates a project with engineering consultants:**
 - Consultant provides detail drawings / BoQ / Tenders
 - Owner opens tender for bidding or negotiations for each component on separate contracts
 - Owner consultant to supervise the construction, project equipment integration and commission all equipment
 - Consultant to provide training and manual or (optional) monitoring assistant

General Frameworks and Tenders

2. Owner to grant Turn Key and B.O.O.T. contract

- Owner or Consultant provides conceptual requirements and draft spec.
- Tender participant to propose detail design to meet requirements
- If pass; Tender participant allows to submit financial proposal
- Negotiation and Contract award
- Constructions and supervision (on site engineer required by law)
- Reporting and weekly meeting
- Commissioning and training with performance guarantee per contract
- For BOOT; operation shall be provided per contract

Conclusions

Keywords for Thailand Biogas Projects:

- Technology Preferences
- Firm / Semi-Firm FiT Bidding Scheme
- PPA with Power Authority
- Involved License (Delay may be anticipated)
 - ERC/DIW/Municipality
- Code of Practice for project
- Frameworks for tenders
 - Owner integrations
 - Turn key
 - BOOT



Thank you for your kind attention



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