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RENEWABLE ENERGY DATA COLLECTION IN THAILAND

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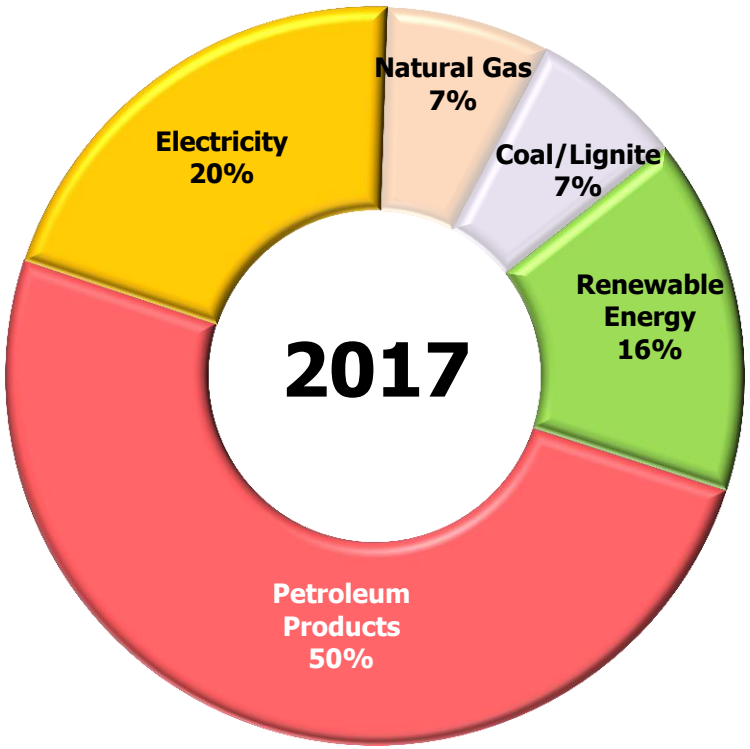
Ministry of Energy, Thailand

Outline of Presentation

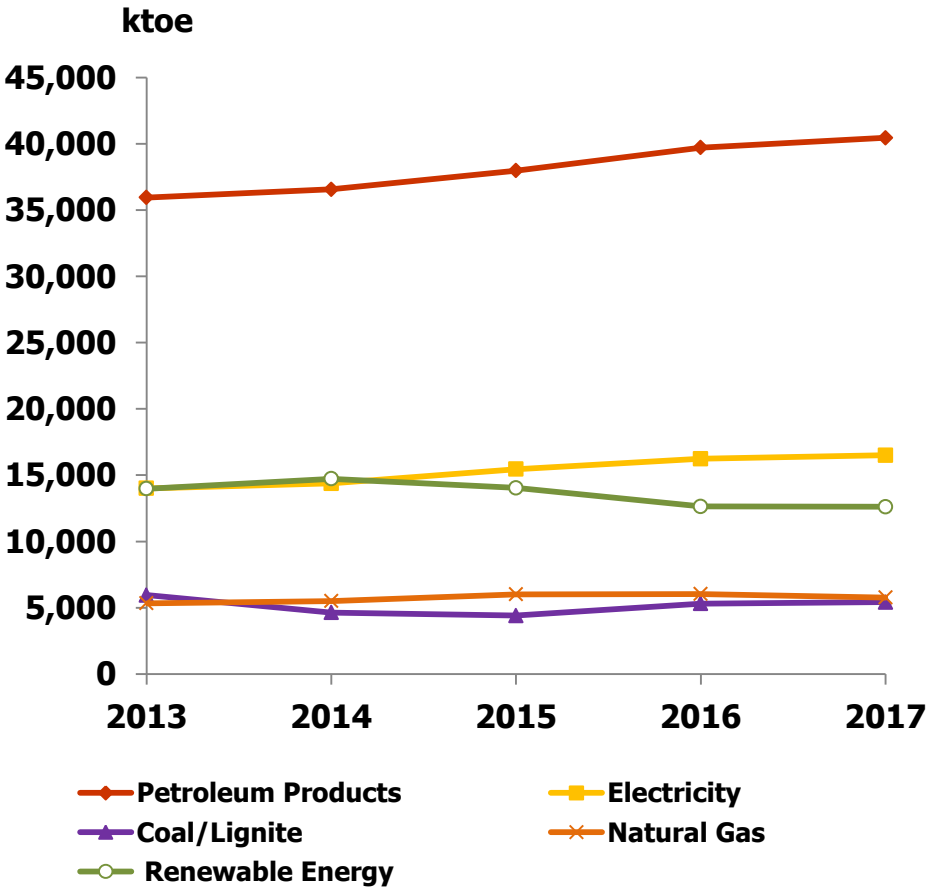
1. • Thailand's Energy Situation
2. • Renewable Energy Situation
3. • Renewable Energy Data Collection

1. Thailand's Energy Situation

Final energy consumption by Fuels



Total 80,752 ktoe



Source: Department of Alternative Energy Development and Efficiency

Outline of Presentation

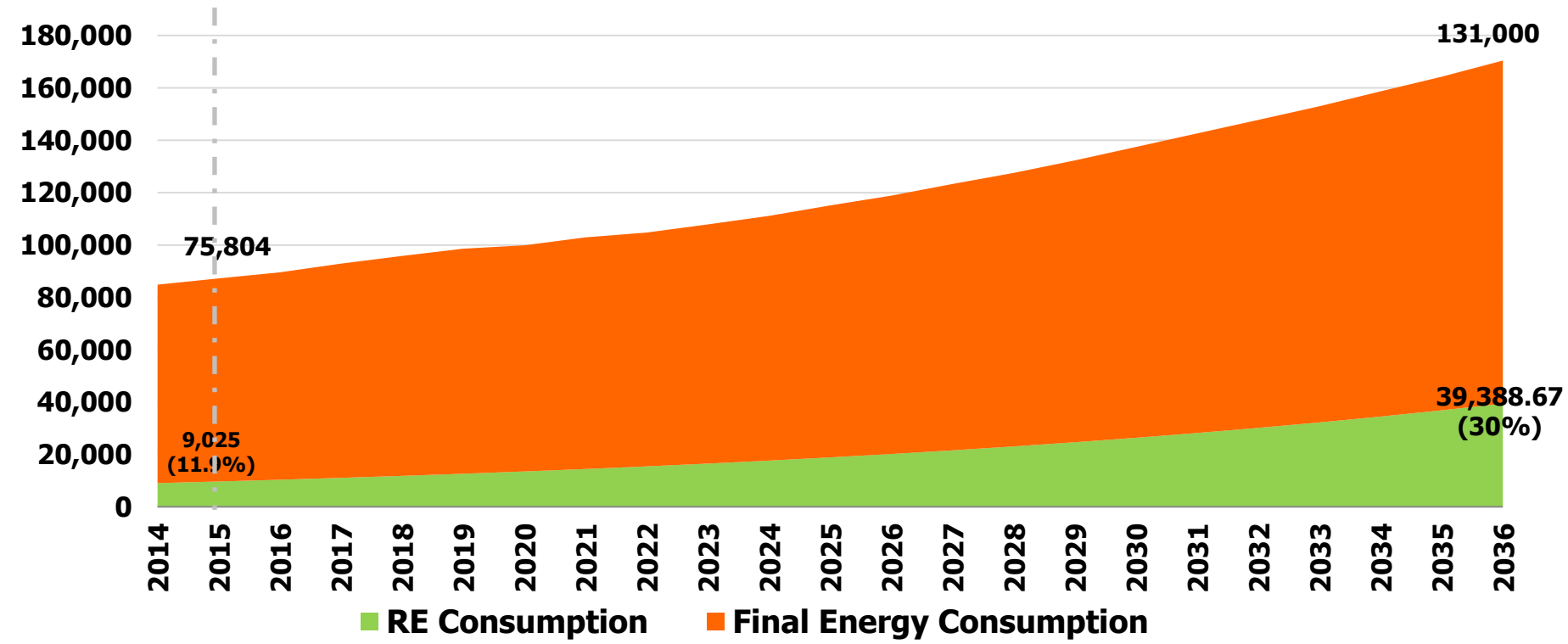
2

- **Renewable Energy Situation**

Alternative Energy Development Plan: AEDP 2015

Goal: 30% renewables in Total Energy Consumption by 2036

Target	ktoe
RE Consumption	39,388.67
Final Energy Consumption	131,000
RE Share (%)	30%



Source: Department of Alternative Energy Development and Efficiency

Alternative Energy Development Plan: AEDP 2015

Target = 30%

Electricity

5,588.24 ktoe (4.27%)

Fuels	Target at 2036 (MW)
1. MSW	500.00
2. Industrial Waste	50.00
3. Biomass	5,570.00
4. Biogas (WW/SW)	600.00
5. Small Hydro	376.00
6. Biogas (Energy Crop)	680.00
7. Wind	3,002.00
8. Solar	6,000.00
9. Large Hydro	2,906.40
Total capacity	**19,684.40**

Share of RE in Electricity Capacity
27.99%

Thermal

25,088.00 ktoe (19.15%)

Feedstock	Target at 2036 (ktoe)
1. MSW	495.00
2. Biomass	22,100.00
3. Biogas	1,283.00
4. Solar	1,200.00
5. Other Alternative Heat Source/(1)	10.00
Total Heat Demand	**25,088.00**

Share of RE for Heat Production
36.67%

Bio-Fuel

8,712.43 ktoe (6.65%)

Type of Fuels	Target at 2036	
	Million Liters/day	ktoe
1. Bio-diesel	14.00	4,404.82
2. Ethanol	11.30	2,103.50
3. Pyrolysis Oil	0.53	170.87
4. CBG(ton/day)	4,800.00	2,023.24
5. Other Alternative fuels/(2)		10.00
Total		**8,712.43**

Share of RE in Transportation Sector
25.04%

/(1) Other Alternative Heat Source such as Geothermal, Oil from used tires etc.
/(2) Other Alternative fuels such as Bio-oil , Hydrogen and Others etc.

Source: Department of Alternative Energy Development and Efficiency

AEDP 2015

Main Activities

Electricity

- Area-based RE power generation target must be related to RE potential (RE Grid Capacity)
- Develop and support for power generation from unutilized fuel (e.g. agricultural waste, industrial waste, fast growing crop)
- Support competitive bidding for power purchasing system

Heat

- Promote and support RDF transformation for municipal waste management
- Promote and support biomass-derived fuel (e.g. biomass pellet, bio-coal)
- Support biogas generation from waste water or solid waste
- Promote heat utilization in building by building code establishing

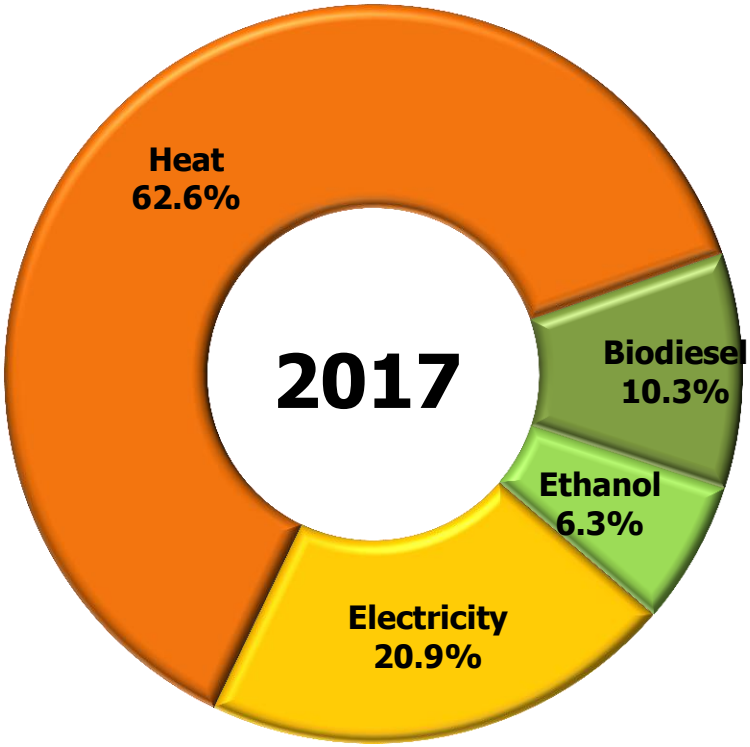
Biofuel

- Promote utilization of B10, B20 in both transportation and industrial sector
- Promote gasohol utilization (e.g. price mechanism, publicize information)
- Promote CBG utilization for vehicle and industry
- Promote biofuel production efficiency improvement

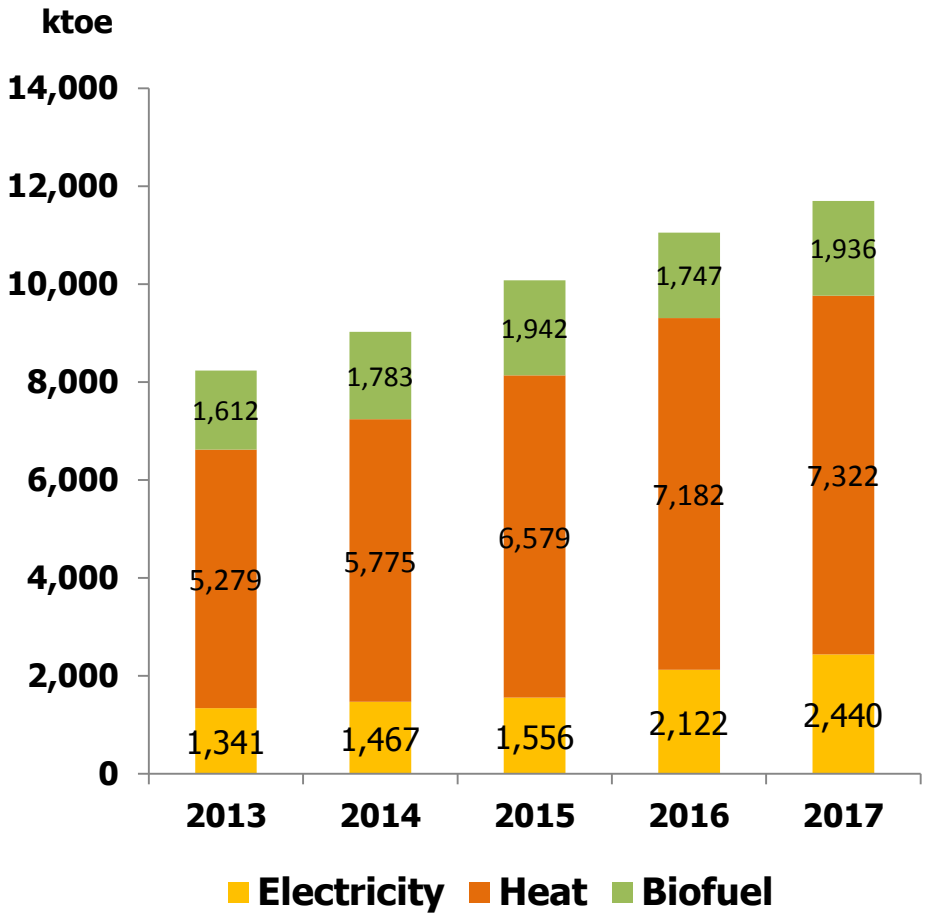
Source: Department of Alternative Energy Development and Efficiency

2. Renewable Energy Situation

Renewable energy consumption



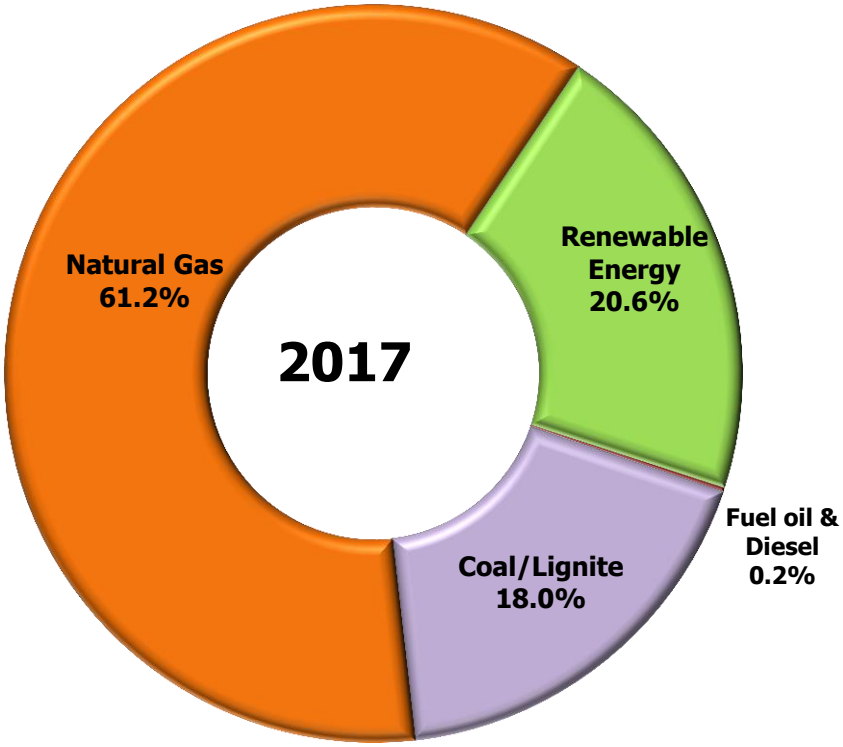
Total 11,698 ktoe



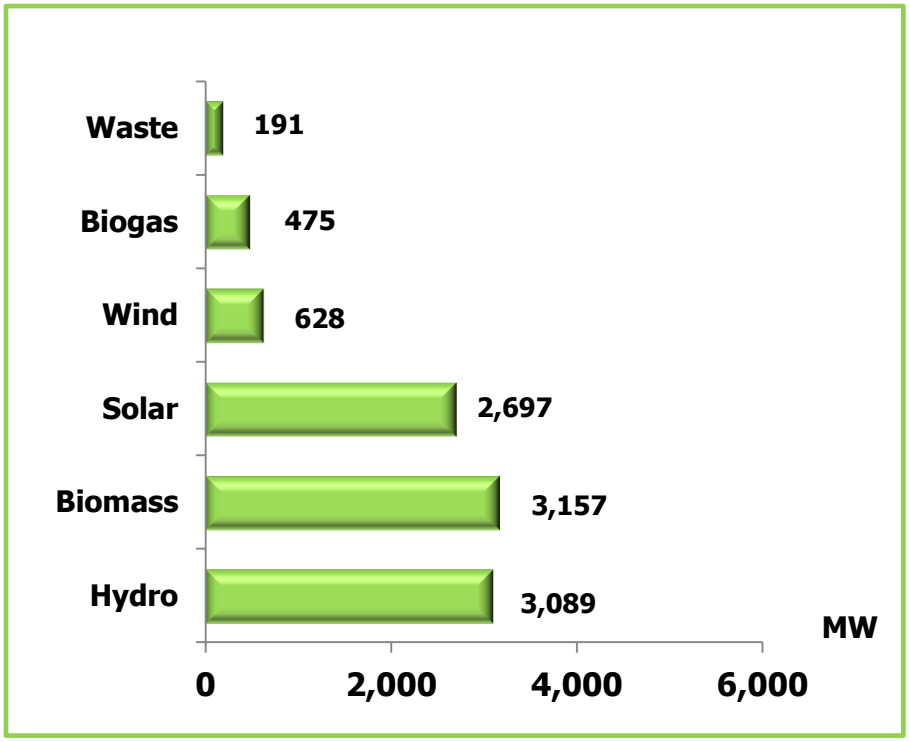
Source: Department of Alternative Energy Development and Efficiency

Renewable Energy in Power Sector

Power Generation by Fuel Type



Renewable energy Install capacity in 2017*

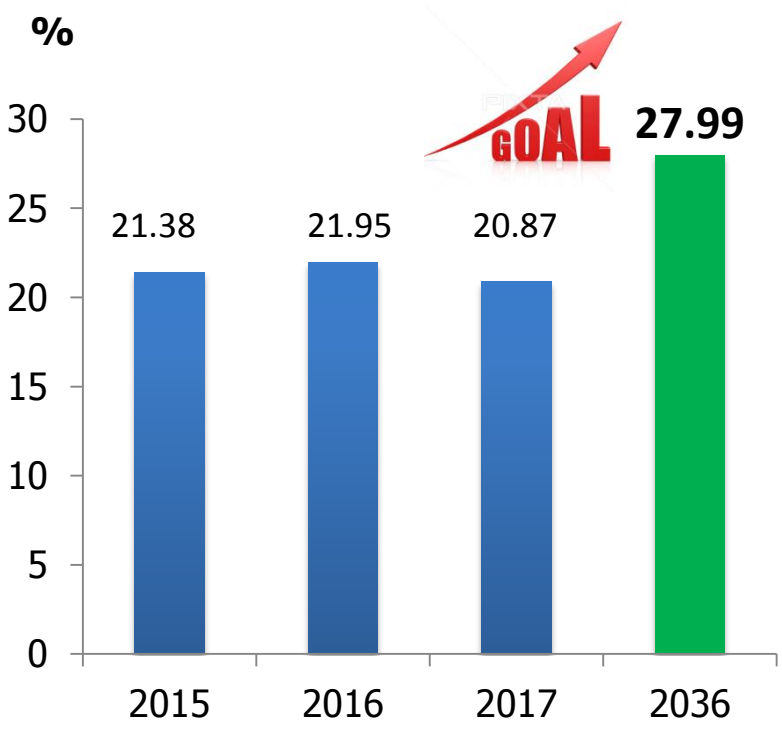


Total 10,238 MW

*Including off grid power generation

Source: Department of Alternative Energy Development and Efficiency

Electricity



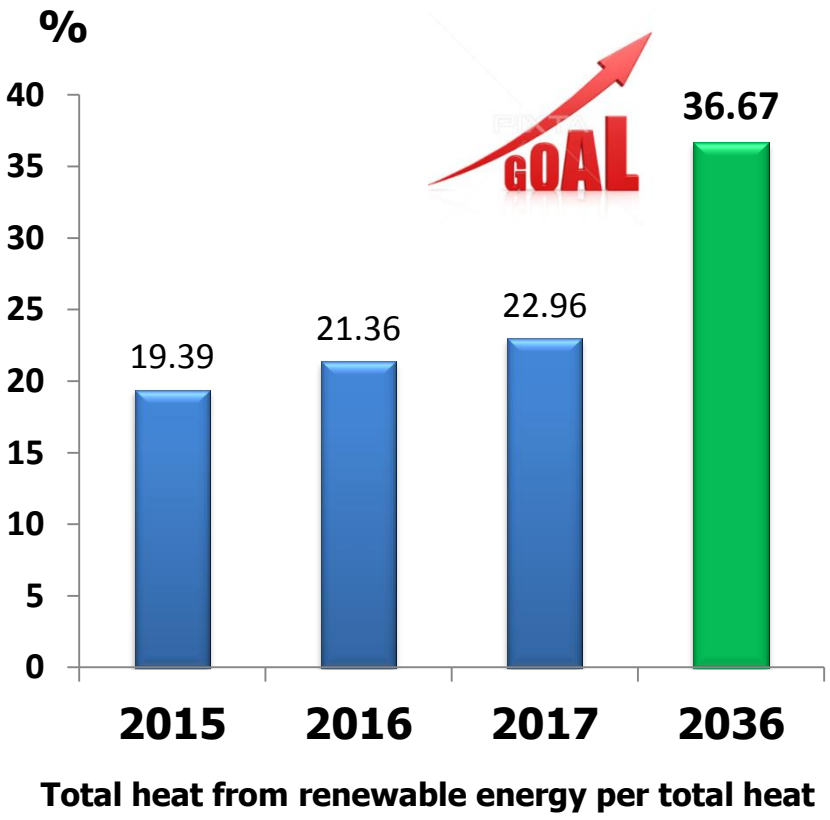
Renewable capacity per total capacity

Unit : MW

	2015	2016	2017	Target 2036
Solar	1,420	2,446	2,697	6,000
Wind	234	507	628	3,002
Hydro	3,079	3,089	3,089	3,282
Biomass	2,727	2,815	3,157	5,570
Biogas	373	435	475	1,280
MSW	132	145	191	550
Total RE (MW)	7,964	9,436	10,238	19,684
Total Capacity (MW)	37,247	42,982	49,048	70,335
RE/total capacity (%)	**21.38**	**21.95**	**20.87**	**27.99**

Source: Department of Alternative Energy Development and Efficiency

Heat



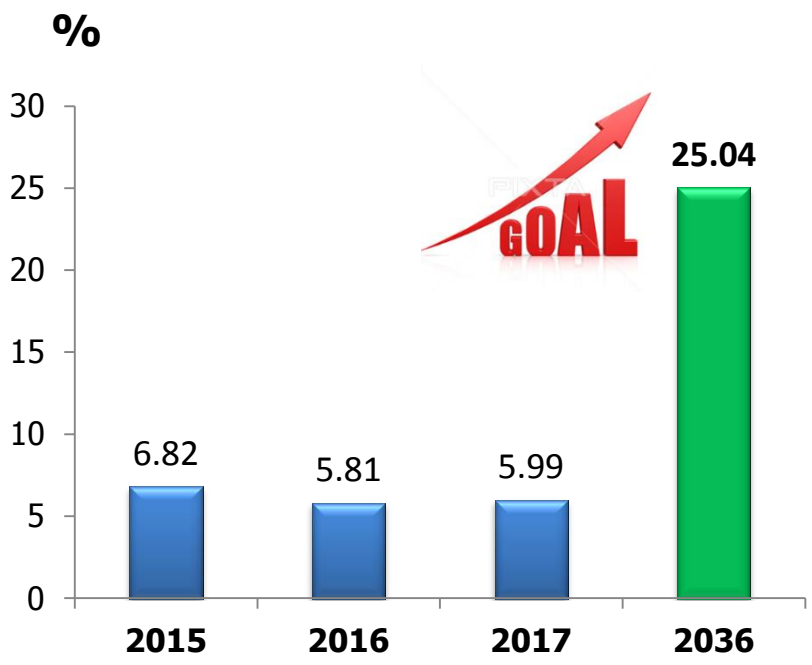
Total heat from renewable energy per total heat

Unit : ktoe

	2015	2016	2017	Target 2036
Solar	5.7	6.7	9.3	1,200
Biomass	5,990	6,507	6,616	22,100
Biogas	495	592	634	1,283
MSW	88	75	63	494
Total Heat from RE (ktoe)	6,579	7,182	7,322	25,088
Total Heat (ktoe)	33,935	33,627	31,896	68,414
RE/total Heat (%)	**19.39**	**21.36**	**22.96**	**36.67**

Source: Department of Alternative Energy Development and Efficiency

Biofuels



Total renewable energy for Biofuels per total fuel in transport

Unit : Million litre/day

	2015	2016	2017	Target 2036
Ethanol	3.5	3.7	3.9	11.3
Biodiesel	3.3	3.4	3.8	14.0
Total	6.8	7.0	7.8	25.3
Total RE (ktoe)	1,942	1,747	1,936	8,712
Total fuel in transport (ktoe)	28,491	30,092	32,351	34,798
RE/Total fuel in transport (%)	**6.82**	**5.81**	**5.99**	**25.04**

Source: Department of Alternative Energy Development and Efficiency

Outline of Presentation

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- **Renewable Energy Data Collection**

Thailand's Energy Data

Thailand's national energy statistic data come from 2 main sources.

- ***Energy Policy and Planning Office (EPPO)***
- ***Department of Alternative Energy Development and Efficiency (DEDE)***

Publication

www.eppo.go.th

Description	Current 2017 (1 Months)	Historical Statistics 1986-2015 (30-Year Series)	
		Monthly	Yearly
5.1 Generation Capacity			
Table 5.1-1: Capacity (Graph)		-	
5.2 Generation (on EGAT system)			
Table 5.2-1: Power Generation by Type of Fuel			
Table 5.2-2: Power Generation Classified by Fuel Type			
Table 5.2-3: Power Generation Classified by Fuel Type (Major Sources) - Graph			
Table 5.2-4: Power Generation Classified by Fuel Type (Detail) - Graph			
Table 5.2-5: Peak Demand and Load Factor			
Table 5.2-6: Power Generation and Sales		-	-

Energy Statistics Report

www.dede.go.th

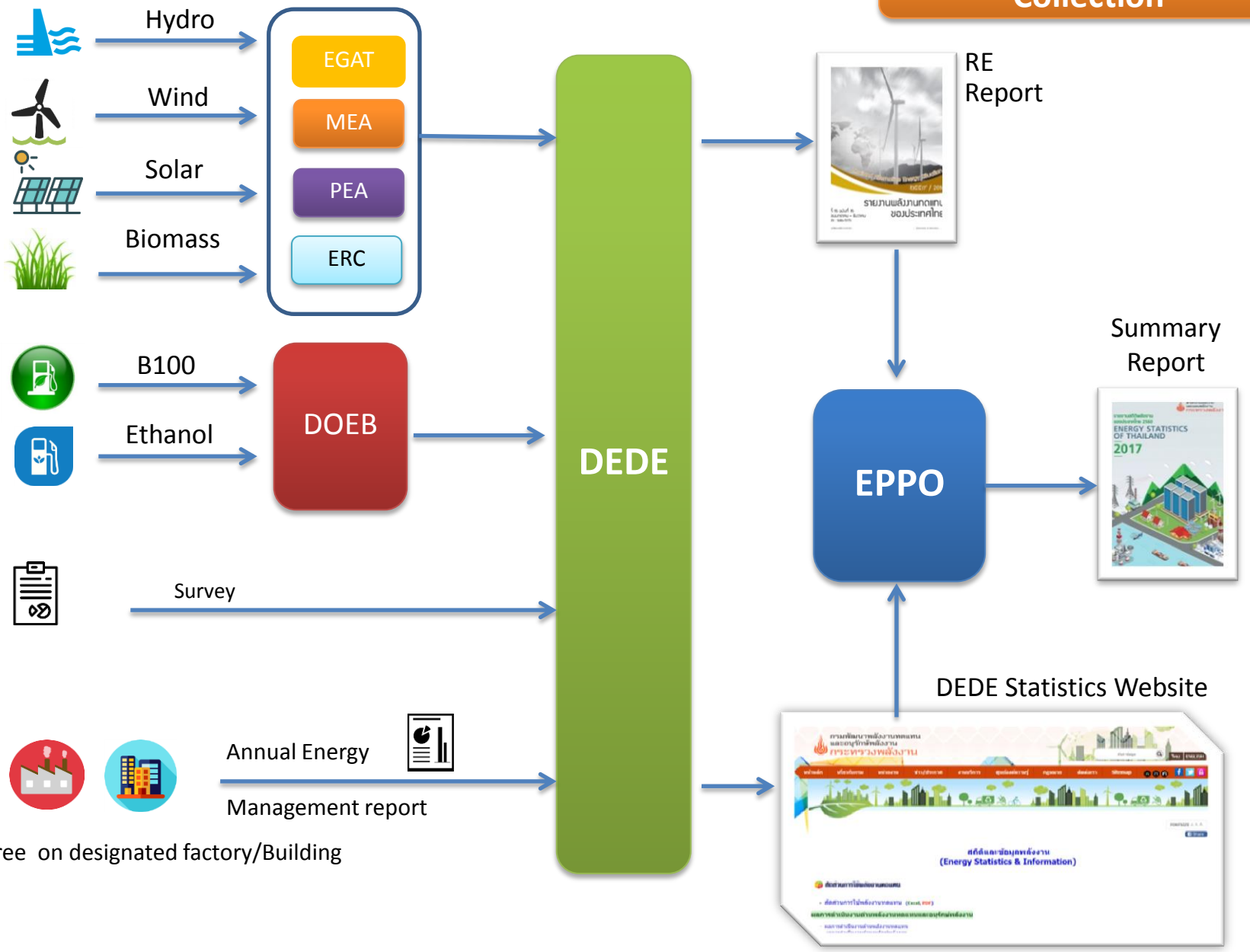
- Table of Thailand Energy Balance [Monthly/ Yearly]
- Energy Situation
- Energy Consumption by Economic Sector

Annual Report

- Energy Balance of Thailand 2016
- Thailand Energy Efficiency Situation 2016
- Thailand Alternative Energy Situation 2016

Source: EPPO/DEDE

Renewable Energy Data Collection



EGAT: Electricity Generating Authority of Thailand.
ERC : Energy Regulatory Commission

MEA: Metropolitan Electricity Authority
DOEB: Department of Energy Business

PEA : Provincial Electricity Authority

SUPPLY AND CONSUMPTION	หน่วย	พลังงานหมุนเวียน[5/] RENEWABLE ENERGY[5/]														
								ชีวมวล SOLID BIOMASS								
		แสงอาทิตย์ (ความร้อน) SOLAR (HEAT)	แสงอาทิตย์ SOLAR	ลม WIND	พลังน้ำขนาดเล็ก[6/] SMALL HYDRO POWER[6/]	พลังน้ำขนาดใหญ่[7/] LARGE HYDRO POWER[7/]	พลังงานความร้อนใต้พิภพ GEOTHERMAL	ฟืน FUEL WOOD	แกลบ PADDY HUSK	กากอ้อย BAGASSE	วัสดุเหลือใช้จากการเกษตร AGRICULTURAL WASTE	รวมชีวมวล TOTAL SOLID BIOMASS	ขยะ MSW	ก๊าซชีวภาพ BIOGAS	รวมพลังงานหมุนเวียน TOTAL RENEWABLE ENERGY	
		(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	
		จิกะจูล GJ	ล้านกิโลวัตต์ชั่วโมง Gwh					พันตัน thousand tons					พันตัน thousand	ลูกบาศก์เมตร m^3		
1	DOMESTIC PRODUCTION	389,210	4,512	1,112	497	4,328	0	605	3,118	42,629	16,622	62,974	903	1,809,785,533		1
2	IMPORTS	-	-	-	-	-	-	-	-	-	-	-	-	-		2
3	EXPORTS	-	-	-	-	-	-	-	-	-	-	-	-	-		3
4	STOCK CHANGE/STATISTICAL DIFFERENCES	-	-	-	-	-	-	-	-	-	-	-	-	-		4
5	TOTAL PRIMARY ENERGY SUPPLY	389,210	4,512	1,112	497	4,328	0	605	3,118	42,629	16,622	62,974	903	1,809,785,533		5
6	PETROLEUM REFINERIES	-	-	-	-	-	-	-	-	-	-	-	-	-		6
7	NG PROCESSING PLANTS															7
8	POWER PLANTS	-	(4,512)	(1,112)	(497)	(4,328)	(0)	-	(2,044)	(21,183)	(9,306)	(32,533)	(343)	(538,060,223)		8
9	HYDRO	-	-	-	(497)	(4,328)	-	-	-	-	-	-	-	-		9
10	STEAM THERMAL	-	-	-	-	-	-	-	(1,969)	(19,992)	(9,150)	(31,111)	(343)	-		10
11	GAS TURBINE	-	-	-	-	-	-	-	-	-	(29)	(29)	-	-		11
12	COMBINED CYCLE	-	-	-	-	-	-	-	-	-	-	-	-	-		12
13	DIESEL	-	-	-	-	-	-	-	-	-	-	-	-	-		13
14	GAS ENGINE	-	-	-	-	-	-	-	(75)	(1,191)	(127)	(1,393)	-	(538,060,223)		14
15	OTHERS[13/]	-	(4,512)	(1,112)	-	-	(0)	-	-	-	-	-	-	-		15
16	OTHER CONVERSION	-	-	-	-	-	-	-	-	-	-	-	-	-		16
17	TOTAL TRANSFORMATION	-	(4,512)	(1,112)	(497)	(4,328)	(0)	-	(2,044)	(21,183)	(9,306)	(32,533)	(343)	(538,060,223)		17
18	OWN USES	-	-	-	-	-	-	-	-	-	-	-	-	-		18
19	LOSSES	-	-	-	-	-	-	-	-	-	-	-	-	-		19
20	TOTAL FINAL ENERGY CONSUMPTION	389,210	-	-	-	-	-	605	1,074	21,446	7,316	30,441	560	1,271,725,310		20
21	FINAL NON-ENERGY USES	-	-	-	-	-	-	-	-	-	-	-	-	-		21
22	FINAL ENERGY CONSUMPTION	389,210	-	-	-	-	-	605	1,074	21,446	7,316	30,441	560	1,271,725,310		22
23	AGRICULTURE	-	-	-	-	-	-	-	-	-	-	-	-	-		23
24	MINING															24
25	MANUFACTURING	-	-	-	-	-	-	605	1,074	21,446	7,316	30,441	560	1,271,725,310		25
26	CONSTRUCTION	-	-	-	-	-	-	-	-	-	-	-	-	-		26
27	RESIDENTIAL	-	-	-	-	-	-	-	-	-	-	-	-	-		27
28	COMMERCIAL	389,210	-	-	-	-	-	-	-	-	-	-	-	-		28
29	TRANSPORTATION	-	-	-	-	-	-	-	-	-	-	-	-	-		29
30	ROAD	-	-	-	-	-	-	-	-	-	-	-	-	-		30
31	RAIL	-	-	-	-	-	-	-	-	-	-	-	-	-		31
32	AIR	-	-	-	-	-	-	-	-	-	-	-	-	-		32
33	WATERWAY	-	-	-	-	-	-	-	-	-	-	-	-	-		33

SUPPLY AND CONSUMPTION		พลังงานหมุนเวียนดั้งเดิม[5/] TRADITIONAL RENEWABLE ENERGY[5/]					เชื้อเพลิงชีวภาพ BIOFUELS			พลังงานอื่น ๆ OTHER	
		ฟืน FUEL WOOD	ถ่าน CHARCOAL	แกลบ PADDY HUSK	วัสดุเหลือทางการเกษตร[7/] AGRICULTURAL WASTE[7/]	รวมพลังงานหมุนเวียนดั้งเดิม TOTAL TRADITIONAL RENEWABLE ENERGY	เอทานอล[8/] ETHANOL[8/]	ไบโอดีเซล[9/] BIODIESEL[9/]	รวมเชื้อเพลิงชีวภาพทั้งหมด TOTAL BIOFUELS	แบล็คเคลและก๊าซเหลือใช้จากกระบวนการผลิต BLACK LIQUOR & RESIDUAL GAS	
		(49)	(50)	(51)	(52)	(53)	(54)	(55)	(56)	(57)	
หน่วย		พันตัน thousand tons					ล้านลิตร million litres			จิกะจูล GJ	
1	DOMESTIC PRODUCTION	1	15,538	-	1,536	7,175	24,249	1,420	1,429	2,849	12,442,407
2	IMPORTS	2	-	100	-	-	100	-	-	-	-
3	EXPORTS	3	-	(24)	-	-	(24)	-	-	-	-
4	STOCK CHANGE/STATISTICAL DIFFERENCES	4	-	-	-	-	-	5	(34)	(29)	-
5	TOTAL PRIMARY ENERGY SUPPLY	5	15,538	76	1,536	7,175	24,325	1,425	1,395	2,820	12,442,407
6	PETROLEUM REFINERIES	6	-	-	-	-	-	(1,425)	(1,395)	(2,820)	-
7	NG. PROCESSING PLANTS	7	-	-	-	-	-	-	-	-	-
8	POWER PLANTS	8	-	-	-	-	-	-	-	-	(12,442,407)
9	HYDRO	9	-	-	-	-	-	-	-	-	-
10	STEAM THERMAL	10	-	-	-	-	-	-	-	-	(12,442,407)
11	GAS TURBINE	11	-	-	-	-	-	-	-	-	-
12	COMBINED CYCLE	12	-	-	-	-	-	-	-	-	-
13	DIESEL	13	-	-	-	-	-	-	-	-	-
14	GAS ENGINE	14	-	-	-	-	-	-	-	-	-
15	OTHERS[13/]	15	-	-	-	-	-	-	-	-	-
16	OTHER CONVERSION	16	(13,015)	2,603	(522)	-	(10,934)	-	-	-	-
17	TOTAL TRANSFORMATION	17	(13,015)	2,603	(522)	-	(10,934)	(1,425)	(1,395)	(2,820)	(12,442,407)
18	OWN USES	18	-	-	-	-	-	-	-	-	-
19	LOSSES	19	-	-	-	-	-	-	-	-	-
20	TOTAL FINAL ENERGY CONSUMPTION	20	2,523	2,679	1,014	7,175	13,391	-	-	-	-
21	FINAL NON-ENERGY USES	21	-	-	-	-	-	-	-	-	-
22	FINAL ENERGY CONSUMPTION	22	2,523	2,679	1,014	7,175	13,391	-	-	-	-
23	AGRICULTURE	23	-	-	-	-	-	-	-	-	-
24	MINING	24	-	-	-	-	-	-	-	-	-
25	MANUFACTURING	25	-	-	-	-	-	-	-	-	-
26	CONSTRUCTION	26	-	-	-	-	-	-	-	-	-
27	RESIDENTIAL	27	2,523	2,679	1,014	7,175	13,391	-	-	-	-
28	COMMERCIAL	28	-	-	-	-	-	-	-	-	-
29	TRANSPORTATION	29	-	-	-	-	-	-	-	-	-
30	ROAD	30	-	-	-	-	-	-	-	-	-
31	RAIL	31	-	-	-	-	-	-	-	-	-
32	AIR	32	-	-	-	-	-	-	-	-	-
33	WATERWAY	33	-	-	-	-	-	-	-	-	-

Sources of Data	Mainly Data Collected by	Types of Renewable Energy
 Power plants	EGAT, MEA, PEA, ERC	Solar, Wind, Hydro, Geothermal, Biomass , MSW, Biogas
 Oil Company Biofuel plants	Department of Energy Business	Biofuels (Ethanol Biodiesel)
 Manufacturing	DEDE	Biomass
 Commercial	Subsidized Projects	Solar heat
 Residential	Survey and Analytical Reports	Traditional renewable (Wood, Charcoal, Paddy Husk, Agricultural waste)
 Solar off grid	Subsidized Projects	Solar off grid

Thank you for Your attention