



Thailand

Renewable Energy & Energy Efficiency Target

35rd CAFEO 2017



Wongkot Wongsapai

Assistant Professor

Chiang Mai University, Thailand

2316 November 2017, Thailand

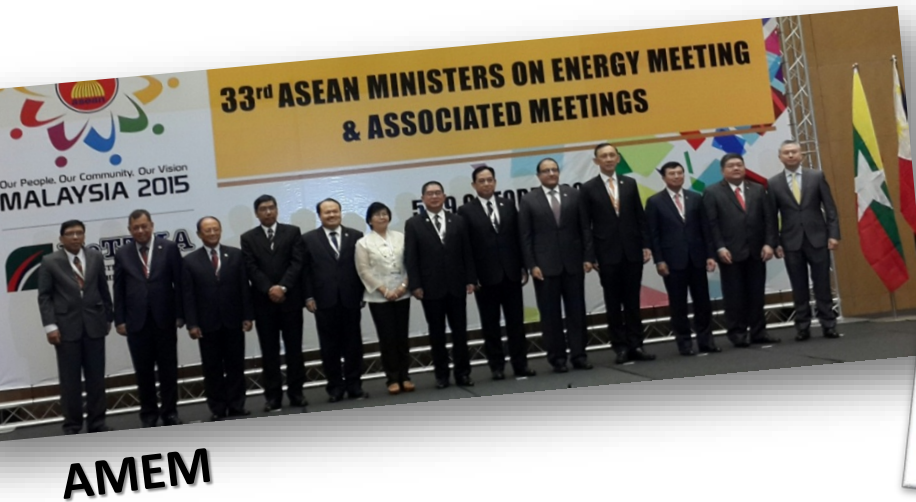
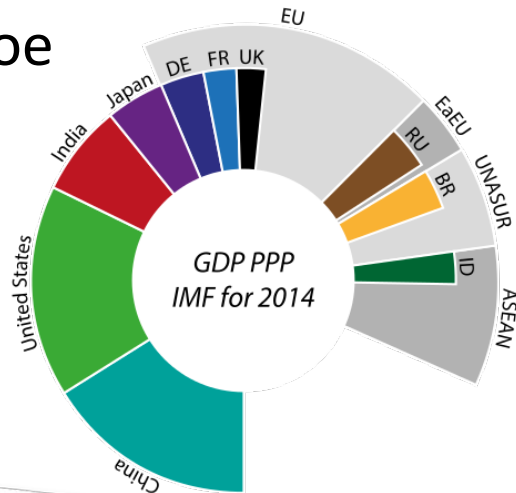


ASEAN

The Association of Southeast Asian Nations



- 10 nations
 - Population: 625 millions
 - GDP_{ppp}: 3.6 Trillion US\$
 - Primary energy production: 778 Mtoe
 - TFEC: 606 Mtoe
- All are 2013 data



ASEAN Energy Awards

1

Thailand Situation





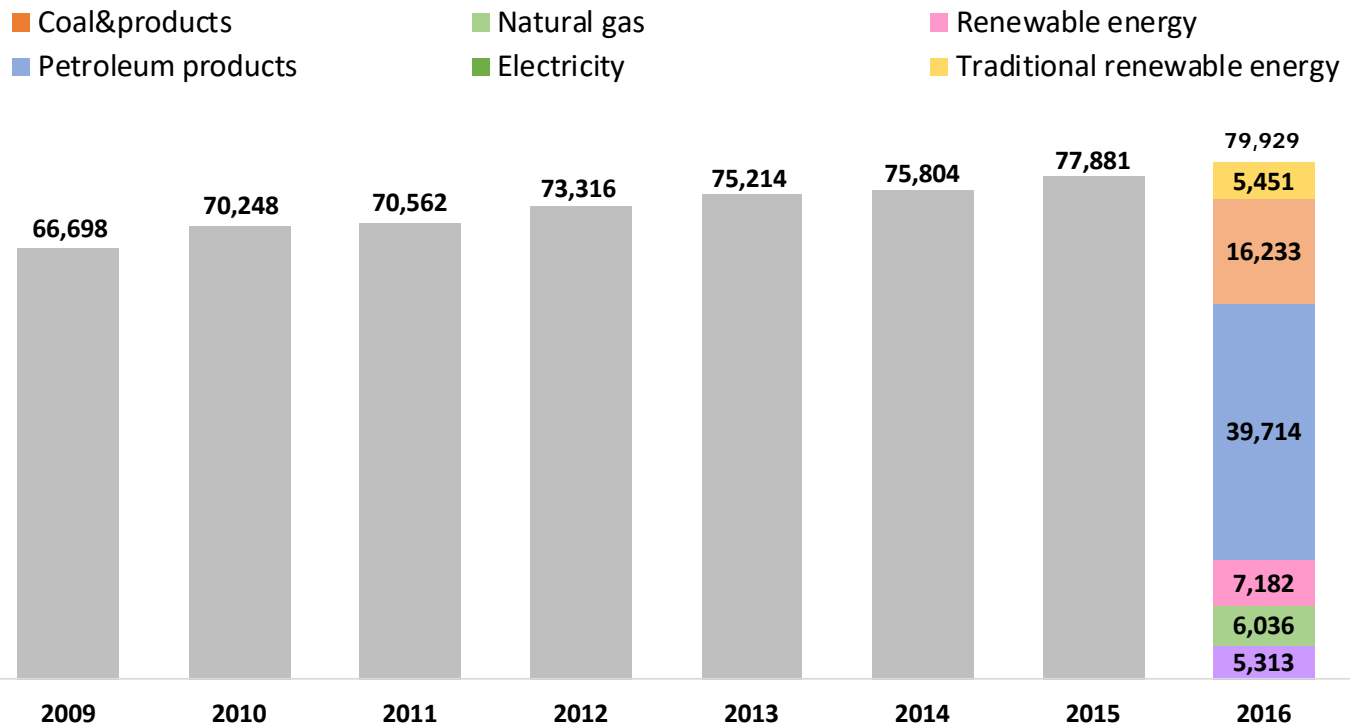
Thailand's Energy Policies



**General Prayuth Chan O-cha
Prime Minister**

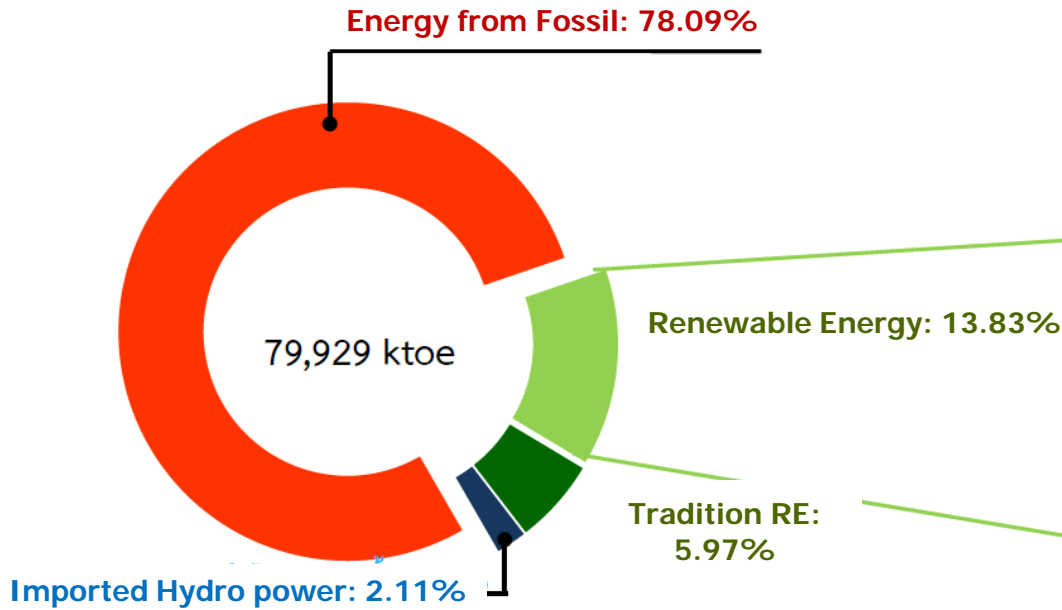
- ✓ **Secure Thailand Energy supply**
 - Exploration and production of natural gas and crude oil both in the sea and on land
 - More new power plant by government agencies and private organizations
 - Increase the use of renewable energy
 - International energy development cooperation
- ✓ **Fair Energy Pricing**
 - Energy price restructure
 - Appropriate tax between different types of oil
- ✓ **Energy conservation**
 - More efficient use of energy
 - Awareness of consumer

**Energy consumption has been growing at 2.6% per year;
 Renewable account for <10% of consumption**

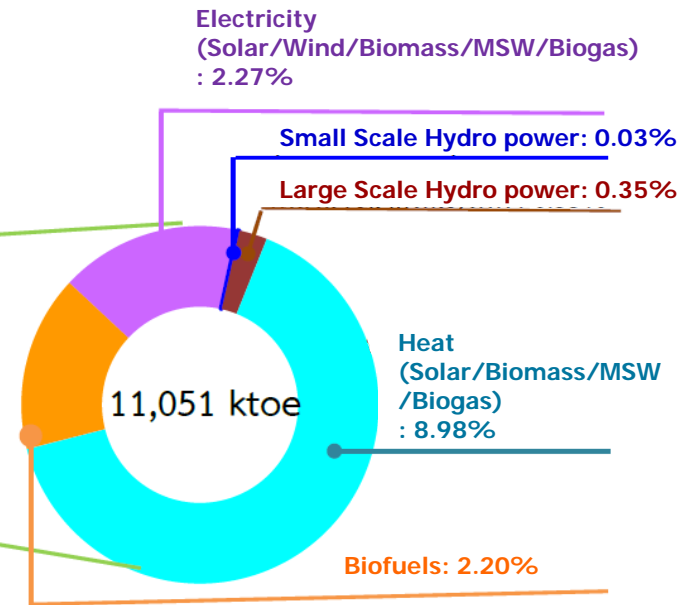


Thailand Energy Consumption 2016

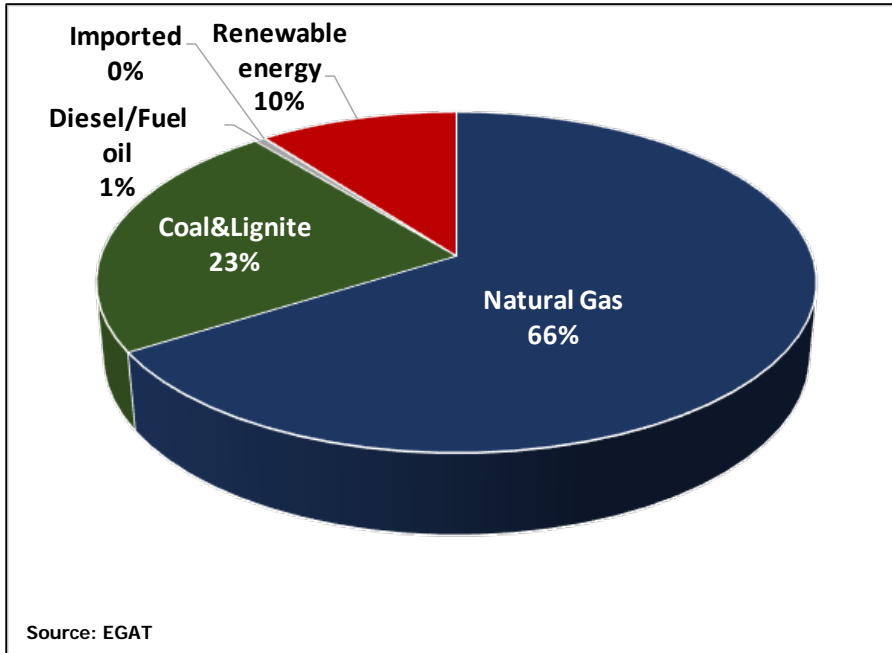
**Final Energy Consumption
(Jan – Dec 2015)**



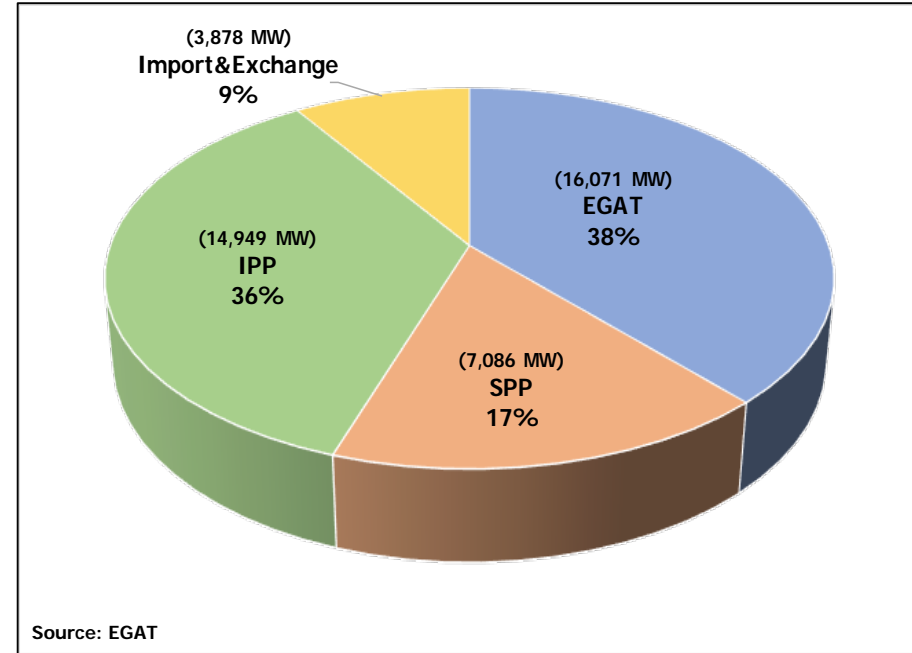
**Renewable Energy Consumption
(Jan – Dec 2015)**



Power Generation by Fuel Type 2016



Power Generation by Fuel Type

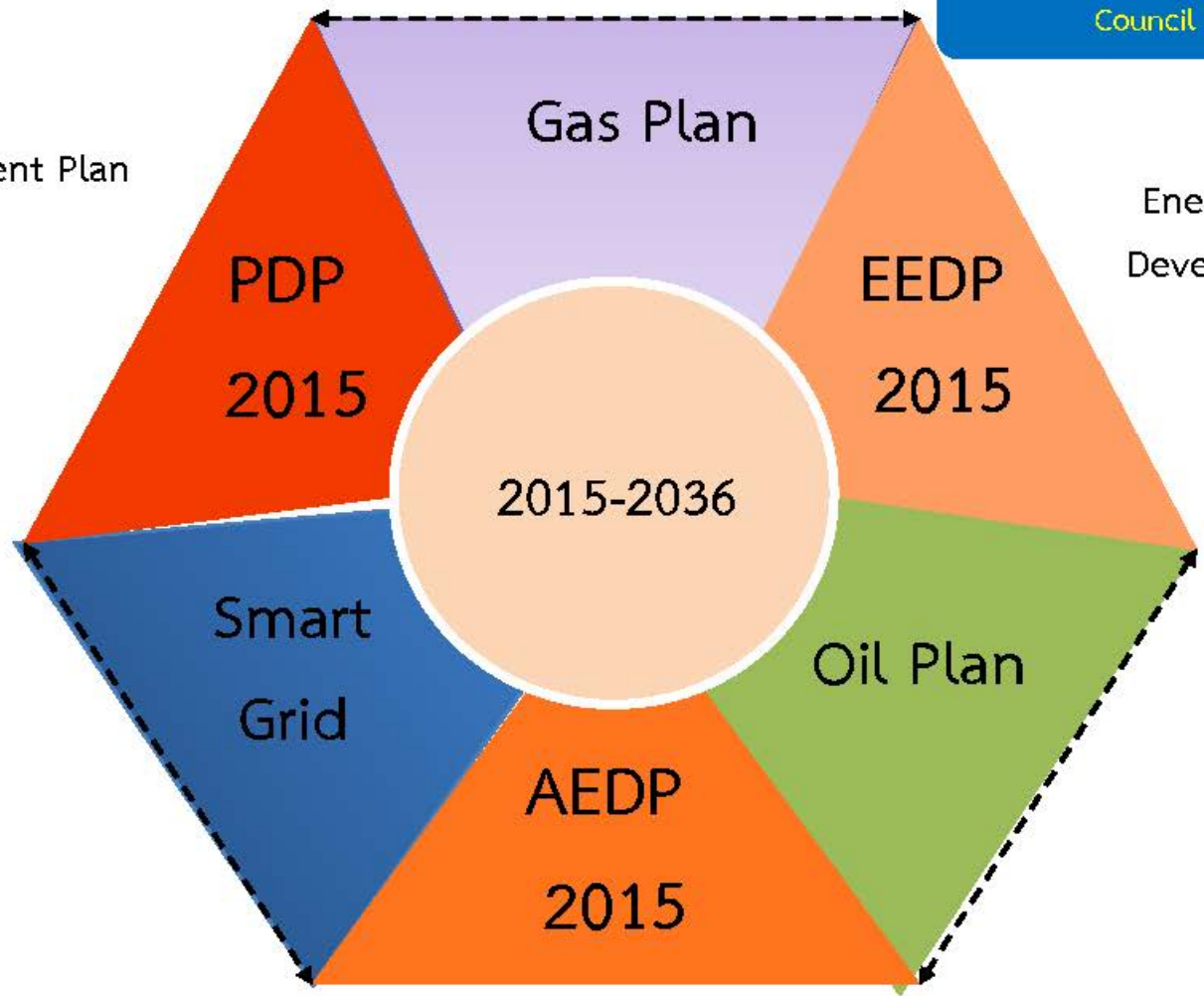


Power Generation by Producer

Resolution of National Energy Policy Council (15/08/2014)

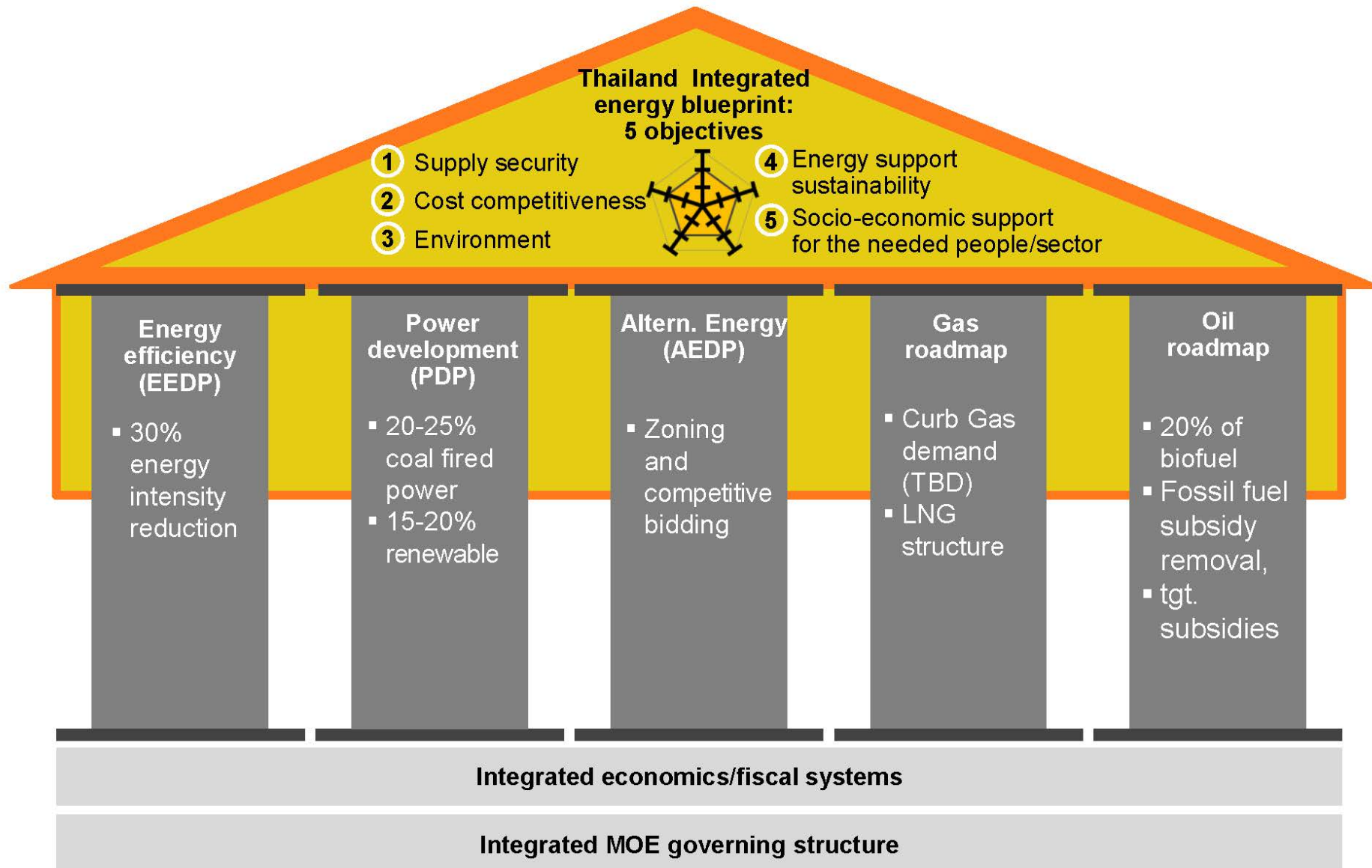
Power Development Plan

Energy Efficiency Development Plan

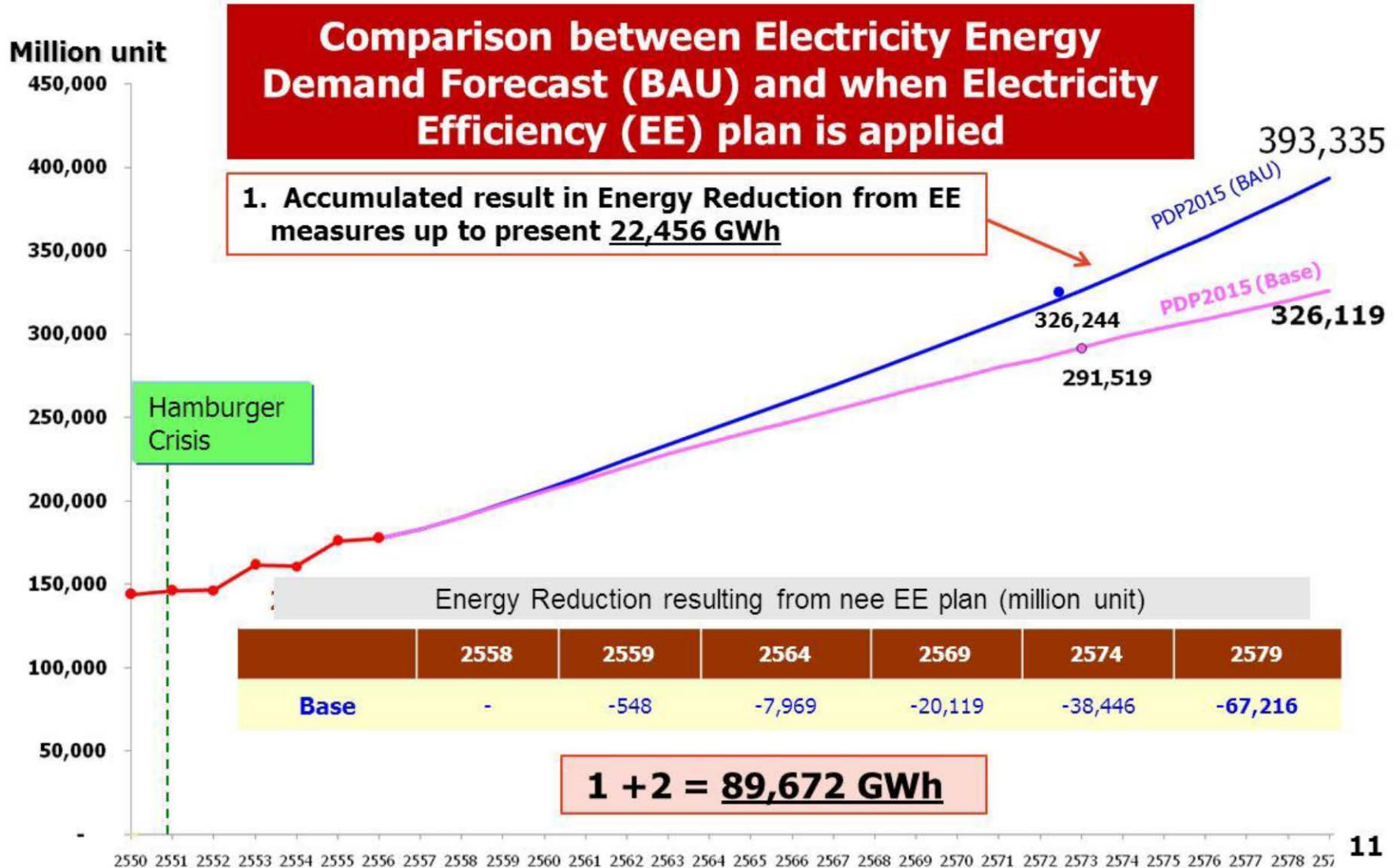


Alternative Energy Development Plan

Summary of Thailand Integrated Energy Blueprint



Demand Forecast for Electricity 2016-2036





Estimated fuel mix (percentage)

PDP 2015				PDP2010 Rev.3
Fuel type	September 2014	2026	2036	2030
Purchasing from neighbouring countries	7	10-15	15 – 20	10
Clean coal and lignite	20	20-25	20 – 25	19
Renewable Energy	8	10-20	15 – 20	8
Natural Gas	64	45-50	30 – 40	58
Nuclear	-	-	0 – 5	5
Diesel/ Fuel Oil	1	-	-	-
Total	100	100	100	100

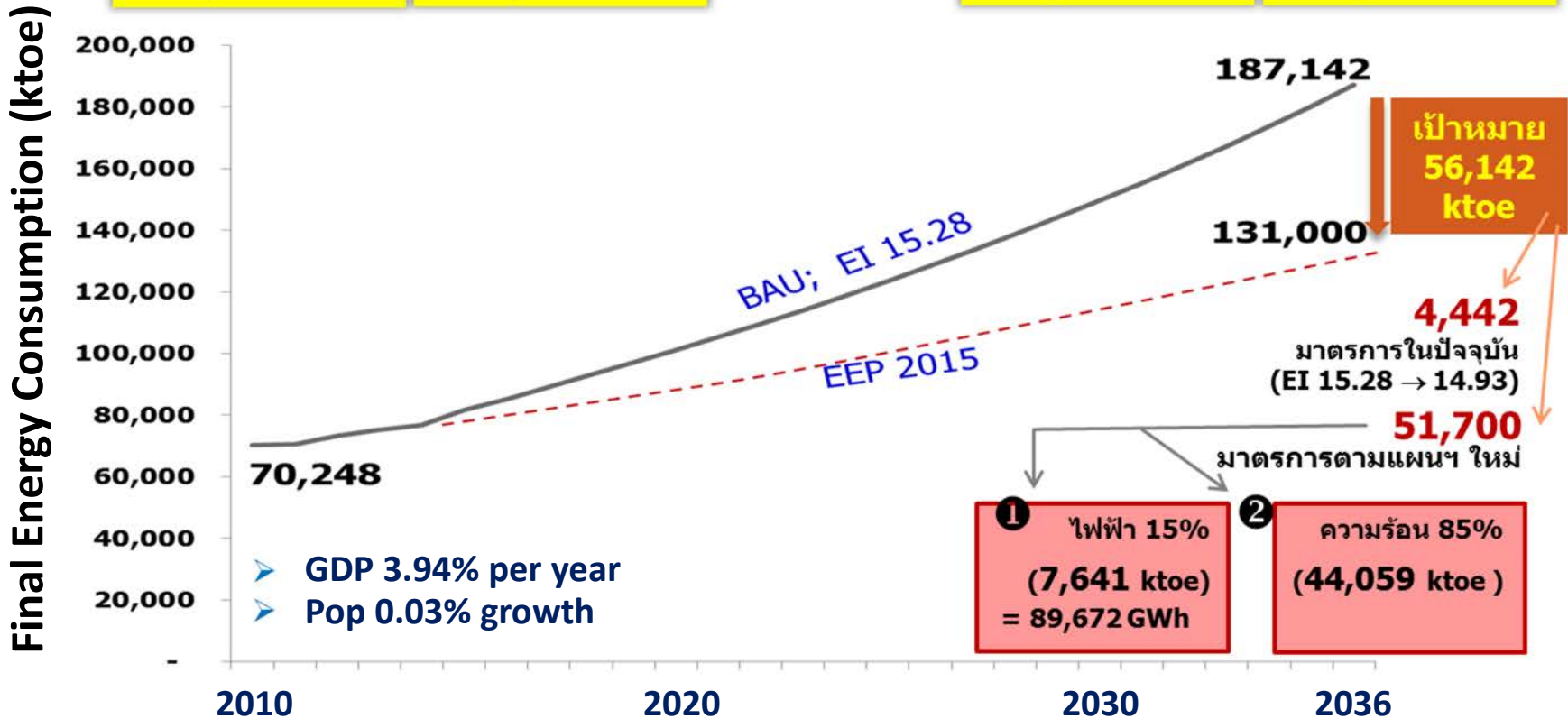


Thailand Energy Efficiency Plan 2015-2036

Energy intensity (EI) is key indicator

Reduce 30% of EI by 2036 (compare to 2010)

EI (2553) จริง 15.28 ktoe/billion baht	EI (2556) จริง 14.93 ktoe/billion baht	EI (2573) คาดการณ์ 11.0 ktoe/billion baht	EI (2579) คาดการณ์ 10.7 ktoe/billion baht
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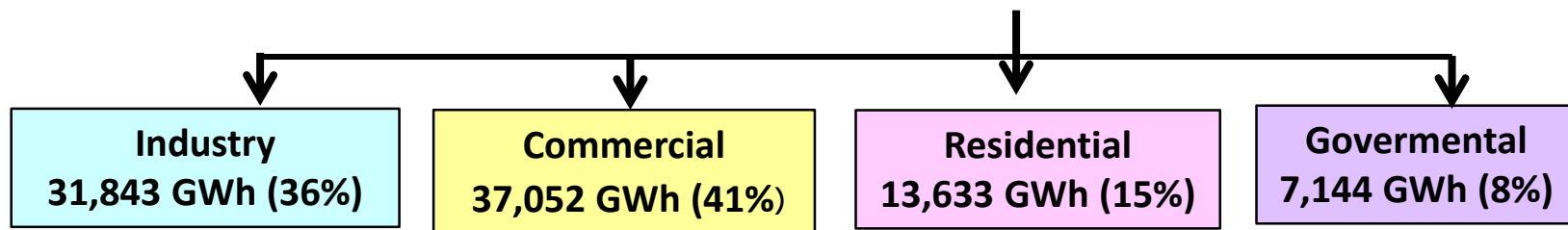
Source: Energy Policy and Planning Office (2015)



Thailand Energy Efficiency Plan 2015-2036

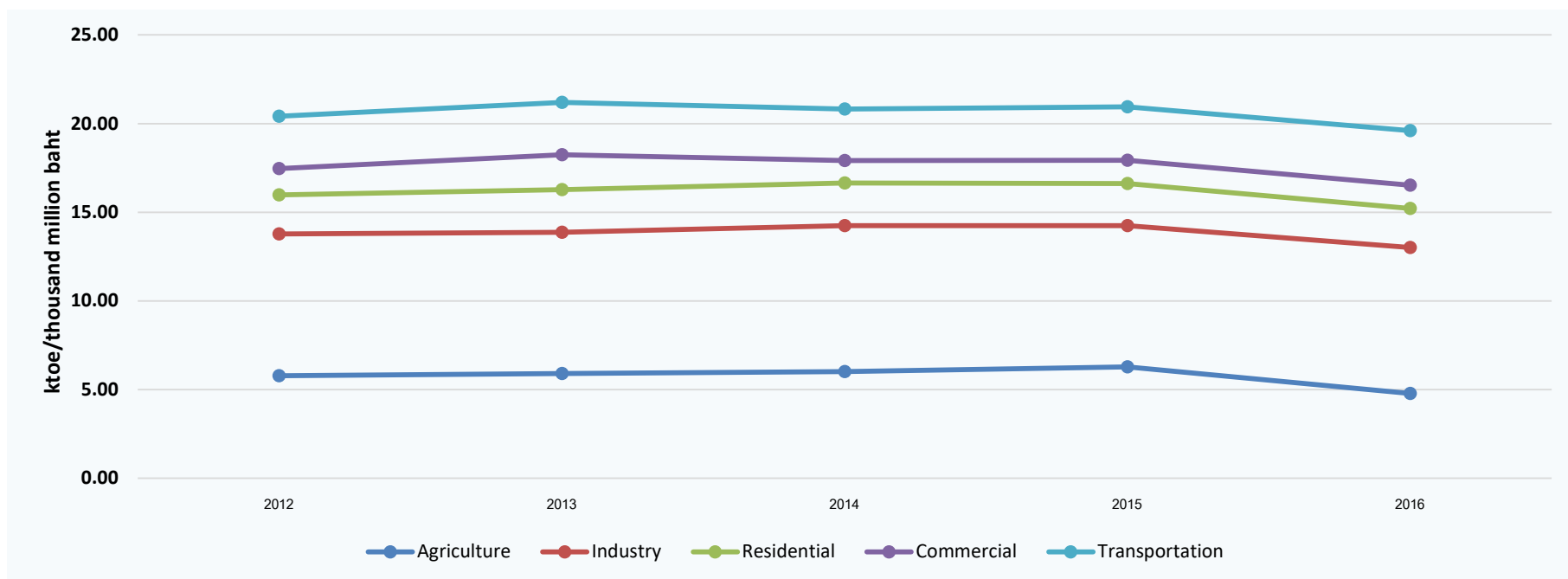
Measure	EEDP 2015 Saving Target			
	Electricity		Heat	Total
	GWh	ktoe	ktoe	ktoe
1. Compulsory Program				10,972
(1) Enforcement of energy management system designated factories and buildings	19,649	1,674	3,482	5,156
(2) Building Energy Code on the new buildings (BEC , LEED ,TREES)	13,685	1,166	-	1,166
(3) Energy labeling on equipment/appliances (HEPS & MEPS)	23,760	2,025	2,125	4,150
(4) Enforcing of Energy Efficiency Resource Standard (EERS)	5,872	500	-	500
2. Voluntary Measures				40,728
(5) Financial mechanisms and incentives				
- Standard offer Program , DSM Bidding	15,074	1,285	8,239	9,524
- Soft loan , ESCOs				
- Tax Incentive				
(6) Promoting of LED	11,632	991	-	991

Measure	EEDP 2015 Saving Target			
	Electricity		Heat	Total
	GWh	ktoe	ktoe	ktoe
2. Voluntary Program				
(7) Energy saving measures in transport sector - Oil subsidy removing - Restructuring automobile tax - Efficiency improvement in oil pipeline - Developing traffic and transport infrastructure - New Technology (EV)	-	-	30,213	30,213
(8) Supporting the energy efficiency technology research and development	-	-	-	-
3. Complementary Program				
(9) Supporting the human resource development on energy conservation	-	-	-	-
(10) Supporting the public awareness and behavioral change	-	-	-	-
Total	89,672	7,641	44,059	51,700





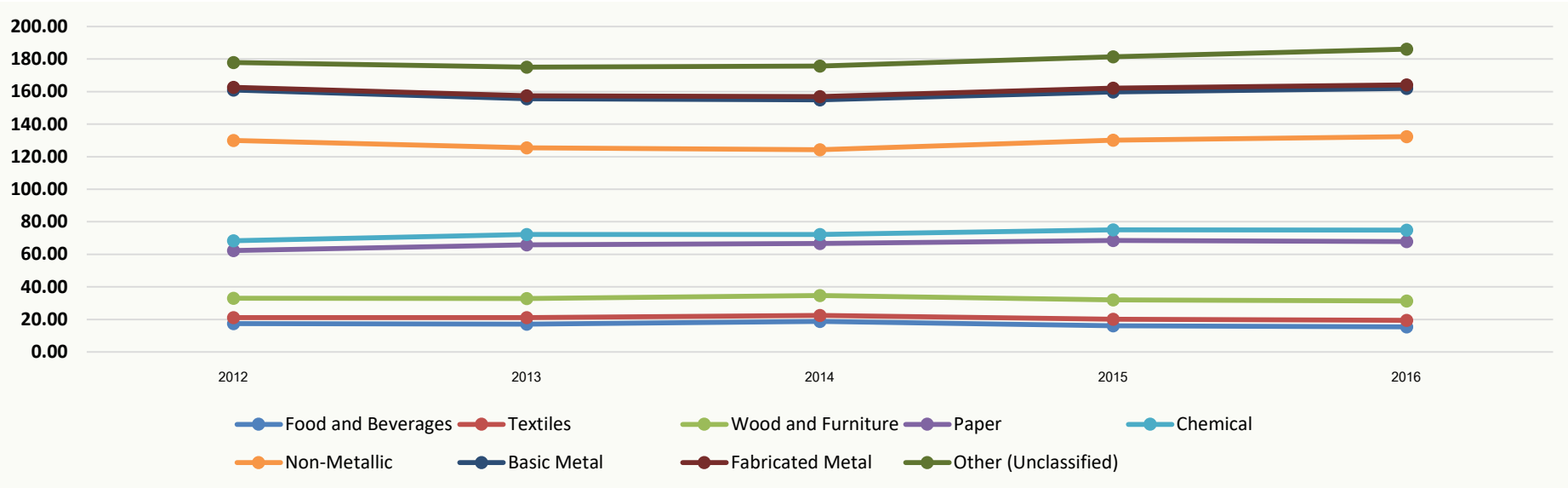
Energy Intensity by Economic Sectors 2012-2016



Sector	2012	2013	2014	2015	2016
Agriculture	5.78	5.91	6.02	6.28	4.79
Industry	8.00	7.96	8.23	7.96	8.22
Residential	2.20	2.40	2.40	2.38	2.20
Commercial	1.49	1.97	1.27	1.32	1.32
Transportation	2.95	2.95	2.90	3.01	3.08



Energy Intensity by Manufacturing Sub Sectors 2012-2016



Sector	2012	2013	2014	2015	2016
Food and Beverages	17.41	17.13	18.83	16.02	15.38
Textiles	3.72	3.94	3.69	4.13	4.10
Wood and Furniture	11.82	11.70	12.22	11.79	11.82
Paper	29.41	33.05	31.90	36.61	36.56
Chemical	5.91	6.36	5.55	6.56	7.04
Non-Metallic	61.72	53.21	52.05	55.03	57.48
Basic Metal	30.90	30.24	30.74	29.71	29.51
Fabricated Metal	1.68	1.81	2.01	2.23	2.30
Other (Unclassified)	15.25	17.62	18.67	19.26	21.96

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Thailand RE Target





Study for the potential of domestic RE source (Power/Heat/Biofuel) and forecast the quantity of RE in future

Analyze and appoint the share of RE for power, heat and biofuel at present and future

Total energy used prediction from EPPO's model

Opportunity for fossil replacing using RE

Power

Provide RE for power generation by the potential of transmission line of PEA's substation by the consideration of:

- 1) RE potential of each area
- 2) Priority of RE by merit order, using "Levelized Cost of Electricity (LCOE) model"

Heat

Provide RE for heat generation by the potential of fossil fuel replacement/target group

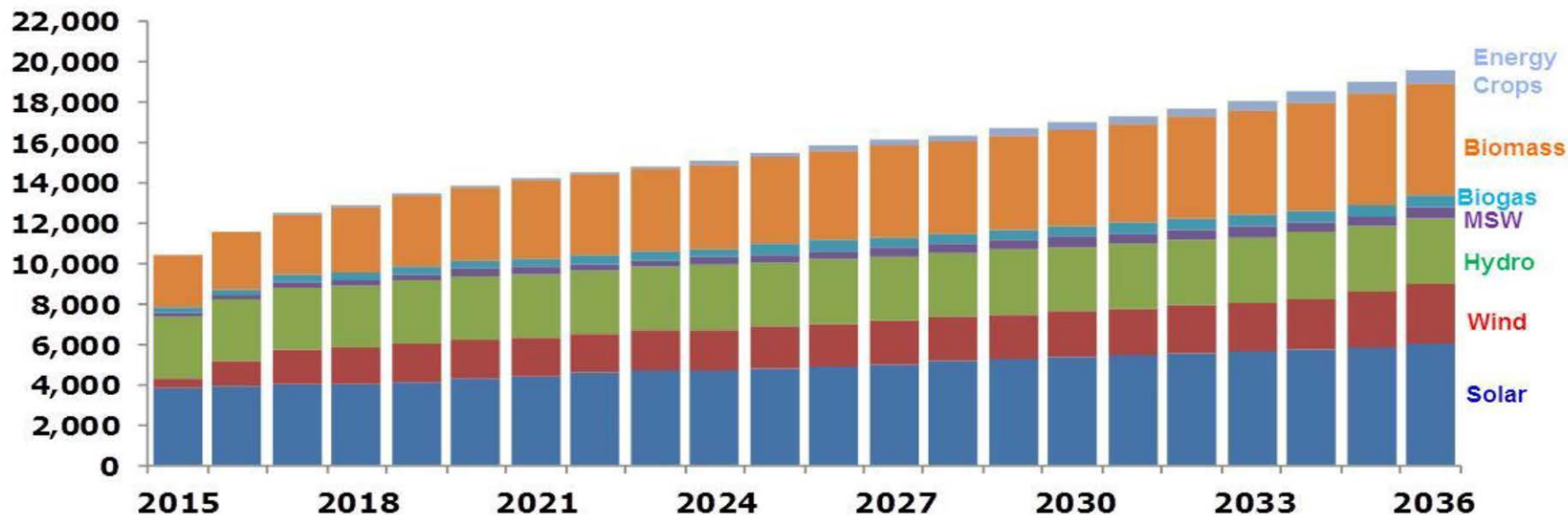
Biofuel

Increase amount of biofuel production instead of fuel oil in transportation sector, by considerate the equilibrium of production and utilization

Alternative Energy Target

Type	Solar	Wind	Hydro	Mini Hydro (<12MW)	MSW	Biogas	Energy Crops	Biomass	Total
<u>Installed Capacity 2014</u>	1,298.5	224.5	2,906.4	142	65.7	311.5	-	2,541.8	<u>7,490.4</u>
<u>Installed Capacity 2036</u>	6,000	3,002	2,906.4	376	500	600	680	5,570	<u>19,634.4</u>

Megawatts



AEDP 2015-2036

RE = 30% Energy Consumption

Energy Sector	2014 (MW)	Target (MW)
1. Waste	65.72	500.00
2. MSW	-	50.00
3. Biomass	2,451.82	5,570.00
4. Biogas (Waste)	311.50	600.00
5. Small hydro power	142.01	376.00
6. Biogas (Energy Crops)	-	680.00
7. Wind Energy	224.47	3,002.00
8. Solar Energy	1,298.51	6,000.00
9. Hydro Power	2,906.40	2,906.40
Total	7,400.43	19,684.40

Energy Sector	2014 (ktoe)	Target (ktoe)
1. Waste (MSW)	98.10	495.00
2. Biomass	5,184.00	22,100.00
3. Biogas	488.10	1,283.00
4. Solar Energy	5.12	1,200.00
5. Others heat	-	10.00
Total	5,775.00	25,088.00

Energy Sector	2014	Target	
Biofuels	Million liters/day	Million liters/day	ktoe
1. Biodiesel	2.89	14.00	4,404.82
2. Ethanol	3.21	11.30	2,103.50
3. Pyrolysis Oil	-	0.53	170.87
4. CBG (toe/day)	-	4,800.00	2,023.24
5. Others fuel	-	-	10.00
Total	6.10		8,712.43

Electricity

5,588.24 ktoe
(4.27%)



Electricity Ratio
for RE / Electricity
Consumption
20%

Heat

25,088.00 ktoe
(19.15%)



Heat Ratio
for RE / Heat
Consumption
36.67%

Biofuels

8,712.43 ktoe
(6.65 %)



Fuels Ratio for RE
/ Fuels Consumption
25%

Performance on Alternative Energy Policy 2016

Alternative Energy	Target 2036				Performance 2016			
	MW	Million litres/day	GWh	ktoe	MW	Million litres/day	GWh	ktoe
Electricity	19,684		65,583	5,588	9,437		24,903	2,122
Solar	6,000		8,410	717	2,446		3,377	288
Wind	3,002		4,734	403	507		345	29
Small Hydropower	376		1,350	115	182		312	27
Biomass	5,570		34,155	2,910	2,815		16,446	1,402
Biogas	1,280		8,326	709	435		595	51
MSW	550		3,373	287	145		683	58
Large Hydropower	2,906		5,236	446	2,906		3,143	268
Heat				25,088				7,182
Solar				1,200				7
Biomass				22,100				6,507
Biogas				1,283				593
MSW				495				75
Alternative Heat				10				
Biofuels				8,713			7	1,747
Ethanol		11		2,104		4		684
Biodiesel		14		4,405		3		1,063
Pyrolysis Oil		1		171				
Compressed Bio-methane Gas		4,800		2,024				
Alternative Fuels				10				
Total Alternative Energy Consumption				39,389				11,051
Final Energy Consumption				131,000				79,929
Percentage of Alternative Energy Consumption (%)				30				14



Thank you very much

Wongkot Wongsapai

Email: wongkot@eng.cmu.ac.th




Helen Keller

Alone we can do so little;

together

we can do so much.

Photo by Wellington College

 Symphony of Love