



Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

Biodiesel policy in Thailand



Dec.13, 2017

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AGENDA



1. About the Plan

Alternative Energy Development Plan (AEDP)

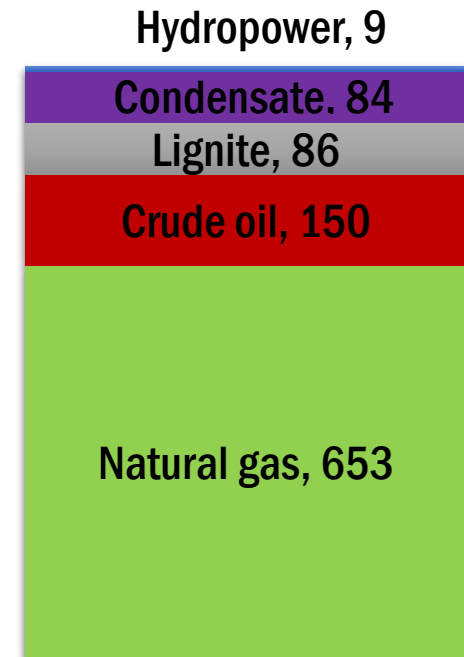
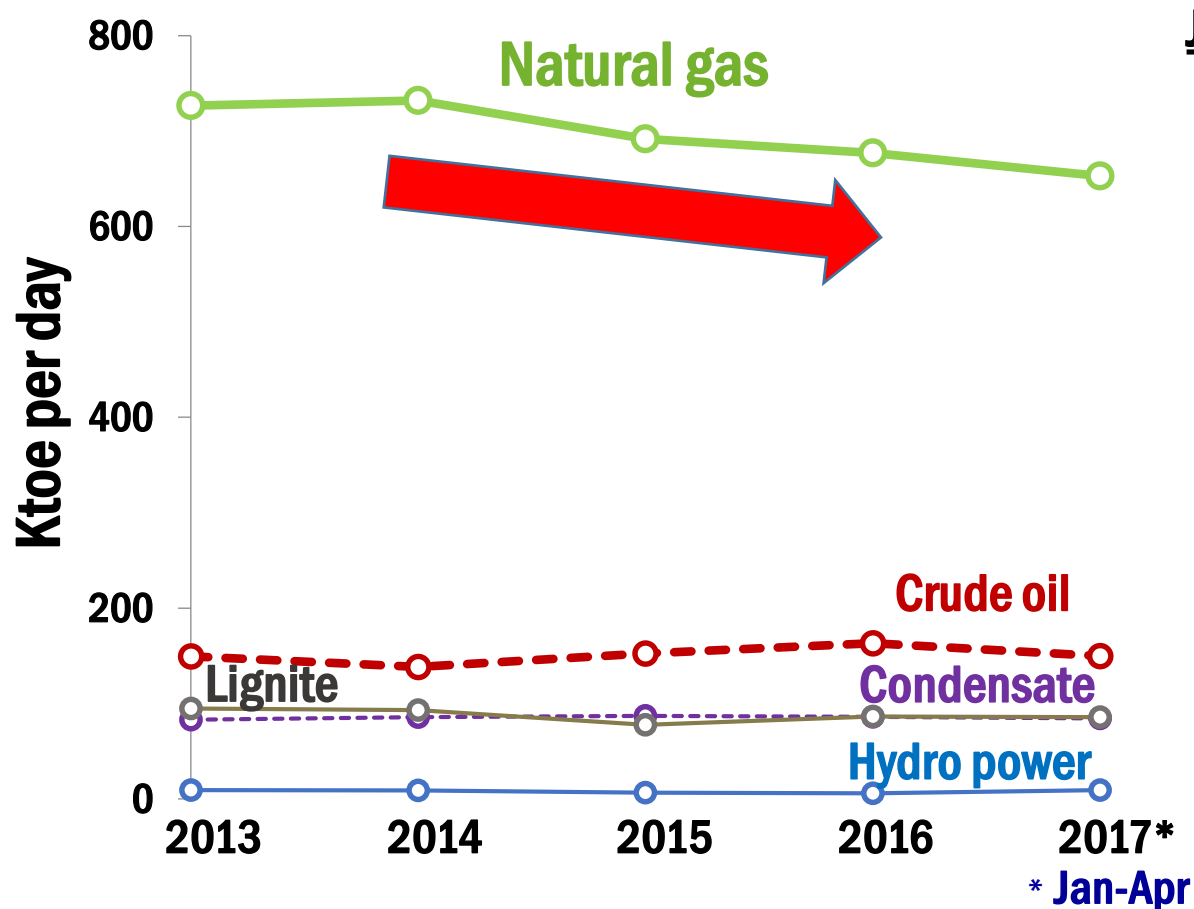
2. About the Bioethanol

Bioethanol – Creation of demand and market

3. About the Biodiesel

Biodiesel – Creation of demand and market

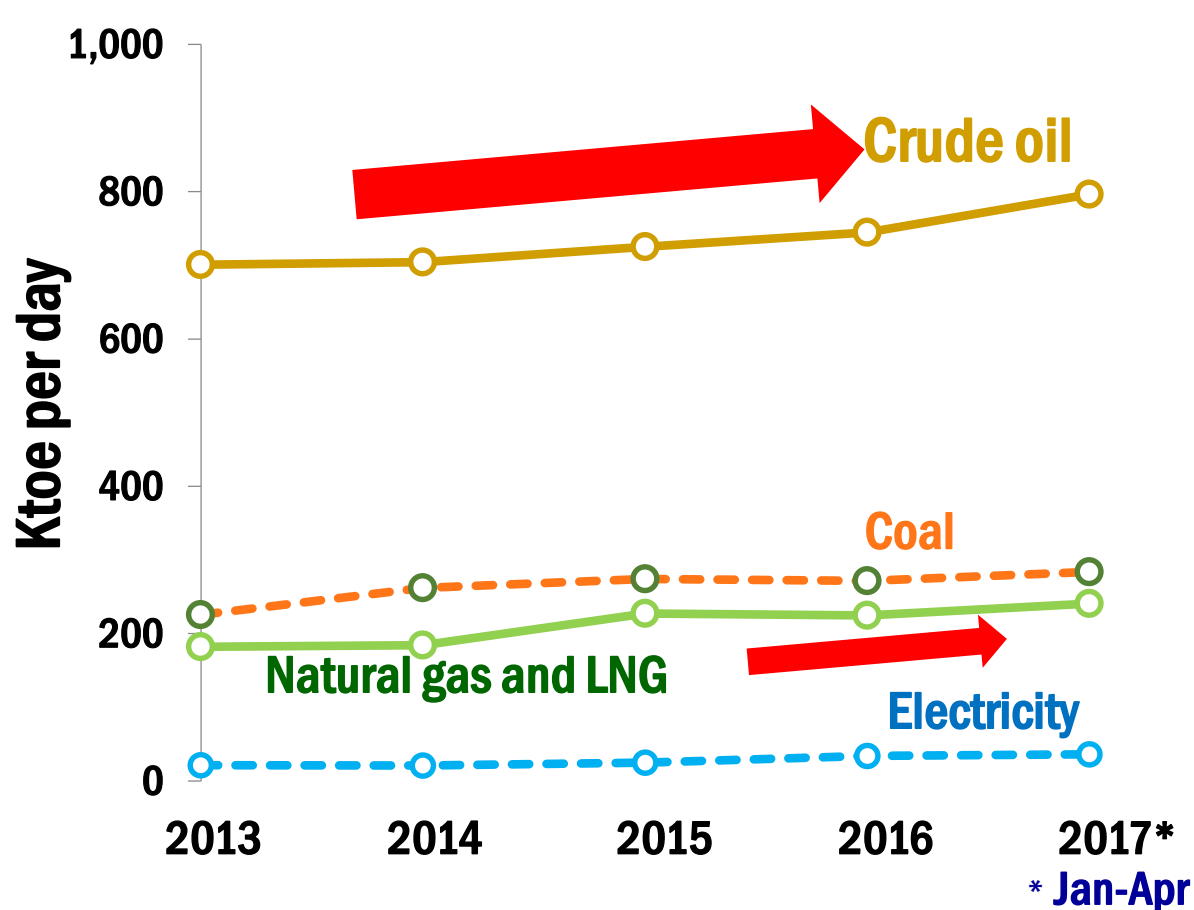
Thailand energy production



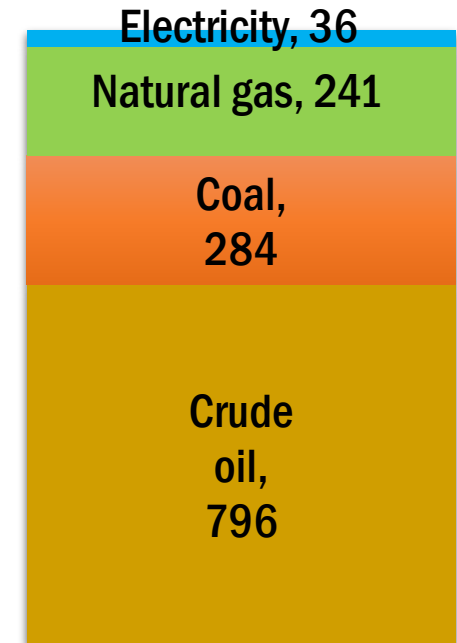
**Out of energy produced, natural gas takes the largest share.
BUT....natural gas resource is depleting and decreasing.**

Source – EPP0 (2017)

Thailand energy import



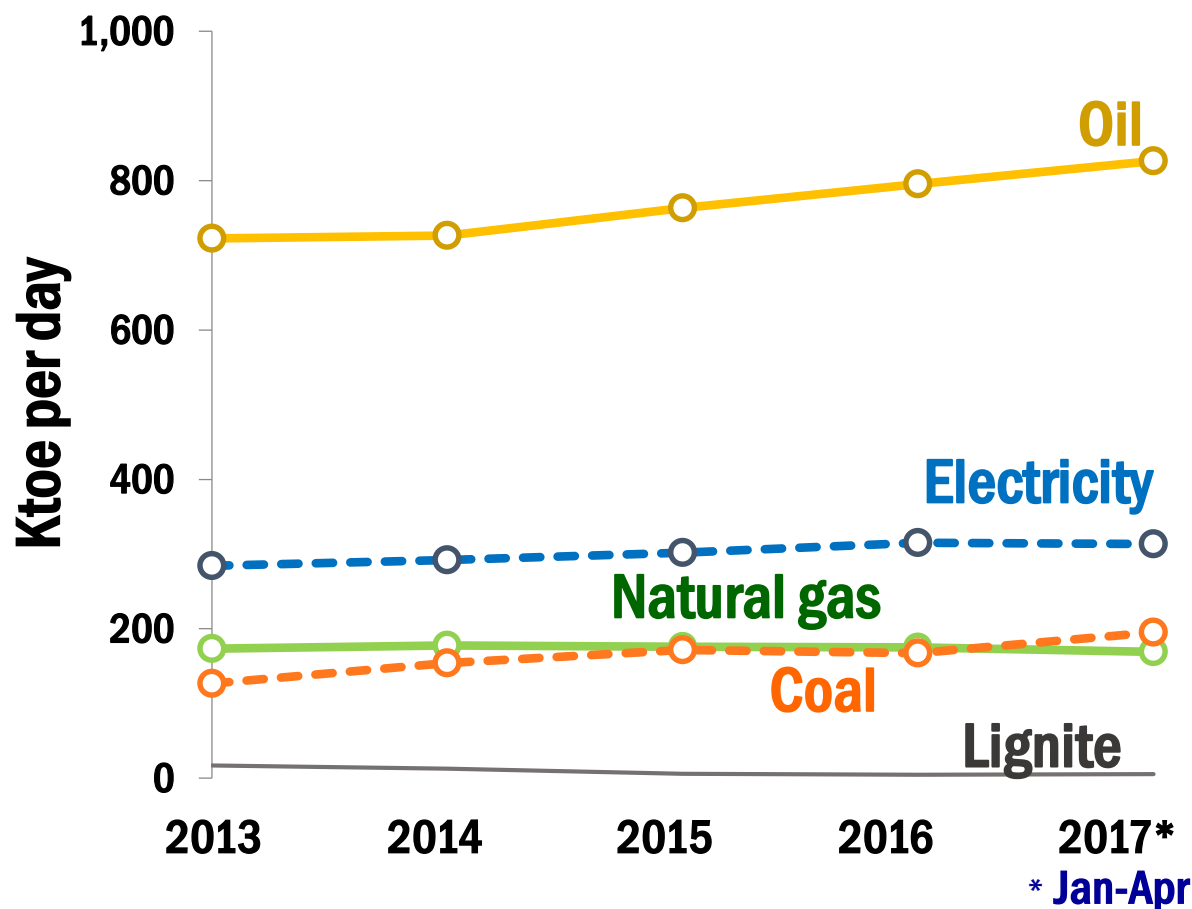
Jan. – Apr. 2017 Energy import



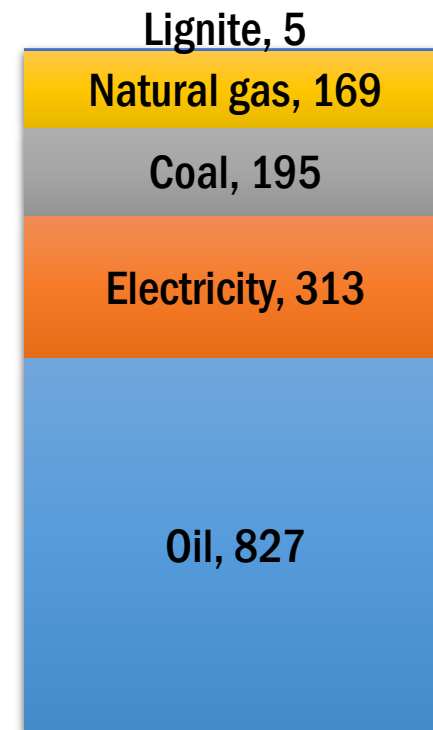
**Thailand imported energy increasingly over the year.
This is especially true for crude oil and NG.**

Source – EPP0 (2017)

Thailand energy usage



Jan. – Apr. 2017 Energy usage



**Total energy demand also increases especially in fuel demand.
Oil demand is rising due to low oil price.**

Source – EPP0 (2017)

Thailand Energy Masterplan



PDP

Power Development Plan
(Cabinet approve in Jun. 30, 2015)

EEP

Energy efficient Plan
(Cabinet approve in Oct. 6, 2015)

AEDP

Alternative Energy Development plan
(Cabinet approve in Oct. 27, 2015)

GAS

Gas plan
(Cabinet approve in Oct. 27, 2015)

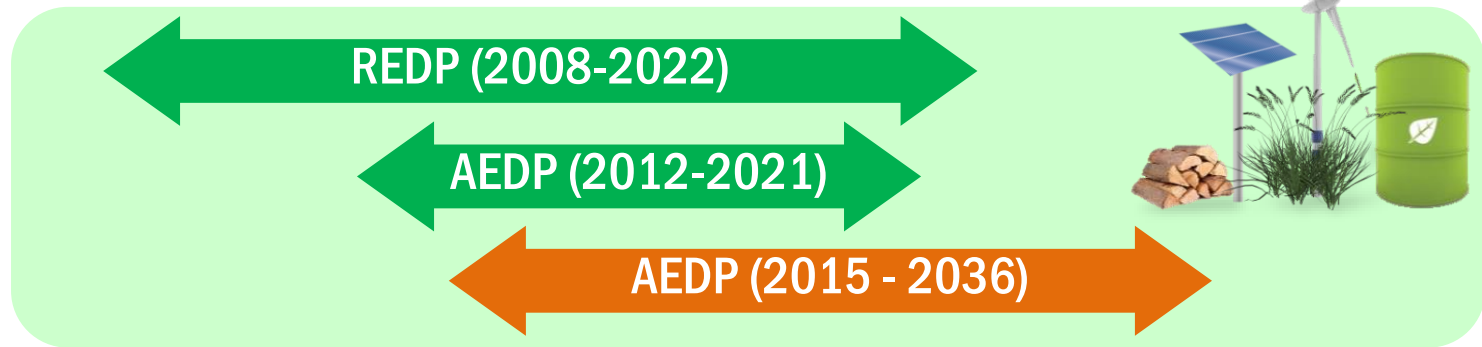
OIL

Oil plan
(Cabinet approve in Oct. 27, 2015)

AEDP – History and Objectives



Renewable/Alternative Energy Development Plan



Economy

- To develop alternative energy production with suitable technology



Energy Security

- To fully utilize county's alternative energy potentials

Ecology

- To increase social and community benefits from alternative energy production and usage

AEDP 2015 - Targets

Overall Targets

30%

By
2036

Renewable Energy
in total energy consumption



Electricity

19,684.4 MW



Wind



Hydro



Waste



Heat

25,088 ktoe



Solar



Biomass



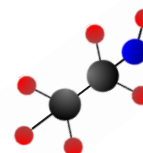
Biogas



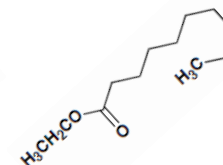
Fuel

11.3 MLPD Ethanol
14 MLPD B100

+0.53 MLPD Pyrolysis Oil
+4,800 TPD of CBG



Ethanol



Biodiesel

CBG

Compressed
Biogas

AEDP 2015 Targets - Biofuel



Fuel

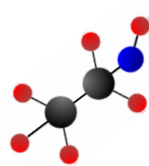
2036 RE Biofuel targets

8,712 ktoe*

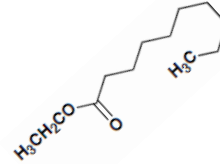
(25.04% of fuel demand)

2016 biofuel usage

1,742 ktoe



Ethanol



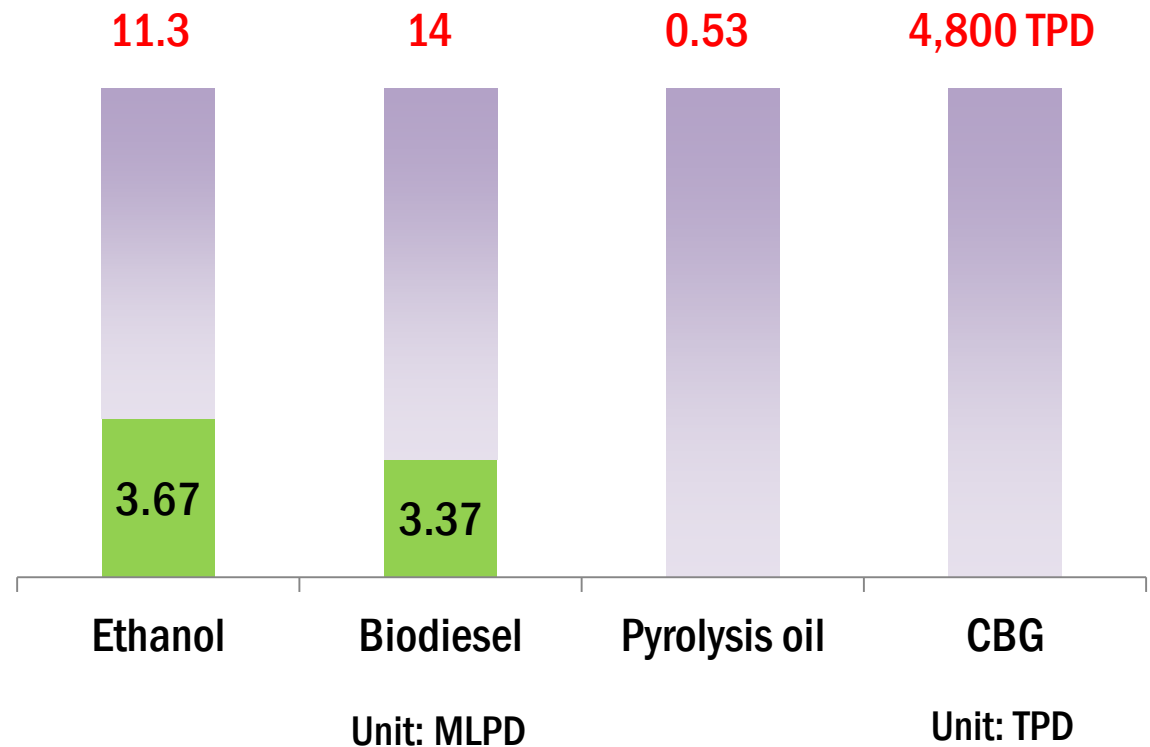
Biodiesel



Pyrolysis
oil

CBG

Compressed
Biogas



Remark : * ktoe equivalent of biofuel

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Bioethanol – Creation of demand and market

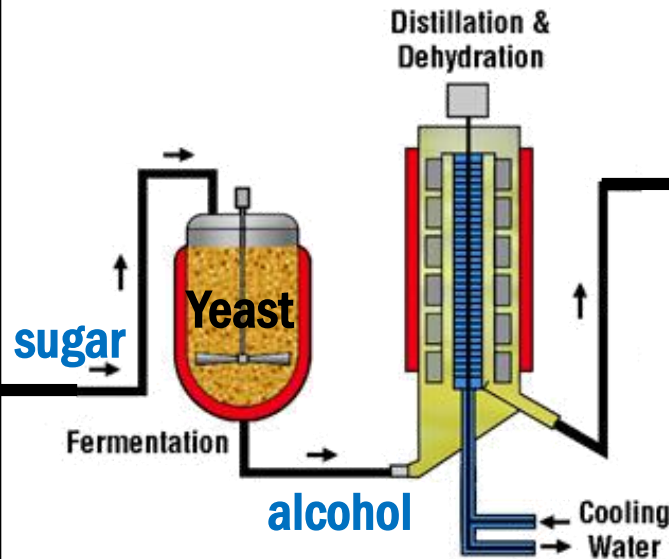
3. About the Biodiesel

Biodiesel – Creation of demand and market

Ethanol supply

Feedstock

- **Sugar-based**
(Sugarcane and its derivatives)
- **Starch-based**
(Cassava, Corn)
- **Cellulosic-based**
(Rice straw, Bagasse)



3.15 MT of Molasses were used to produce ethanol in 2016



2.50 MT of Cassava were used to produce ethanol in 2016

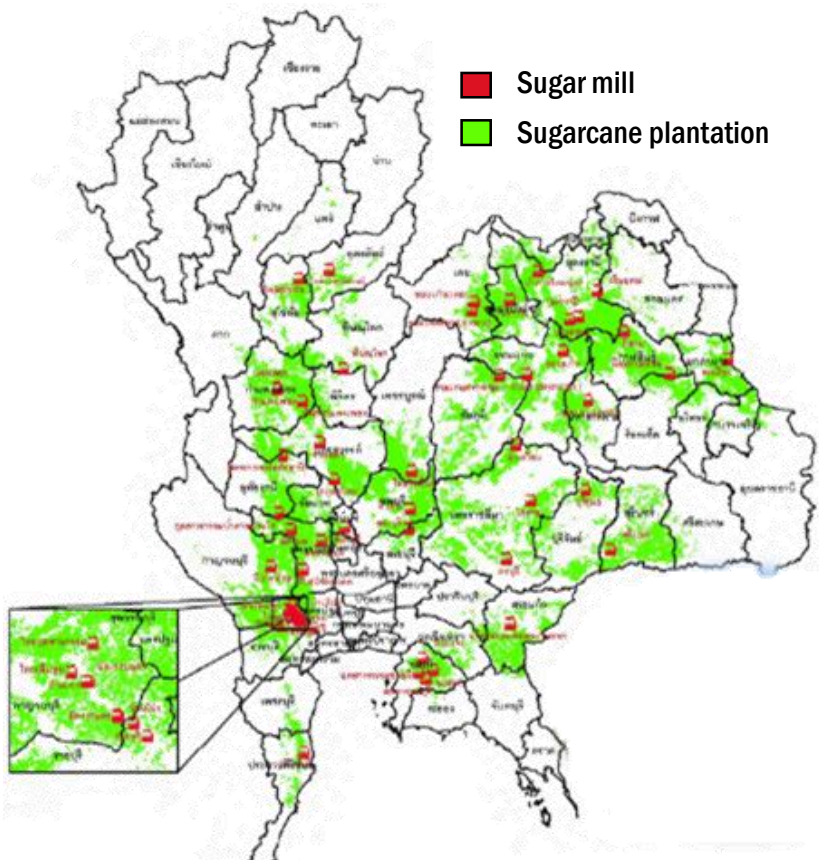
26 ethanol plants
Total capacity of **5.79 MLPD**

Hybrid 0.9 MLPD
Cassava 2.08 MLPD
Molasses 2.81 MLPD



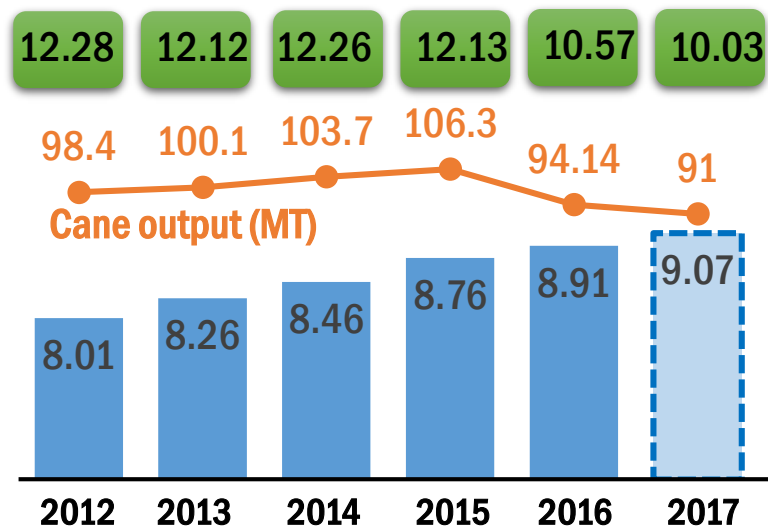
1,214 Million liter
Of ethanol was produced in 2016

Feedstock - Sugarcane plantation



Source: Office of Agriculture economics (2016)
Office of the cane and sugar board (2016)

Yield (T/Rai)



Plantation area (M.Rai)

• Demand of Sugarcane products (2015)

Sugarcane
106.3 MT

Sugar
11.34 MT

Molasses
4.61 MT

Domestic uses 2.50 MT

Export 8.84 MT

Ethanol 3.17 MT

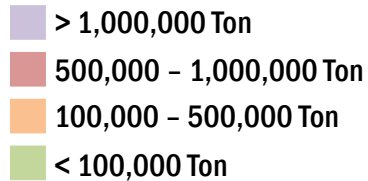
Others 1.45 MT

Area: 1 Hectare = 6.25 Rai

Feedstock - Cassava plantation



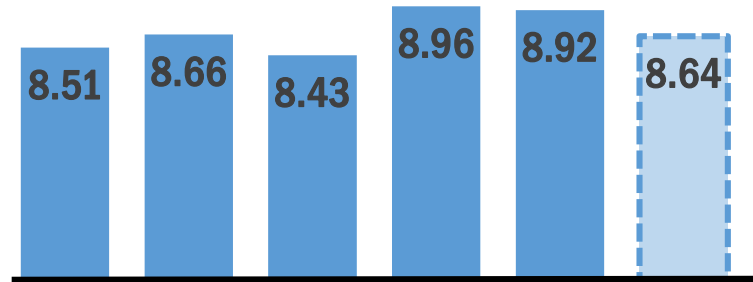
Production by province



Yield (T/Rai)



Cassava output (MT)



2012 2013 2014 2015 2016 2017

Plantation area (M.Rai)

• Demand of Cassava products (2015^o)

Domestic
32.36 MT

Local uses
9.48 MT

Domestic uses 7.18 MT

Ethanol 2.3 MT ★

Stock/Import
9.52 MT

Export
32.4 MT

Cassava pellets 0.4 MT

Cassava chips 7.3 MT

Cassava starch 3.9 MT

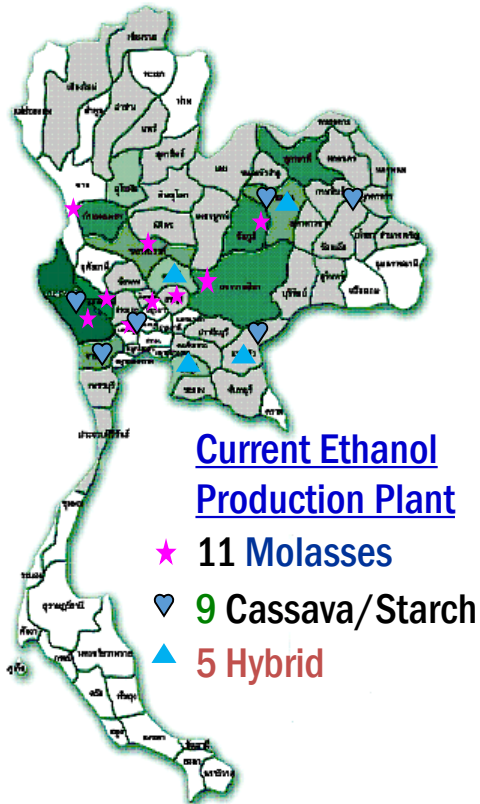
Area: 1 Hectare = 6.25 Rai

Source: Office of Agriculture economics (2016)

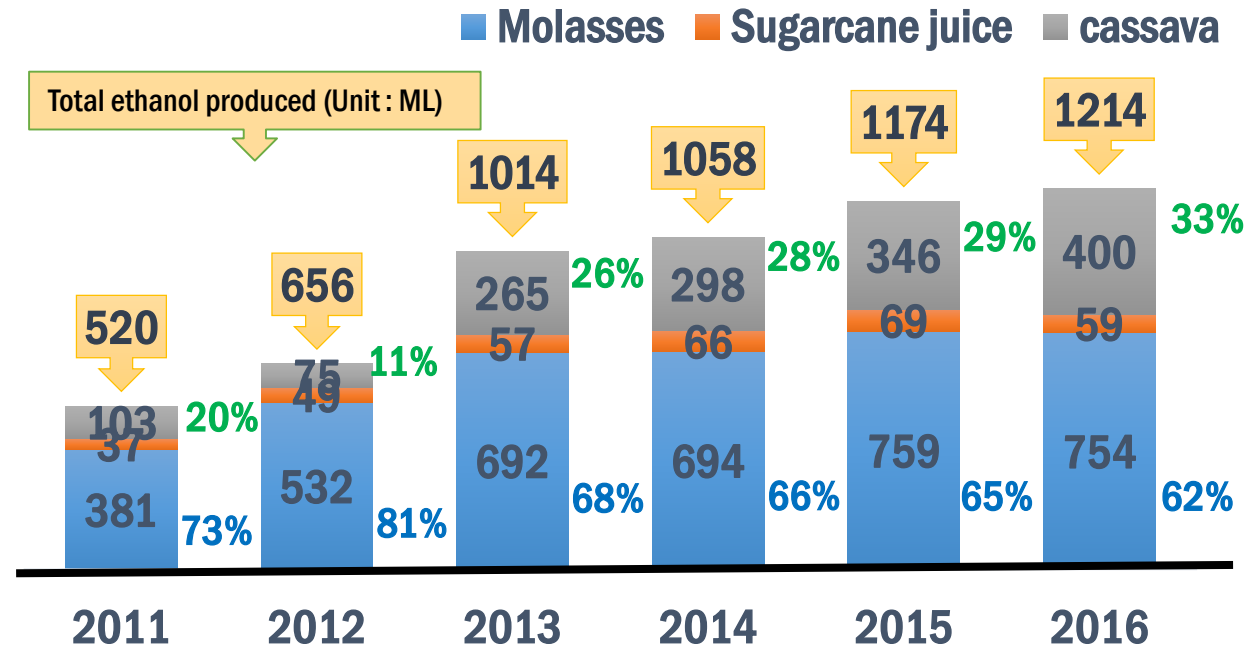
Bioethanol - Ethanol production

Thailand has 25 ethanol plants

Feedstock	Capacity (ML/day)
Molasses/Sugar cane	2.49
Cassava	2.08
Molasses and Cassava	0.90
TOTAL	5.47



Ethanol production (Unit : ML)



Feedstock uses (Unit : MT)

Type	2011	2012	2013	2014	2015	2016
Molasses	1.59	2.22	2.62	2.90	3.17	3.15
Sugarcane juice	0.49	0.65	0.76	0.88	0.91	0.79
Cassava	0.65	0.47	1.67	1.86	2.17	2.50

Source – Department of Alternative Energy and Efficiency

Ethanol policy in Thailand is “*All about Marketing*”



- ★ Is our *product* good?
- ★ Is our *price* competitive?
- ★ Is our *place* accessible?
- ★ Is our *promotion* enough?

Product - Ethanol and Gasohol



- Ethanol has ~70% heating value of gasoline
- Thailand's fuel ethanol spec. is up to international standard
- Quality of fuel grade ethanol is tightly control by department of energy business.



- Ethanol blended gasoline is called “**GASOHOL**”



90% gasoline

9 - 10% ethanol



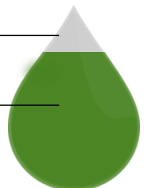
80% gasoline

19- 20% ethanol



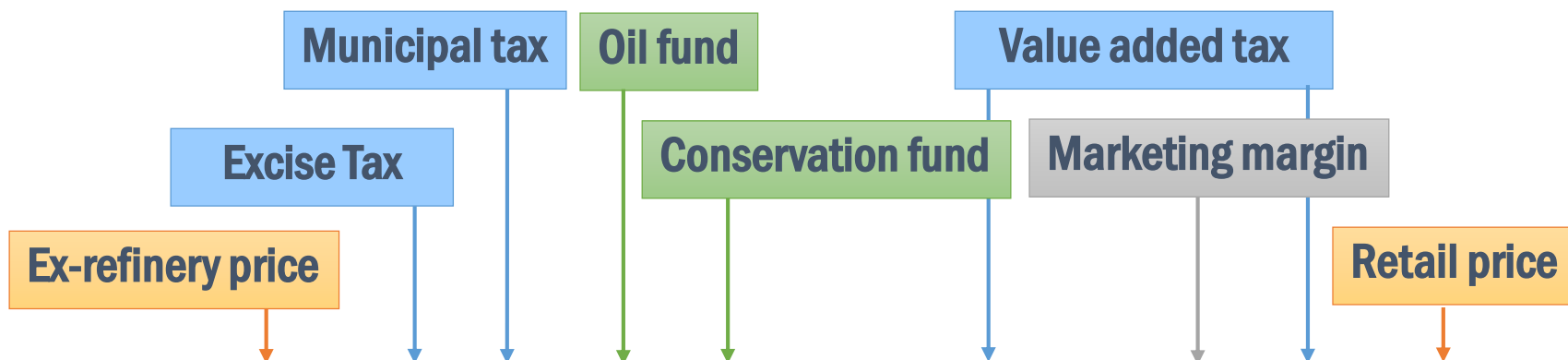
15% gasoline

75% and above
ethanol



E10 (91) & E10 (95)

Price – Gasohol price structure



UNIT:BAHT/LITRE	EX-REFIN. (AVG)	TAX B./LITRE	M. TAX B./LITRE	OIL FUND	CONSV. FUND	WHOLESALE PRICE(WS)	VAT	WS&VAT	MARKETING MARGIN	VAT	RETAIL
ULG	15.5956	6.5000	0.6500	6.3100	0.2500	29.3056	2.0514	31.3570	2.6196	0.1834	34.16
GASOHOL95 E10	16.6344	5.8500	0.5850	0.3500	0.2500	23.6694	1.6569	25.3262	1.6110	0.1128	27.05
GASOHOL91	16.4029	5.8500	0.5850	0.3500	0.2500	23.4379	1.6407	25.0786	1.5901	0.1113	26.78
GASOHOL95 E20	17.6746	5.2000	0.5200	-3.0000	0.2500	20.6446	1.4451	22.0898	2.2899	0.1603	24.54
GASOHOL95 E85	22.6639	0.9750	0.0975	-9.3500	0.2500	14.6364	1.0245	15.6609	4.0926	0.2865	20.04
H-DIESEL	15.8781	5.8500	0.5850	0.0100	0.2500	22.5731	1.5801	24.1532	1.5298	0.1071	25.79
FO 600 (1) 2%S	11.8230	0.6400	0.0640	0.0600	0.0700	12.6570	0.8860	13.5430			
FO 1500 (2) 2%S	11.5244	0.6400	0.0640	0.0600	0.0700	12.3584	0.8651	13.2235			
LPG	20.7216	2.1700	0.2170	-6.5965	0.0000	16.5121	1.1558	17.6679	3.2566	0.2280	21.15
Exchange Rate	=	33.2976	BAHT/\$								
Ethanol Reference Price	=	25.02	BAHT/LITRE								
Biodiesel(B100) Reference Price	=	25.58	BAHT/LITRE								

Biofuel reference price

Example of fuel price structure (Source – EPP0 Oct.24, 2017)

Bureau of biofuel development (DEDE)

Price – Oil fund makes gasohol competitive

Oil fund collections of ULG and E10s and subsidies to E20 and E85 create price incentives for E20 and E85.

UNIT:BAHT/LITRE	EX-REFIN. (AVG)	OIL FUND	RETAIL	
ULG (Unleaded gasoline)	15.5956	6.3100	34.16	7.11 THB
GASOHOL95 E10	16.6344	0.3500	27.05	
GASOHOL91	16.4029	0.3500	26.78	2.51 THB
GASOHOL95 E20	17.6746	-3.0000	24.54	
GASOHOL95 E85	22.6639	-9.3500	20.04	4.50 THB

why

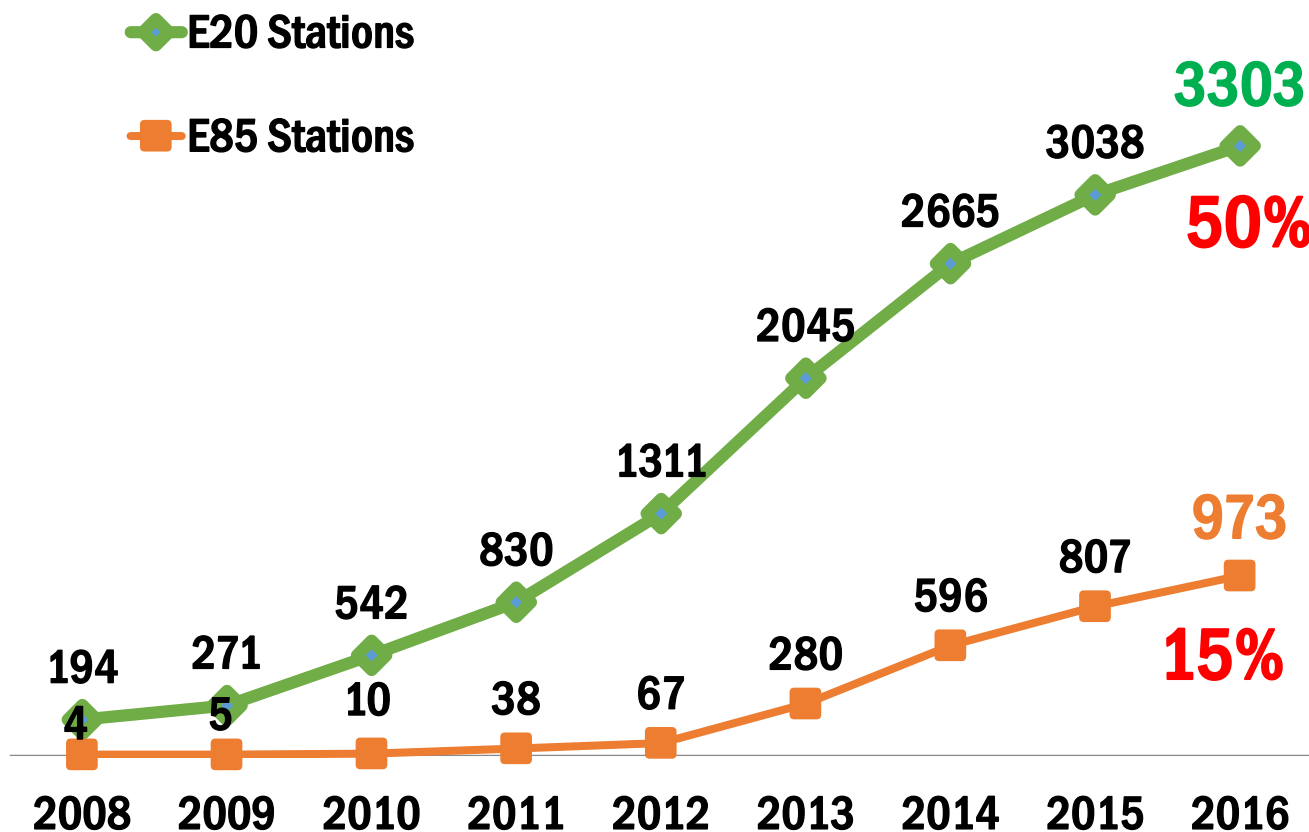
Ethanol has less heating value than gasoline yet ethanol is more expensive

To incentivize gasohol, oil fund is used to make gasohol competitive to gasoline

Place – Where can we find gasohol?

There are total over 25,000 gas stations with about 18,500 small-non-brand stations

E10 stations are well-spread in Thailand



Sources – Department of Energy Business (2017)

Place – Vehicles that can use gasohol

ULG

(Unleaded gasoline)

Pure gasoline



All cars

E10

90% gasoline

9 - 10% ethanol

E10 (91) & E10 (95)

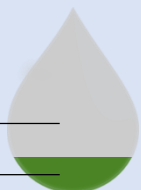


Most cars
manufactured
since 1995

E20

80% gasoline

19- 20% ethanol

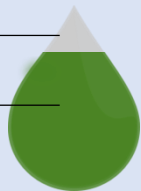


Most cars
manufactured
since 2008

E85

15% gasoline

75% and above
ethanol



Flex-fuel
Vehicles
(FFV)

4.82 million cars



32%

57%

11
%

ULG/E10

E20

E85

20.3 million motorcycles



44%

56%

ULG/E10

E20

Sources – Department of Land Transportation (2016)
Thai Automotive Industry Association (2016)

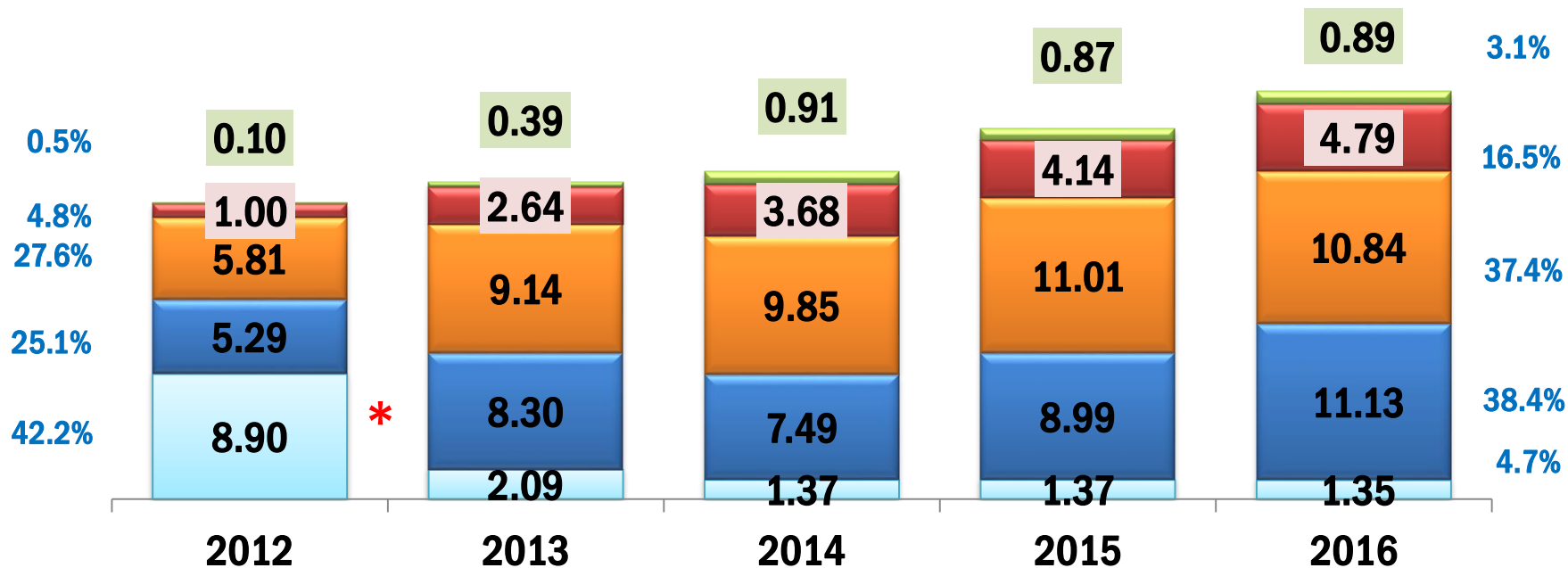
- **FFV cars** in Thailand are produced by Toyota, Honda, Nissan, Mitsubishi, Chevrolet, Volvo, Mazda and Ford. Yamaha offered **FFV motorcycles**
- Out of new cars and motorcycles registered in 2016
 - 47% are FFV cars
 - 83% are E20 motorcycles



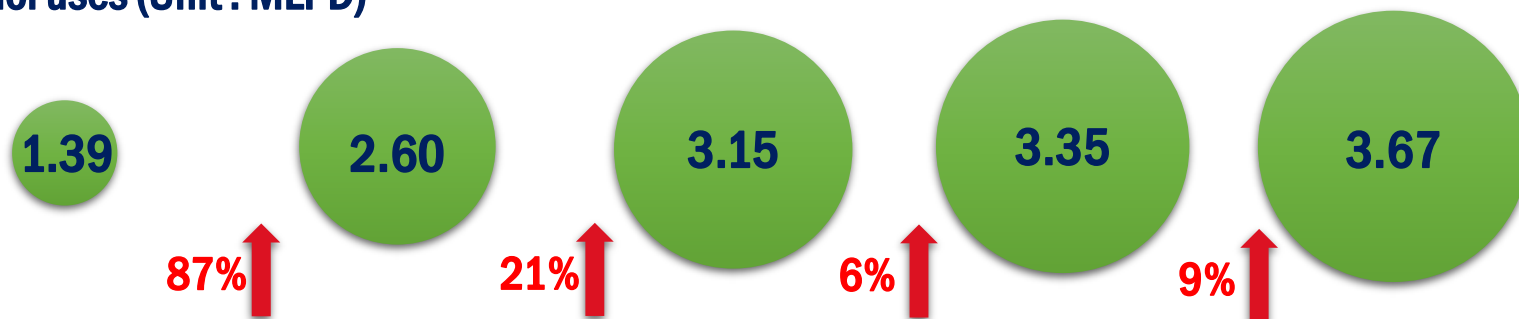
Policy results – fuel usage

Fuel uses (Unit : MLPD)

ULG E10 (95) E10 (91) E20 E85



Ethanol uses (Unit : MLPD)



Obstacles met in Thailand ethanol development

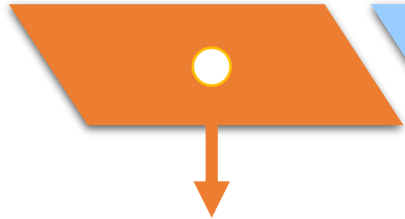
Molasses and cassava chips

- Competing demand from other industries
- Freely export/Import without system to track local stocks

“Gasohol”

- Ethanol is more expensive than gasoline
- No measures to systemically increase E20/E85 stations coverage

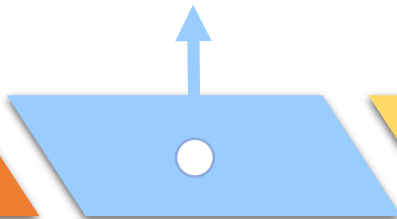
Plantation



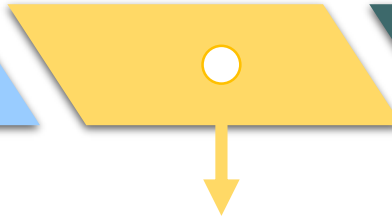
Sugarcane and cassava

- High cost of production due to low yield in some areas
- Limit plantation areas for sugarcane

Feedstock



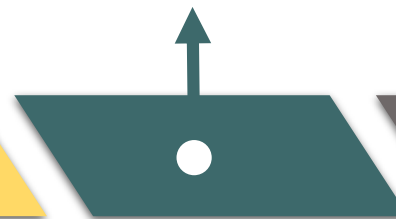
Ethanol



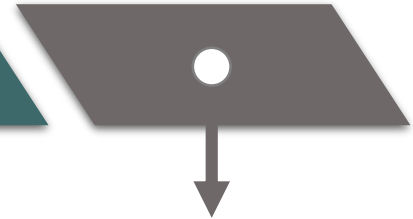
Ethanol

- Need more ethanol plants for future demand (As planned)
- Lack of open trading system for ethanol

“Gasohol”



Vehicles



Vehicles

- E20 car and motorcycles owners still prefer E10
- More EV cars in the future
- More FFV motorcycles are needed

Future policies

Demand



Promoting Ethanol Consumption

Ethanol Consumption Promoting Policies

1. Increase gasohol demand through marketing mechanisms
(Price incentive/Gasohol service coverage/PR)
2. Increase share of gasohol vehicles
(Increase E20/E85 compatible car)

Supply

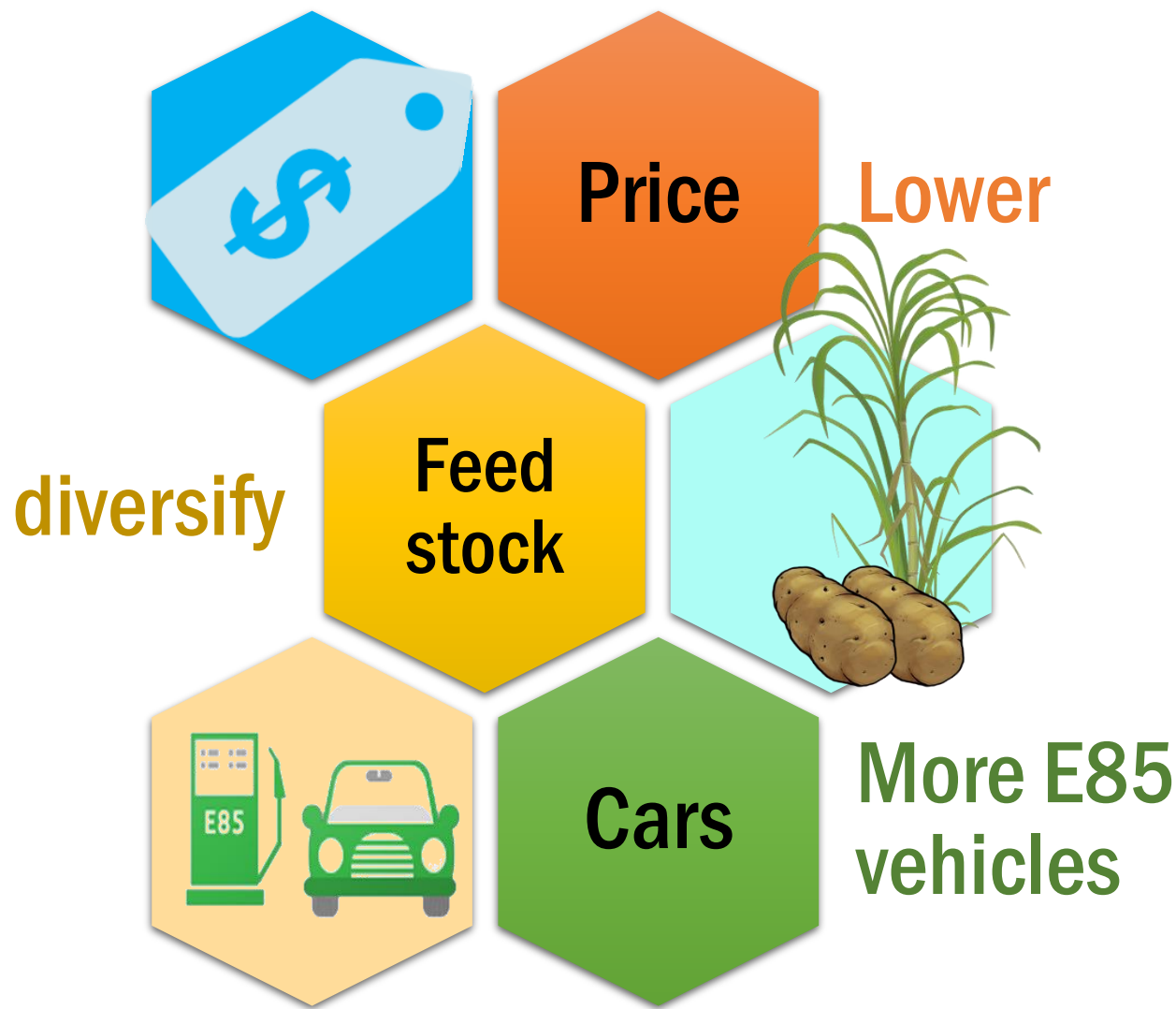


Promoting Sustainable Ethanol Production

Ethanol Production Promoting Policies

1. Promote more sustainable and more efficient ethanol feedstock plantation/production
2. Increase ethanol production efficiency
(Reduce production cost + logistic cost)

Future for ethanol will depend on



AGENDA



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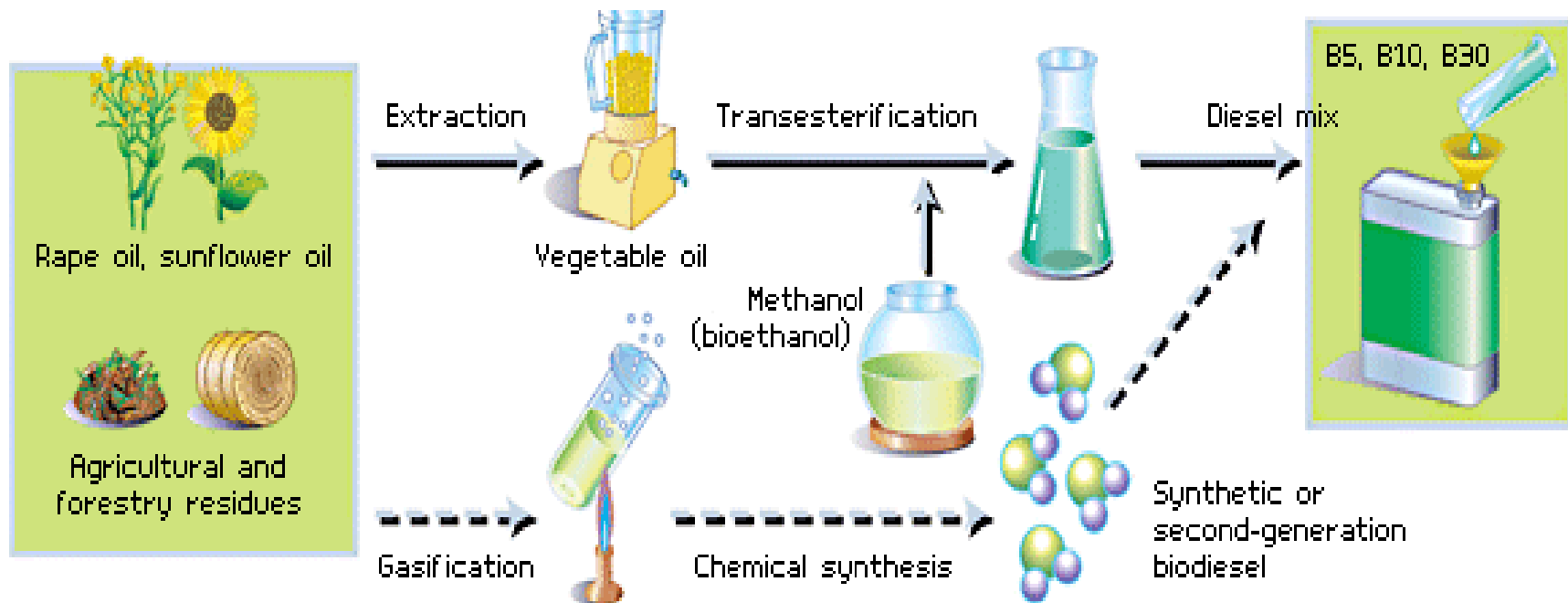
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Biodiesel or B100

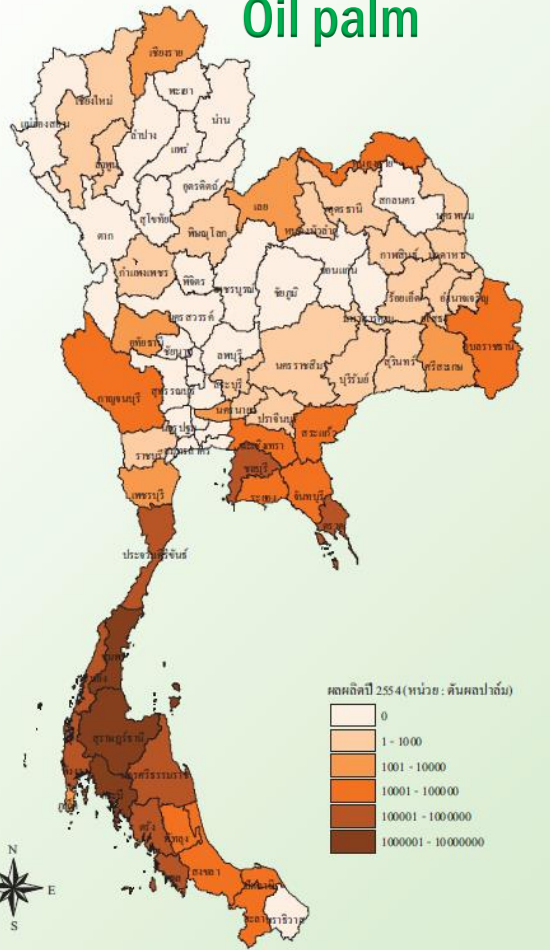


Biodiesel can be produced by 2 methods. The simple one is through “**transesterification process**” using oil from oil plants such as palm, rapeseed, sunflower etc. The more complicated one is using “**Gasification process**” using any agricultural or forestry residues.

The **biodiesel or B100** will then be blended with regular fossil diesel. At the moment, car industry in Thailand accepts maximum ratio of 7% or **B7**

A touch on biodiesel supply

Oil palm

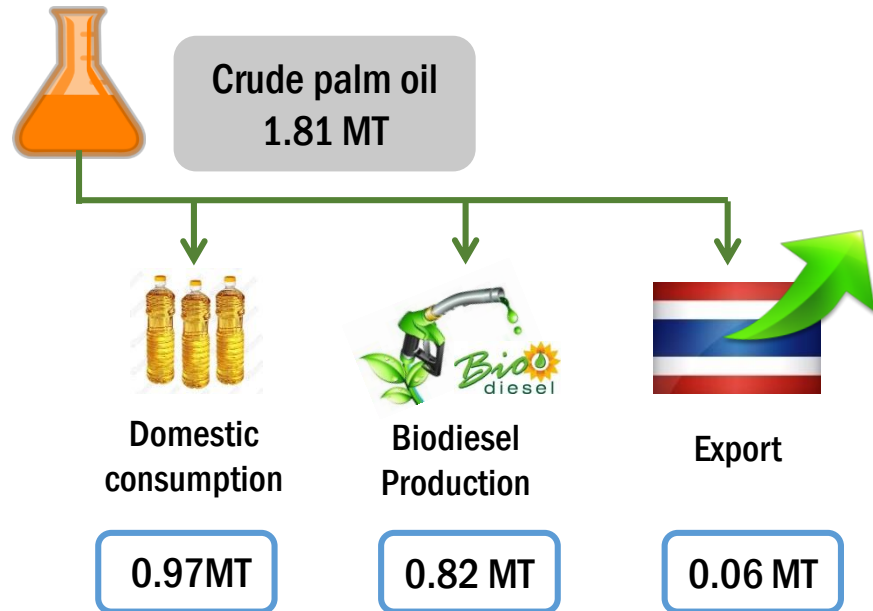


Oil palm plantation in Thailand

There are only some certain areas suitable for oil palm plantation in Thailand (eg. Southern and Eastern)

Oil palm plantation area : 0.73 million Hectare

Remark – yielding plantation



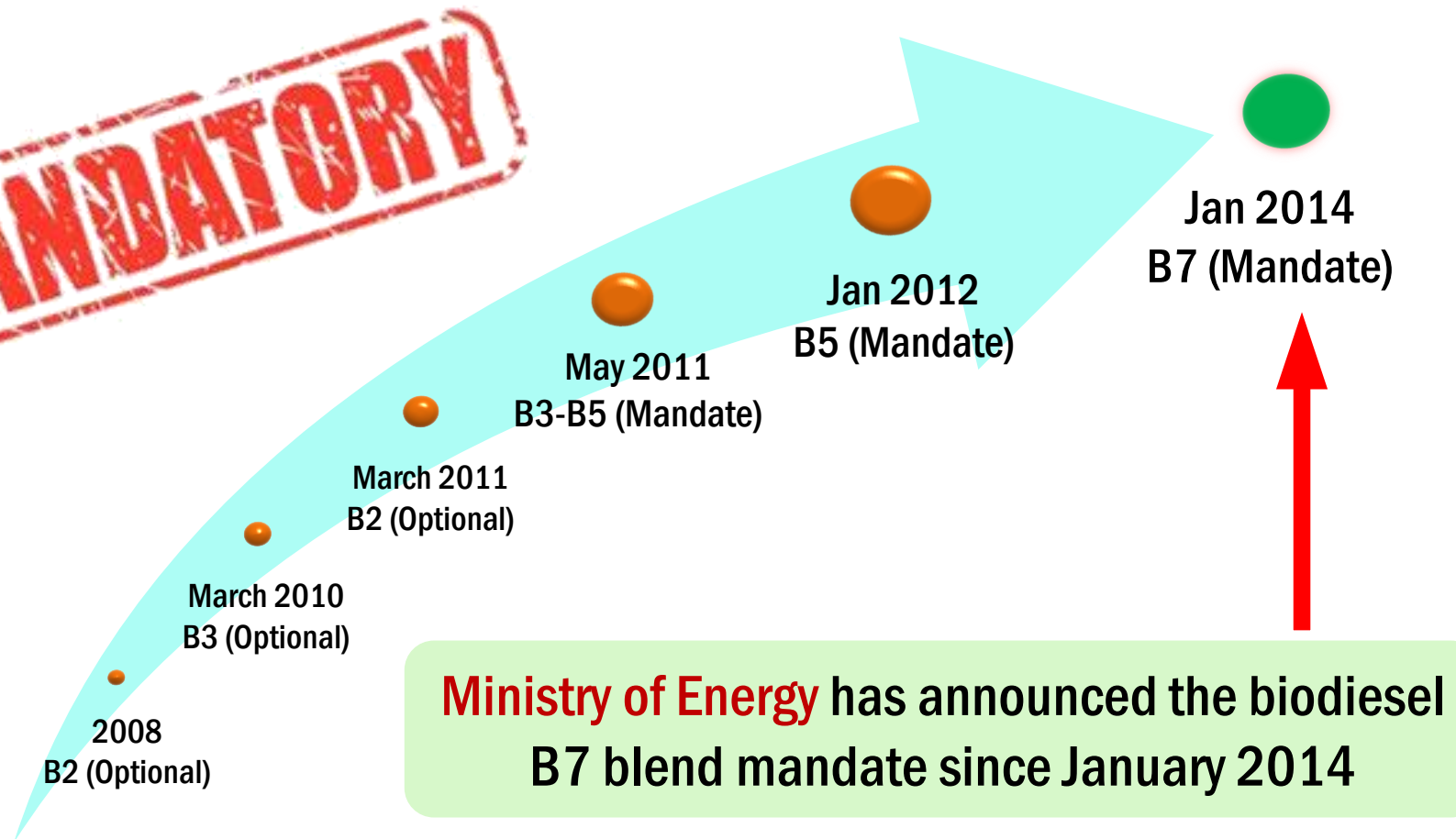
Average (2016) B100 consumption : 3.37 ML/day

There are 12 biodiesel plant with capacity of 6.52 MLPD

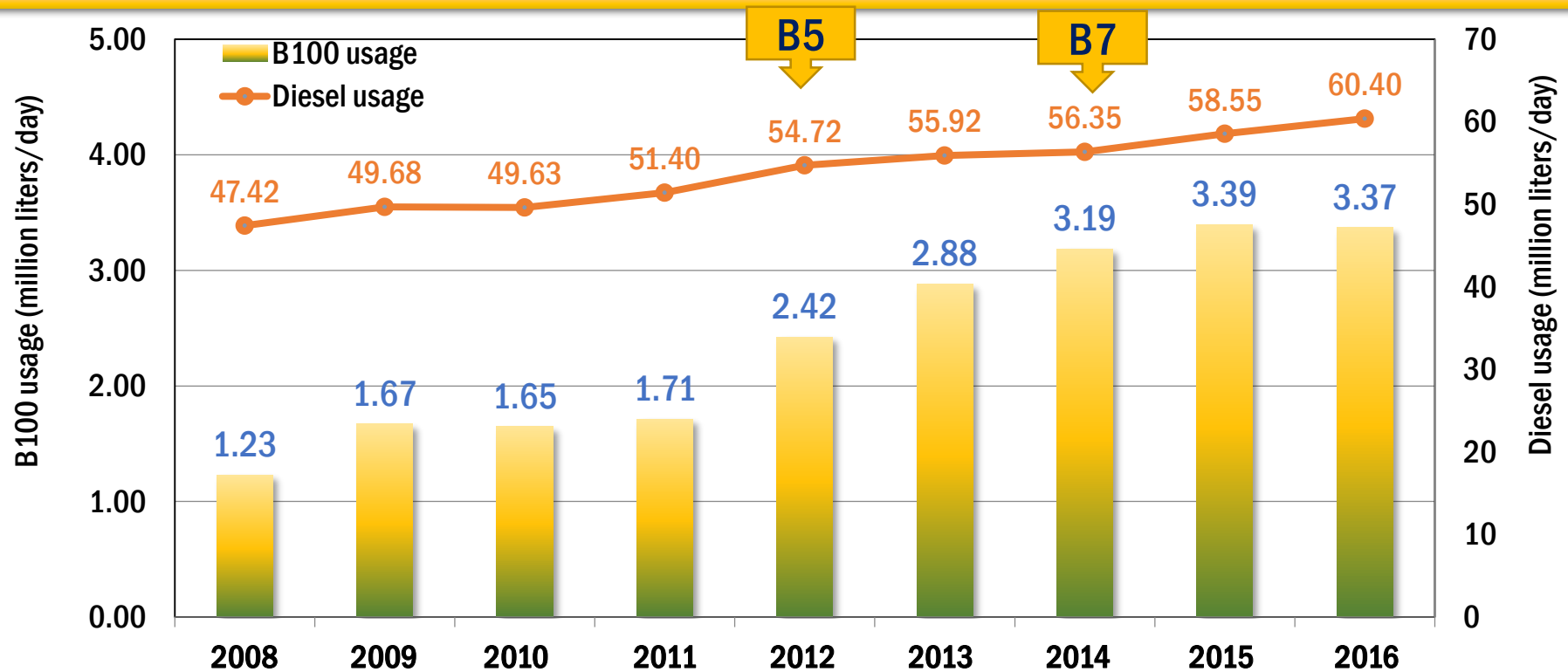
Source: Department of Agricultural economics

Demand and market creation - Biodiesel

MANDATORY



Mandate and biodiesel usage



- Jan. 1, 2014 - Thailand diesel mandate biodiesel blending between 6 – 7%
- Due to domestic palm oil shortage, the blending range was extend lower to 3.5 – 7%
 - Feb. 17 – May. 13, 2014 and Jan. 20 – Apr. 15, 2015
- Aug. 3, 2016 - Thailand diesel mandate biodiesel blending between 6.5 – 7%
- Aug. 25, 2016 - Thailand diesel mandate biodiesel blending between 3 – 7%
- Nov.25, 2016 - Thailand diesel mandate biodiesel blending between 5 – 7%
- May 8, 2017 - Thailand diesel mandate biodiesel blending between 6.5 – 7%

Future of biodiesel will depend on



Price

Lower

**Higher
biodiesel
blend**

**Blend
wall**



Rail

**Public
transportation**

Thank you for your attention

Thank you

