Ethanol Production and Export in Thailand - Present Status and Future Prospects

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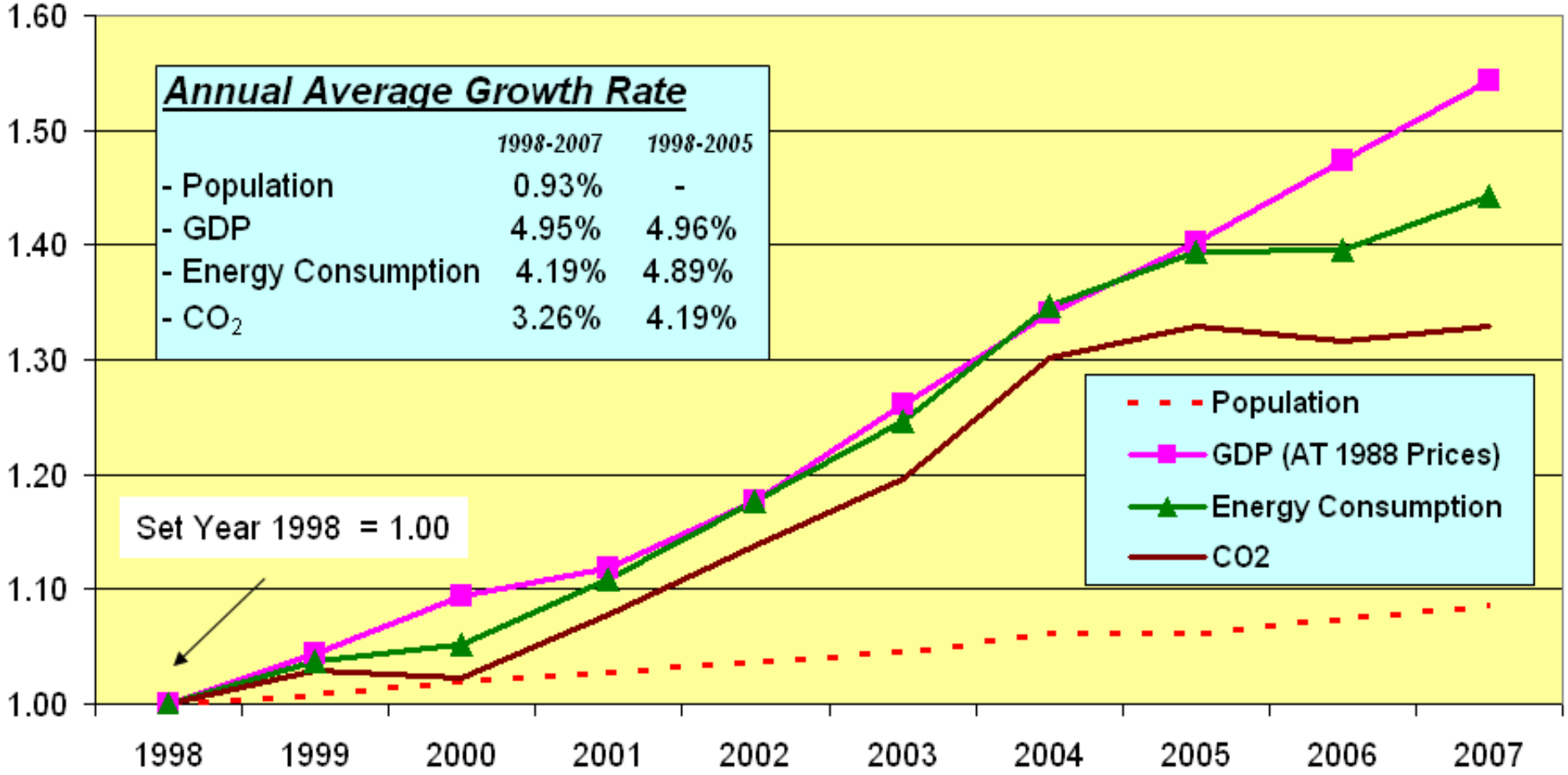
Scope

- Thailand's energy and climate concerns
- Recent policies on renewable energy and biofuels
- Feedstocks for biofuels
- Current status of ethanol production and export
- Future prospects for export

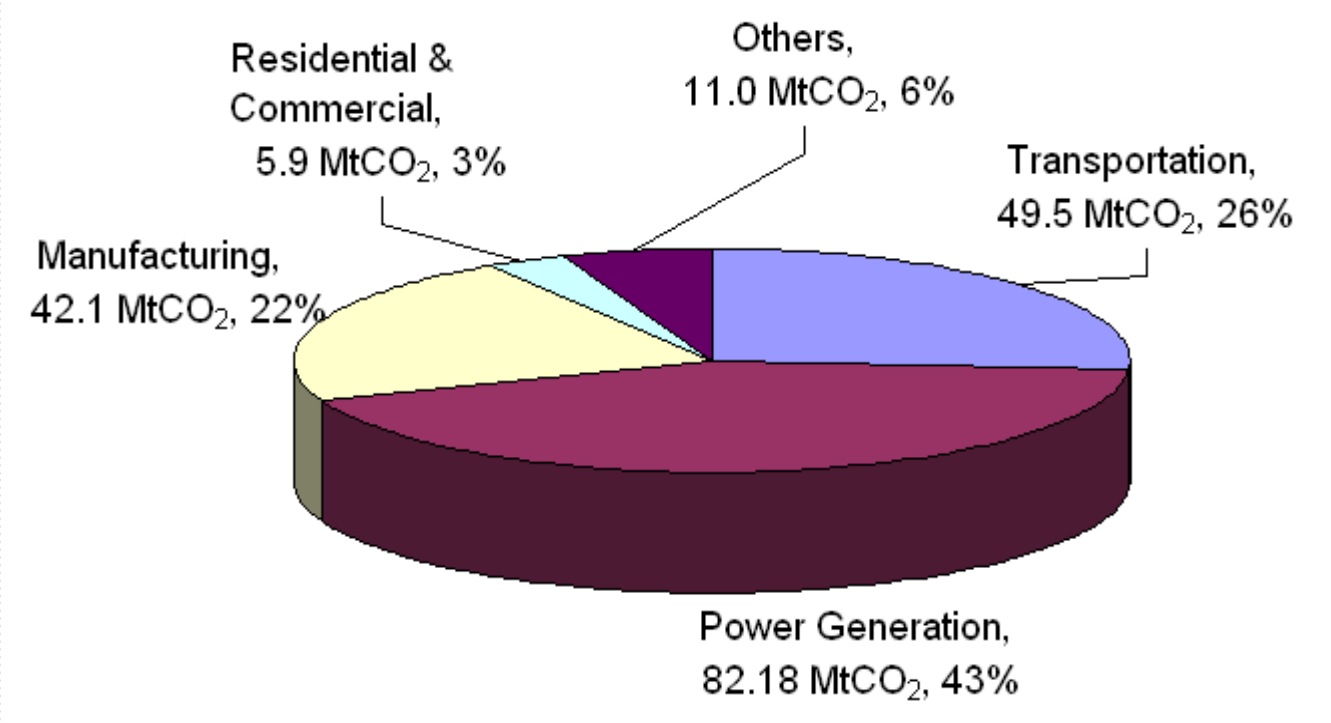
Population, GDP, Energy Consumption and CO_2 Trends in Thailand 1998 - 2007



Source: Derived from DEDE report, Thailand and UN

CO_2 Emission in the Energy Sector, 2007

Energy related emission accounts for roughly 2/3 of total, or 202 $MtCO_{2\text{-}eq}$ in 2007



Source: Derived from DEDE Energy Situation Report, Thailand

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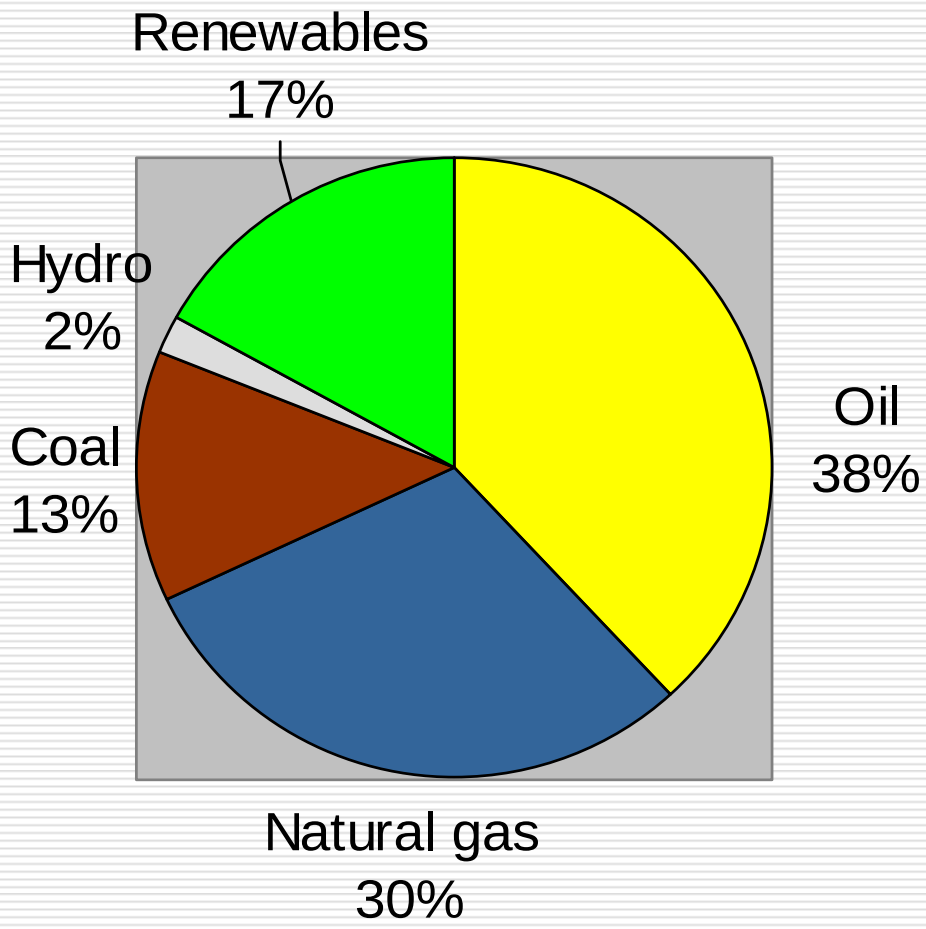
Primary Energy Supply Mix 2007

Total PES: 107 Mtoe

Fossil: 81%

New Renewables (minus fuelwood): ~ 6 %



Source: Adapted from DEDE 2007

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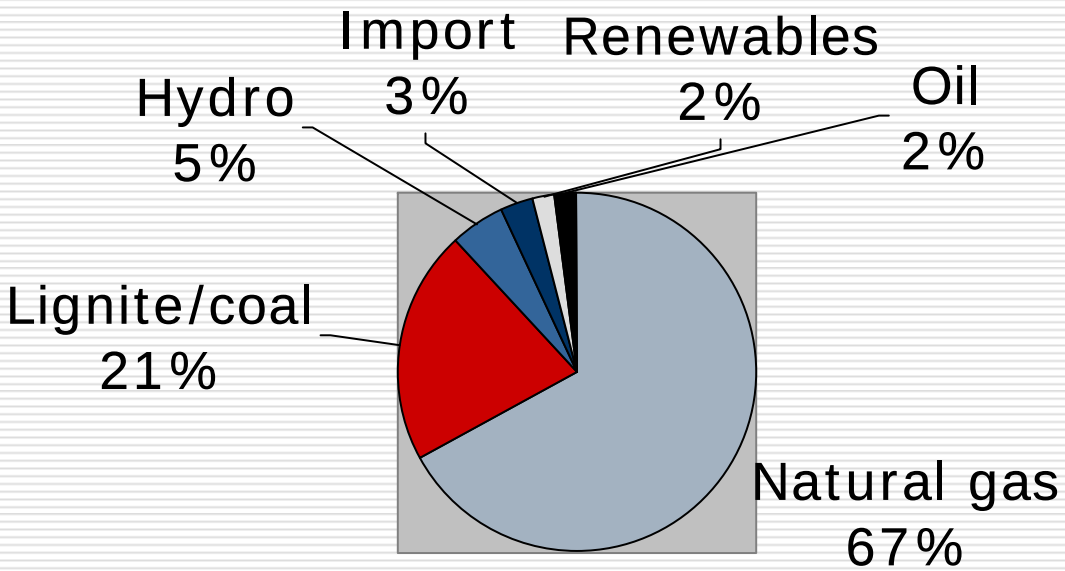
Electricity Supply by Energy Type - 2007



Total installed capacity: 29 GW

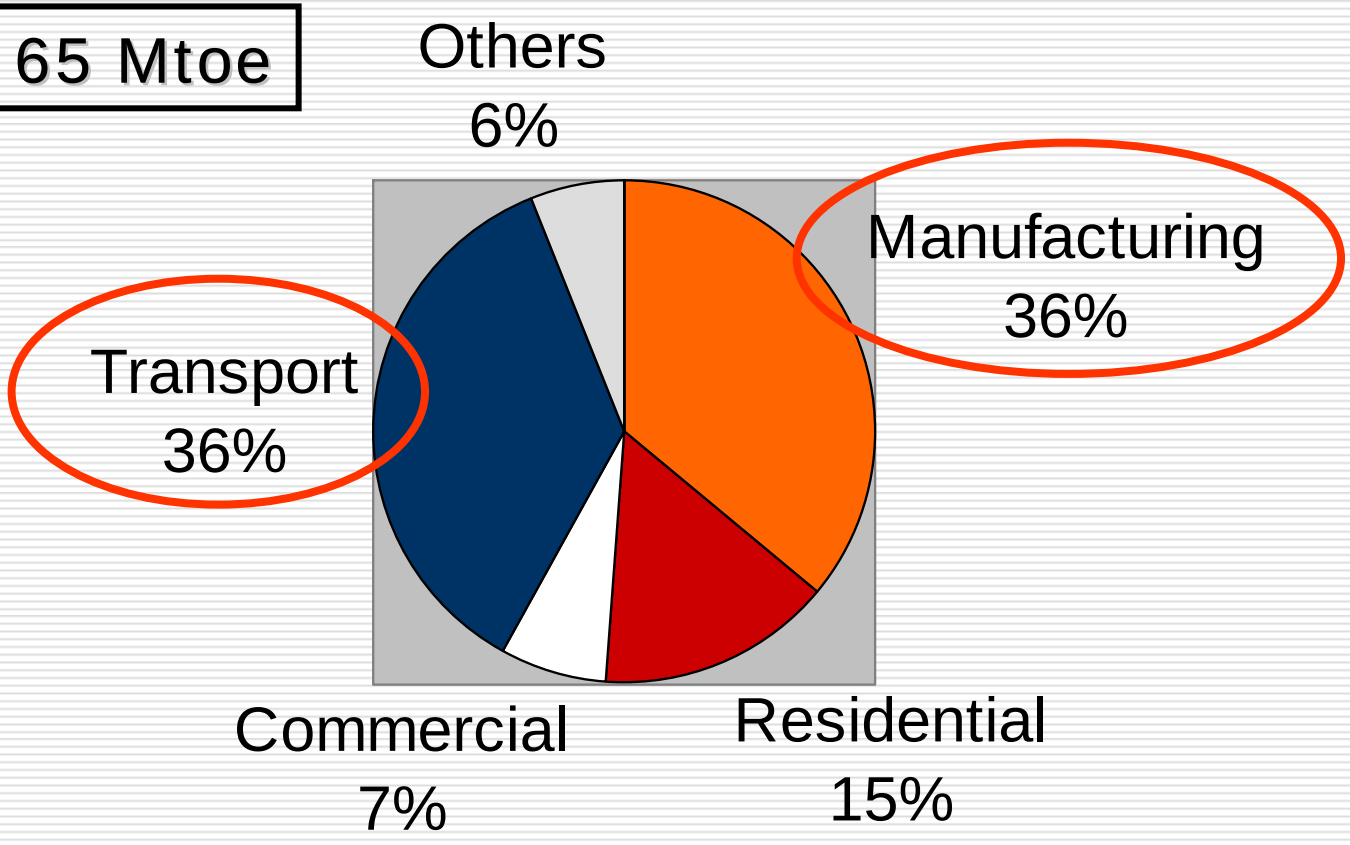
Total generation: 143,000 GWh

Fossil: 90%

Source: Adapted from DEDE 2007

Final Energy Consumption by Sector 2007

Total FEC: 65 Mtoe



Source: DEDE

Critical Security Issues

- High import dependence (>50%)
- Heavy reliance on natural gas for power generation
- Domestic energy resource limited: gas to run dry in 26 years
- Fossil dominance: 90% for power, 80% for energy
- High proportion of energy consumption transport sector (road transport)
- Barriers on large scale hydro, coal, and nuclear

Recent Policies on Renewable Energy and Biofuels

Alternative Energy Development Plan (2009 – 2022) targets to increase contribution of

- Renewable energy from around 6% to 12% of total final energy consumption by 2022
- Biofuels for transport: 9 ml/d ETOH and 4.5 ml/d biodiesels (Current consumption: 20 ml/d gasoline, 50 ml/d diesel)

Present and Future Contribution of Renewable Electricity (MW)

Source	2008	2022
Solar	32	500
Wind	1	700
Small hydro	50	320
Biomass	1,597	3,700
Biogas	29	120
MSW	5	160
Total	**1,714**	**5,500**

"Adders" for different renewable technologies – main policy instrument

Source: DEDE 2009

Policies on Biofuels

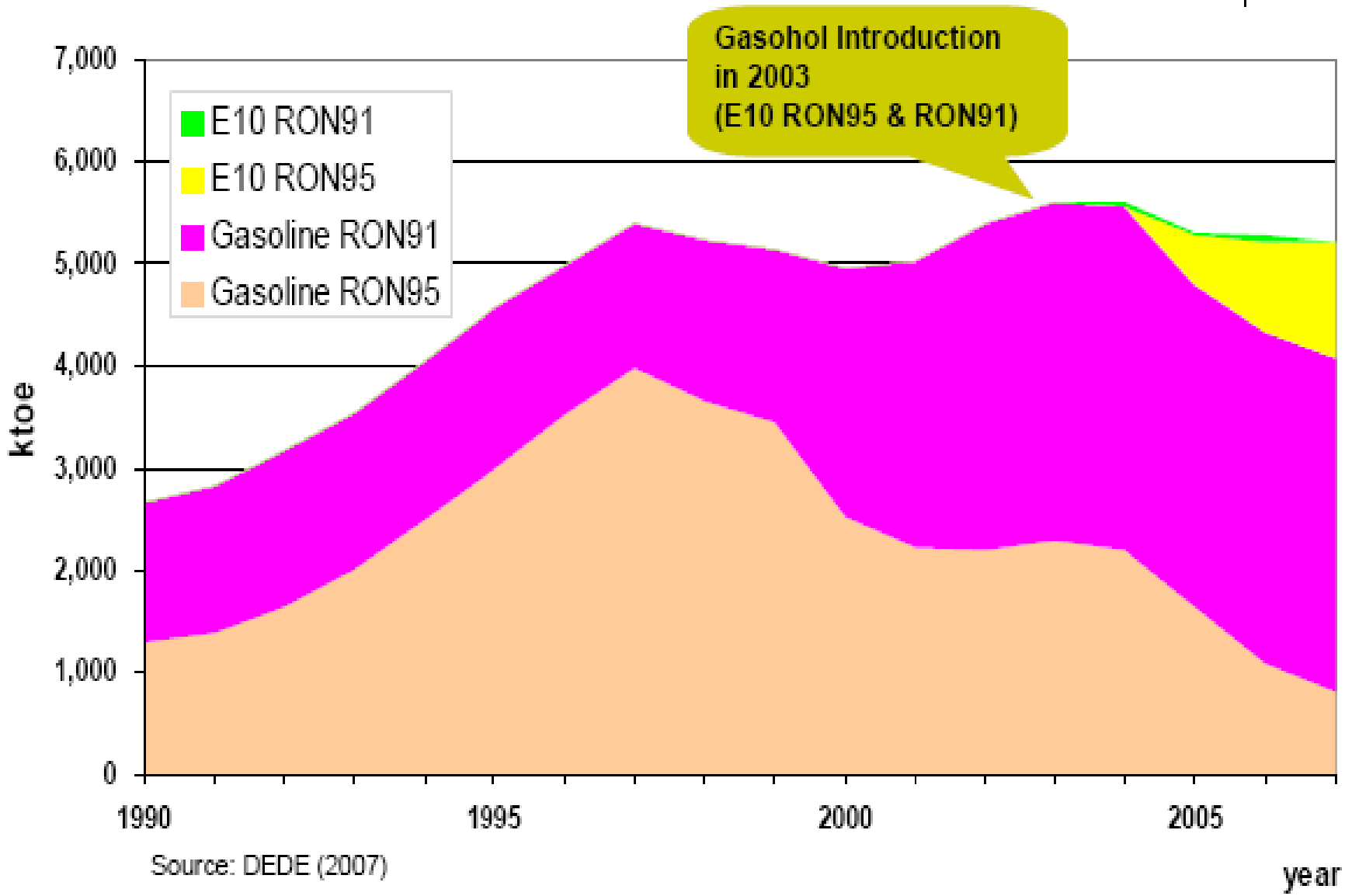
- Biofuel industry development policy introduced in 2000
- Market: E10 in 2003, E20 since 2007, E85 in 2008 but still lacks infrastructure and flexible fuel vehicles (FFVs)
- Production:
  - 1 ml/d in 2008 (mainly from molasses, though potential exists for cassava)
  - palm biodiesel reached 1.4 ml/d

Policies on Biofuels

- Fuel mandates
  - B2 (2% biodiesel) enforced in April 2008, (B5 also available, will be mandated with adequate supply)
  - Ethanol blend has NOT yet been mandated

- Pricing and subsidy: retail gasohol priced substantially lower than gasoline, and subsidies and tax incentives provided for refineries (fuel blenders)

Ethanol in Road Transport Fuel



Source: DEDE (2007)

Major Crop Production

	World Ranking	Production (mt)
Rubber	1	3.1
Cassava	3	25.3
Oil palm	3	7.3
Sugar	5	73.2
Rice	6	29.3

Source: FAO, Thai OAE

Feedstocks for Ethanol: Sugar

Office of the Cane and Sugar Board, 2008

73.2 mt-cane feeds 46 mills (>75 mt-cane capacity)	7.7 mt-sugar	¾ export ¼ local
	3.3 mt-molasse	15% or 0.5 mt export 85% or 2.8 mt local
	1.4 mt-molasse (50% of local)	1ml/d-ethanol *(Situation 2006/07)*

Feedstocks for Ethanol: Cassava

Office of Agricultural Economics, 2008

25.2 mt-cassava	
56% or 14.1 mt for starch	60% export 40% local
43% or 10.8 mt for chips/pellets	56% export 44% local
1% or 0.3 mt for ethanol	39 ml-ethanol p.a. or 0.1 ml/d

Feedstocks for Biodiesel: Palm Oil

Office of Agricultural Economics, 2007

7.3 mt-fresh palm

1.4 mt-CPO

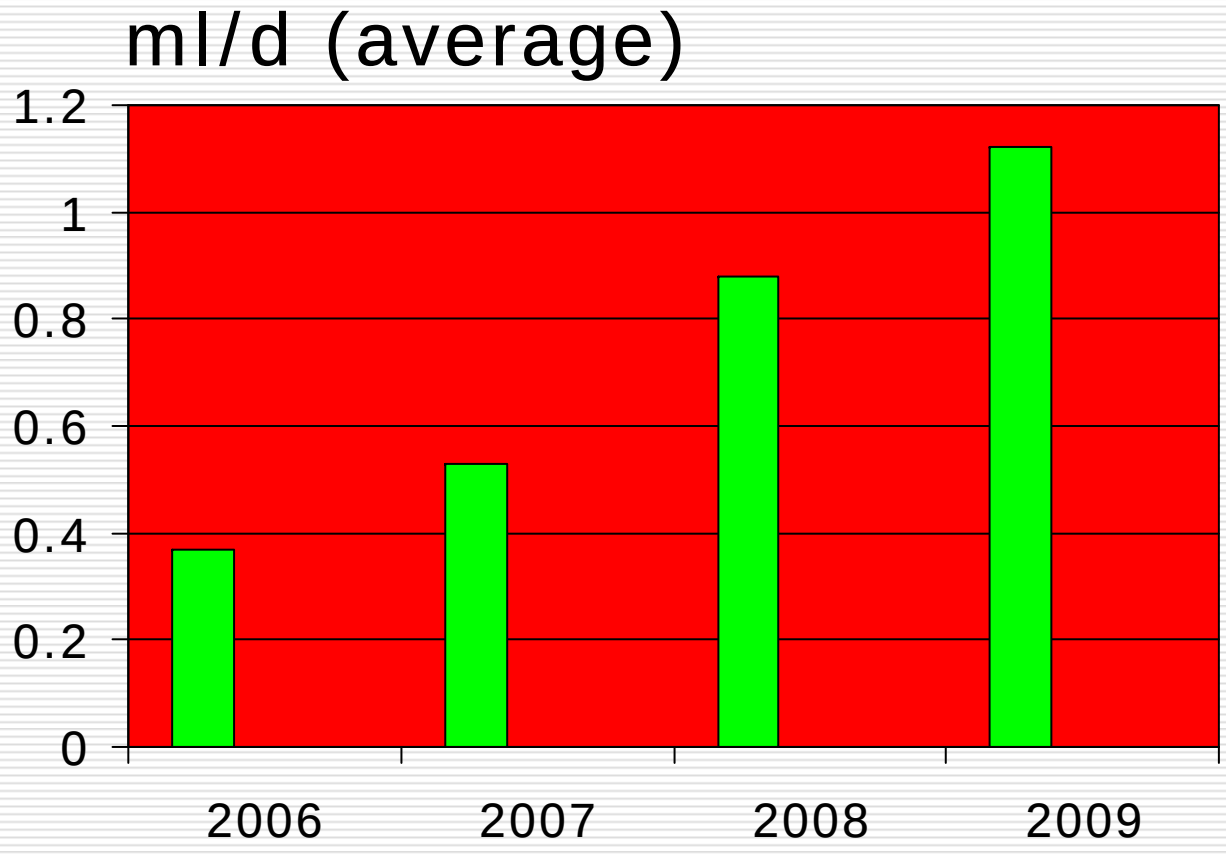
14% export

64% for vegetable oil

22% or 0.3 mt for biodiesel

0.8 ml/d biodiesel

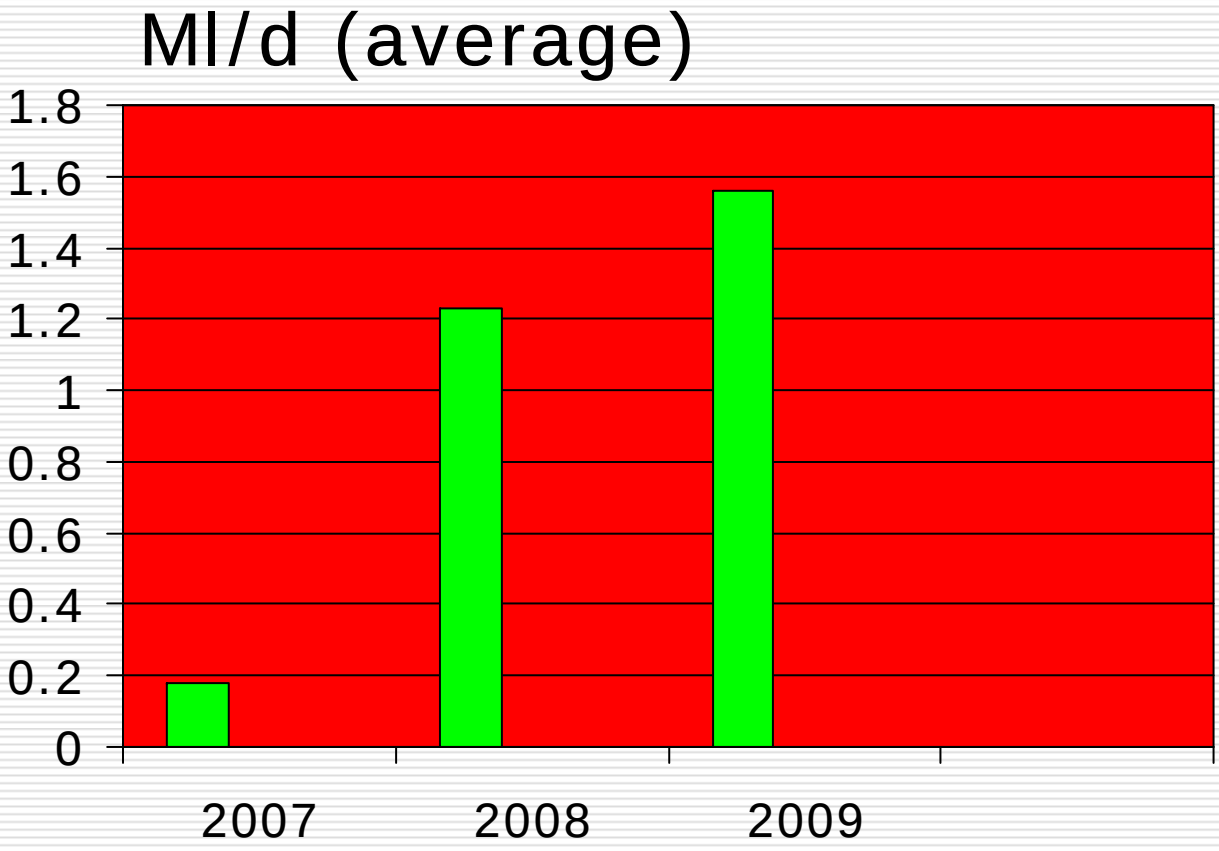
Ethanol Production Status



- 17 plants: 100,000 – 200,000 l/d
- Total capacity: 2.8 ml/d
- 11 molasses
- 1 sugar
- 5 cassava (2 in operation)

2009: end of August, Source DEDE

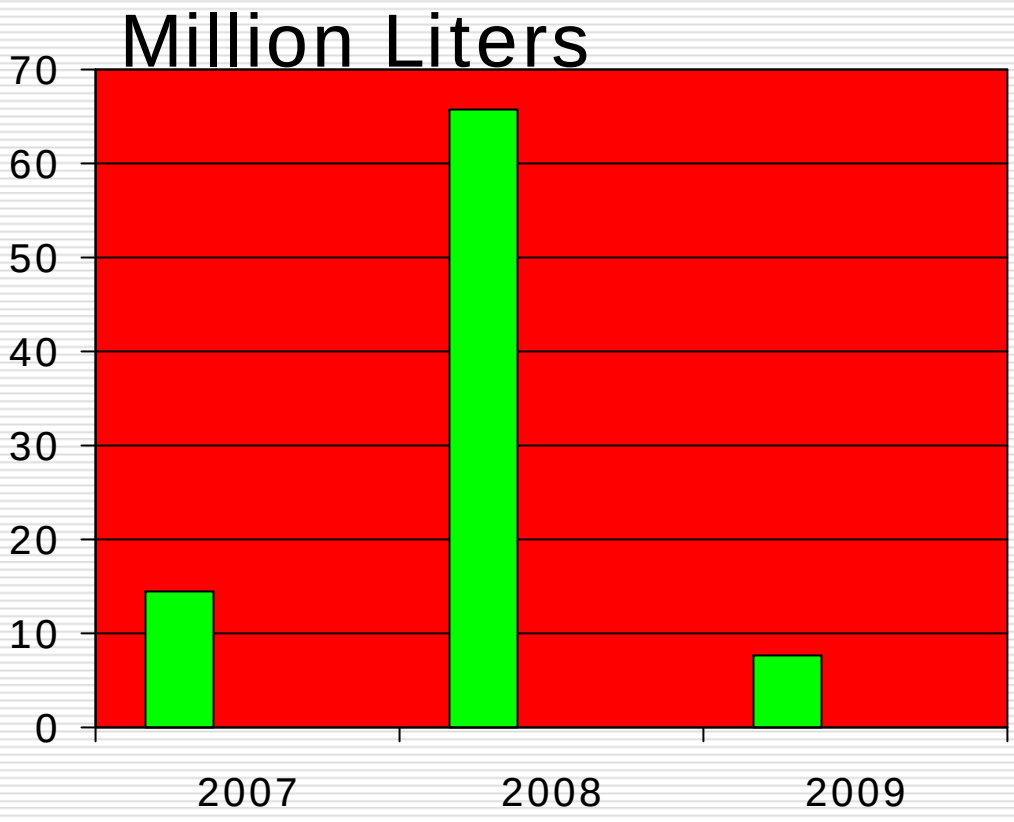
Biodiesel Production Status



- 13 plants: 100,000 – 300,000 l/d range, also 600,000 & 1,200,000 l/d
- Total capacity: 4.5 ml/d
- Mostly palm stearine, CPO, some used VO

2009: end of August, Source DEDE

Ethanol Export



- About 5 companies
- Main destination: China, Korea, Japan, Indonesia, Philippines, the Netherlands, MidEast

2009: end of August, Source DEDE

Policy on Ethanol Export

- Producers free to export but domestic consumption a priority
- Must seek permit from Excise Department as ethanol is treated as alcohol
- When domestic demand for ethanol fuel is high or supply is low (due to high price of molasses), government intervenes by seeking cooperation from producers to refrain from export

Future Prospects for Ethanol Export

- Ethanol production possible to exceed local demand on E20-scenario. Recent studies by BIOTEC-NSTDA shows crop yield can be doubled with **technology and better agricultural practices without increasing plantation area** for both sugarcane and cassava.
  - Sugarcane: likely from 70 t/ha/y to 90 t/ha/y in the near term and to 120 t/ha/y in the longer term
  - Cassava: likely from 20 t/ha/y to 40 t/ha/y in the near term to 60 t/ha/y in the loner term

Future Prospects for Ethanol Export

- Possibilities to produce ethanol from sugarcane juice if Sugarcane and Sugar Industry Act can be amended
- Longer term: biofuels from second generation feedstocks (currently baggasse ethanol being tried, integrated in an existing ethanol plant)
- Sustainability certificates may or may not be an issue

GHG Emissions

(Thai values from Gheewala, et al).

Biofuel	Feedstock	Thailand	RTFO default
		$kgCO_2e/L$	$kgCO_2e/L$
Biodiesel	Palm oil	0.52	1.55
	Waste cooking oil	0.23	0.43
Bioethanol	Molasses	0.65-0.84	0.84-1.87
	Cassava	1.92-2.88	NA

Renewable Transport Fuel Obligation (RTFO) default values are usually conservative to encourage producers to do the actual calculations and report better results

RTFO default values: Palm oil biodiesel: Malaysia and Indonesia; Molasses bioethanol: UK and S. Africa

GHG Emissions Reductions

(Thai values from Gheewala, et al).

Biofuel	Feedstock	Thailand	RTFO default
		%	%
Biodiesel	Palm oil	82	46
	Waste cooking oil	92	85
Bioethanol	Molasses	54-64	(4)-53
	Cassava	(6)-(59)	NA

GHG emissions reductions are computed on an energy (kgCO_2e/MJ) basis

Renewable Transport Fuel Obligation (RTFO) default values:
Diesel: 0.086 kgCO_2e/MJ; Gasoline: 0.085 kgCO_2e/MJ

Conclusion

- Thai biofuel industry has grown rapidly in recent years
- Clear quantitative targets until 2022
- Producers and consumers enjoy relatively strong support from government
- Export prospects for ethanol strongly dependent on ability to improve sugar and cassava crop yield, amendment of relevant laws to promote sugar-ethanol, improvement of energy and CO_2 balance for cassava-ethanol

Acknowledgement

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Thank you for your attention

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