Sustainable Biodiesel Development in Thailand

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2nd ATRANS Symposium

Transportation for Sustainable Transport under Global Financial Crisis: Opportunity or Disaster?

27-28 August 2009

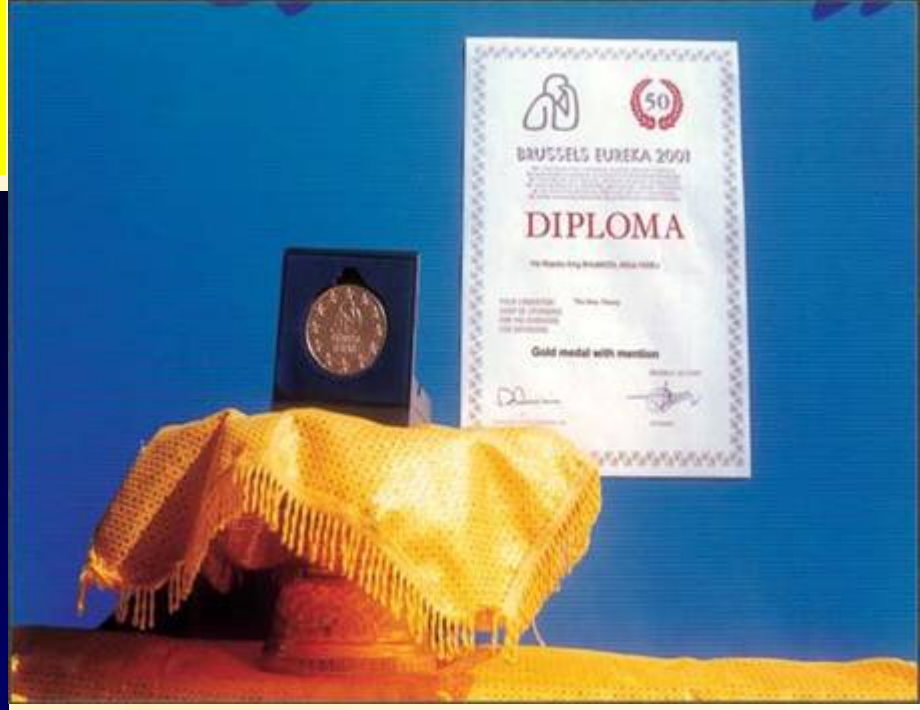
Imperial Queen's Park Hotel, Bangkok/Thailand

Outline

- History
  - His Majesty pioneer work on biodiesel
- Rationale
  - Thailand economy and energy situation
  - Thailand behavior on fossil fuel consumption
- Sustainable factors
  - Governmental strategic plan
  - Potentials of feedstock
  - Implementation & promotion plan to use biodiesel
  - Confidence in users: fuel quality & standard
  - Integration with existing infrastructure

Biodiesel Projects

- Demonstration of Diesel Palm (Refined) by Royal Fleets
- Eureka 2001 : HM The King's Initiatives
- Pilot Plant for BDF May, 2004
- Cabinet Res. 10.07.2001 : Promotion of Biodiesel (Ester), Vegetable Oil blends
- Renewable Energy Strategy 09.2003 for Ethanol/Biodiesel
- Cabinet Res. 17.05.2004 :
  - palm oil plantation
  - biodiesel admixture
  - dual fuel & niche market scheme
- Cabinet Res. 18.01.2005
  - B10 Mandate by 2012
  - Require 85 Biodiesel Plants for 8.5MLPD Output




อาคารไบโอดีเซล
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ไบโอดีเซล
1 6 2006

Thailand's Economy in 2007

- 65 Millions Population ~1% of World; Per capita 3,625$
- GDP $245 Billions
- Agriculture:
  - 8.9% of GDP
  - 39% of Employment
- Manufacturing:
  - 39.3% of GDP
  - 15.1% of Employment
- 1st Import Item : Crude Oil (15.6% of import bill)
- Major Agricultural Products
  - Rice 30.2 MT from 11 M. Ha.
  - Sugarcane 64.4 MT from 1.01 M. Ha.
  - Cassava 27 MT from 1.17 M. Ha.
  - Oil Palm 6.6 MT from 0.42 M. Ha.
  - Rubber 3.02 MT from 1.76 M. Ha.

Source: S. Jai-in et al, WAESE 2009

FIGURE 8 TRENDS OF FINAL ENERGY CONSUMPTION BY ECONOMIC SECTOR

Energy Consumption

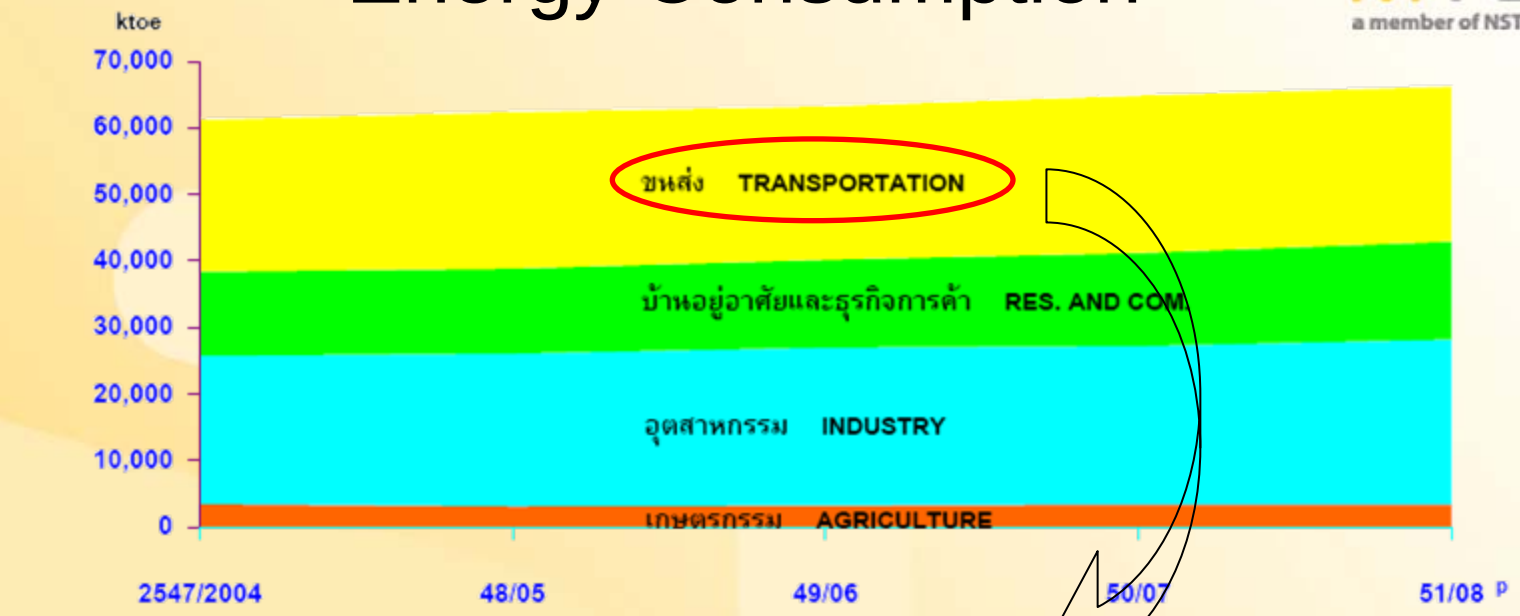
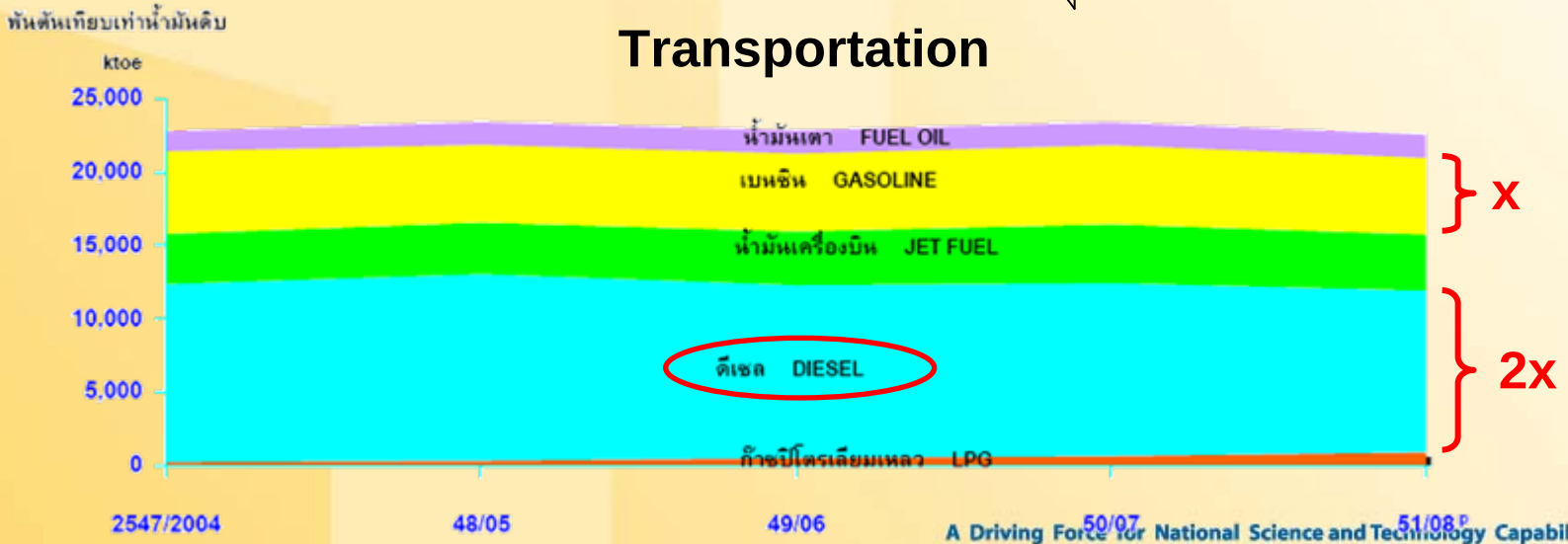


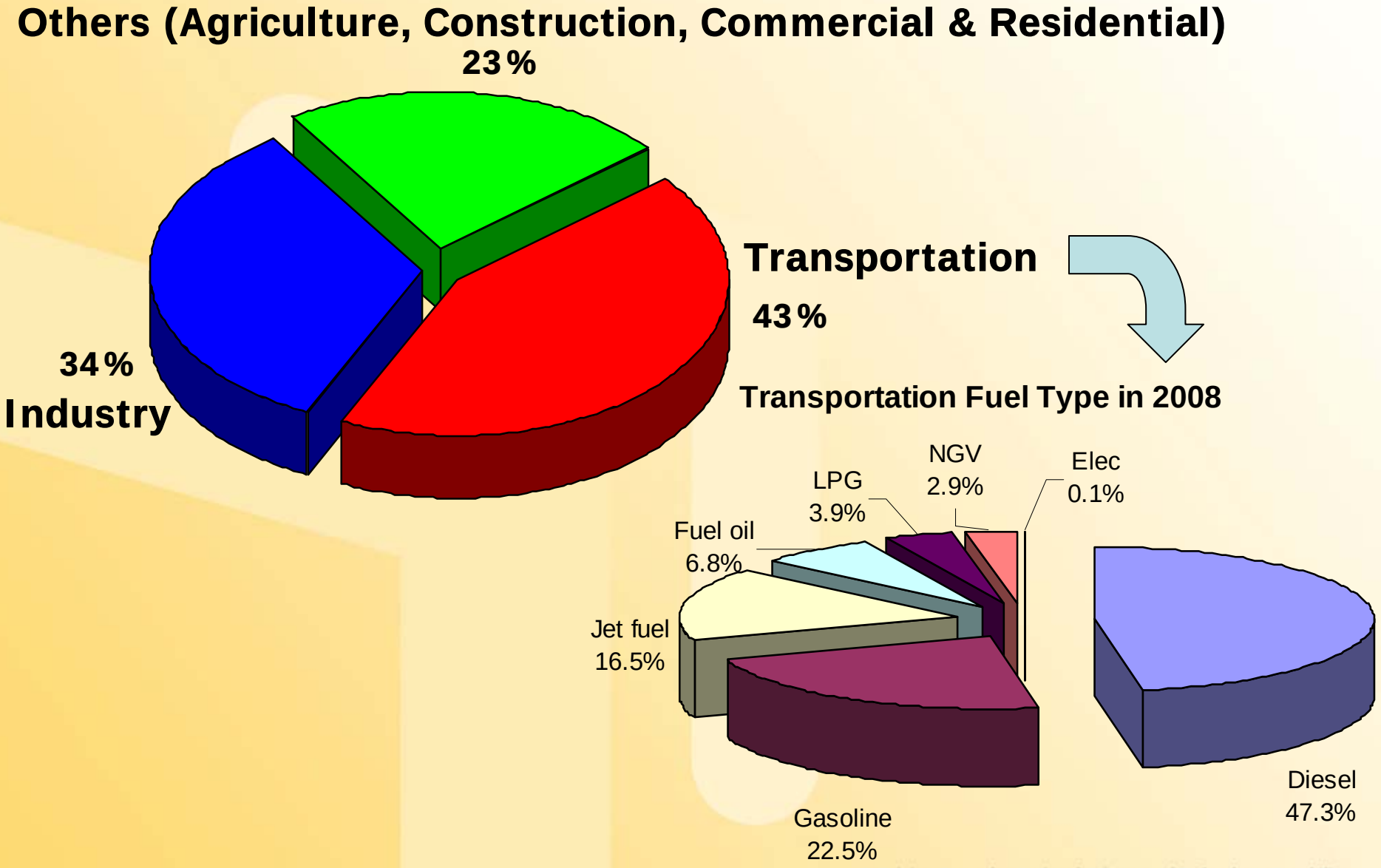
FIGURE 11 TRENDS OF TRANSPORT ENERGY CONSUMPTION BY TYPE

Transportation



Source: Department of Alternative Energy Development and Efficiency (DEDE)

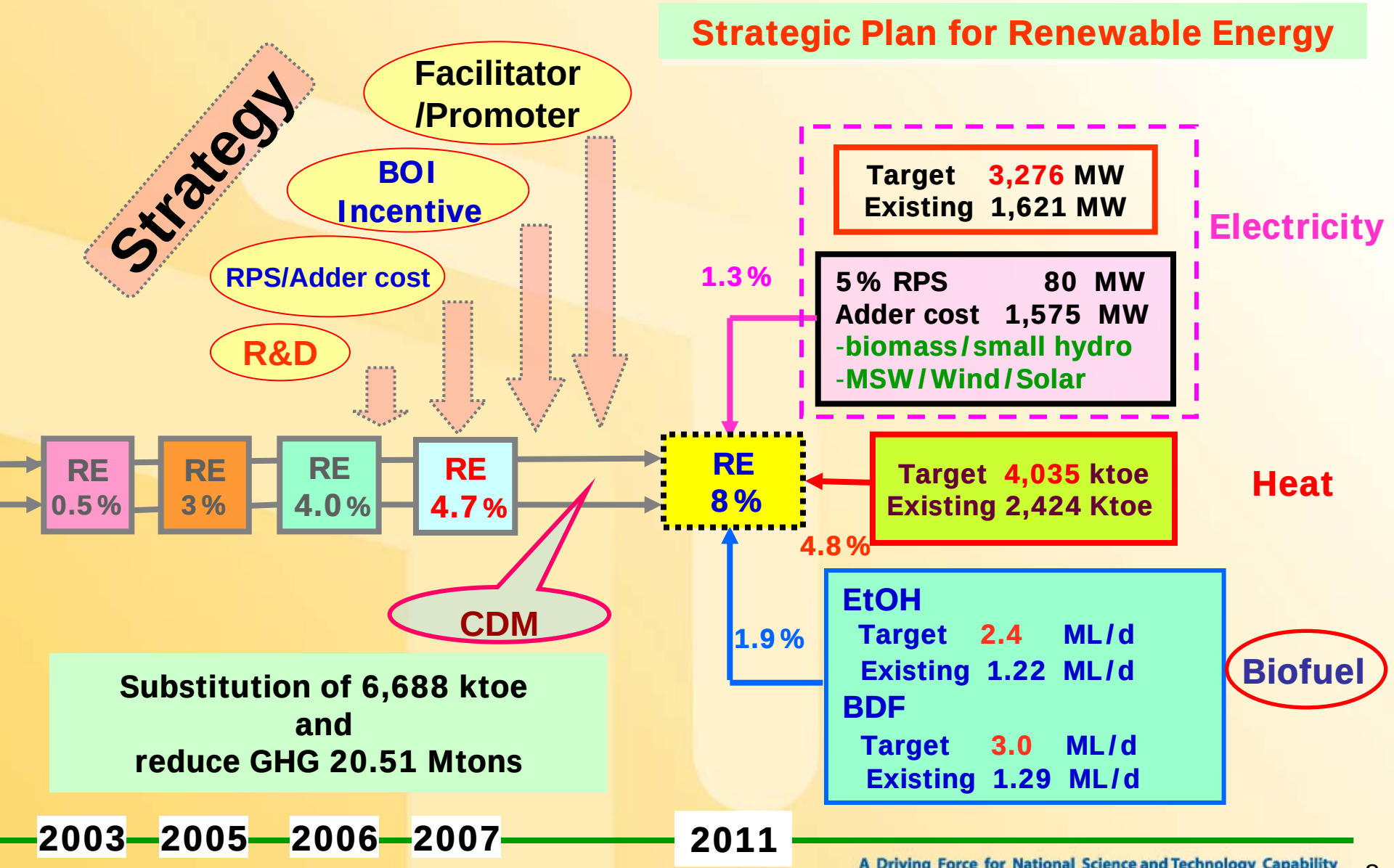
Share of Final Energy by Sector 2008 (ktoe)



Source: Department of Alternative Energy Development and Efficiency (DEDE)

Strategic Plan for Renewable Energy 2003 – 2011 (Previous plan)

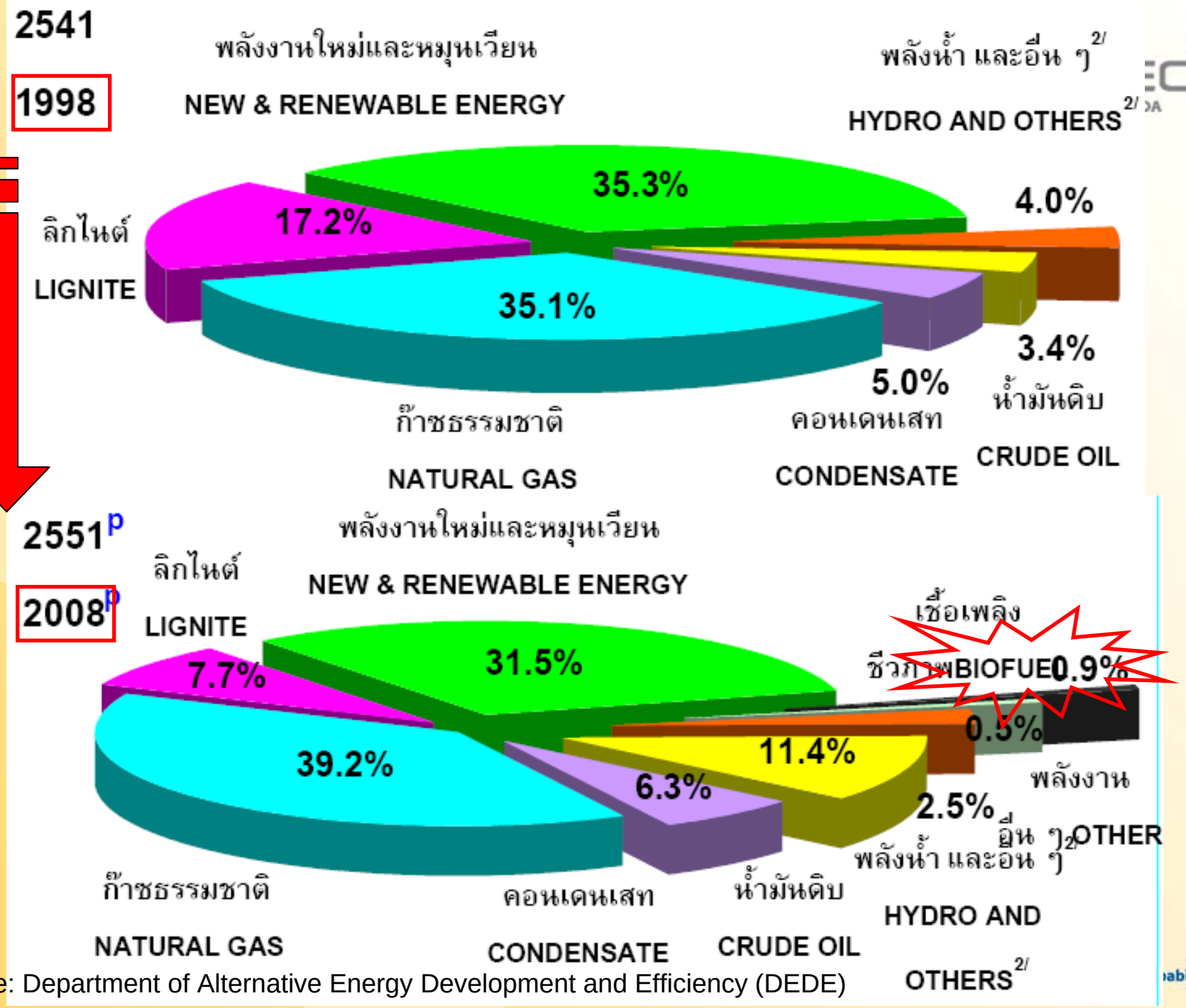
MTEC a member of NSTDA



From Ministry of Energy

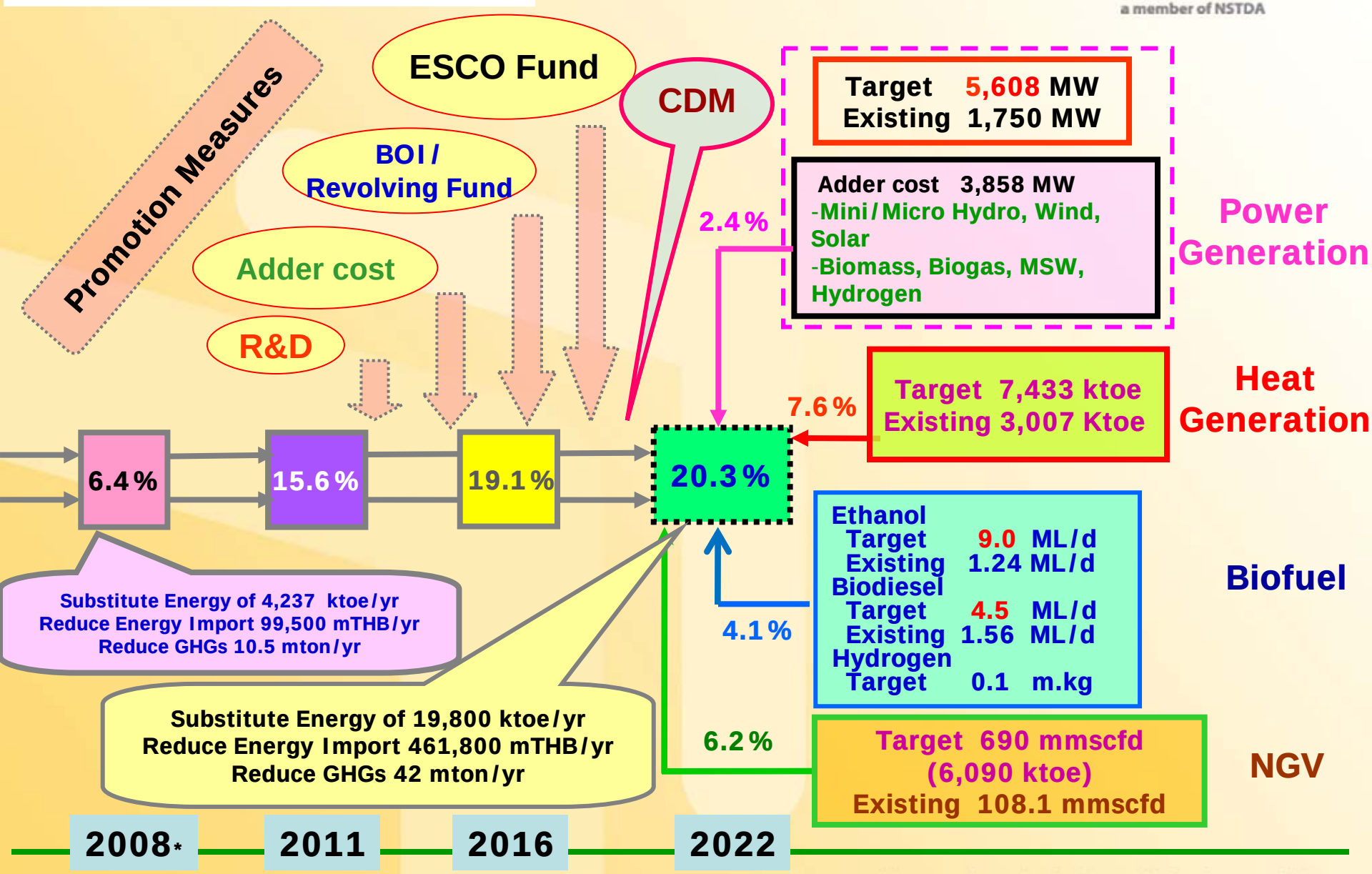
Remarks: as of Mar 2008

Domestic Production of Primary Energy



Source: Department of Alternative Energy Development and Efficiency (DEDE)

Development Strategy on Alternative Energy for 2008 - 2022



Projected with 2008 average crude oil price of $94.45/barrel

Remarks: * as of Jan 2009

Target for Alternative Energy in Land Transport Sector 2008 – 2022 (Ministry of Energy)

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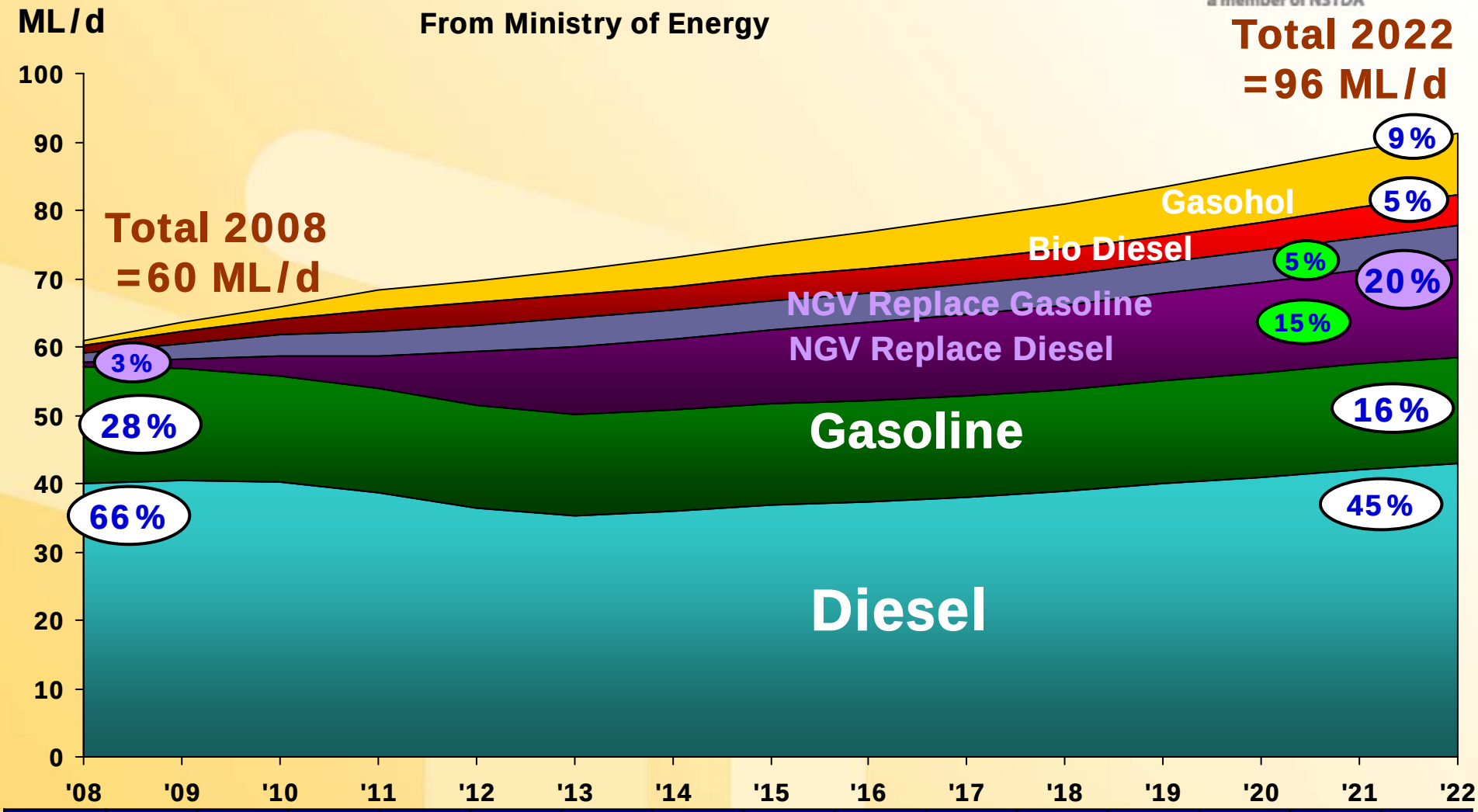


ML/D	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21	'22
Gasoline sub	1.23	2.23	3.16	3.63	3.96	4.14	4.21	4.28	4.35	4.42	4.49	4.56	4.64	4.72	4.79
Diesel sub	0.78	1.55	2.75	4.82	7.90	10.05	10.46	10.88	11.32	11.78	12.25	12.75	13.26	13.8	14.35

Department of Alternative Energy Development and Efficiency, **Ministry of Energy**

Biodiesel Strategic Plan: 2008 – 2022* (Pending)

R&D BDF with Fishing boat

Commercial B5 nationwide

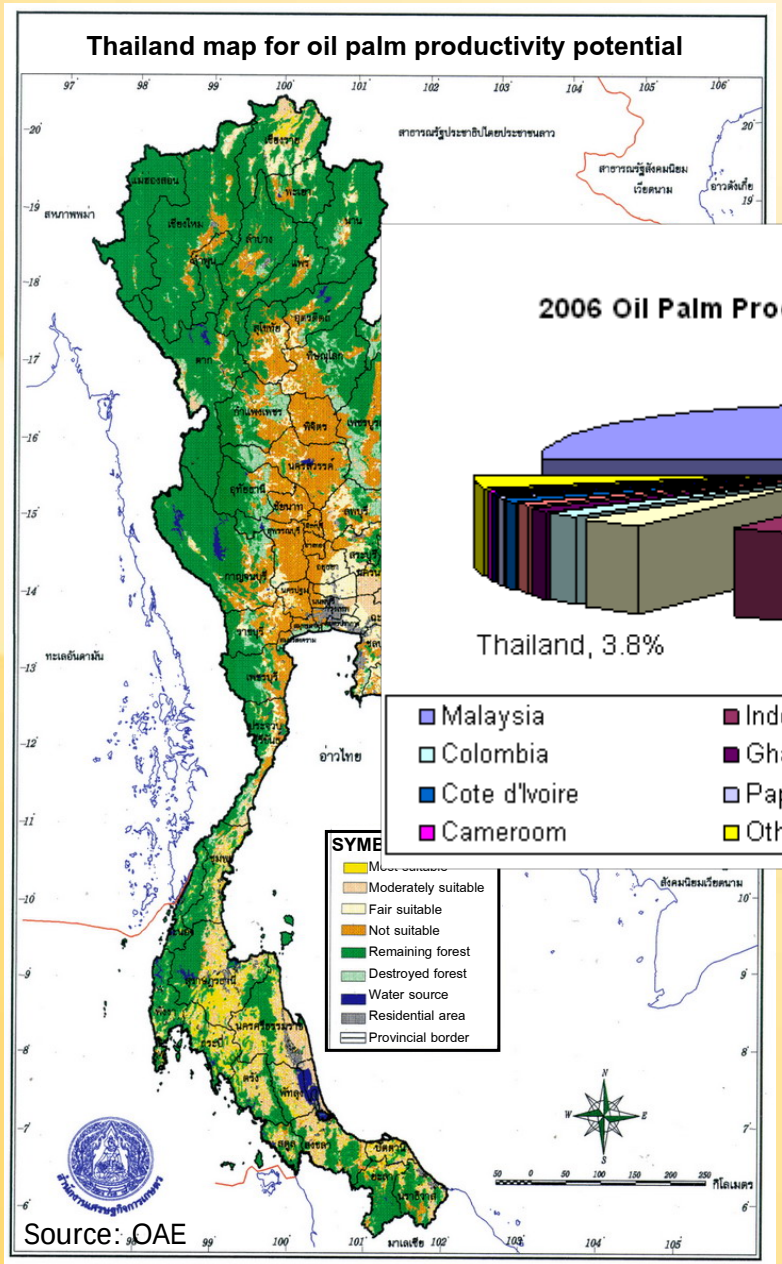
B10 commercial sale (optional)

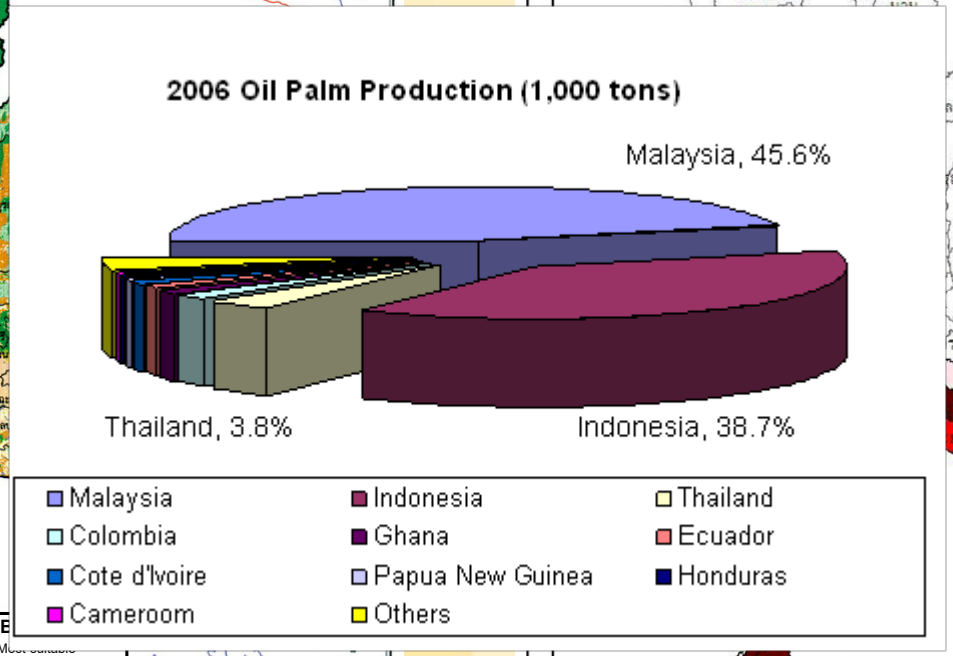
	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
Budget (MTHB)	129.75	37.4	29.4	19.4	250			200			180			150	
B100 demand (MLPD)	1.35	1.35	1.35	3.02	3.14	3.31	3.42	3.53	3.64	3.75	3.87	4.01	4.15	4.32	4.50

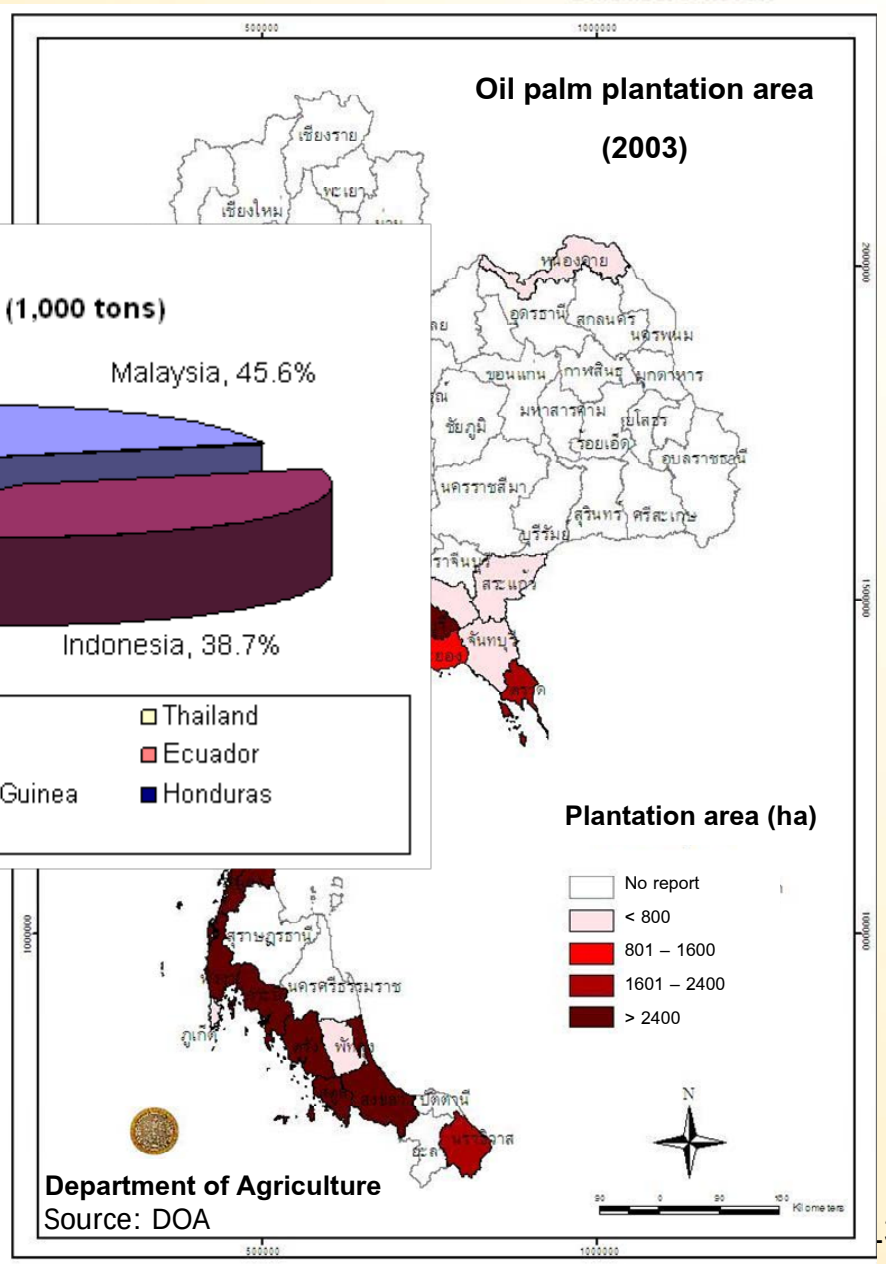
- B100 production: BDF production from palm oil & stearin
- Commercial sale
- Mandatory: B2 → B5
- Optional: B5 → B10
- Raw materials: Increase oil palm yield from 2.8 to 3.2 ton/rai.yr & Increase plantation by 2.5 Mrai by 2012
- R&D: R&D algae BDF; R&D / demonstration of glycerin value-adding process; R&D / demonstration of BTL production
- Demonstration of complete-cycle jatropha plantation & utilization
- Promote Industry/Community: Promote community BDF production; Promote production and utilization of BTL

*http://www.dede.go.th/dede/fileadmin/usr/solar_semina/REDP_Biofuel_edited%2011%20Nov%2008.pdf

Biodiesel Feedstock: Palm

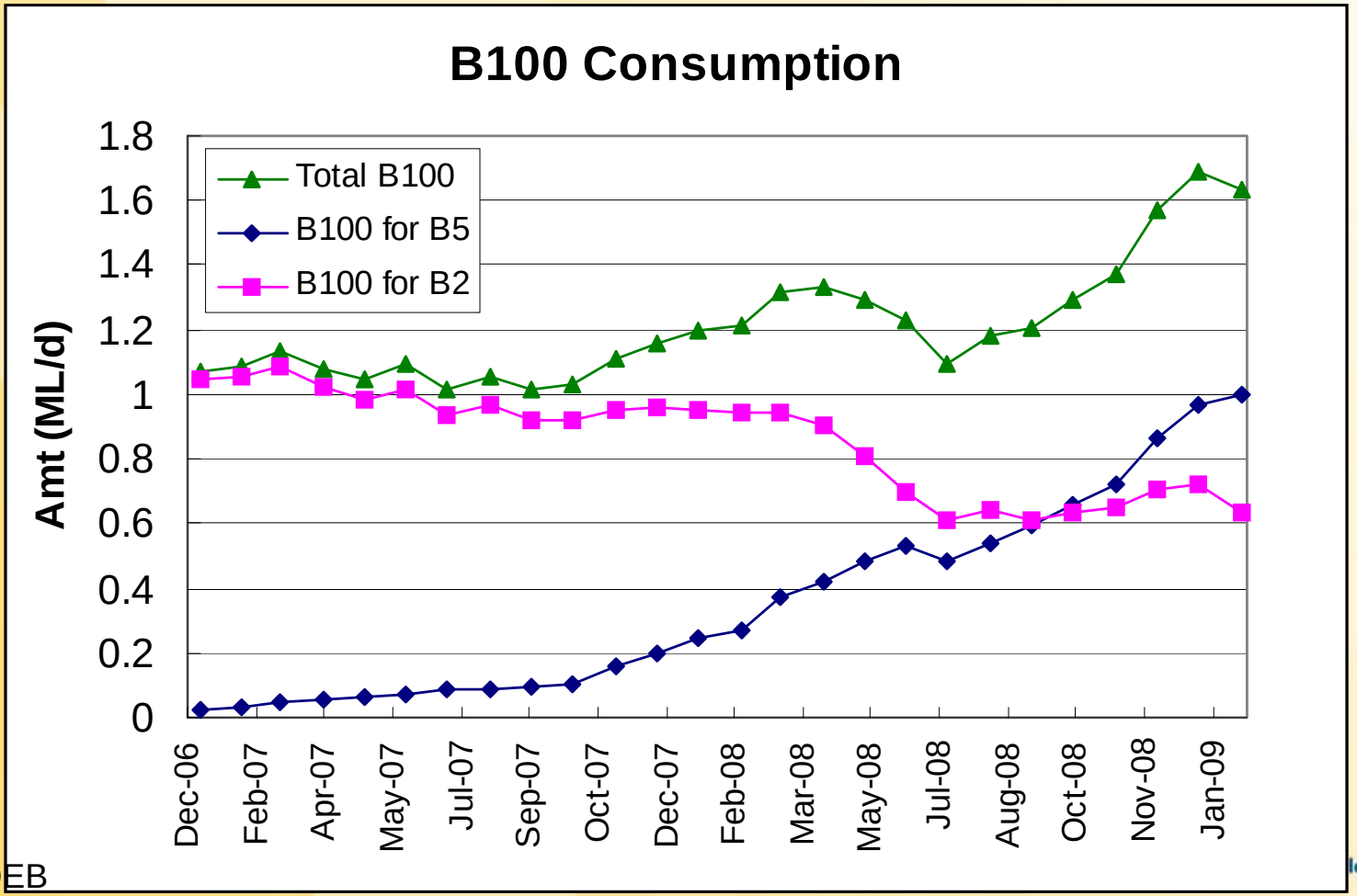






Biodiesel Current Situation: Demand

- As of Feb 09, 1.63 ML/d of B100 is consumed
  - B5 sale volume = 19.97 ML/D → B100 = 1 ML/d
  - B2/regular diesel sale volume = 31.56 ML/d → B100 = 0.63 ML/d



Source: DOEB

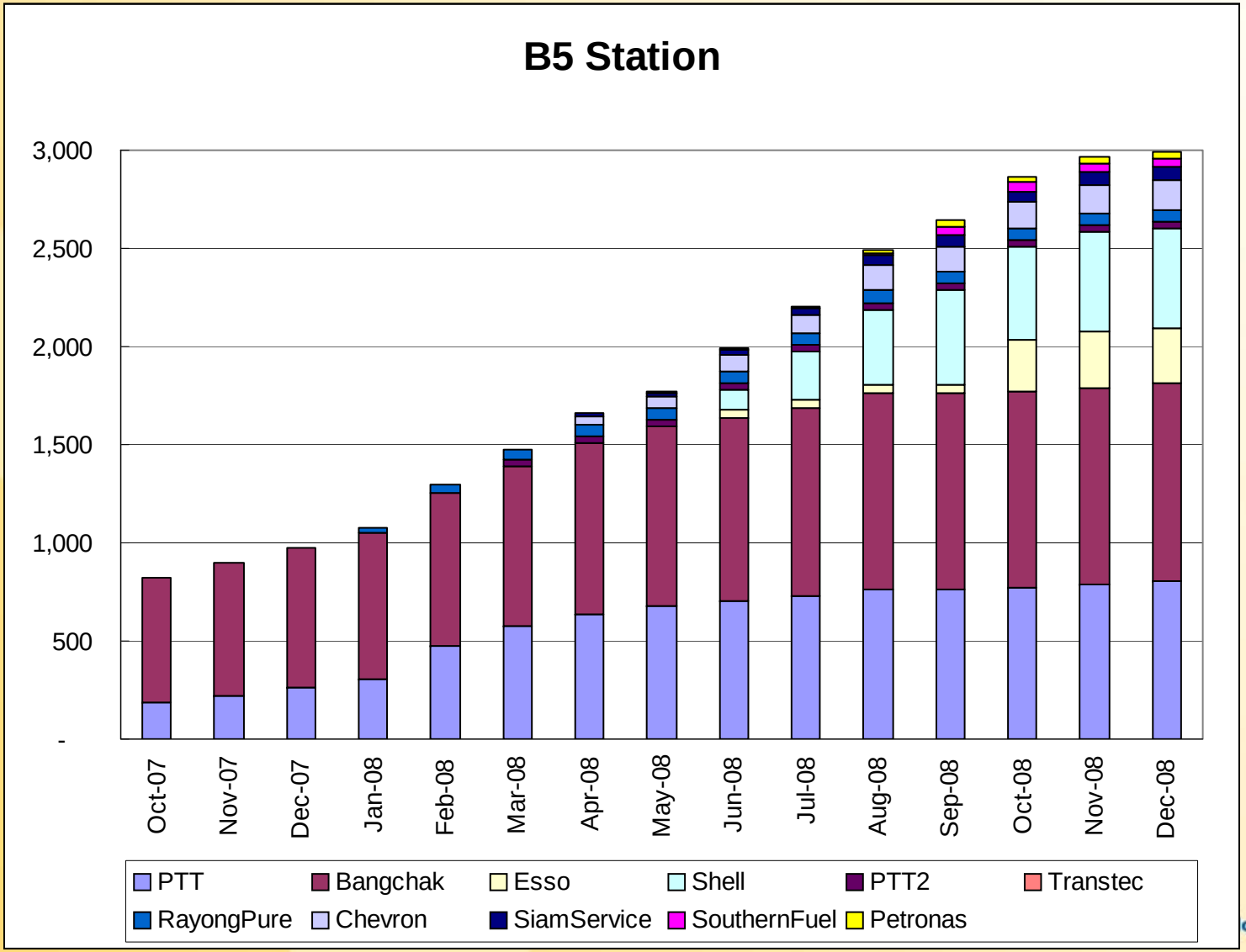
Biodiesel Current Situation: Supply

No	Name	Location	Installed Capacity (L/d)
Currently holding commercial license for BDF production			
1	Bioenergy Plus	Ayutthaya	100,000
2	Pathum Vegetable Oil	Pathumtani	800,000
3	Bangkok Renewable Energy	Chachoengsao	200,000
4	AI Energy	Samutsakhon	250,000
5	Green Power Corporation	Chumporn	200,000
6	Bangchak Petroleum Public	Bangkok	50,000
7	Veerasuwan	Samutsakhon	200,000
8	Sun Tech Palm Oil	Prachinburi	200,000
9	Thai Oleochemical	Rayong	685,800
10	New Biodiesel	Suratthani	220,000
11	Pure Biodiesel	Rayong	300,000
12	Siam Gulf Petrochemical	Petchaburi	1,200,000
		Current capacity	**4,405,800**

Source: http://www.doeb.go.th/information/stat/B100.pdf

Biodiesel Current Situation: Service Station

- As of Dec 08, 2,989 B5 fuel stations



Governmental Measure

Promotion of Biodiesel Production

- BOI benefit
- Circulating fund to promote renewable energy e.g. biogas from biomass at 50M THB with interest less than 4%

Promotion of Biodiesel Usage

- Mandate B2 nationwide since 1 Feb 08 with B5 target in 2011
- Use Oil Fund to control B5 lower than B2 at least 0.7 THB/L

Administration and Managment

- Regulate Biodiesel price referenced from CPO and methanol prices

  B100 = 0.97CPO+0.15MtOH+3.32

- Establish Biofuel Development and Promotion Committee

- Announce standard for community Biodiesel (2006) on 30 Jun 06, effective on 21 Jul 06
- Announce standard for industrial Biodiesel (2007) on 30 Apr 07, effective on 7 Jun 07 (B100)
- Announce standard for diesel (2007) on 27 Dec 07 for B2 mandate on 1 Feb 08

Ministry of Energy

Biodiesel Fuel Quality and Standard

- Critical for safe utilization in conventional engine
- Necessary for cross-border trading of biofuel and biofuel-compatible vehicle
- Common guideline and harmonization in the region is useful but maybe difficult to achieve due to
  - Differences in feedstock
  - Differences in climate and geography
  - Differences in policy and support
- Domestic standard: Department of Energy Business
- International: ASTM, EN, Tripartie†, EAS-ERIA‡, WWFC

†http://ec.europa.eu/energy/renewables/biofuels/doc/standard/white_paper_icbs_final.pdf
‡http://www.eria.org/research/no6-2.html

Units	U.S. ASTM D6751-07b	EU EN14214:2003	Thailand DOEB: 2009	EAS-ERIA BDF Standard (EEBS):2008	WWFC Biofuel Guidelines B100 for up
mass%	-	96.5 min.	96.5	96.5 min.	96.5 min.
kg/m3	-	860-900	860-900	860-900	Report
mm2/s	1.9-6.0	3.50-5.00	3.5-5.0	2.00-5.00	2.00-5.00
deg. C	93 min.	120 min.	120 min	100 min.	100 min.
mass%	0.0015 max.	0.0010 max.	0.0010 max	0.0010 max.	0.0010 max.
deg. C	360 max.	-	-	-	-
mass%	0.05 max. -	- 0.30 max.	- 0.30 max.	0.05 max. 0.3 max.	0.05 max. -
	47 min.	51.0 min.	51.0 min	51.0 min.	51.0 min.
mass%	0.02 max.	0.02 max.	0.02 max	0.02 max.	0.005 max.
mg/kg	0.05[vol%] max.	500 max.	0.05[Wt%] max	500 max.	500 max.
mg/kg	-	24 max.	24 max.	24 max.	24 max.
	No.3	Class-1	Class-1	Class-1	-
mgKOH/g	0.50 max.	0.50 max.	0.50 max.	0.50 max.	0.50 max.
hrs.	3 min.	6.0 min.	10.0 min.	10.0 min. (****)	10.0 min.
g Iodine/100 g	-	120 max.	120 max.	Reported (***)	130 max.
mass%	-	12.0 max.	12.0 max.	12.0 max.	12.0 max.
mass%	-	1 max.	-	N.D. (***)	1 max.
mass%	0.2 max. (*)	0.20 max.	0.20 max.	0.20 max.	0.20 max.
mass%	-	0.80 max.	0.80 max.	0.80 max.	0.80 max.
mass%	-	0.20 max.	0.20 max.	0.20 max.	0.20 max.
mass%	-	0.20 max.	0.20 max.	0.20 max.	0.20 max.
mass%	0.020 max.	0.02 max.	0.02 max.	0.02 max.	0.02 max.
mass%	0.240 max.	0.25 max.	0.25 max.	0.25 max.	0.24 max.
mg/kg	5 max.	5.0 max.	5.0 max.	5.0 max.	5.0 max.
mg/kg	5 max.	5.0 max.	5.0 max.	5.0 max.	5.0 max.
mg/kg	10 max.	10.0 max.	10.0 max.	10.0 max.	4.0 max.

Source: ERIA Biodiesel Working Group,
http://www.mtec.or.th/en/images/users/81/mtec_ir/docs/NEDOGlycerin16Feb.09/NEDO_Glycerin_AIST.pdf


ขอบคุณ
Thank you