

THAILAND OF INVESTMENT

Where success stories begin

Alternative Energy



Powering the Future



THAILAND BOARD OF INVESTMENT
www.boi.go.th

Energy Policy and Development Plan (1/2)

Short term:

1. Restructure and Improve Energy Industry Management
2. Procure Energy
3. Promote Conservation and efficiency
4. Promote Alternative Energy
5. Establish Energy Price Structure
6. Establish Measures Pertaining to Clean Energy
7. Promote Private Sector and Public Participation in policy-making



Energy Policy and Development Plan **2/2**

Longer term

1. Energy Supply

- ✓ Secure, sufficient and accessible supply to reduce imports
- ✓ Support and promote alternative energy, and R&D

2. Sustainable Energy Development

- ✓ Application of modern technology
- ✓ Compliance with environmental commitments
- ✓ Shared responsibility for environmental impact
- ✓ Public participation in energy management

3. Energy Efficiency

- ✓ Support reduced energy consumption, e.g in logistics and mass transit

4. Promotion of Competition in the Energy Business

- ✓ Competition encourages efficiency and fairness



Energy Policy and Development Plan

Short term:

- ✓ **Restructure and Improve Energy Industry Management**
- ✓ **Procure Energy and Promote Conservation**
- ✓ **Promote Alternative Energy and Establish Energy Price Structure**
- ✓ **Establish Measures Pertaining to Clean Energy**
- ✓ **Promote Private Sector and Public Participation in policy-making**

Longer term:

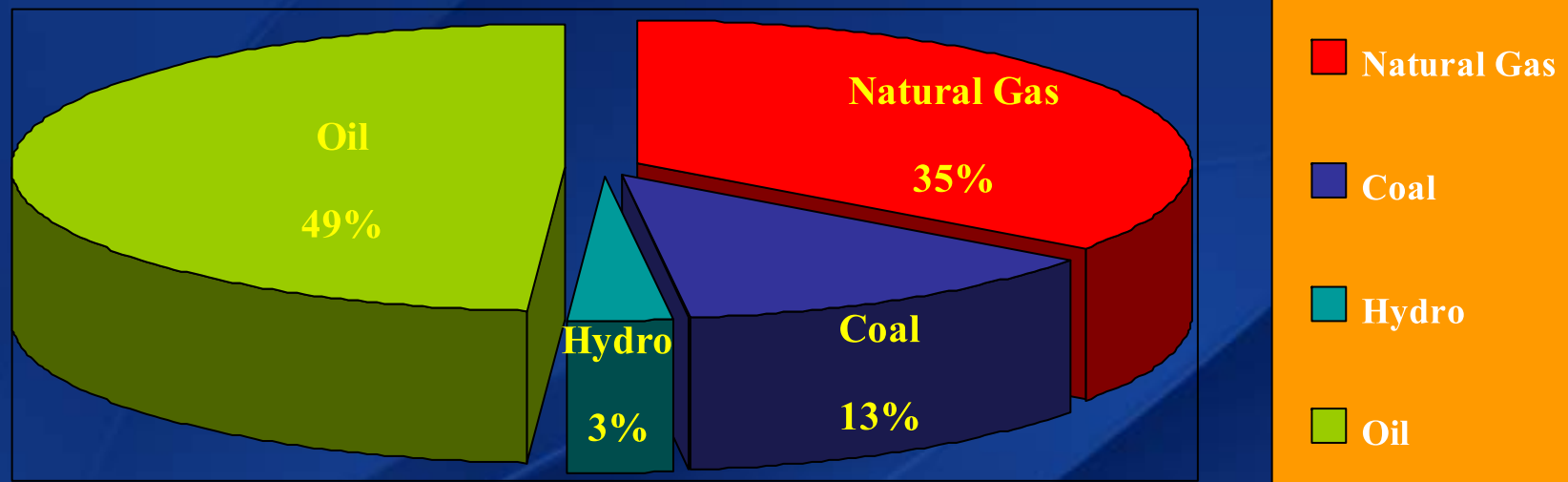
- ✓ **Support and promote alternative energy, and R&D**
- ✓ **Sustainable Energy Development**
- ✓ **Energy Efficiency**
- ✓ **Promotion of Competition in the Energy Business**
 - **Competition encourages efficiency and fairness**



Thailand's Energy Situation

- ❑ For the last 15 years, energy consumption has grown faster than GDP by an average of 40% a year¹
- ❑ Consumption of electricity has grown about 7% per year 2000-2005²
- ❑ Imported oil in 2005 averaged 1,007,200 b/d and domestically supplied oil 565,600 b/d. The total cost of imported refined products was up 92% from 2004³

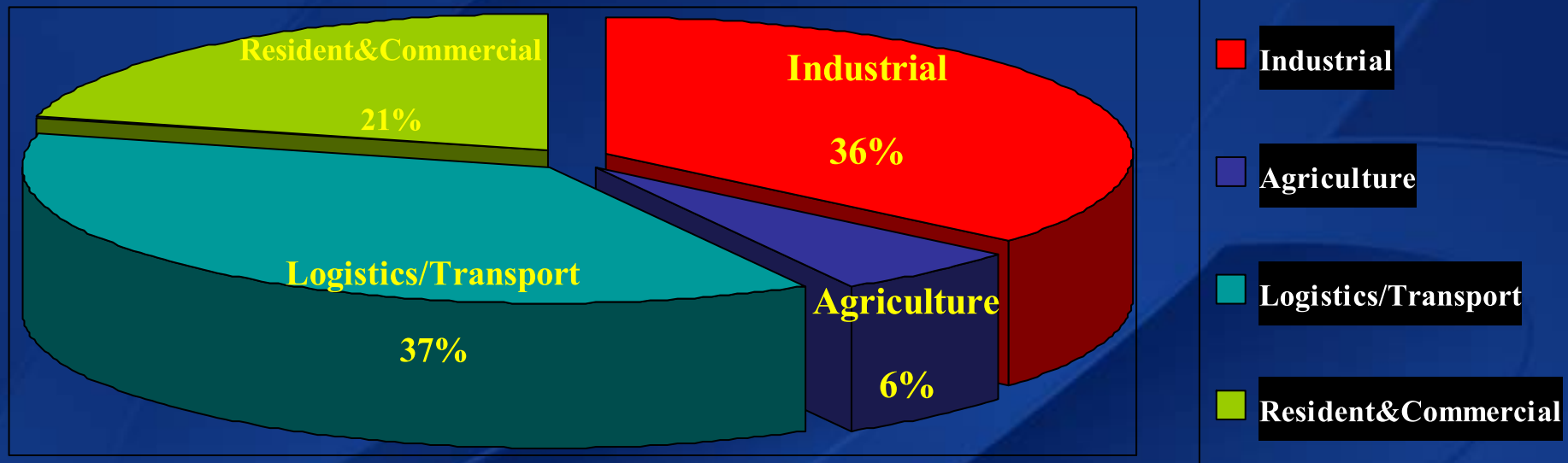
Thailand: Energy Situation



Energy consumption: 51% Electricity / 49% Oil
Total Cost: 15.7% GDP

Source: Dept Alt Energy Dev/Efficiency, MOE

Sectoral Energy Consumption

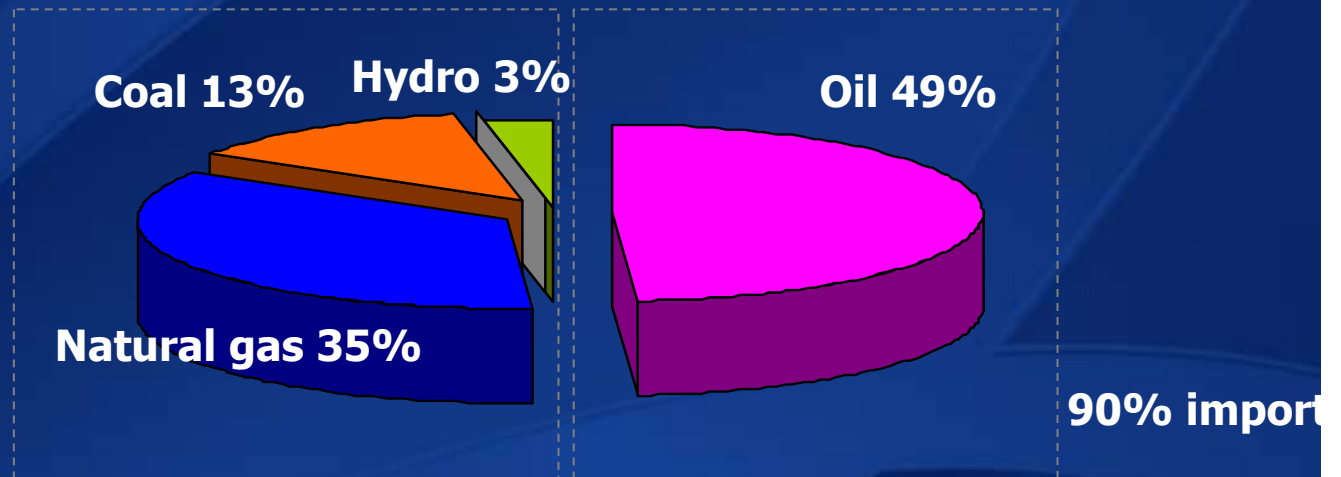


Source: Dept Alt Energy Dev/Efficiency, MOE

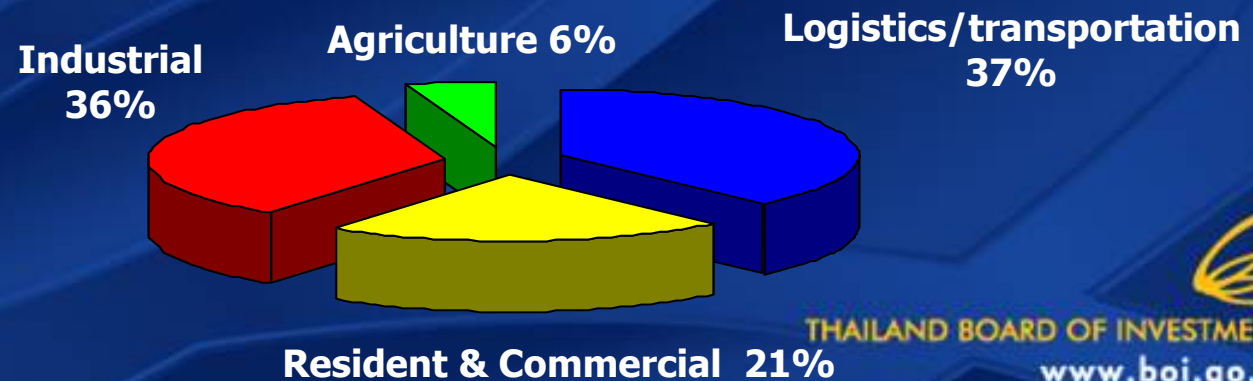
Energy Situation in Thailand

Energy consumption : 51% Electricity, 49% Oil
2005 Thailand's energy cost 15.7% of GDP

Primary energy consumption



Consumption by Sector



Commercial Primary Energy Consumption

	2005	2006*	2007f
Consumption	1,520	1,557	1,636
Oil	689	676	688
Natural gas	566	581	622
Coal	107	145	288
Lignite	125	109	
Hydro/Imported Electricity	33	46	38
Change rate%			
Consumption	4.8	2.4	5.1
Oil	0.4	-1.9	1.7
Natural gas	9.2	2.8	7
Coal	13.8	34.9	13.4
Lignite	4.6	-12.3	
Hydro/Imported electricity	2.4	39.2	-13.3



2011 Alternative Energy Consumption Targets

Energy Type	Electricity		Heat	Fuels		Total	% total energy consumption
	MW	Ktoe	Ktoe	M. ltr/day	Ktoe	Ktoe	
2011 Target	3,246	1,443	3,851	7	6,426	11,311	13.5
Renewable Energy	3,246	1,034	3,851	7	2,708	6,963	8.3
Ethanol	-	-	-	3	820	820	-
Biodiesel	-	-	-	4	1,258	1,258	-
Biomass (+395MW)	2,800	940	3,660	-	-	4,600	-
Municipal Solid Waste (+100MW)	100	45	-	-	-	45	-
Biogas(-33MW)	30	14	186	-	-	200	-
Hydropower(-244 MW)	156	18	-	-	-	18	-
Wind Power	115	13	-	-	-	13	-
Solar Energy	45	45	5	4,348	4,348	9	-
NGV	-	-	-	- 508	-	-	5.2

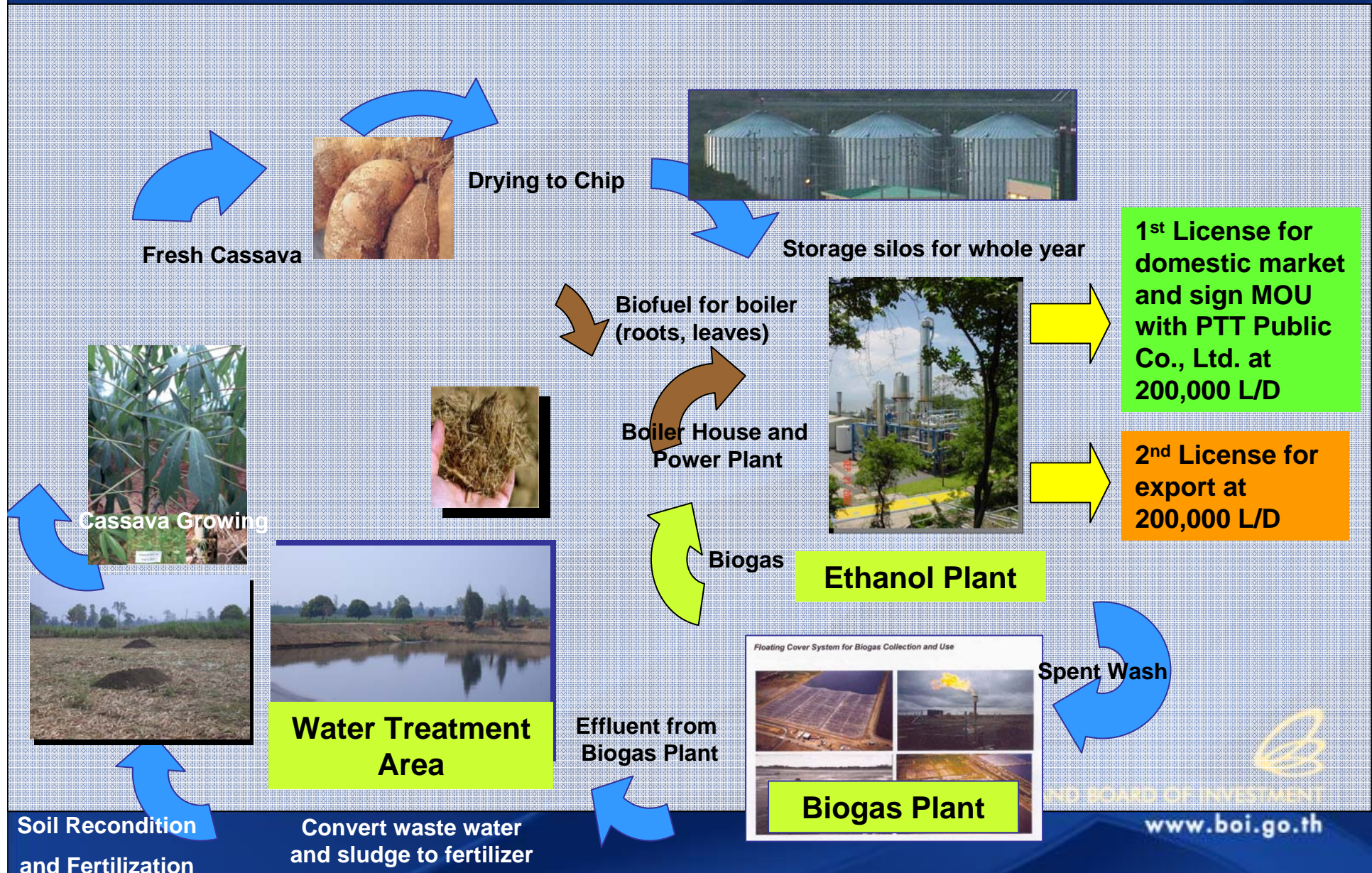
Alternative Energy Industry Promoted activities

- Biofuels**
- Solar cells**
- Energy service companies**
- Electricity or steam power using alternative energy sources** (e.g. wind, biogas or agricultural materials)
- Energy-saving machinery/equipment, or those utilizing alternative energy**
- Duty-free import of energy-saving machinery/equipment for any promoted project**



VSAT station, Thailand

Ethanol Production



Thailand's Major Agricultural Wastes

Sugar Cane

Bagasse

13,960,739
tons/yr



Tops and leaves

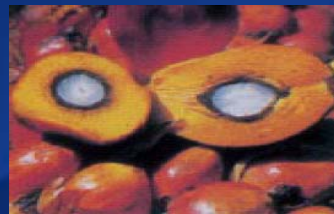
11,412,433
tons/yr



Oil Palm

- Fiber

12,887 tons/yr



Shell

16,347 tons/yr

Bunches

237,285 tons/yr



Tapioca

Tapioca slurry

1,331,520 tons/yr



Tapioca Rhizome

101,771 tons/yr



Rice

- Husk

2,307,984 tons/yr



- Rice Straw

24,692,013 tons/yr



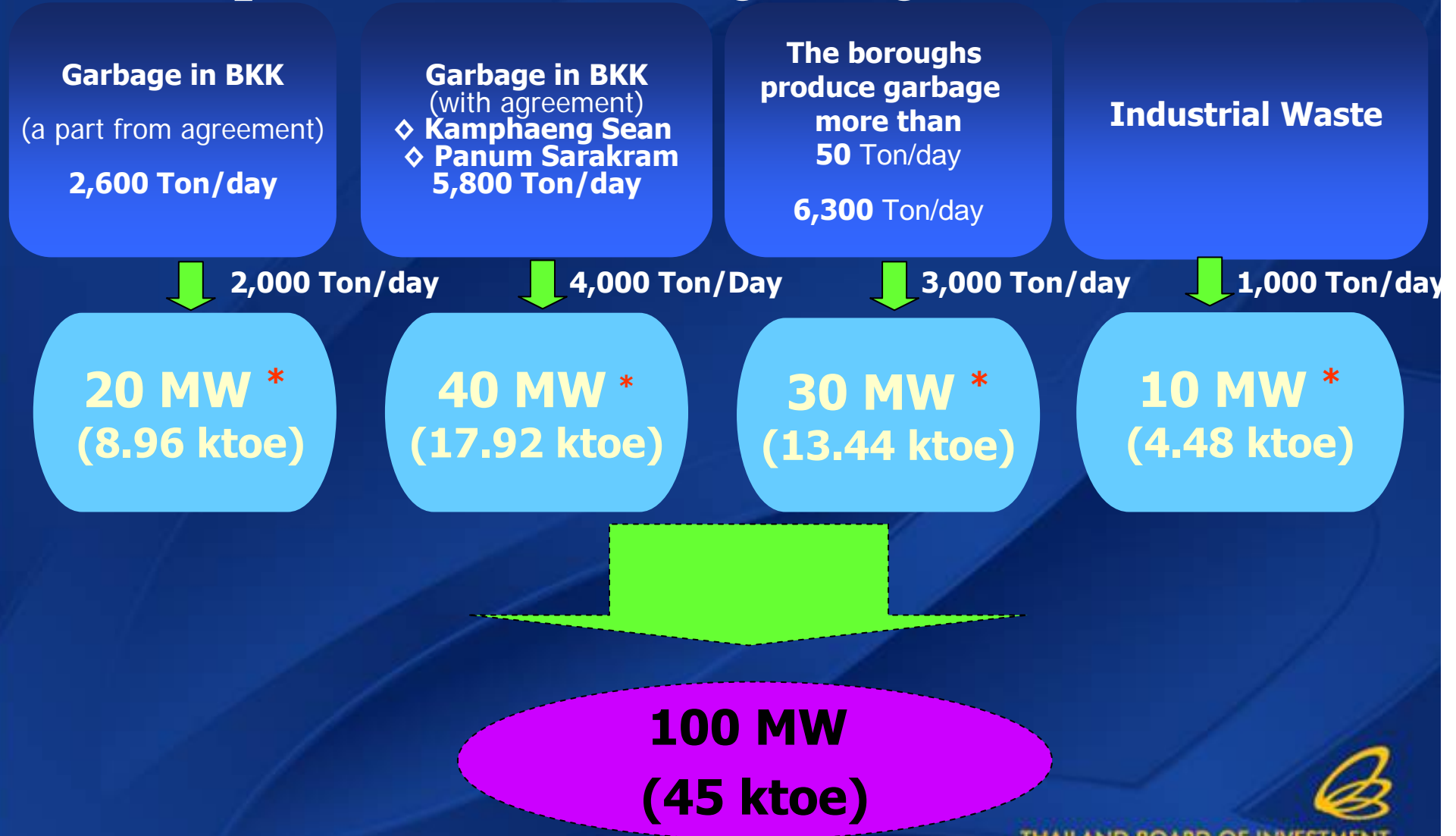
THAILAND BOARD OF INVESTMENT

www.boi.go.th

Biomass: SPP Project

Biomass Type	No. of Projects	Installed Capacity	Grid Connected
Bagasse	22	536.20	169.30
Rice Husks	6	85.90	54.00
Rice Husk&Wood	3	60.80	35.20
Rice Husk, Baggase & Waste Wood	4	108.80	62.20
Bark, Waste Wood & Black Liquored	1	87.20	50.00
Black Liquored	1	32.90	25.00
MSW	1	2.50	1.00
Total	38	(MW) 914.30	(MW) 396.70

Target strategy electricity production from garbage in 2011



*100 Ton of garbage can produce electricity 1 MW

Targeting of wind energy

2011 Target – 115 MW

Present

- ❑ Mega Windmill 900KW at Huasai, Nakornsri

Thammarat

- ❑ (2004-2006)
- ❑ Mega Windmill 600KW at Leampramthep, Phuket
- ❑ (2004-2006)
- ❑ Mega Windmill 600KW at Satingpra, Songkra
- ❑ (2004-2007)

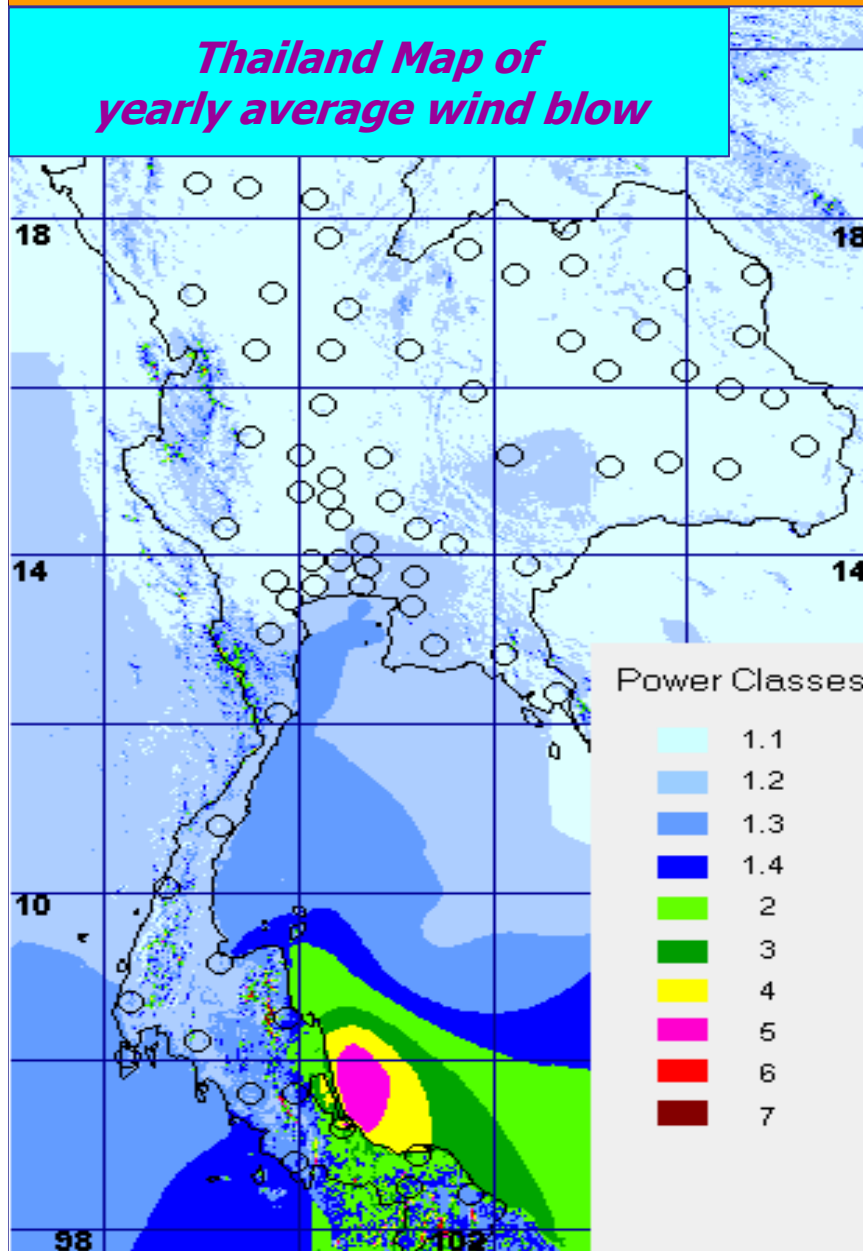
Support Plan

- ❑ Continuously measure and collecting wind data from
- ❑ every station over the country (2004-2011)
- ❑ Develop and adjust the network of the wind
- ❑ measurement stations up to the standard (2005)
- ❑ Determine the specific location for developing wind
- ❑ energy (2005-2007)
- ❑ Correcting and updating map of wind capacity (2007)

Installation supporting project of windmill for agriculture for 7,000 units as well as integrating with energy plan of the provinces (2005-2011)



Wind capacity within Thailand



		THAILAND WIND POWER CLASSES										
Elevation		1.1	1.2	1.3	1.4	2	3	4	5	6	7	
10 m	m/s	0	2.8	3.6	4.0	4.4	5.1	5.6	6.0	6.4	7.0	9.4
	W/m ²	0	25	50	75	100	150	200	250	300	400	1,000
30 m	m/s	0	3.3	4.1	4.7	5.2	5.9	6.5	7.0	7.4	8.2	11.0
	W/m ²	0	40	80	120	160	240	320	400	480	640	1,600
50 m	m/s	0	3.6	4.4	5.1	5.6	6.4	7.0	7.5	8.0	8.8	11.9
	W/m ²	0	50	100	150	200	300	400	500	600	800	2,000

The height level 50 meters

Yearly average capacity of wind blow

6.4 m/sec or higher: Nakornsri Thamarat,
Songkra, Patthani

4.4 m/sec or higher: Phangnga, Phuket,
Trang, Satun

Yearly average of wind blow
At speed 4.4-6.4 m/sec

THAILAND OF INVESTMENT

Where success stories begin

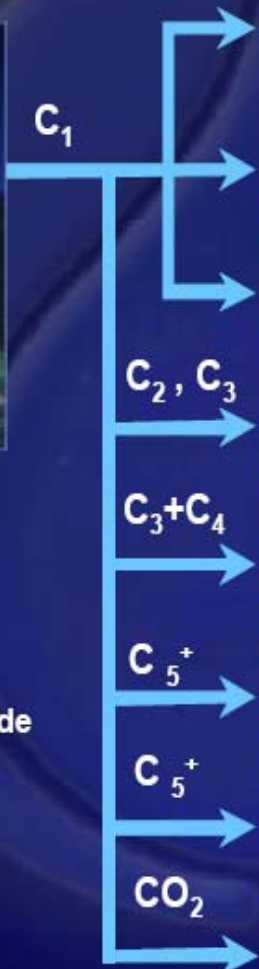
Natural Gas Utilization



Natural Gas from Gulf of Thailand



C_1	Methane
C_2	Ethane
C_3	Propane
C_3+C_4	LPG
C_5^+	NGL
CO_2	Carbon Dioxide



Power Generation



Fuel for Industry



Compressed Natural Gas for Vehicle (NGV)



Feedstock for Petrochemical Industry (NPC/TOC)



LPG for Household & Vehicle



NGL for Industry & Oil Refinery



Feedstock for Petrochemical Industry (TOC)



Carbon Dioxide for Industry

Increased NGVs 2006

	<u>Unit: vehicle</u>
Public Vehicle	
BMTA	3,200
Taxi	30,000
Corporate/Government Car	16,800
Van/Pickup	10,000
Truck/Tractor	<u>3,000</u>
The increasing number of vehicles in total (2006)	63,000

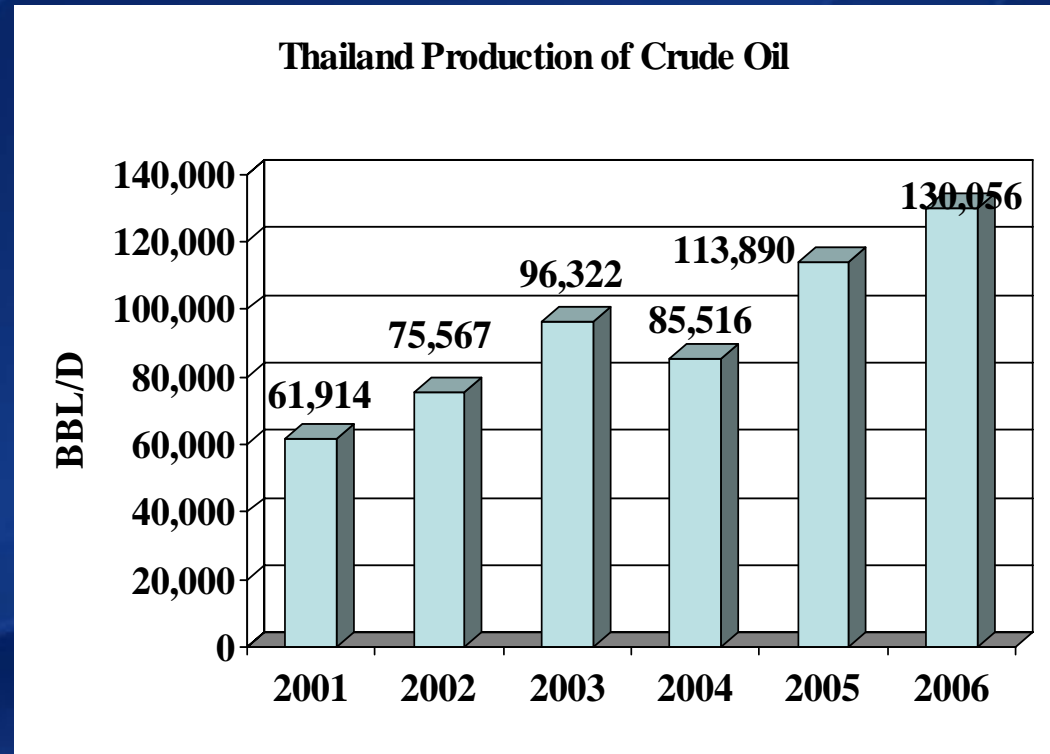
**Currently, there are 18 companies with 70 service centers
to install NGV equipments, and 7 auditors.**

Total vehicle in 2006	73,000
Oil import replacement in 2006 (million liter)	846
Replaced value (million baht)	14,520
Fuel saving value for users (million baht)	7,415

Push for Energy Security

1. Increase domestic energy production

- ❑ Increase refining capacity
- ❑ New crude oil discoveries in Sukothai



Source: DMF, EPPO

2. Purchase energy from neighboring countries

- ❑ Purchase agreements with Laos PDR, China, and Myanmar

Investment Opportunities in Alternative Energy

- **The BOI Offers an 8-year Corporate Income Tax Exemption, Regardless of Zone:**
 - ✓ Production of Solar Cells
 - ✓ Manufacture of energy-saving machinery/equipment or machinery/equipment using alternative energy
 - ✓ Energy Service Consulting Companies (ESCO), with approval of the Ministry of Industry
- **Energy-saving machinery or equipment for existing BOI projects can be imported duty-free**



Invest in renewable energy

- Thailand needs an additional 200,000 litres of ethanol / day to be used in making gasohol.**
- The government targets the use of 4.25 million litres of biodiesel / day by 2011.**
- 15 biomass plants have been short listed for foreign investment**



Environmental Conventions Signed by Thailand

- Biodiversity Convention at Rio de Janeiro on 12 June.**
- ASEAN Agreement on the Conservation of Nature and Natural Resources, Kuala Lumpur, 1985.**
- UN Framework Convention on Climate Change at Rio de Janeiro on 12 June 1992.**
- Basel Convention on 22 March 1990.**



Thailand is a Party to

- CITIES in 1983**
- World Heritage in 1987**
- the Vienna Convention for the Protection of the Ozone Layer.**
- the Montreal Protocol on Substances that deplete the ozone layer**



Government Institutions

- Ministry of Science, Technology and Environment**
- Office of Environmental Policy and Planning (OEPP)**
- Department of Pollution Control (PCD)**
- Department of Environmental Quality Promotion (DEQP)**

