



# Thailand Energy Situation

## COGEN 3 Launching Seminars

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Shangri - La Hotel

Phongjaroon Srisovanna  
Chief Country Co-ordinator, Thailand





- **Local Energy Situation**





# 1 Primary energy consumption

: ktoe

<b>Petroleum Product</b>	<b>2,671</b>	<b>55.3%</b>
<b>NG</b>	<b>1,376</b>	<b>2.8%</b>
<b>Coal and its product</b>	<b>3,627</b>	<b>7.5%</b>
<b>Renewable Energy</b>	<b>9,132</b>	<b>18.9%</b>
<b>Electricity</b>	<b>7,492</b>	<b>15.5%</b>



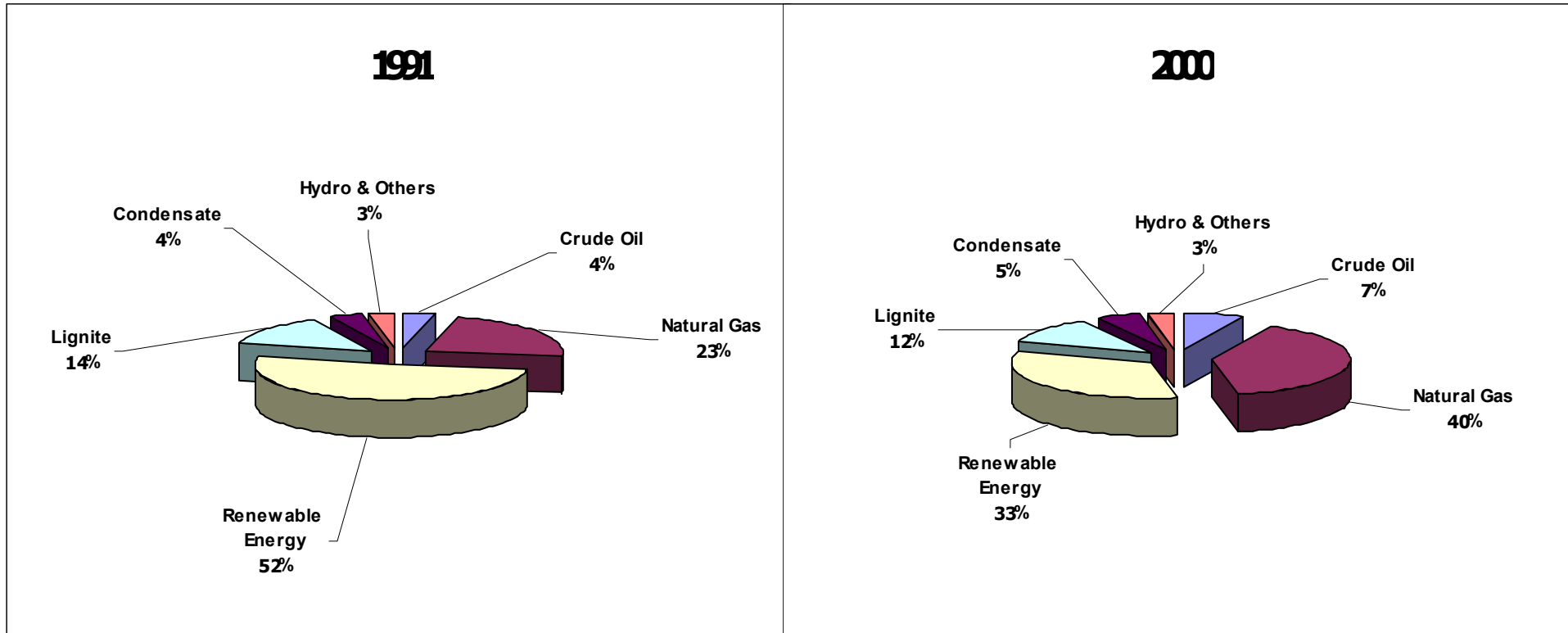


**Table 1 DEDP/Thailand Renewable Energy Year 2000**

	PRODUCTION		CONSUMPTION	
	(1,000 tons)	KTOE	(1,000 tons)	KTOE
Fuel Wood	25,441	9,629	8,609	3,258
Rice Husk	5,278	1,799	2,389	814
Bagasse	16,617	2,964	15,603	2,783
Total	47,336	14,392	26,601	6,855



**Figure 1 COMPARISON OF DOMESTIC PRODUCTION OF PRIMARY ENERGY BETWEEN 1991 AND 2000**



**DEDP/THAILAND ENERGY SITUATION 2000**

**Table 2 Biomass Potential for Surplus Electricity**

Type	Total Amount (1,000 Tons)	Surplus Availability (Factor)	Biomass Available (1,000 Tons)	Electricity Generation MW
<b>Bagasse</b>	<b>11,178</b>	<b>0.207</b>	<b>2,426</b>	<b>202</b>
<b>Rice Husk</b>	<b>5,423</b>	<b>0.469</b>	<b>2,543</b>	<b>426</b>
<b>Empty</b>	<b>1,147</b>	<b>0.5847</b>	<b>670</b>	
<b>Fiber</b>	<b>394</b>	<b>0.134</b>	<b>53</b>	<b>375</b>
<b>Shell</b>	<b>131</b>	<b>0.037</b>	<b>3</b>	
<b>Total</b>	<b>18,813</b>		<b>5,697</b>	<b>1,003</b>

Sources : 1) Calculate from Thailand Agriculture Statistic 1997/1998  
 2) Thailand Biomass-Based Power generation 1999 Black & Veach (Thailand)  
 3) The Investigation of Residue from Palm oil Industry 1995 (DEDP)



### Table 3 Potential of Thailand Renewable Energy

Energy	Existing	Potential
<b>Photovoltaic</b>	<b>5 MW</b>	<b>18.2 MW</b>
<b>Wind</b>	<b>&lt;1 MW</b>	<b>N/A</b>
<b>Biomass for electricity -generation</b>	<b>157 MW</b>	<b>1,000 MW</b>
<b>Biogas</b>	<b>4 MW</b>	<b>20 MW</b>

Source : National Energy Policy Office





## 2 Electric Production divided in fuels

: GWh

NG	54,003	56.30%
Coal and Lignite	15,582	16.50%
Furnace Oil	9,824	10.20%
Hydro	6,026	6.3%
Diesel	122	0.1%
Cogeneration (SPP)	10,148	10.6%
Geothermal, Solar cells, Wind turbine	2	





# 3 Map of country with electricity transmission network





## 4a Power plants, tables of major power plants (with fuel)

Types/ Names of Power Plants	Number and Unit Capacity (No * MW)	Total Capacity (MW)	Type of Fuel	Generation (GWh)
<b>Thermal (Steam)</b>				
South Bangkok	2*200, 3*310	1,330.0	NG, Fuel Oil & Diesel	5,602
North Bangkok	2*75, 1*87.5	237.5	Fuel Oil & Diesel	299
Mea Moh	3*75, 4*150, 6*300	2,625.0	Lignite & Diesel	15,892
Bang Pakong	2*550, 2*600	2,300.0	NG, Fuel Oil & Diesel	10,300
Ratchaburi (IPP)	2*735	1,470.0	NG, Fuel Oil & Diesel	4,818
Kegco (IPP)	2*75	150.0	NG, Fuel Oil & Diesel	1,098
<b>Total</b>		<b>8,112.5</b>		<b>38,009</b>



Sources : DEDP/ELECTRIC POWER IN THAILAND

SYCON

Carl Bro  
Intelligent Solutions





## 4a Power plants, tables of major power plants (with fuel)

Types/ Names of Power Plants	Number and Unit Capacity (No * MW)	Total Capacity (MW)	Type of Fuel	Generation (GWh)
<b>Gas Turbine</b>				
Nong Chok	2*122	244.0	Diesel	-
Lan Krabu	2*16, 4*20, 4*14	168.5	NG	1,151
<b>Total</b>		<b>412.0</b>		<b>1,151</b>

Sources : DEDP/ELECTRIC POWER IN THAILAND



## 4a Power plants, tables of major power plants (with fuel)

Types/ Names of Power Plants	Number and Unit Capacity (No * MW)	Total Capacity (MW)	Type of Fuel	Generation (GWh)
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### Combined Cycle

Nam Phong	2*355	710.0	NG & Diesel	3,132
Bang Pakong	2*380.3, 2*307	1,374.6	NG & Diesel	4,013
South Bangkok	1*355, 1*623	958.0	NG & Diesel	6,043
Wang Noi	2*651, 1*729	2,031.0	NG & Diesel	11,060
Ratchaburi	4*230	920.0	NG & Diesel	147
Kegco (IPP)	1*674	674.0	NG & Diesel	4,682
Regco (IPP)	4*308	1,232.0	NG & Diesel	8,091
Ipt (IPP)	1*700	700.0	NG & Diesel	1,235
Teco (IPP)	1*700	700.0	NG	2,222


**Total**

Sources : DEDP/ELECTRIC POWER IN THAILAND

**9,299.6**
**40,625**




## 4a Power plants, tables of major power plants (with fuel)

Types/ Names of Power Plants	Number and Unit Capacity (No * MW)	Total Capacity (MW)	Type of Fuel	Generation (GWh)
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### Diesel

Mae Hong Son	6*1	6.0	Diesel	2
Pea	36.1	Diesel	14	
<b>Total</b>	<b>42.1</b>			<b>16</b>

### Cogeneration

SPP		1,790.9	Coal,Lignite,Fuel oil, Diesel,Renewable & Others	10,148
<b>Total</b>		<b>1,790.9</b>		<b>10,148</b>

### Others

		0.6		2
<b>Total</b>		<b>0.6</b>		<b>2</b>



Sources : DEDP/ELECTRIC POWER IN THAILAND





## 4b SPP in Commercial Operation in 2000

Types	No. Of Contracts		Types of Fuel	Capacity	
	Firm	Non - Firm		Installed (MW)	Selling to Grid (MW)
<b>Fiber Production</b>	-	1	Lignite	17.2	6.0
<b>Petrochemical</b>	2	1	Waste Gas,NG. Fuel Oil & Coal	261.7	87.0
<b>Pulp &amp; Paper</b>	-	2	Fuel Oil, Black Liquor, Coal, Paddy Husk & Fuel Wood	114.0	60.0
<b>Sugar Mills</b>	-	13	Bagasse	277.5	65.0
<b>Utility Company</b>	22	1	NG ,Diesel, Fuel Oil, Coal, Bagasse & Fuel Wood	2,448.2	1,572.9
<b>Total</b>	<b>24</b>	<b>18</b>		<b>3,118.6</b>	<b>1,790.9</b>



Sources : DEDP/ELECTRIC POWER IN THAILAND





## Existing, On-Going And Planned Cogeneration Project

### List of IPPs

	Company	Mw	Gwh/Yr	Fuel	Location	Status
1	Independent Power Thailand	1 X 700	4,513.15	Ng	Chonburi	In Operation
2	Tri Energy	1 X 700	4,513.15	Ng	Ratburi	In Operation
3	Eastern Power And Electric	1 X 350	2,256.58	Ng	Samutprakarn	In Operation
4	Union Power Development	2 X 700	7,358.40	Coal	Prachubkirikan	(Postpone)
5	Gulf Electric	2 X 367	3,857.90	Coal	Prachubkirikan	(Postpone)
6	Bowin Power	1 X 713	4,596.97	Ng	Chonburi	In Operation
7	Blcp Power	2 X 673.25	7,077.20	Coal	Rayong	In Operation
8	Klcp Power - Thermal	2 X 75	1,050	Ng + F.O.	Nakon Srithammarat	In Operation
	- Cogen	1 X 674	4,723	Ng + Diesel	Nakon Srithammarat	In Operation
9	Regco - Cogen	4 X 308	8,634	Ng + Diesel	Rayong	In Operation
10	Ratchaburi - Cogen	2 X 735	10,302	Ng + F.O.	Ratchaburi	In Operation





## List Of SPP (Firm)

	Company	Installed (Mw)	Pdp (Mw)	Fuel	Location	Station
1	The Cogeneration Co., Ltd. (Public) 1	150	90	Ng	Rayong	In Operation
2	The Cogeneration Co., Ltd. (Public) 2	150	90	Ng	Rayong	Ditto
3	Tuntex Petrochemical Co., Ltd.	55	10	Coal	Rayong	Ditto
4	National Petrochemical Co., Ltd.	133.70	32	Ng + Off Gas	Rayong	Ditto
5	Industrial Power (1)	67.68	55	Ng	Rayong	Ditto
6	Thai Oil Power	117.20	41	Ng	Chonburi	Ditto
7	Defence Energy	10.40	9	F.O.	Chiangmai	Ditto
8	Gulf Cogeneration	111	90	Ng	Saraburi	Ditto
9	Amata Egco	150	90	Ng	Chonburi	Ditto
10	Industrial Power (2)	66.34	55	Ng	Rayong	Ditto
11	Bangkok Cogeneration	107	90	Ng	Rayong	Ditto
12	National Power Supply (1)	164	90	Coal + Waste Wood	Prachinburi	Ditto
13	NPC Cogeneration (1)	70	60	Ng	Rayong	Ditto
14	Saha Cogeneration	120	90	Ng	Chonburi	Ditto
15	Thai Power Supply (1)	105	47.40	Husk + Waste Wood	Chachoengsao	Ditto
16	NPC Cogeneration (2)	70	60	Ng	Rayong	Ditto
17	Thai Power Supply	10.40	6.40	Husk + Waste Wood	Chacheonsao	In Operation
18	Rojana Power	120	90	Ng	Ayudthaya	Ditto
19	National Power Supply (2)	164	90	Coal+ Waste Wood	Prachinburi	Ditto
20	Samutprakarn Cogeneration	160.30	90	Ng	Samutprakarn	Ditto
21	Thai Cogeneration (1)	160	90	Coal	Rayong	Ditto
22	Thai Cogeneration (2)	160	90	Coal	Rayong	Ditto
23	Thai National Power	110	90	Ng	Rayong	Ditto
24	Noangkal Cogeneration	159.50	90	Ng	Chonburi	Ditto
25	Laem Chabang Power	103.58	60	Ng	Chonburi	Ditto
26	Biomass Power	6	5	Rice Husk	Cahinat	Ditto
27	Amatu Power Banpakong	150	90	Ng	Chonburi	Ditto
28	Roiet Green	9.9	8.8	Rice Husk	Roiet	Syn.Jul' 02
29	TLP Cogeneration	103	60	Ng	Rayong	Syn.Jan' 03
30	Alpha Power	210	70	Ng	Chachoengsao	Syn.Mar' 03
31	Siam Power Supply	300	60	Ng	Rayong	Syn.Aug' 03
32	Panjaphol Pulp Industry (1)	150	90	Coal	Rayong	Syn.Aug' 03
33	Panjaphol Pulp Industry (2)	150	90	Coal	Ayudthaya	Syn.Apr' 03





# 5 Gas Utilization in sectors in 2000

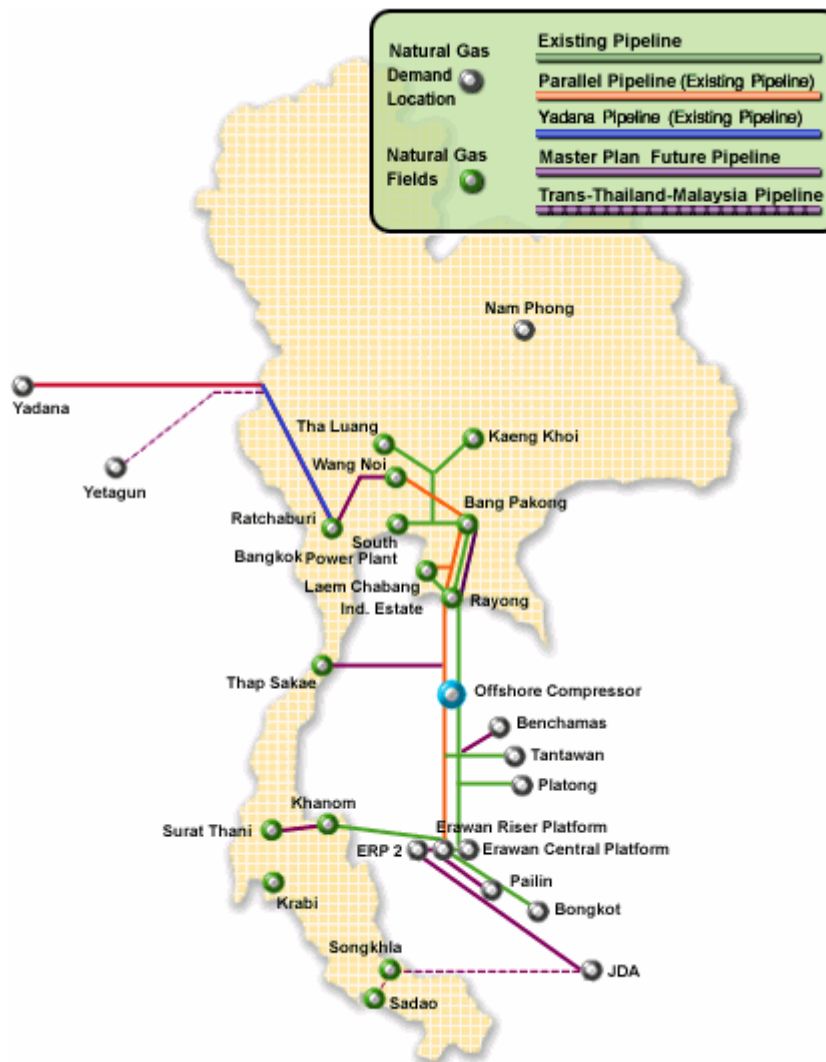
Unit : ktoe

Sub-Sector	Natural Gas
Food and Beverages	54
Textiles	-
Wood and Furniture	-
Paper	-
Chemical	402
Non-Metallic	715
Basic Metal	-
Fabricated Metal	203
Others (Unclassified)	-
<b>Total</b>	<b>1,374</b>





# 6 Map of country with gas transmission network





## 8 Average Energy Pricing

Fuel	Power	Energy	Total
<b>SPP</b>			
NG	0.85	1.54	2.39
Furnace Oil	0.61	1.63	2.24
Coal	1.05	0.80	1.85
Biomass	0.92	1.59	2.51
<b>IPP</b>			
NG	0.49	1.24	1.73
Coal	0.98	0.66	1.64
Ratchaburi	0.79	1.49	2.28
EGCO	0.70	1.26	1.96
<b>Others</b>			
Diesel	6.93	3.26	10.19
Solar Cell	9.50	0	9.50
Wind Turbine	7.0	0	7

NB : 1. April 2001  
2. Thai - Lao Tariff negotiation 1.77 B/unit

Source Nepo 27 September 2001  
Thansetakit February 2002





## 11 Promotion actions for CHP/cogen

### ● The subsidy for Power Purchase from SPPs Renewable Energy

**First Group** : Total 17 project 313 MW Subsidy Fund about 1,955 million Baht were approved for technical and financial proposals.

No	Company	Fuel	Mw
1	N.Y.Sugar	Bagasse	3.0
2	V O Green Power (Nakornpathom)	Paddy Husk	8.5
3	Rv Green Power	Paddy Husk	8.5
4	Biomass Power	Paddy Husk	16.0
5	Central Energy	Paddy Husk	55.0
6	Gulf Electric	Bark/Palm Shell	20.0
7	Gulf Electric	Bark	20.0
8	Korat Industry	Bagasse	8.0
9	Central Energy	Paddy Husk	55.0
10	A.T.Biopower	Paddy Husk	20.0
11	EGAT	Hydro	8.0
12	EGAT	Hydro	10.0
13	EGAT	Hydro	14.0
14	TPK Starch	Cassava Root	22.0
15	A.T.Biopower	Paddy Husk	20.0
16	P.R.G.Crop	Paddy Husk	5.0
17	A.T.Biopower	Paddy Husk	20.0





**Second Group** : Total 20 project 224.20 MW Subsidy Fund about 1,000 million Baht were approved for technical and financial proposals.

<b>No</b>	<b>Company</b>	<b>Fuel</b>	<b>MW</b>
1	A.T.Biopower	Paddy Husk	20.0
2	Advance Agro	Waste Wood/Husk	40.0
3	Aa Plup Mill (2)	Black Liquor	25.0
4	Pairoj Somponge Panit	Biogas	0.9
5	Thai Power Supply	Waste Wood/Husk	16.0
6	Thai Power Supply	Paddy Husk	3.0
7	Thai Power Supply	Waste Wood/Husk	10.4
8	Mitr Kaset Industry	Bagasse	3.0
9	Country Power	Paddy Husk	15.0
10	Mitr Phol	Paddy Husk /Waste Wood	25.0
11	Mitr Kalasilp	Bagasse	5.1
12	Thai Rungroeng Industry	Bagasse	4.0
13	Ratchasima Sugar	Bagasse	18.0
14	Chaimongkol Refind Sugar	Bagasse	7.0
15	Eastern Sugar	Bagasse	5.6
16	Pitsanuloke Sugar	Bagasse	4.0
17	Kanchanaburi Sugar Industry	Bagasse	4.0
18	Saraburi Sugar	Bagasse	4.0
19	Phoenix Pulb and Paper	Black Liquor/Waste Wood	2.2
20	Thai Carbon Black	Waste Gas	12.0





## ● The Information Service Center For Power Generation From Biomass Fuels

NEPO received 6.8 million \$ from GEF and UNDP to set up one stop clearing house to give consultant for interested person and investors about the power generation by biomass fuel.

## ● Feasibility Study CHP From Biomass

ENCON FUND approved 5 million Baht for ECCT (EEIT) to carry out the feasibility study CHP by biomass fuels. This project also received the technical assistance from Finland government through Fortum Engineering Ltd.





## ● Thailand Biomass - Based Power Generation And Cogeneration Within Small Rural Industries

NEPO hired Black & Veatch (Thailand) to study the potential of generation power from waste in agro industry cover each region of Thailand. The factories were :

- 1) Sommai Roiet
- 2) Sanan Muang
- 3) Thitiporn Thanya
- 4) Plan Creation
- 5) Chumporn Palm Oil
- 6) Kanchanaburi Sugar Industry
- 7) Wood Work Creation
- 8) Mitr Kalasilp Sugar Mill
- 9) Lianhongchai Rice Mill
- 10) Thaksin Plan Oil (1993)

From the study factories no. 1, 5, 8 were feasibility to utilize own biomass for power generation because of EIRR more than 23%. NEPO will assist these factories to implement within 5 years according to M.O.U. four factories no.4, 6, 7, 8 out of lists proposed the proposal for subsidy of power selling SPPs renewable energy.

