



PDP 2007: Revision 2

Electricity Generating Authority of Thailand

THAILAND POWER DEVELOPMENT PLAN

2008 – 2021

(PDP 2007: Revision 2)

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Thailand Power Development Plan

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1. Introduction

Thailand Power Development Plan 2007 – 2021 (PDP 2007) was formulated by the Electricity Generating Authority of Thailand (EGAT) under the policy framework of the Ministry of Energy, in terms of reliability of power supply, fuel diversification, power purchase from neighboring countries, and power demand forecast, etc. The PDP 2007 was approved by the National Energy Policy Council (NEPC) and endorsed by the cabinet in June 2007.

Later, the Energy Planning and Policy Office (EPPO) of the Ministry of Energy had successfully executed the power purchase from the Small Power Producers (SPPs), including both co-generation and renewable projects, as well as the selection of the Independent Power Producers (IPPs). Regarding power purchase from neighboring countries, EGAT has also finalized power purchase deal and entered into either the Power Purchase Agreement (PPA) or tariff MOU in many projects with their developers.

EGAT under the guidance of the Ministry of Energy reviewed the PDP 2007 to cope with such current situation, so called “Thailand Power Development Plan 2007-2021: PDP 2007 Revision 1”. The PDP 2007 Revision 1 was approved by NEPC and endorsed by the cabinet in December 2007.

However, after 10 months of applying the PDP 2007 Revision 1, the situation and condition affecting the plan has significantly changed, especially the declined power demand was found lower than the forecast due to the global economic recession. If the plan remained unchanged, the power system would reflect with high reserved margin. Furthermore, the power development projects in Lao PDR, which tariff MOU have expired or were terminated, are required to review and re-negotiate their proposed tariff.

Therefore, EAGT together with the Ministry of Energy have again reviewed the PDP 2007 Revision 1 according to the present situation, called “Thailand Power Development Plan 2007-2021: PDP 2007 Revision 2”

The PDP 2007 Revision 2 was endorsed by NEPC on January 16, 2009 and proposed to the Cabinet on January 28, 2009. The Cabinet assigned NEPC to consider the necessity of public hearing process on the PDP 2007 Revision 2 and, in the meeting of the PDP Review Committee on February 2, 2009, EPPO and EGAT was assigned to prepare information for the PDP workshop in exchanging points of view among relevant stakeholders and collecting comments for further adjustment of the PDP. The workshop was arranged on February 11, 2009 in which the following issues on the PDP were discussed.

1. Load forecast applied in this PDP is revised according to the declined power demand, of which the GDP growths in 2009, 2010 and 2011 were lower projected to 2.0 %, 3.0 % and 4.5 % respectively while the GDP growth projection from 2012 to 2021 is remained the same as the previous load on March 2007. The load forecast will be executed again after 8 – 10 months when the consultancy engaged with EPPO finish the long term GDP forecast considering the change of customer structure such as industry sector.

2. The load forecast was adjusted from the load on March 2007 and has deducted the energy saving as derived from the potential of the Demand Side Management (DSM) programs. Besides, energy from the Very Small Power Producers (VSPP) and renewable energy are also considered on the load. The net energy after deducting the energy from DSM potential and from VSPP was applied in this PDP. However, the load forecast for the next PDP will be made based on the latest long term GDP projection while the DSP programs and the VSPP projects will be considered in more details.

3. The acceleration of power purchase from SPPs reflecting the Government policy on the economic enhancement since SPPs mainly generate power supporting the growth of industrial sector.

4. Chana block 2 is a required power plant in the PDP as its role to supply increased power demand from 2014 in lower part of Southern Thailand.

5. The postponement of large power projects including IPPs, EGAT owned plants and power purchase from neighboring countries due to the reduced power demand as maintaining reserved margin at an appropriate level. Moreover, the large power projects

usually required oversea funding which is now facing the global economic crisis causing difficult approval of loan.

The review of the PDP 2007 Revision 2 according to comments collected from the workshop was then completed and the Ministry of Energy again proposed to NEPC. The proposed PDP 2007 Revision 2 was endorsed by NEPC on March 9, 2009 and finally endorsed by the Cabinet on March 24, 2009. The PDP 2007 Revision 2 will be applied only for the period of 2009 – 2015 to maintain appropriate level of reserved margin, with respect to the present situation of economic recession, as well as to reduce the investment burden on unnecessary expansion of power generation and transmission projects to an appropriate level. Further plan during 2016 – 2021 will be review in the next PDP.

According to the PDP 2007 Revision 2, the country in overview will benefit from the revised implementation in power sector as following.

1. Thailand power reserved margin can be maintained at appropriate level with respect to the declined power demand, therefore most of previously planned power plants were postponed as stated in the PDP.

2. The investment on power generation and transmission projects can be reduced due to the postponement of power projects of IPPs, EGAT, new unidentified capacities, as well as power purchase from neighboring countries with respect to the declined power demand that makes the whole plan investment be reduced.

3. The acceleration of power purchase from SPPs to support the Government policy on the economic enhancement and reduction of public debt.

2. Summary

2.1 Current Status

The peak power demand of 2008 occurred on April 21, 2007 of which the maximum power generation of the country has reached 22,586.2 MW which is 17.9 MW or 0.08 % lower than the record of 2007.

2.1.1 Power Plants

As of December 2008, the total installed capacity is 29,139.5 MW, comprising 14,268.7 MW (49.0%) from EGAT's power plants, 14,230.8 MW (48.8%) from domestic private power producers (IPPs and SPPs) and 640 MW (2.2%) from neighboring country power purchase. The details of installed capacity of Thailand power system are shown in Appendix 3.

2.1.2 Transmission Systems

The standard voltage levels of EGAT transmission systems are 500 kV, 230 kV, 132 kV, 115 kV, and 69 kV at operating frequency of 50 Hz. The total length of high voltage transmission line as of December 2008 is 30,219 circuit-kilometers. The total number of high voltage substations is 209 with total transformer capacity of 72,075 MVA. The summary of transmission line length and number of EGAT's substations classified by voltage level are shown in table below:

Voltage	Substation		Transmission (Circuit-km)
	Number	MVA	
500 kV	10	15,850	3,432
230 kV	68	41,160	13,277
132 kV	-	133	9
115 kV	131	14,544	13,459
69 kV	-	-	19
300 kV HVDC	-	388	23
Total	209	72,075	30,219

The details of transmission lines and substations are shown in Appendix 4.

2.2 Additional and Updated Information for the Revision of PDP 2007

Additional and updated information and assumptions used for the revision of PDP 2007 are as follows:

2.2.1 The Load Forecast was reviewed to cope with the actual energy consumption which is lower than the projection. The peak power demand at the end of 2021 was estimated at 44,281 MW which is 4,333 MW lower than that of the PDP 2007 Revision 1. The amended demand forecast is shown in Appendix 5.

2.2.2 The review of the Commercial Operation Dates (COD) of the firm contract SPPs become earlier than those scheduled in the PDP 2007 Revision 1 responding the Government policy on the economic enhancement without causing public debt.

2.2.3 The review of the Commercial Operation Dates (COD) of 2 IPPs, Siam Energy Block 1-2 and National Power Supply Block 1-4, to be postponed for 1 year in order to maintain the appropriate level of reserved margin and to cope with the present situation of declined power demand.

2.2.4 The review of the power purchased from the IPP projects in neighboring countries, especially in Lao PDR. In case of the Nam Theun 1 and Nam Ngum 3 projects, their tariff MOUs have expired while, in case of the Hong Sa, Nam Ngiep 1 and Nam Ou, their construction cost have increased until the projects were not viable with the committed tariff so that they terminated their tariff MOU. All mentioned projects will be renegotiated.

2.2.5 New future capacities were postponed and the capacities of the proposed nuclear power plants in 2020 and 2021 were reduced from 2,000 MW per year to 1,000 MW per year in order to maintain the appropriate level of reserved margin and to cope with the present situation of declined power demand.

2.2.6 The estimated annual energy of power purchase from non-firm SPPs is 365.3 GWh.

2.2.7 The power generation from VSPPs which information is given by power distribution authorities, Provincial Electricity Authority (PEA) and Metropolitan Electricity Authority (MEA), considered as expected dependable capacity is based on the following assumption.

- VSPPs with wind and solar power generation are uncertain capacities and no reliability to assist the system during peak demand period.
- Other VSPPs such as co-generation plants, biogas, waste and biomass can be partially considered as planning capacity only for an expected dependable portion.
- The possibility of the proposed VSPP projects to be successfully implemented and energized to the system is considered as 50%.
- The potential of the VSPP projects, except wind and solar power, for their ability of supplying to the system during peak demand period is assumed as 30%.
- The growth of the expected dependable capacity of VSPPs to be specified in planning is projected with 50 MW per year.

According to the above mentioned assumption, the expected dependable capacity of VSPPs can be described as follows:

Unit in MW

Year	Wind and Solar		Others; Co-generation, Biogas, Waste and Biomass			VSPP Capacity in PDP
	Proposed Capacity	Planning Capacity	Proposed Capacity	Planning Capacity	Projected Capacity	
2009	136	-	40	6	-	6
2010	135	-	68	10	-	10
2011	148	-	321	48	-	48
2012	173	-	334	50	-	50
2013	174	-	-	-	50	50
2014	174	-	-	-	50	50
2015	26	-	-	-	50	50
2016	73	-	-	-	50	50
2017	72	-	-	-	50	50
2018	74	-	-	-	50	50
2019	76	-	-	-	50	50
2020	79	-	-	-	50	50
2021	82	-	-	-	50	50

2.2.8 The Combined Heat and Power (CHP), previously expected to increase installed capacity of 74 MW for the South Bangkok power plant block 2 and 243 MW for the Wang Noi power plant blocks 1-3, was terminated since it had been found technically unfeasible and unviable for investment.

2.2.9 The capacity of new power plants with natural gas fuel from 2012 was adjusted from 700 MW to 800 MW according to the latest power plant technology.

Accordingly, the CODs of all new capacities were rescheduled to maintain the reserved margin at the level not lower than 15%.

2.3 Thailand Power Development Plan (PDP 2007: Revision 2)

Based on the additional and updated information on the future power sources of EGAT, IPPs, SPPs and power purchase from neighboring countries as well as load forecast as

mentioned, EGAT and the Ministry of Energy have successfully reviewed the PDP 2007 :
Revision 1 as follows:

2.3.1 Projects during 2009-2015 are:

- EGAT power plant projects	3,768.7 MW
- IPP power purchase projects	4,400.0 MW
- SPP power purchase projects	1,985.5 MW
- VSPP power purchase projects	264.0 MW
- Power purchased from neighboring countries	2,186.6 MW

A list of new projects during 2009-2015 is shown in the following table:

Year	Power Plants	
2009	<i>Retirement of South Bangkok Thermal Power Plant Units 4-5</i>	-559 MW
	<i>Retirement of Lankrabue Gas Turbine Power Plant Units 1-11</i>	-220.1 MW
	<i>Retirement of Nong Chok Gas Turbine Power Plant Units 1-3</i>	-351 MW
	<i>Retirement of Suratthani Gas Turbine Power Plant Units 1-2</i>	-234 MW
	VSPP	6 MW
	SPP (Renewable)	26.5 MW
	South Bangkok Combined Cycle Power Plant Block 3	710 MW
	Bang Pakong Combined Cycle Power Plant Block 5	710 MW
	Power purchased from Lao PDR (Nam Theun 2)	920 MW
	Chao Phraya Dam Small Hydro Unit 1	6 MW
	Wind and Solar Power (Undependable)	(3) MW
2010	VSPP	10 MW
	Chao Phraya Dam Small Hydro Unit 2	6 MW
	North Bangkok Combined Cycle Power Plant Block 1	670 MW
	Mae Klong Dam Small Hydro Units 1-2	2 x 6 MW
	Pasak Jolasid Dam Small Hydro	6.7 MW
	Khun Dan Prakarnchon Dam Small Hydro	10 MW
	SPP (Co-generation)	90 MW

Year	Power Plants	
2011	Power purchased from Lao PDR (Nam Ngum 2)	596.6 MW
	VSPP	48 MW
	Kwae Noi Dam Small Hydro Units 1-2	2 x 15 MW
	Naresuan Dam Small Hydro	8 MW
	SPP (Renewable)	250 MW
	Gheco-one Co.,Ltd	660 MW
	<i>Retirement of Khanom Thermal Power Plant Unit 1</i>	<i>-69.9 MW</i>
2012	VSPP	50 MW
	SPP (Renewable)	65 MW
	SPP (Co-generation)	924 MW
	Power purchased from Lao PDR (Theun Hinbun-expanded)	220 MW
2013	VSPP	50 MW
	National Power Supply Co., Ltd Units 1-2	2 x 135 MW
	SPP (Co-generation)	540 MW
	Siam Energy Co., Ltd Units 1-2	2 x 800 MW
2014	VSPP	50 MW
	National Power Supply Co., Ltd Units 3-4	2 x 135 MW
	SPP (Co-generation)	90 MW
	Power Generation Supply Co., Ltd Units 1-2	2 x 800 MW
	<i>Retirement of Bank Pakong Thermal Power Plant Units 1-2</i>	<i>-1,052 MW</i>
	Wang Noi Combined Cycle Power Plant Block 4	800 MW
	Chana Combined Cycle Power Plant Block 2	800 MW
2015	<i>Retirement of Rayong Combined Cycle Power Plant Blocks 1-4</i>	<i>-1,175.1 MW</i>
	VSPP	50 MW
	Power purchased from neighboring countries	450 MW

2.3.2 Projects during 2016-2021 are:

- EGAT new power plants (Coal) 4 x 700 MW
- EGAT new power plants (Nuclear) 2 x 1,000 MW
- VSPP power plants 300 MW
- Power purchased from neighboring countries 2,850 MW

- New power plants
 - EGAT 4 x 800 MW
 - IPP 2 x 800 MW
 - Unidentified 6 x 800 MW

The list of all projects in the PDP 2007 : Revision 2 during 2009-2021 is shown in Table 2.1. The list of new projects categorized by power producers is shown in Table 2.2.

2.3.3 Share of Power Generation Capacity

The share of installed capacity in Thailand power system among EGAT, IPPs and power purchase from neighboring countries in 2009 is equal to 47.5 %, 47.3 % and 5.2 % respectively. At the end of 2015, the share will be 41.0 %, 51.6 % and 7.4 % respectively and, at the end of 2021, it will be 42.5 %, 37.2 % and 11.0 % respectively with a share of new power plants of 9.3 %.

Year	EGAT		IPP		New Power Plants		Power Purchase from Neighboring Countries		Total
	MW	%	MW	%	MW	%	MW	%	MW
2009	14,330.6	47.5	14,263.3	47.3	-	-	1,560.0	5.2	30,153.9
2010	15,035.3	48.6	14,363.3	46.4	-	-	1,560.0	5.0	30,958.6
2011	15,073.3	46.4	15,251.4	47.0	-	-	2,156.6	6.6	32,481.3
2012	15,073.3	44.7	16,290.4	48.3	-	-	2,376.6	7.0	33,740.3
2013	15,073.3	41.6	18,750.4	51.8	-	-	2,376.6	6.6	36,200.3
2014	15,621.3	40.3	20,760.4	53.6	-	-	2,376.6	6.1	38,758.3
2015	15,621.3	41.0	19,635.3	51.6	-	-	2,826.6	7.4	38,083.2
2016	17,021.3	42.5	18,937.1	47.3	800.0	2.0	3,276.6	8.2	40,035.0
2017	18,107.3	42.9	18,807.1	44.5	1,600.0	3.8	3,726.6	8.8	42,241.0
2018	19,868.3	44.7	18,815.1	42.3	1,600.0	3.6	4,176.6	9.4	44,460.0
2019	20,668.3	43.8	18,676.1	39.6	3,200.0	6.8	4,676.6	9.9	47,221.0
2020	21,027.3	43.1	19,438.1	39.8	3,200.0	6.6	5,176.6	10.6	48,842.0
2021	22,027.3	42.5	19,288.1	37.2	4,800.0	9.3	5,676.6	11.0	51,792.0

Table 2.1
Thailand Power Development Plan
(PDP 2007 : Revision 2)

Year	Peak Demand (MW)	Power Plant	Capacity (MW)	Reserve Margin (%)	
2009	22,886	Retirement of South Bangkok TH # 4-5 (Jan.)	-559 MW	30,153.9	22.4
		Retirement of Lankrabue GT # 1-11 (Jan.)	-220 MW		
		Retirement of Nong Chok GT # 1-3 (Jan.)	-351 MW		
		Retirement of Suratthani GT # 1-2 (Jan.)	-234 MW		
		VSPP (Jan.)	6 MW		
		SPP (Renew) (Jan.)	16.5 MW		
		SPP (Renew) (Mar.)	10 MW		
		South Bangkok CC # 3 (Mar.)	710 MW		
		Bang Pakong CC # 5 (Jul.)	710 MW		
		Power purchased from Lao PDR (Nam Theun 2) (Nov.)	920 MW		
		Chao Phraya Dam # 1 (Dec.)	6 MW		
		Wind energy and Solar energy (Dec.)	(3) MW		
		2010	23,936		
Chao Phraya Dam # 2 (Mar.)	6 MW				
North Bangkok CC # 1 (May.)	670 MW				
Mae Klong Dam # 1-2 (Aug.,Dec.)	2x6 MW				
Pasak Jolasid Dam (Oct.)	6.7 MW				
Khun Dan Prakarnchon Dam (Nov.)	10 MW				
SPP (Co-Gen) (Nov.)	90 MW				
2011	25,085	Power purchased from Lao PDR (Nam Ngum 2) (Jan.)	596.6 MW	32,481.3	23.7
		VSPP (Jan.)	48 MW		
		Kwae Noi Dam # 1-2 (Jan., Apr.)	2x15 MW		
		Naresuan Dam (Feb.)	8 MW		
		Retirement of Khanom TH # 1 (Jul.)	-69.9 MW		
		SPP (Renew) (Aug.)	250 MW		
2012	26,572	Gheco-one Co.,Ltd (Nov.)	660 MW	33,740.3	20.3
		VSPP (Jan.)	50 MW		
		SPP (Renew) (Jan.)	65 MW		
		SPP (Co-Gen) (Jun.)	924 MW		
2013	28,188	Power purchased from Lao PDR (Theun Hinbun-expanded) (J	220 MW	36,200.3	20.4
		VSPP (Jan.)	50 MW		
		Siam Energy Co., Ltd # 1-2 (Mar.,Sep.)	2x800 MW		
		SPP (Co-Gen) (Jun.)	540 MW		
2014	29,871	National Power Supply Co., Ltd # 1-2 (Nov.)	2x135 MW	38,758.3	16.6
		Retirement of Bank Pakong TH # 1-2 (Jan.)	-1052 MW		
		VSPP (Jan.)	50 MW		
		National Power Supply Co., Ltd # 3-4 (Mar.)	2x135 MW		
		Wang Noi CC # 4 (Jun.)	800 MW		
		SPP (Co-Gen) (Jun.)	90 MW		
		Power Generation Supply Co., Ltd # 1-2 (Jun., Dec.)	2x800 MW		
		Chana CC # 2 (Jul.)	800 MW		
2015	31,734	Retirement of Rayong CC # 1-4 (Jan.)	-1175 MW	38,083.2	16.6
		VSPP (Jan.)	50 MW		
		Power purchased from neighboring countries (Jun.)	450 MW		

Table 2.1 (Cont.)
Thailand Power Development Plan
(PDP 2007 : Revision 2)

Year	Peak Demand (MW)	Power Plants	Capacity (MW)	Reserve Margin (%)	
2016	33,673	Retirement of Khanom TH # 2 (Jun.)	-70.2 MW	40,035.0	16.6
		Retirement of Khanom CC (Jul.)	-678 MW		
		VSPP (Jan.)	50 MW		
		Thermal power plant (Coal)_EGAT # 1-2 (Jan.)	2x700 MW		
		Power purchased from neighboring countries (Mar.)	450 MW		
		New power plant_South (Jul.)	800 MW		
2017	35,668	Retirement of Bang Pakong CC # 3 (Jan.)	-314 MW	42,241.0	16.6
		Retirement of SPP (Apr.,Oct.)	-180 MW		
		VSPP (Jan.)	50 MW		
		Thermal power plant (Coal)_EGAT # 3-4 (Jan.)	2x700 MW		
		New power plant (Jan.)	800 MW		
		Power purchased from neighboring countries (Jan.)	450 MW		
2018	37,725	Retirement of Bang Pakong CC # 4 (Jan.)	-314 MW	44,460.0	15.8
		Retirement of Nam Pong CC # 1 (Jan.)	-325 MW		
		Retirement of SPP (Feb.,Apr.)	-42 MW		
		VSPP (Jan.)	50 MW		
		South Bangkok CC # 4-5 (Jan.)	2x800 MW		
		Bang Pakong CC # 6 (Jan.)	800 MW		
		Power purchased from neighboring countries (Jan.)	450 MW		
2019	39,828	Retirement of SPP (Jun.,Sep.)	-189 MW	47,221.0	17.0
		VSPP (Jan.)	50 MW		
		North Bangkok CC # 2 (Jan.)	800 MW		
		New power plant (Jan.)	2x800 MW		
		Power purchased from neighboring countries (Jan.)	500 MW		
2020	42,024	Retirement of South Bangkok CC # 1 (Jan.)	-316 MW	48,842.0	16.1
		Retirement of Nam Pong CC # 2 (Jan.)	-325 MW		
		Retirement of power plant of Tri Energy Co.	-700 MW		
		Retirement of SPP (Feb.,May.,Aug.)	-188 MW		
		VSPP (Jan.)	50 MW		
		Thermal power plant (Nuclear)_EGAT # 1 (Jan.)	1000 MW		
		New power plant _IPP (Jan.)	2x800 MW		
		Power purchased from neighboring countries (Jan.)	500 MW		
2021	44,281	Retirement of SPP (Feb.,Sep.,Oct.)	-200 MW	51,792.0	15.3
		VSPP (Jan.)	50 MW		
		Thermal power plant (Nuclear)_EGAT # 2 (Jan.)	1000 MW		
		New power plant (Jan.)	2x800 MW		
		Power purchased from neighboring countries (Jan.)	500 MW		
Total capacity (as of December 2008)			29,139.5	MW	
Total added capacity			30,154.8	MW	
Total retired capacity			- 7,502.3	MW	
Grand total capacity (at the end of 2021)			51,792.0	MW	

Table 2.2
List of Projects as Thailand Power Development Plant during 2009 - 2015 (by Generators)
(PDP 2007 : Revision 2)

Year	EGAT's Projects				Private Power Company's Projects						Power purchased from neighboring countries				Total Capacity MW	Peak Demand MW	Reserved Margin %
	Projects Name	MW	Subtotal Capacity / Share		Projects Name	IPP MW	SPP MW	VSPP MW	Subtotal Capacity / Share		Projects Name	MW	Subtotal Capacity / Share				
			MW	%					MW	%			MW	%			
2009	South Bangkok CC # 3 Bang Pakong CC # 5 Small Hydro Power Plants Wind energy and Solar energy	710 710 6 (3)	14,330.6	47.5%	VSPP SPP (Renew)		26.5	6	14,263.3	47.3%	Nam Theum 2	920	1,560.0	5.2%	30,153.9	22,886	22.4%
2010	North Bangkok CC # 1 Small Hydro Power Plants	670 35	15,035.3	48.6%	VSPP SPP (Co-Gen)		90	10	14,363.3	46.4%	-	-	1,560.0	5.0%	30,958.6	23,936	24.0%
2011	Small Hydro Power Plants	38	15,073.3	46.4%	VSPP SPP (Renew) Gheco-one Co.,Ltd	660	250	48	15,251.4	47.0%	Nam Ngum 2	596.6	2,156.6	6.6%	32,481.3	25,085	23.7%
2012	-	-	15,073.3	44.7%	VSPP SPP (Renew) SPP (Co-Gen)		65 92.4	50	16,290.4	48.3%	Theum Hinbun-expanded	220	2,376.6	7.0%	33,740.3	26,572	20.3%
2013	-	-	15,073.3	41.6%	VSPP SPP (Co-Gen) Siam Energy Co., Ltd # 1-2 National Power Supply Co., Ltd # 1-2	1,600 270	540	50	18,750.4	51.8%	-	-	2,376.6	6.6%	36,200.3	28,188	20.4%
2014	Wang Noi CC # 4 Chana CC # 2	800 800	15,621.3	40.3%	VSPP SPP (Co-Gen) National Power Supply Co., Ltd # 3-4 Power Generation Supply Co., Ltd # 1-2		90	50	20,760.4	53.6%	-	-	2,376.6	6.1%	38,758.3	29,871	16.6%
2015	-	-	15,621.3	41.0%	VSPP			50	19,635.3	51.6%	Power purchased from neighboring countries	450	2,826.6	7.4%	38,083.2	31,734	16.6%
Additional Capacity 2009-2015(MW)			3,768.7			4,400.0	1,985.5	264.0	6,649.5				2,186.6		12,604.8		
Total Capacity at the end of 2015(MW) (After less retired capacity)			15,621.3			15,306.7	4,064.6	264.0	19,635.3				2,826.6		38,083.2		

Table 2.2 (Continued)
List of Projects as Thailand Power Development Plant during 2009 - 2015 (by Generators)
(PDP 2007 : Revision 2)

Year	EGAT's Projects				Private Power Company's Projects				Power purchased from neighboring countries				New Projects				Total Capacity / MW	Peak Demand / MW	Reserved Margin / %
	Projects Name	MW	Subtotal Capacity / Share		Projects Name	IPP / MW	SPP / MW	VSPP / MW	Projects Name	MW	Subtotal Capacity / Share		Projects Name	MW	Subtotal Capacity / Share				
			MW	%							MW	%			MW	%			
2016	Thermal power plant (Coal)_EGAT # 1-2	1,400	17,021.3	42.5%	VSPP		50	18,937.1	47.3%	Power purchased from neighboring countries	450	3,276.6	8.2%	New power plant_South	800	800.0	2.0%	35,673	16.6%
2017	Thermal power plant (Coal)_EGAT # 3-4	1,400	18,107.3	42.9%	VSPP		50	18,807.1	44.5%	Power purchased from neighboring countries	450	3,726.6	8.9%	New power plant	800	1,600.0	3.8%	35,668	16.6%
2018	South Bangkok CC # 4-5	1,600	19,868.3	44.7%	VSPP		50	18,815.1	42.5%	Power purchased from neighboring countries	450	4,176.6	9.4%	-	-	1,600.0	3.6%	37,725	15.8%
	Bang Pakong CC # 6	800			VSPP														
2019	North Bangkok CC # 2	800	20,668.3	43.8%	VSPP		50	18,676.1	39.6%	Power purchased from neighboring countries	500	4,676.6	9.9%	New power plant	1,600	3,200.0	6.8%	39,828	17.0%
2020	Thermal power plant (Nuclear)_EGAT # 1	1,000	21,027.3	43.1%	VSPP	1,600	50	19,438.1	39.8%	Power purchased from neighboring countries	500	5,176.6	10.6%	-	-	3,200.0	6.6%	42,024	16.1%
2021	Thermal power plant (Nuclear)_EGAT # 2	1,000	22,027.3	42.5%	VSPP		50	19,288.1	37.2%	Power purchased from neighboring countries	500	5,676.6	11.0%	New power plant	1,600	4,800.0	9.3%	44,281	15.3%
Additional Capacity 2016-2021 (MW)			8,000.0				300.0	1,900.0				2,850.0			4,800.0			17,550.0	
Total Capacity at the end of 2021 (MW) (After less retired capacity)			22,027.3				564.0	19,288.1				5,676.6			4,800.0			51,792.0	

3. Power Demand Forecasting

The load forecast used for the preparation of the PDP 2007: Revision 2 was amended from the “September 2007 Load Forecast” which was previously amended from the “March 2007 Load Forecast” prepared by Thailand Load Forecast Subcommittee, as the following description.

1. The “March 2007 Load Forecast” prepared by Thailand Load Forecast Subcommittee is based on the following assumption.

1.1 The growth of Gross Domestic Product (GDP) was forecasted by the Macro Economic Planning Office, the National Economic and Social Development Board based on the economic projection from 2006 to 2016 used for the respective load forecast with the annual average GDP growth rate in 2006 – 2016 as shown below.

GDP Growth Rate Projection in 2006 – 2016

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GDP (%)	4.6	4.8	5.0	5.2	5.0	5.0	5.3	5.5	5.5	5.8	5.8

The annual average GDP growth rate is referred to the GDP growth rate in the 10th National Economic and Social Development Plan (2007 – 2011) and the 11th National Economic and Social Development Plan (2012 – 2016) which rate is approximately 5.0 % and 5.6 % respectively. The main assumption applied for such projection is the growth of global economic with the rate of 3.5 % - 4.7 % and Dubai Oil Price of 55 – 60 US Dollars per Barrel.

1.2 The Thailand Load Forecast Subcommittee had projected additional GDP growth rate from 2017 to 2021 (12th National Economic and Social Development Plan) equal to the average rate of 5.6 % in the 11th National Economic and Social Development Plan. The load forecast was considered as base case while low and high cases were also prepared with respect to the annual GDP growth rate of 0.5 % lower and higher than the base case respectively.

GDP Projection for Load Forecast (%)
March 2007

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Low	4.0	4.5	4.7	4.5	4.5	4.8	5.0	5.0	5.3	5.3	5.2	5.1	5.0	5.0	5.0
Base	4.8	5.0	5.2	5.0	5.0	5.3	5.5	5.5	5.8	5.8	5.7	5.6	5.5	5.5	5.5
High	5.0	5.5	5.7	5.5	5.5	5.8	6.0	6.0	6.3	6.3	6.2	6.1	6.0	6.0	6.0

1.3 In the March 2007 Load Forecast, the energy loss in transmission and distribution system was specified as follows:

- Energy loss in EGAT transmission system was fixed constant for the whole period of the forecast (2007-2021), equal to 2.5 % of total energy sale.
- Energy loss in distribution system of the Metropolitan Electricity Authority (MEA) was fixed constant for the whole period of the forecast (2007-2021), equal to 3.64 % of total energy demand of MEA.
- Energy loss in distribution system of the Provincial Electricity Authority (PEA) in the period 2007 – 2011 and 2012 – 2021 was 5.1 % and 5.0 % of total energy demand of PEA respectively.

1.4 The Demand Side Management (DSM) was considered in the March 2007 Load Forecast with various measures for energy saving, i. e. the specification of different rate of tariff according to Time of Use (TOU) which can reflect the actual cost, the efficiency specification of electric devices such as the energy label 5 for air conditioner and refrigerator, the establishment of an energy management company (ESCO), energy saving project in building and factory. The mentioned measures were expected to reduce future energy elasticity as of MEA and PEA given in this load forecast. Furthermore, the Ministry of Energy have launch a project to replace lighting with energy saving light which was expected to save 330 GWh energy.

1.5 The March 2007 Load Forecast considered the power purchase from the Very Small Power Producers (VSPP) since it is the Government policy to promote the power generation from renewable energy. This will increase the quantity of future VSPP

which can directly sell electricity to MEA and PEA. The amount of VSPP electricity sold to MEA and PEA will reduce the energy demand of MEA and PEA to purchase from EGAT. The expected energy of VSPP selling to MEA and PEA was estimated as follows:

- VSPP in MEA area categorized into two groups

1) Cogeneration or Combined Heat and Power (CHP) is former MEA large scale power users locating close to the gas pipeline and consumes natural gas. The energy produced from CHP will be partially consumed in its own factory that reduces their purchased energy from MEA and the remaining energy will be sold to MEA that reduces MEA purchased energy from EGAT. It was forecasted that the CHP producers will reduce 311 GWh of the energy purchased from MEA while they could sell 1,351 GWh of energy to MEA in 2021.

2) Renewable Energy in MEA area is mainly residential power users who installed solar cell on their roof and generate power for their own consumption while the remaining energy will be sold to MEA. It was forecasted that this group of VSPP will grow up 5 % annually and will reduce 3 GWh of the purchased energy from MEA while the remaining energy selling to MEA will be approximately 17 GWh in 2021.

In conclusion, VSPP in MEA area will reduce 314 GWh of purchased energy from MEA and reduce 3,107 GWh of the MEA purchased energy from EGAT or equivalent to the peak power of 231 MW in 2021.

- In PEA area, VSPPs were expected from the SPPs who previously proposed power purchase with EGAT, both non-firm SPPs who have already operated and non-firm SPPs who are on progress. Since 2009, there will be new VSPPs to sell energy to PEA increasing 10 % every year. Therefore, PEA will purchase the total energy of 3,107 GWh from VSPPs or equivalent to the peak power of 740 MW in 2021.

2. The “September 2007 Load Forecast” was amended from the “March 2007 Load Forecast” which energy demand was reviewed based on statistical trend in 2007. It was expected that the energy demand growth rate of MEA and PEA from 2007 remained the same as given in continuous growth of the March 2007 Load Forecast as the energy

demand during 2007 - 2021 will reduce approximately 2,592 – 5,321 GWh or 1.6 % - 1.9 %. The peak demand was kept as given in the March 2007 Load Forecast.

3. The amendment of “December 2008 Load Forecast” is as follows:

3.1 In the amendment of the December 2008 load forecast for using in revising the power development plan, the load forecast was reviewed to cope with the economic growth projection in base case as endorsed by the Thailand Load Forecast Subcommittee on December 8, 2008. The load forecast was reviewed with the actual data and the adjustment of the GDP growth rate in base case during 2009 – 2011 to cope with the global economic recession while the same values of GDP growth rate during 2012 – 2021 as used in the March 2007 load forecast were still applied in this amendment. This amendment resulted in the reduction of 28,273 GWh on energy demand and 4,333 MW on peak demand compared with the September 2007 load forecast.

The economic growth rate projection in base case as endorsed by the Thailand Load Forecast Subcommittee in 2009 – 2011 was estimated to be 2.0 %, 3.0 % and 4.5% respectively while the growth rates in 2012 – 2021 is equal to the values in the March 2007 load forecast which annual average is 5.6 %. Besides, the high case and low case of load forecast were also prepared in which the GDP growth rates in 2009 – 2010 of the high and low cases are 1.0 % higher and lower than the base case as well as the GDP growth rates in 2011 - 2021 of the high and low cases are 0.5 % higher and lower than the base case. Therefore, the GDP growth rates in 2011 - 2021 of the base, high and low cases remain the same as in the March 2007 load forecast.

GDP Projection for Load Forecast (%)

December 2008

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Low	-	1.0	2.0	4.0	4.8	5.0	5.0	5.3	5.3	5.2	5.1	5.0	5.0	5.0
Base	3.9	2.0	3.0	4.5	5.3	5.5	5.5	5.8	5.8	5.7	5.6	5.5	5.5	5.5
High	-	3.0	4.0	5.0	5.8	6.0	6.0	6.3	6.3	6.2	6.1	6.0	6.0	6.0

3.2 The energy demand forecast was carried out using the same elasticity as in the September 2007 load forecast considering the energy which the distribution electricity authorities purchase from VSPPs.

3.3 The peak demand forecast was carried out using the same load factor as in the September 2007 load forecast.

The amended load forecast (December 2008) compared with the September 2007 load forecast indicate the following differences.

Year	September 2007 (1)		December 2008 (2)		Difference (2)-(1)	
	Peak (MW)	Energy (GWh)	Peak (MW)	Energy (GWh)	Peak (MW)	Energy (GWh)
2551	23,490	152,124	22,017	147,229	-1,473	-4,895
2552	24,784	160,798	22,886	150,458	-1,898	-10,340
2553	26,206	170,037	23,936	155,645	-2,270	-14,392
2554	27,540	178,824	25,085	162,884	-2,455	-15,940
2555	29,172	189,483	26,572	172,593	-2,600	-16,890
2556	30,946	201,148	28,188	183,218	-2,758	-17,930
2557	32,794	213,343	29,871	194,326	-2,923	-19,017
2558	34,840	226,823	31,734	206,604	-3,106	-20,219
2559	36,968	240,803	33,673	219,339	-3,295	-21,464
2560	39,158	255,156	35,668	232,413	-3,490	-22,743
2561	41,417	270,019	37,725	245,950	-3,692	-24,069
2562	43,726	285,158	39,828	259,740	-3,898	-25,418
2563	46,137	300,971	42,024	274,144	-4,113	-26,827
2564	48,614	317,193	44,281	288,920	-4,333	-28,273

4. Thailand Power Development Plan (PDP 2007: Revision 2)

This PDP 2007: Revision 1 covers the planning horizon during 2007-2021. The detail of the plan can be described as follows:

4.1 Power Development Plan: The total additional generation capacity during the period of 2007-2021 netted the power purchase from SPP, VSPP and the retirement of aging power plants is 22,652.5 MW. Accounting the contracted capacity of 29,139.5 MW, the total installed capacity by the end of plan in 2021 will be 51,792.0 MW. The details of power plants, power purchase from IPP, SPP, VSPP and neighboring countries are shown in Table 4.1 and Figure 4.1 while the detailed capacity by power plant type is shown in Appendix 9.

4.2 New Power Plant Projects during 2009 – 2015: The total installed capacity of the new projects during this period is 12,604.8 MW. The list of projects categorized by power producers are:

4.2.1 EGAT Projects:

- South Bangkok Combined Cycle Power Plant Block 3	710 MW
- Bang Pakong Combined Cycle Power Plant Block 5	710 MW
- North Bangkok Combined Cycle Power Plant Block 1	670 MW
- Wang Noi Combined Cycle Power Plant Block 4	800 MW
- Chana Combined Cycle Power Plant Block 2	<u>800</u> MW
	<u>3,690</u> MW

4.2.2 IPP Projects:

- GHECO-One	660 MW
- Siam Energy Block 1-2	2x800 MW
- National Power Supply (NPS) Unit 1-4	4x135 MW
- Power Generation Supply Block 1-2	<u>2x800</u> MW
	<u>4,400</u> MW

4.2.3 Renewable Projects:

- Small Hydropower Plants	78.7 MW
- Solar Energy Power Plants (Non-firm)	(1) MW
- Wind Energy Power Plants (Non-firm)	<u>(2) MW</u>
	<u>78.7 MW</u>

4.2.4 Power Purchased from SPPs:

- SPP - Cogeneration	1,644 MW
- SPP - Renewable energy	<u>341.5 MW</u>
	<u>1,985.5 MW</u>

4.2.5 Power Purchased from VSPPs

264 MW

4.2.6 Power Purchased from Neighboring Countries:

- Nam Theun 2 (Lao PDR)	920 MW
- Nam Ngum 2 (Lao PDR)	596.6 MW
- Theun Hinboun – Expansion (Lao PDR)	220 MW
- New Project	450 MW

4.3 New Power Plant Projects during 2016 – 2021: Projects presented in the plan in this period are all new projects with the total capacity of 17,550 MW as follows:

4.3.1 EGAT Projects:

- EGAT Coal-Fired Power Plants	2,800 MW
- EGAT New Power Plants	3,200 MW
- EGAT Nuclear Power Plants	<u>2,000 MW</u>
	<u>11,200 MW</u>

4.3.2 IPP Projects: the total capacity is 1,600 MW.

4.3.3 New Projects: the total capacity is 4,800 MW.

4.3.4 Power Purchased from VSPPs: the total capacity is 300 MW.

4.3.5 Power Purchased from Neighboring Countries: the total capacity is 2,850 MW.

4.4 Fuel Consumption for Power Generation: The estimate of annual fuel consumption for power generation during 2009-2021 according to the PDP 2007: Revision 2 can be summarized as the following table.

Year	Lignite (Mton)	Coal (Mton)	Gas/LNG (mmcf/d)	Heavy Oil (Mliters)	Diesel Oil (Mliters)	Nuclear (Ton)
2009	16.3	3.7	2,064	77.51	13.30	-
2010	16.3	3.7	2,025	28.60	8.29	-
2011	16.6	4.4	2,040	-	8.29	-
2012	16.2	5.5	2,064	0.01	8.28	-
2013	16.6	5.6	2,136	-	10.64	-
2014	15.8	6.9	2,138	-	7.20	-
2015	15.7	7.0	2,136	0.03	7.20	-
2016	15.1	10.8	2,284	0.19	7.22	-
2017	15.1	14.5	2,287	0.17	7.00	-
2018	15.1	14.5	2,494	0.28	6.30	-
2019	14.5	14.5	2,701	0.16	6.30	-
2020	14.5	14.6	2,783	0.36	5.62	22.93
2021	13.6	14.5	2,891	0.35	5.60	45.72

Remark: Considering Gas/LNG as fuel for EGAT and IPP new power plants but not including SPP power plants

(Details of estimation of energy generation classified by fuel types are shown in the Appendix 10)

Table 4.1
List of Projects as Thailand Power Development Plan 2008-2021
(PDP 2007: Revision 2)

Power Plant Project Names	Fuel Types	Capacity (MW)	Total (MW)	Scheduled Commissioning Date	
VSPP	-	6	6	January	2009
SPP (Renew)	-	26.5	27	Jan 09	- Mar 09
South Bangkok CC # 3	Gas	710	710	March	2009
Bang Pakong CC # 5	Gas	710	710	July	2009
Power purchased from Lao PDR (Nam Theun 2)	Hydro	920	920	November	2009
Wind energy and Solar energy	-	(3)	(3)	December	2009
Small Hydro Power Plants	Hydro	78.7	79	2009 - 2011	
VSPP	-	10	10	January	2010
North Bangkok CC # 1	Gas	670	670	May	2010
SPP (Co-Gen)	-	90	90	November	2010
Power purchased from Lao PDR (Nam Ngum 2)	Hydro	596.6	597	January	2011
VSPP	-	48	48	January	2011
SPP (Renew)	-	250	250	August	2011
Gheco-one Co.,Ltd	Coal	660	660	November	2011
SPP (Renew)	-	65	65	January	2012
VSPP	-	50	50	January	2012
SPP (Co-Gen)	-	924	924	June	2012
Power purchased from Lao PDR (Theun Hinbun-expand)	Hydro	220	220	July	2012
VSPP	-	50	50	January	2013
Siam Energy Co., Ltd # 1-2	Gas	2x800	1,600	Mar 13	- Sep 13
SPP (Co-Gen)	-	540	540	June	2013
National Power Supply Co., Ltd # 1-2	Coal	2x135	270	November	2013
VSPP	-	50	50	January	2014
National Power Supply Co., Ltd # 3-4	Coal	2x135	270	March	2014
SPP (Co-Gen)	-	90	90	June	2014
Wang Noi CC # 4	Gas	800	800	June	2014
Power Generation Supply Co., Ltd # 1-2	Gas	2x800	1,600	Jun 14	- Dec 14
Chana CC # 2	Gas	800	800	July	2014
VSPP	-	50	50	January	2015
Power purchased from neighboring countries	-	450	450	June	2015

Table 4.1 (Continued)
List of Projects as Thailand Power Development Plan 2008-2021
(PDP 2007: Revision 2)

Power Plant Project Names	Fuel Types	Capacity (MW)	Total (MW)	Scheduled Commissioning Date	
VSPP	-	50	50	January	2016
Thermal power plant (Coal)_EGAT # 1-2	Coal	2x700	1,400	January	2016
Power purchased from neighboring countries	-	450	450	March	2016
New power plant_South	Gas	800	800	July	2016
VSPP	-	50	50	January	2017
Thermal power plant (Coal)_EGAT # 3-4	Coal	2x700	1,400	January	2017
New power plant	Gas	800	800	January	2017
Power purchased from neighboring countries	-	450	450	January	2017
VSPP	-	50	50	January	2018
South Bangkok CC # 4-5	Gas	2x800	1,600	January	2018
Bang Pakong CC # 6	Gas	800	800	January	2018
Power purchased from neighboring countries	-	450	450	January	2018
VSPP	-	50	50	January	2019
North Bangkok CC # 2	Gas	800	800	January	2019
New power plant	Gas	2x800	1,600	January	2019
Power purchased from neighboring countries	-	500	500	January	2019
VSPP	-	50	50	January	2020
Thermal power plant (Nuclear)_EGAT # 1	Nuclear	1000	1,000	January	2020
New power plant _IPP	-	2x800	1,600	January	2020
Power purchased from neighboring countries	-	500	500	January	2020
VSPP	-	50	50	January	2021
Thermal power plant (Nuclear)_EGAT # 2	Nuclear	1000	1,000	January	2021
New power plant	Gas	2x800	1,600	January	2021
Power purchased from neighboring countries	-	500	500	January	2021
Total installed capacity as of December 2008		29,139.5	MW		
Total added capacity		30,154.8	MW		
Total retired capacity		-7,502.3	MW		
Grand total capacity at the end of 2021		<u>51,792.0</u>	MW		

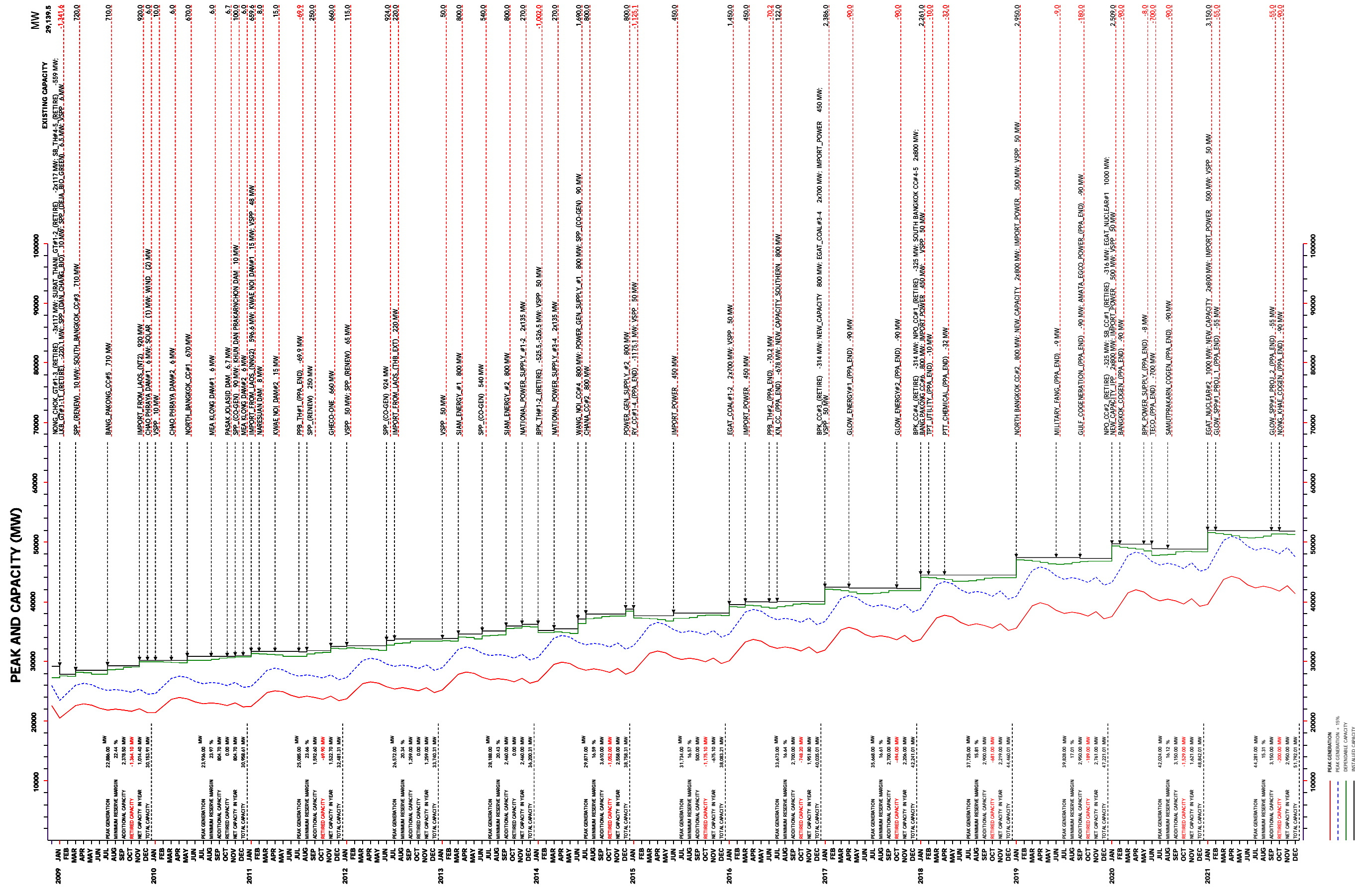


POWER DEVELOPMENT PLAN

GENERATION SYSTEM DEVELOPMENT PLANNING DEPARTMENT
SYSTEM PLANNING DIVISION
ELECTRICITY GENERATING AUTHORITY OF THAILAND

Thailand PDP2007 : Revision 2
LOAD FORECAST : December 2008
RUN DATE : March 24, 2009

FIGURE 4.1 THAILAND POWER DEVELOPMENT PLAN (PDP 2007 : REVISION 2)



4.5 EGAT Renewable Energy

The renewable energy projects of EGAT with the total capacity of 81.7 MW was concurred by the Committee on Energy Policy Administration (CEPA) on 20 November 2006 and was approved by the National Energy Policy Committee (NEPC) on 4 December 2006. The approved EGAT renewable energy projects comprised as following and the details are given in Appendix 6.

- Small Hydropower Plants	78.7	MW
- Solar Energy Power Plant	1.0	MW
- Wind Energy Power Plants	<u>2.0</u>	MW
	<u>81.7</u>	MW

4.6 Coal Supply Plan for 4 EGAT's Coal-fired Power Plants

EGAT has prepared the procurement of high quality imported coal by contacting with the potential coal producers in Indonesia, Vietnam and Australia for the supply of high quality coal throughout the power plant lives.

5. Project Descriptions

The description of projects in the PDP 2007: Revision 2 for the commissioning during 2009-2015 can be described as follows:

5.1 500 kV Transmission System Development for Power Purchase from Nam Theun 2 Hydroelectric Project

The scope of work for the transmission line portion in Thailand comprises the construction of 500 kV double circuit lines from Roi Et 2 substation to Thailand/Lao PDR Border in Mukdaharn province, a distance of approximately 166 km, for the power purchase from the Nam Theun 2 Hydroelectric Project with the installed capacity of 920 MW and commercial operation date in 2009.

The project was approved by the Cabinet on 23 November 2004.

5.2 Bulk Power Supply for the Greater Bangkok Area Phase 2

The Bulk Power supply for the Greater Bangkok Area Phase 2 (BSB2) is a successive project of the phase 1 project by constructing new 230 kV terminal substations to supply to Metropolitan Electricity Authority (MEA) to cope with the increasing demand of the metropolitan area. The project consists of the construction and upgrade of the existing transmission facilities as well as the conversion of existing lines from 230 kV to 500 kV voltage levels, which will supply the electricity in the Greater Bangkok Area with a high stability and reliability. The scope of reinforcement of EGAT's transmission system was designed to effectively support the expansion of MEA's long-term distribution system reinforcement plan and scheduled to complete during 2009 - 2011.

The project was approved by the cabinet on 8 August 2006.

5.3 Renovation of Aging Hydropower Project

As the turbine-generator of small hydropower projects including Ubol Ratana, Sirindhorn, Chulabhorn, Nam Pung and Kaeng Krachan were operated for long time and run over their ages, they need refurbishment to extend their service lives, maintain operational efficiency and availability while reducing maintenance cost in the long run while the associated dams are still serviceable with the following consideration:

- Improve and increase efficiency
- Lower cost compared with new power plant

- To be completed during 2008 - 2010

The project was approved by the Cabinet on 4 January 2005.

5.4 South Bangkok Combined Cycle Power Plant Block 3 Project

The project is one of EGAT new natural gas-fired combined cycle power plants which site is the compound of the existing South Bangkok Power Plant in Samut Prakan Province, outskirts of Bangkok. The project description is:

- Base load power plant
- Contracted capacity is 710 MW
- Fuel is natural gas
- To be completed in March 2009
- The project was approved by the Cabinet on 25 October 2005

5.5 Bang Pakong Combined Cycle Power Plant Block 5 Project

The project is one of EGAT new natural gas-fired combined cycle power plants which site is the compound of the existing Bang Pakong Power Plant, Chachoengsao Province. The project description is:

- Base load power plant
- Contracted capacity is 710 MW
- Fuel is natural gas
- To be completed in July 2009
- The project was approved by the Cabinet on 25 July 2006

5.6 North Bangkok Combined Cycle Power Plant Block 1 Project

The project is one of EGAT new natural gas-fired combined cycle power plants which is constructed at the existing site of North Bangkok Power Plant at Bang Krui Subdistrict, Nonthaburi Province.

- Base load power plant
- Contracted capacity is 670 MW
- Fuel is natural gas
- To be completed in May 2010
- The project was approved by the Cabinet on 12 December 2006

5.7 500 kV Transmission System Project for Power Purchase from Nam Ngum 2 Hydroelectric Power Project

The project is the construction of 500 kV double circuit transmission line portion in Thailand from Udon Thani 3 substation to Thailand-Lao PDR Border, a distance of approximately 80 km but initially energized at 230 kV to purchase power of 597 MW from the Nam Ngum 2 Hydroelectric Project, which is scheduled to be completed by 2010.

The Project was approved by the Cabinet on 22 August 2006.

5.8 500 kV Transmission System Projects to Purchase Power from Private Power Plants

The project is the construction of 500 kV transmission line from Pluak Daeng substation to Nong Chok connection and to Wang Noi substation, the 3rd and 4th circuit (2nd line) to reinforce the main transmission system and support power purchase from private power producers that strengthen the stability and reliability of the power system. The project is scheduled to complete in 2011.

5.9 Transmission System Expansion Projects No.11

The project includes the expansion and improvement of the transmission system in provincial area to cope with increasing demand nationwide except the Greater Bangkok Area and to maintain reliability of power supply. The project, continued from the Transmission System Expansion Projects No.10 (TS10), will assist the Provincial Electricity Authority (PEA) to effectively expand distribution system to the required area. The project is scheduled to complete during 2010-2011.

The project was approved by the Cabinet on 2 October 2007.

5.10 Transmission System Expansion Projects No. 12 - 14

The projects include the expansion and improvement of the transmission system in provincial area to cope with increasing demand nationwide except the Greater Bangkok Area and to maintain reliability of power supply. The projects, continued from the Transmission System Expansion Projects No.11 (TS11), will assist the Provincial Electricity Authority (PEA) to effectively expand distribution system to the required area. The expected completion dates of the projects are:

<u>Projects</u>	<u>Commissioning Date</u>
TS. 12	2012–2013
TS. 13	2014–2015
TS. 14	2016–2017

5.11 Transmission System Development for Power Purchase from Theun Hinboun Expansion Project

The project is the transmission system in Thailand with the construction of new Nakhon Phanom 2 substation with replacing new 230 kV transmission line from Thailand-Lao PDR border in Nakhon Phanom province to the Nakhon Phanom 2 substation and constructing additional 230 kV and 115 kV transmission lines for 440 MW power purchase from the existing and expansion Theun Hinboun hydroelectric power project. The project is scheduled to complete in 2012.

5.12 Transmission System Projects to Purchases Power from Independent Power Producers (IPP)

The project is the transmission system to purchase power from the Independent Power Producers (IPP), as referred to the PDP 2007: Revision 1 including 4 awarded IPPs, Gheco-One, Siam Energy, National Power Supply and Power Generation Supply, with the total capacity of 4,400 MW and Commercial Operation Date (COD) during 2011 – 2013. the transmission project will connect the IPP projects to EGAT power system and is scheduled to complete during 2011-2013.

5.13 500 kV Transmission System to Supply Upper Northern System Project

The project is 500 kV double circuit transmission line construction from the new Mae Moh 5 substation to Chiang Mai province with a distance of approximately 145 km to cope with the increasing demand of the upper part of Northern Region of Thailand, in Chiang Mai and Lampun, as well as to enhance the system stability and reliability in the area. The project is scheduled to complete by 2018.

5.14 EGAT New Power Project (2012-2015)

The new generating capacities to be developed by EGAT are as follows:

<u>COD</u>	<u>Power Plant</u>	<u>Capacity (MW)</u>
June 2014	Wang Noi CC Power Plant Block 4	800
July 2014	Chana CC Power Plant Block 2	800

6. Nuclear Power Plant

6.1 The Need for Nuclear Power Plants in Thailand

Electricity is one of the vital infrastructures for living, business and industry to enhance the competitiveness of the country. The present energy situation indicates inconsistent tendency so that the consideration of long term power development plan has to deal with various factors as well as respond to the national energy policy. As possible alternative of power generation in Thailand is limited, nuclear power plant becomes an attractive alternative for the consideration of long term power development plan.

Advantages: Nuclear power plant has many advantages as it is a large-scale power plant with high power stability as well as its security of fuel supply because the plant can operate up to 18 months for each fuel refill and there is abundance of naturally occurring uranium to be used as nuclear fuel. Furthermore, the nuclear power plant is clean with no emission of green house gas to pollute environment while the plant is reliable and high efficiency with lower rate of fuel consumption than other types of power plant while its low fuel cost could give low tariff.

Disadvantages: Nuclear power plant requires high investment cost with the risk of accident that could cause danger from radiation leakage. Furthermore, the nuclear power plant is difficult to achieve public acceptance so that an appropriate preparation for safety and effective implementation is necessary.

At present, there are 438 nuclear power plants in operation in 30 countries worldwide, most of which are in USA and Europe, and 18 plants under construction. In Thailand, the development of nuclear power plant as an alternative power source is necessary due to the following reason.

- Supply increasing power demand
- Strengthen the stability of national power and energy system
- Increase efficiency and reliability in power generation
- Avoid risk on fuel price
- Respond to the need of clean energy

6.1.1 Supply Increasing Power Demand

Thailand is a developing country with increasing population, improving social living standard and growing economic, although there are still impacts from the present global economic recession. These situations cause the national power demand increase every year. According to the power demand forecast during 2008 – 2021, the annual power demand growth will be approximate 4.9 % or 1,589 MW so that the power demand of the next 13 years, in 2021, will increase twice that in 2008. Therefore, EGAT is necessary to provide sufficient power supply in which the nuclear power plant is an appropriate alternative in responding the future power demand of the country.

6.1.2 Strengthen Stability of National Power and Energy System

As the fossil fuel has limited reserve, especially the natural gas in the Gulf of Thailand will run out in the near future. The present power generation in Thailand mostly depends on the natural gas with 79 % of total fuel consumption. However, the power generation, in actual, should not rely on sole fuel but it should be diversified to various fuel to avoid the risk of fuel security as well as to strengthen the stability of the national power system. The base load power plant which is required for the stability of power system should be an effective, stable and sufficiently durable plant with less possibility to trip from the system. Since the nuclear power plant is considered to be effective, stable, durable and capable for continuously long term operation, it is appropriate as the base load power plant to enhance the security the power system.

6.1.3 Increase Efficiency and Reliability in Power Generation

The nuclear power plant utilizes very small fuel consumption. It is therefore an effective power plant as its power generation per fuel consumption is only 1 kg of Uranium to produce the energy of 50,000 kWh while 1 kg of coal and natural gas can produce the energy of only 3 and 4 kWh respectively. Moreover, the nuclear power plant is a large scale power plant and capable for continuously long term operation with more than 80 % capacity factor allowing base load operation and higher reliability than smaller power plants.

6.1.4 Avoid Risk on Fuel Price

According to the global fuel crisis situation which tends to be shortage, the uncertainty of fossil fuel price leads to risk on the consumers. In order to mitigate the risk,

other fuel should be taken into account. Uranium is a low cost and insensitive pricing fuel which price does not depend on oil therefore it is an applicable alternative fuel to avoid risk on fuel price.

6.1.5 Respond to Need of Clean Energy

The nuclear power plant uses Uranium as fuel therefore it will not emit the polluted Green House Gases such as NO_x, SO₂ and CO₂, which have impacts to environment, like the power generation from fossil fuel. At present, all over the world is facing the global warming problem and Thailand also concerns this problem. The nuclear power plant is then an alternative of power generation in Thailand to help the global warming situation.

6.2 Nuclear Power Plant in PDP 2007 Revision 2

As the Cooperation Committee for Nuclear Power Infrastructure Establishment informed that the nuclear power project can be proceeded as planned but the capacity was reduced to 1,000 MW per year that is 1,000 MW in 2020 and another 1,000 MW in 2021. The PDP 2007 Revision 2 indicates the nuclear power plants of 1,000 MW per year as base load plant in the system since 2020.

In order to govern the preparation of the nuclear power plant implementation to keep on plan, the Government has approved the final plan of Infrastructure Implementation for Nuclear Power Generation by establishing the Office of Nuclear Power Project Development under the Ministry of Energy to coordinate and activate the mentioned infrastructure implementation plan.

The first 3 years, 2008 – 2010, is the preparation phase before the decision making by the government and public to proceed the nuclear power project in early 2011. The preparation phase comprises 6 following activities.

1. Legal, regulation and binding among countries
2. Safety and environmental protection
3. Industrial and commercial infrastructure
4. Human resources development and technology transfer
5. Public relation and stakeholder involvement
6. Nuclear power project implementation planning

Currently, EGAT has engaged with Burns and Roe Asia Co., Ltd., the consultant on the preparation of nuclear power plant development in the budget of 174 Million Baht for study period of 20 months from October 1, 2008 and such consultant was designated by the coordination subcommittee of nuclear power project implementation planning to perform the feasibility study of the project including selection of technology and project site, initial environmental examination, economic and financial study, as well as human resource development planning which will be concluded within 2010 and proposed to the Government for further decision making.

The nuclear power plant will support the security in providing fuel for power generation in the future and maintain the stability of energy price while support the policy to diversify various energy resources. Furthermore, the nuclear power plant is also the clean power plant without the emission of Carbon Dioxide to help the global warming problem.

7. Power Purchasing from Private Power Companies and Neighboring Countries

7.1 Independent Power Producers (IPPs)

Independent Power Producers (IPPs) are the large scale private power producers participating in the electricity supply industry by selling the generated power to EGAT. The fuel used in the IPPs could be natural gas, coal or heavy oil. At present, EGAT has the Power Purchase Agreement (PPA) with 7 IPPs from the first round of IPP solicitation with the total capacity of 6,677.5 MW. The capacities of these IPPs range from 350 MW to 1,400 MW in which the 7 IPPs have commercially generated power to the system including Tri Energy Co., Ltd., Independent Power Producer (Thailand) Co., Ltd., Glow IPP CO., Ltd., Eastern Power & Electric CO., Ltd., BLCP Power Co., Ltd., Gulf Power Generation Co., Ltd. and Ratchaburi Power Co., Ltd. In addition, EGAT subsidiary companies, Electricity Generating Public Co., Ltd. (EGCO) and Ratchaburi Holding Public Co., Ltd. (RATCH) have also commercially generated power to the system.

Later, on 27th June 2007, the Ministry of Energy (by Energy Policy and Planning Office, EPPO) and the IPP Power Purchase Proposal Evaluation and Selection Subcommittee announced the second solicitation for proposals from independent power producers for the supply of power to EGAT during 2011 to 2014 with the total capacity of 3,200 MW which Commercial Operation Date (COD) is 2012 for 800 MW, 2013 for 800 MW and 2014 for 1,600 MW.

After the deadline of bidding proposal on 19th October 2007, there are 20 qualified bid proposals with the total capacity of 17,407 MW in which 14 proposals of 13,807 MW are gas-fired power plants and another 6 proposals of 3,600 MW are coal-fired power plants.

According to the evaluation of the lowest levelized unit price of each bidder by the Subcommittee, 4 successful bidders were selected and, in the PDP 2007 Revision 2, they have been negotiated to postpone their COD in order to maintain reserve margin at an appropriate level corresponding to the present situation. Resulting from the negotiation, 2

IPPs agreed to postpone their COD for one year with no impact on previously proposed tariff. The 4 IPPs comprise:

Project	Companies	Fuel Types	Proposed Capacity (MW)	Scheduled Commercial Operation Date (SCOD)
1	GHECO-One	Coal	660	November 2011
3	Siam Energy	Natural Gas	1,600	March - September 2013
2	National Power Supply (NPS)	Coal	540	November 2013 – March 2014
4	Power Generation Supply	Natural Gas	1,600	June – December 2014
Total			4,400	

7.2 Small Power Producers (SPPs)

Small Power Producers (SPPs) are the private power producers selling the generated power to EGAT with the capacity between 10 MW and 90 MW. The generation technology of the SPPs are cogeneration which fuel is mainly natural gas and coal, and renewable energy, such as biomass, waste, biogas, solar and wind, which could enhance the efficiency in the energy utilization of the country. As of December 2008, there are 90 SPPs of 4,203 MW in which 64 SPPs of 3,839.6 MW have firm contract while another 26 SPPs of 363.4 MW have non-firm contract. 60 SPPs of 2,285.5 MW have generated power in the system in which 41 SPPs of 2,079.1 MW have firm contract while another 19 SPPs of 206.4 MW have non-firm contract. Besides, another 30 SPPs of 1,917.5 MW have not yet generated power in the system in which 23 SPPs of 1,760.5 MW have firm contract while another 7 SPPs of 157 MW have non-firm contract.

7.3 Very Small Power Producers (VSPPs)

Very Small Power Producers (VSPPs) are the private power producers selling the generated power to EGAT with the capacity lower than 10 MW. The generation technology of the VSPPs are cogeneration which fuel is mainly natural gas and coal, and renewable energy, such as biomass, waste, biogas, solar and wind. At the end of 2008, it was expected to supply 235 MW to the peak load and further expected that the VSPPs proposed to MEA and PEA could supply power of 499 MW and 700 MW to the peak load in 2015 and 2021 respectively.

7.4 Power Purchase from Lao PDR

The Government of Thailand and Lao PDR have entered into several Memorandums of Understanding (MOU) to promote the cooperation in developing power generation projects in Lao PDR as follows:

- 4 June 1993 purchase power up to 1,500 MW
- 19 June 1996 extending power purchase to 3,000 MW
- 18 December 2006 extending power purchase to 5,000 MW
- 22 December 2007 extending power purchase to 7,000 MW

At present, the 214 MW Theun Hinboun and 126 MW Houay Ho projects have signed the Power Purchase Agreement (PPA) and are in operation. The projects with PPA and under construction are the 920 MW Nam Theun 2, 597 MW Nam Ngum 2 and 220 MW Theun Hinboun – Expansion. Moreover, there are many projects which had early signed tariff MOU but some MOU have expired while some projects have terminated MOU due to increasing project cost so that the projects could not proceed. These projects require further cooperation and negotiation with the Lao Government and project developers as follows:

1. Nam Theun 1 523 MW
2. Nam Ngum 3 440 MW
3. Nam Ngiep 261 MW
4. Nam Ou 1,043 MW
5. Hong Sa 1,470 MW

7.5 Power Purchase from the Union of Myanmar

The governments of Thailand and the Union of Myanmar have entered into the Memorandum of Understanding (MOU) on the power purchase from the Union of Myanmar on 4th July 1997. According to the MOU, Thailand will cooperate with the Union of Myanmar to encourage the purchase of power up to 1,500 MW. Later on 30 May 2005, the Ministry of Energy of Thailand and the Ministry of Electric Power (1) of the Union of Myanmar signed additional MOU on the Cooperation in the Development of Hydropower Projects on the Thanlwin and Tanintharyi River in which 2 projects on the Thanlwin River were proposed to sell power to Thailand as following.

1. Hutgyi Hydropower Project 1,190 MW expected to connect to Thailand at Tha Song Yang district, Tak province
2. Tasang Hydropower Project 7,000 MW expected to connect to Thailand at Mae Eye district, Chiang Mai province

7.6 Power Purchase from the People Republic of China

The Government of Thailand entered into a Memorandum of Understanding (MOU) with the Government of People's Republic of China (PRC) on 12 November 1998 as the intention that the Government of Thailand agreed to purchase power of 3,000 MW within 2017. PRC will propose feasible projects to Thailand and both parties agreed to cooperate in planning and construction of transmission system between the two countries as well as the negotiation with Lao PDR on the issues relating to the right-of-way of the transmission line passing through the territory of Lao PDR.

7.7 Power Purchase from Cambodia

The Governments of Thailand and Cambodia has no Memorandum of Understanding (MOU) on power cooperation. However, private agencies have developed project in Cambodia and proposed to sell power to Thailand such as Koh Kong power project which is a proposed 3,600 MW coal fired power plant separated into two phases each of 1,800 MW.

Appendices

Appendix 1

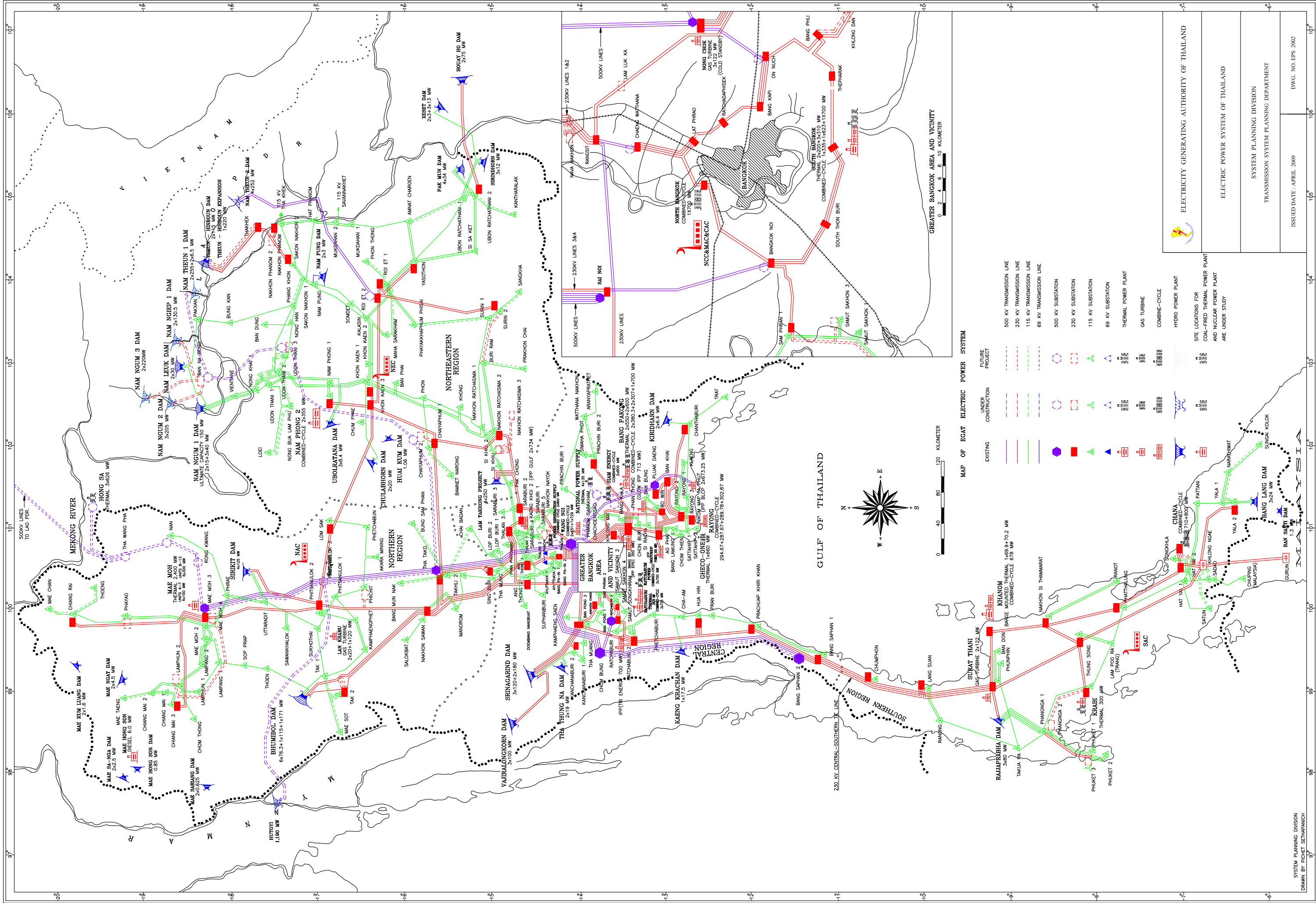
Comparison of Thailand Power Development Plans

COMPARISION BETWEEN THAILAND PDP 2007 : Revision 1 AND PDP 2007: Revision 2
(2009 - 2021)

Year	PDP 2007 : Revision 1		PDP 2007 : Revision 2	
	Power Plants	MW	Power Plants	MW
2009	SPPs (Jan.)	88	VSPP (Jan.)	6
	CHP of South Bangkok CC # 2 (Jan.)	74	SPP (Renew) (Jan.)	16.5
	South Bangkok CC # 3 (Mar.)	715	SPP (Renew) (Mar.)	10
	Bang Pakong CC # 5 (Mar.)	715	South Bangkok CC # 3 (Mar.)	710
	Power purchased from Lao PDR (Nam Theun 2) (Nov.)	920	Bang Pakong CC # 5 (Jul.)	710
	Small hydro Power (RPS) (Mar., Aug., Sep., Dec.)	45.7	Power purchased from Lao PDR (Nam Theun 2) (Nov.)	920
			Chao Phraya Dam # 1 (Dec.)	6
			Wind energy and Solar energy (Dec.)	(3)
2010	SPPs (Jan.)	225	VSPP (Jan.)	10
	CHP of Wang Noi CC # 1-3 (Jan.)	243	Chao Phraya Dam # 2 (Mar.)	6
	Small hydro Power (RPS) (Jan., Apr.)	33	North Bangkok CC # 1 (May.)	670
	North Bangkok CC # 1 (Mar.)	685	Mae Klong Dam # 1-2 (Aug.,Dec.)	2x6
			Pasak Jolasid Dam (Oct.)	6.7
2011			Khun Dan Prakarnchon Dam (Nov.)	10
			SPP (Co-Gen) (Nov.)	90
	Power purchased from Loa PDR (Nam Ngum 2) (Jan.)	596.6	VSPP (Jan.)	48
	SPPs (Mar.)	25	Power purchased from Lao PDR (Nam Ngum 2) (Jan.)	596.6
	Gheco-one Co.,Ltd (Nov.)	660	Kwae Noi Dam # 1-2 (Jan., Apr.)	2x15
2012			Naresuan Dam (Feb.)	8
			SPP (Renew) (Aug.)	250
	Wang Noi CC # 4 (Jan.)	700	Gheco-one Co.,Ltd (Nov.)	660
	Power purchased from Loa PDR (Theun Hinboun – Expanded) (Mar.)	220	VSPP (Jan.)	50
	Siam Energy Co., Ltd # 1-2 (Mar., Sep.)	2x800	SPP (Renew) (Jan.)	65
2013	National Power Supply Co., Ltd # 1-2 (Nov.)	2x135	Power purchased from Lao PDR (Theun Hinboun-expanded) (Jul.)	220
	SPPs (Mar.)	245	SPP (Co-Gen) (Jun.)	924
	Bang Pakong CC # 6 (Jan.)	700	VSPP (Jan.)	50
	Power purchased from Loa PDR (Nam Ngum 3) (Jan.)	440	SPP (Renew) (Jan.)	65
	National Power Supply Co., Ltd # 3-4 (Mar.)	2x135	Power purchased from Lao PDR (Theun Hinboun-expanded) (Jul.)	220
2014	Power purchased from Loa PDR (Hong Sa 1) (Mar.)	490	National Power Supply Co., Ltd # 1-2 (Nov.)	2x135
	SPPs (Mar.)	200		
	Power purchased from Loa PDR (Hong Sa 2-3) (Jan.)	2x490	VSPP (Jan.)	50
	Power purchased from Loa PDR (Nam Theun 1) (Jan.)	523	National Power Supply Co., Ltd # 3-4 (Mar.)	2x135
	Power purchased from Loa PDR (Nam Ngiep) (Jan.)	261	Wang Noi CC # 4 (Jun.)	800
	Power Generation Supply Co., Ltd # 1-2 (Jun., Dec.)	2x800	SPP (Co-Gen) (Jun.)	90
	Power purchased from Loa PDR (Nam Ou 1) (Mar.)	200	Power Generation Supply Co., Ltd # 1-2 (Jun., Dec.)	2x800
SPPs (Mar.)	200	Chana CC # 2 (Jul.)	800	
2015	Power purchased from Loa PDR (Nam Ou 2) (Jan.)	843	VSPP (Jan.)	50
	Thermal power plant (Coal)_EGAT # 1 (Mar.)	700	Power purchased from neighboring countries (Jun.)	450
	SPPs (Mar.)	210		
2016	Thermal power plant (Coal)_EGAT # 2-3 (Jan.)	2x700	VSPP (Jan.)	50
	SPPs (Mar.)	200	Thermal power plant (Coal)_EGAT # 1-2 (Jan.)	2x700
			Power purchased from neighboring countries (Mar.)	450
2017			New power plant_South (Jul.)	800
	New IPP power plant (Gas/Coal) (Jan.)	700	VSPP (Jan.)	50
	South Bangkok CC #4-5 (Jan.)	2x700	Thermal power plant (Coal)_EGAT # 3-4 (Jan.)	2x700
	Power purchased from neighboring countries (Jan.)	510	New power plant (Jan.)	800
	Thermal power plant (Coal) – EGAT #4 (Mar.)	700	Power purchased from neighboring countries (Jan.)	450
2018	SPPs (Mar.)	200		
	New IPP power plant (Gas/Coal) (Jan.)	700	VSPP (Jan.)	50
	Southern region CC - EGAT (Jan.)	700	South Bangkok CC # 4-5 (Jan.)	2x800
	Power purchased from neighboring countries (Jan.)	1780	Bang Pakong CC # 6 (Jan.)	800
	SPPs (Mar.)	175	Power purchased from neighboring countries (Jan.)	450
2019	North Bangkok CC #2 (Jan.)	700	VSPP (Jan.)	50
	Power purchased from neighboring countries (Jan.)	2600	North Bangkok CC # 2 (Jan.)	800
			New power plant (Jan.)	2x800
2020			Power purchased from neighboring countries (Jan.)	500
	Thermal power plant (Nuclear) – EGAT #1-2 (Jan.)	2x1000	VSPP (Jan.)	50
	Power purchased from neighboring countries (Jan.)	2600	Thermal power plant (Nuclear)_EGAT # 1 (Jan.)	1000
2021			New power plant _IPP (Jan.)	2x800
	Thermal power plant (Nuclear) – EGAT #3-4 (Jan.)	2x1000	Power purchased from neighboring countries (Jan.)	500
	Power purchased from neighboring countries (Jan.)	1200	VSPP (Jan.)	50
		Thermal power plant (Nuclear)_EGAT # 2 (Jan.)	1000	
		New power plant (Jan.)	2x800	
		Power purchased from neighboring countries (Jan.)	500	

Appendix 2

Thailand Power System Map



Appendix 3

Installed Capacity of Thailand Power System

CAPACITY OF THAILAND POWER SYSTEM

(as of December 2008)

Plant Type	Fuel Type	Capacity (MW)
Hydroelectric Plant		
Bhumibol	-	779.2
Sirikit	-	500.0
Ubolratana	-	25.2
Sirindhorn	-	36.0
Chulabhorn	-	40.0
Nam Pung	-	6.0
Srinagarind	-	720.0
Vajiralongkorn	-	300.0
Tha Thung Na	-	39.0
Kang Krachan	-	19.0
Bang Lang	-	72.0
Ban Santi	-	1.275
Mae Ngat	-	9.0
Huai Kum	-	1.06
Rajjaprabha	-	240.0
Pak Mun	-	136.0
Lam Takhong PS.	-	500.0
Small Hydro Power Plant	-	0.445
Subtotal		3,424.180 11.75%
Power Plant		
South Bangkok	Unit 3	Gas/Heavy oil 265.0
	Unit 4	Gas/Heavy oil 294.0
South Bangkok	Block 1	Gas 316.0
	Block 2	Gas 562.0
Subtotal		1,437.0
Bang Pakong	Unit 1	Gas/Heavy oil 525.5
	Unit 2	Gas/Heavy oil 526.5
	Unit 3	Gas/Heavy oil 576.0
	Unit 4	Gas/Heavy oil 576.0
Bang Pakong	Block 3	Gas 314.0
	Block 4	Gas 314.0
Subtotal		2,832.0
Mae Moh	Unit 4-7	Lignite 560.0
	Unit 8-13	Lignite 1,620.0
Subtotal		2,180.0
Krabi	Unit 1	Heavy oil 315.0
Subtotal		315.0
Nam Pong	Block 1	Gas 325.0
	Block 2	Gas 325.0
Subtotal		650.0
Wang Noi	Block 1	Gas 612.0
	Block 2	Gas 612.0
	Block 3	Gas 686.0
Subtotal		1,910.0
Chana	Block 1	Gas 710.0
Subtotal		710.0
Subtotal		10,034.0 34.43%
Gas Turbine Power Plant		
Lan Krabu	Gas	220.1
Nong Chok	Diesel	351.0
Surat Thani	Diesel	234.0
Subtotal		805.1 2.76%
Diesel		
Mae Hong Son	Diesel	4.4
Subtotal		4.4 0.02%
Renewable Energy Source		
SubTotal		1.034 0.00%
Total Capacity of EGAT		14,268.7 48.97%

CAPACITY OF THAILAND POWER SYSTEM (Con.)

(as of December 2008)

Plant Type	Fuel Type	Capacity (MW)	
Purchased Power			
<u>Hydroelectric Plant</u>			
Theun Hinboun	-	214.0	
Houay Ho	-	126.0	
Subtotal		340.0	1.17%
<u>Power Plant</u>			
Khanom PPB	Unit 1	Gas/Heavy oil	69.9
	Unit 2	Gas/Heavy oil	70.2
		Gas	678.0
		Subtotal	818.1
Ratchaburi	Unit 1	Gas/Heavy oil	720.0
	Unit 2	Gas/Heavy oil	720.0
	Block 1	Gas	685.0
	Block 2	Gas	675.0
	Block 3	Gas	681.0
			Subtotal
BLCP Power Co.,Ltd (BLCP)	Unit 1	Bituminous Coal	673.3
	Unit 2	Bituminous Coal	673.3
			Subtotal
Rayong	Block 1	Gas	294.7
	Block 2	Gas	287.7
	Block 3	Gas	289.8
	Block 4	Gas	302.9
			Subtotal
Tri Energy Co.,Ltd. (TECO)	Block 1	Gas	700.0
			Subtotal
Independent Power Producer (Thailand) Co., Ltd.(IPT)	Block 1	Gas	700.0
			Subtotal
Glow IPP Co.,Ltd.	Block 1	Gas	356.5
	Block 2	Gas	356.5
			Subtotal
Eastern Power & Electric Co.,Ltd (EPEC)	Block 1	Gas	350.0
			Subtotal
Gulf Power Generation Co., Ltd.	Block 1	Gas	734.0
	Block 2	Gas	734.0
			Subtotal
Ratchaburi Power Co., Ltd.	Block 1	Gas	700.0
	Block 2	Gas	700.0
			Subtotal
SPP		Coal	370.0
		Heavy oil	9.0
		Gas	1,293.0
			Subtotal
Subtotal		13,823.6	47.44%
<u>Renewable Energy Source</u>			
SPP	Biomass	287.1	0.99%
<u>Gas Turbine Power Plant</u>			
SPP	Gas	120.0	0.41%
<u>Others</u>			
EGAT-TNB Stag 2	-	300.0	1.03%
Total Capacity of the Purchased		14,870.7	51.03%
Grand Total Capacity		29,139.4	

Appendix 4

Existing Transmission System

EXISTING TRANSMISSION LINES AND SUBSTATIONS OF EGAT POWER SYSTEM
(as of December 2008)

Voltage Levels (kV)	Substations		Transmission Lines (Circuit-kilometers)
	Number	Transformer Capacity ^{1/} (MVA)	
Metropolitan Area			
500	2	4,050.0	411.1
230	13	14,400.0	805.0
115	-	25.0	-
Subtotal	15	18,475.0	1,216.2
Central Region			
500	5	6,000.0	1,881.6
230	25	14,193.3	4,146.9
115	42	5,242.3	2,618.6
69	-	-	18.8
Subtotal	72	25,435.6	8,665.9
Northeastern Region			
500	1	2,000.0	-
230	11	4,300.0	2,050.7
115	37	3,938.0	5,286.0
Subtotal	49	10,238.0	7,336.7
Southern Region			
230	13	4,366.7	3,045.8
132	- ^{2/}	133.4	8.7 ^{3/}
115	18	2,379.0	2,769.2
300 (HVDC)	- ^{2/}	388.0	23.0 ^{3/}
Subtotal	31	7,267.1	5,846.7
Northern Region			
500	2	3,800.0	1,139.7
230	6	3,900.0	3,228.8
115	34	2,959.5	2,784.8
Subtotal	40	10,659.5	7,153.3
All Regions			
500	10	15,850.0	3,432.4
230	68	41,160.0	13,277.3
132	-	133.4	8.7
115	131	14,543.8	13,458.6
69	-	-	18.8
300 (HVDC)	-	388.0	23.0
Total	209	72,075.2	30,218.8

Remark: 1/ Excluding generator transformers and station service transformers

2/ Sa Dao and Klong Ngea Substations are already included in the 115 kV and 230 kV Substations.

3/ The length of transmission lines from substation to Thailand - Malaysia border

Source: System Control and Operation Division

Appendix 5

Power Demand Statistic and Load Forecast

TOTAL EGAT GENERATION REQUIREMENT

December 2008 : Base Case

Year	Peak			Energy			Load
	MW	Increase		GWh	Increase		Factor
		MW	%		GWh	%	
Actual : Gross Generation							
2000 (2543)	14,918.30	1,205.90	8.79	98,536.85	7,105.23	7.77	75.19
2001 (2544)	16,126.40	1,208.10	8.10	103,868.65	5,331.80	5.41	73.53
2002 (2545)	16,681.10	554.70	3.44	111,299.74	7,431.09	7.15	76.17
2003 (2546)	18,121.40	1,440.30	8.63	118,378.22	7,078.48	6.36	74.57
2004 (2547)	19,325.80	1,204.40	6.65	127,457.04	9,078.82	7.67	75.08
2005 (2548)	20,537.50	1,211.70	6.27	134,826.98	7,369.94	5.78	74.94
2006 (2549)	21,064.00	526.50	2.56	142,004.67	7,177.69	5.32	76.96
2007 (2550)	22,586.10	1,522.10	7.23	146,925.50	4,920.83	3.47	74.26
Average Growth							
2000-2007	-	1,109.21	6.44	-	6,936.74	6.11	-
Forecast : NET Generation							
2008 (2551)	22,017	-19	-0.08	147,229	3,487	2.43	76.34
2009 (2552)	22,886	869	3.95	150,458	3,229	2.19	75.05
2010 (2553)	23,936	1,050	4.59	155,645	5,187	3.45	74.23
2011 (2554)	25,085	1,149	4.80	162,884	7,239	4.65	74.12
2012 (2555)	26,572	1,487	5.93	172,593	9,709	5.96	74.15
2013 (2556)	28,188	1,616	6.08	183,218	10,625	6.16	74.20
2014 (2557)	29,871	1,683	5.97	194,326	11,108	6.06	74.26
2015 (2558)	31,734	1,863	6.24	206,604	12,278	6.32	74.32
2016 (2559)	33,673	1,939	6.11	219,339	12,735	6.16	74.36
2017 (2560)	35,668	1,995	5.92	232,413	13,074	5.96	74.38
2018 (2561)	37,725	2,057	5.77	245,950	13,537	5.82	74.42
2019 (2562)	39,828	2,103	5.57	259,740	13,790	5.61	74.45
2020 (2563)	42,024	2,196	5.51	274,144	14,404	5.55	74.47
2021 (2564)	44,281	2,257	5.37	288,920	14,776	5.39	74.48
Average Growth							
1992-1996	-	1,053.18	10.60	-	7,413.68	11.60	-
1997-2001	-	563.10	3.91	-	3,217.36	3.42	-
2002-2007	-	1,076.62	5.78	-	7,176.14	5.95	-
2008-2011	-	762.35	3.29	-	4,785.52	3.17	-
2012-2016	-	1,717.60	6.07	-	11,291.00	6.13	-
2017-2021	-	2,121.60	5.63	-	13,916.20	5.67	-
2008-2021	-	1,588.96	4.93	-	10,369.86	4.95	-

Note

8 January 2009

- The growth rate in 2008 is calculated by the 2007 actual Net Generation.
- From 2008 onward, EGAT generation requirement presented is the Net Generation (Station Services are exclude

COMPARISON OF TOTAL EGAT GENERATION REQUIREMENT

Year	Case: September 2007 (1)		Case: December 2008 (2)		Difference (2)-(1)			
	MW	GWh	MW	GWh	MW	%	GWh	%
2008	23,490	152,124	22,017	147,229	-1,473	-6.27	-4,895	-3.22
2009	24,784	160,798	22,886	150,458	-1,898	-7.66	-10,340	-6.43
2010	26,206	170,037	23,936	155,645	-2,270	-8.66	-14,392	-8.46
2011	27,540	178,824	25,085	162,884	-2,455	-8.91	-15,940	-8.91
2012	29,172	189,483	26,572	172,593	-2,600	-8.91	-16,890	-8.91
2013	30,946	201,148	28,188	183,218	-2,758	-8.91	-17,930	-8.91
2014	32,794	213,343	29,871	194,326	-2,923	-8.91	-19,017	-8.91
2015	34,840	226,823	31,734	206,604	-3,106	-8.92	-20,219	-8.91
2016	36,968	240,803	33,673	219,339	-3,295	-8.91	-21,464	-8.91
2017	39,158	255,156	35,668	232,413	-3,490	-8.91	-22,743	-8.91
2018	41,417	270,019	37,725	245,950	-3,692	-8.91	-24,069	-8.91
2019	43,726	285,158	39,828	259,740	-3,898	-8.91	-25,418	-8.91
2020	46,137	300,971	42,024	274,144	-4,113	-8.91	-26,827	-8.91
2021	48,614	317,193	44,281	288,920	-4,333	-8.91	-28,273	-8.91

8 January 2009

ESTIMATED DEPENDABLE CAPACITY OF VSPP FOR PDP 2007: REVISION 2

Unit: MW

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
ME and PEA plan for power purchase from VSPP ^{1/}														
Cogeneration	7	18	25	43	79	97	161	177	193	210	225	236	247	247
Biogas	16	27	48	48	48	48	48	48	48	48	48	48	48	48
Waste to Energy	2	2	2	46	91	91	91	91	91	91	91	91	91	91
Biomass	211	228	268	525	778	778	778	778	778	778	778	778	778	778
Wind Energy	-	-	-	0	26	53	79	105	132	158	184	211	237	263
Solar Energy	1	137	272	420	567	715	862	862	910	955	1,003	1,053	1,105	1,161
Small hydropower	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Total	236	411	615	1,084	1,591	1,783	2,020	2,062	2,153	2,241	2,330	2,418	2,507	2,589
1. Estimated capacity of VSPP to be successfully developed and linked to EGAT system ^{2/}														
Cogeneration		6	4	9	18									
Biogas		5	11	-	-									
Waste to Energy		-	-	22	22									
Biomass		9	20	129	126									
Wind Energy		-	-	0	13									
Solar Energy		68	68	74	74									
Small hydropower		0	0	-	-									
Others		-	0	0	-									
Total		88	102	234	254									
2. Estimation of VSPP potential to serve peak demand of the EGAT system ^{3/}														
Cogeneration	-	2	1	3	5									
Biogas	-	2	3	-	-									
Waste to Energy	-	-	-	7	7									
Biomass	-	3	6	39	38									
Wind Energy	-	-	-	-	-									
Solar Energy	-	-	-	-	-									
Small hydropower	-	0	0	-	-									
Others	-	-	0	0	-									
Total		6	10	48	50									
Estimated dependable capacity of VSPP for PDP 2007: Rev. 2 ^{4/}		6	10	48	50	50	50	50	50	50	50	50	50	50
Accumulative estimated dependable capacity ^{5/}	235	241	251	299	349	399	449	499	549	599	649	699	749	799

Note:

^{1/} MEA and PEA plan for power purchase from VSPP, as the meeting of Thailand Load Forecast Subcommittee (2008 data are estimated)

^{2/} To be 50 percent of the additional power purchase from VSPP estimated

^{3/} To be 30 percent of the estimated capacity of VSPP to be successfully developed and linked to EGAT system (Wind and solar energy are excluded)

^{4/} In 2009-2012, it is the VSPP potential estimated to serve peak demand. In 2013-2021, the dependable capacity of VSPP is estimated to increase by 50 MW each year

^{5/} Wind and solar energy are excluded due to their properties of non-firm power plant

Appendix 6

EGAT RPS Power Plant Projects

EGAT RPS Power Plant Projects

Power Plants	Scheduled Commissioning Date	Capacity (MW)			
		2009	2010	2011	Total
1. Small Hydropower Plants					
1.1 Chao Phraya Dam	Unit 1	December 2009	6.0		6.0
	Unit 2	March 2010		6.0	6.0
1.2 Mae Klong Dam	Unit 1	November 2010		6.0	6.0
	Unit 2	February 2011		6.0	6.0
1.3 Pasak Jolasid Dam		October 2010		6.7	6.7
1.4 Khun Dan Prakarnchon Dam		November 2010		10.0	10.0
1.5 Kwae Noi Dam	Unit 1	March 2011		15.0	15.0
	Unit 2	June 2011		15.0	15.0
1.6 Naresuan Dam		February 2011		8.0	8.0
Subtotal			6.0	28.7	44.0
2. Solar Energy Power Plant		December 2009	1.0		1.0
3. Wind Energy Power Plant		December 2009	2.0		2.0
Total			9.0	28.7	44.0
					81.7

Appendix 7

Summary of Power Purchase from SPPs

Summary of Power Purchase from SPPs
(as of December 2008)

Descriptions	Installed Capacity (MW)	Proposed Contracted Capacity (MW)
Firm Contracts		
<i>a) Existing Projects</i>		
Natural Gas	2,260.8	1,413.0
Coal	703.0	370.0
Fuel Oil	10.4	9.0
Black Liquor	32.9	25.0
Rice husk and Wood residue	214.9	169.3
Bagasse	137.7	84.0
Palm cluster, Palm fiber, Palm shell	9.9	8.8
Subtotal	3,369.6	2,079.1
<i>b) Committed Projects</i>	2,447.7	1,760.5
<i>c) On Listing Projects</i>	250.0	225.0
Total Firm Contracts	6,067.3	4,064.6
Non-Firm Contracts		
<i>a) Existing Projects</i>		
Natural Gas	58.3	52.2
Coal	57.2	14.0
Fuel Oil, Gas, Coal	108.0	45.0
Rice husk and Wood residue	9.0	5.0
Bagasse	261.6	81.5
By-product gas from crude oil refine	2.0	1.7
Municipal Solid Waste	2.5	1.0
Waste Gas	19.0	6.0
Subtotal	517.6	206.4
<i>b) Committed Projects</i>	398.0	157.0
Total Non-Firm Contracts	915.6	363.4
Grand Total	6,982.9	4,428.0

List of Small Power Producers Project (Firm Contract)

During Consideration of Purchasing in 2009 - 2014

(As of 31 December 2008)

Projects	MW
Renewable	
Phu Khieo BIO-Energy CO.,LTD.	10.0
Dan Chang BIO-Energy CO.,LTD.	10.0
Deja Bio Green Co.,Ltd.	6.5
Advance Agro Public Co., Ltd.	25.0
Thai Power Generating Co.,Ltd. Project 1	70.0
National Power Supply Co., LTD.	65.0
Bio Mass Power	90.0
Thai Power Supply Co., LTD.	65.0
รวม	341.5
Co-Generation	
Siam Power Generation Plc.	60.0
Siam Power Generation Co.,Ltd. Phase 1	30.0
Amata Steam Supply Co.,Ltd.	90.0
Siam Power Generation Co.,Ltd. Phase 2	90.0
Glow SPP Public Company Limited Project 3	74.0
Rojana Power Co., LTD.	90.0
Navanakorn Electric Co., Ltd.	90.0
Sara Buri B Co-generation Co.,Ltd.	90.0
Industrial Co-Gen Co.,Ltd.	90.0
Bangpain Land Development Co.,Ltd.	90.0
B-Grim BIP Power Co.,Ltd.	90.0
RIL Co-Generation Co.,Ltd.	90.0
Sara Buri B Co-Generation Co.,Ltd.	90.0
Combine Heat and Power Co.,Ltd.	90.0
Chachuengsao Co-generation Co.,Ltd.	90.0
Pathum Co-generation Co.,Ltd.	90.0
Amata Power Co., LTD. (Amata Nakorn)	90.0
Amata Power Co., LTD. (Plauk Daeng)	90.0
Thai National Power Co., LTD. Project 2	90.0
TRC Construction Public Company Limited	40.0
Subtotal	1,644.0
Grand Total	1,985.5

Appendix 8

Summary of Existing Non-Firm Contract SPP

Classified by Fuel Types

**Summary of Existing Non-Firm Contract SPP
Classified by Fuel Types
(As of 31 December 2008)**

Fuel Types	Capacity (MW)	Contracted Capacity (MW)
Commercial Fuels		
Natural gas	58.300	52.200
Fuel oil	108.000	45.000
Coal	57.200	14.000
Subtotal	223.500	111.200
Renewable Energy		
Bagasse	261.600	81.500
Rice husk and wood residue	9.000	5.000
Waste Gas	19.000	6.000
Municipal solid waste	2.500	1.000
By-product gas from crude oil refinery	1.950	1.723
Subtotal	294.050	95.223
Total	517.550	206.423

List of Small Power Producers Project (Non-Firm Contract)
Declare for Cancelling Contract with EGAT
(As of 31 December 2008)

No.	Company	Retirement Date	MW
1	New Kuang Sun Lee Sugar Co.,Ltd.	31 March 2007	2.0
2	Bua Yai Bio Power Co.,Ltd.	31 August 2007	7.0
3	Uthong Biomass Co.,Ltd.	30 September 2007	6.5
4	Salaf Energy Co.,Ltd.	30 November 2007	8.5
5	Saharuang Co.,Ltd.	30 November 2007	7.0
6	Khonburi Sugar Co.,Ltd.	30 November 2007	6.0
7	Korach Industry Co., Ltd. (1)	31 December 2007	8.0
8	TN Sugar Industry Co., Ltd.	31 December 2007	8.0
9	Advance Bio Power Co.,Ltd.	31 December 2007	6.5
10	E-Saan Sugar Industry Co.,Ltd.	31 December 2007	2.5
11	Karnchanaburi Sugar Industry Co., Ltd.	31 December 2007	4.0
12	Bua Sommai Co., Ltd.	31 January 2008	3.0
13	Eastern Sugar Co., Ltd.	31 January 2008	6.0
14	Rayong Sugar Co., Ltd.	31 January 2008	6.0
15	Mitrkasetr Industry Co.,Ltd.	31 January 2008	3.0
16	Rermudom Sugar Factory Co.,Ltd.	29 February 2008	7.0
17	Buri Ram Sugar Co., Ltd.	29 February 2008	8.0
18	Banpong Sugar Co., Ltd.	29 February 2008	3.0
19	Phitsanulok Sugar Co., Ltd.	29 February 2008	4.0
20	New Krung Thai Sugar Factory Co.,Ltd.	31 March 2008	2.0
21	Tha Maka Sugar Co., Ltd.	31 March 2008	2.0
22	Korach Industry Co., Ltd. (2)	31 March 2008	8.0
23	Surin Electric Co., Ltd.	31 March 2008	8.0
24	Pran Buri Sugar Industry Co., Ltd.	31 March 2008	3.0
25	Rajburi Sugar Co., Ltd.	31 March 2008	6.8
26	Sing Buri Sugar Co.,Ltd.	31 May 2008	4.0
27	Thai Identity Sugar Factory Co.,Ltd. ^{1/}	19 January 2009	3.0
28	Kaset Thai Sugar Co., Ltd. ^{1/}	24 January 2009	8.0
29	Thai Permpun Industry Co.,Ltd. ^{1/}	28 February 2009	4.0
30	Ruampol Nakhonsawan Industry Co., Ltd. ^{1/}	31 May 2009	2.5
Total			157.3

Note : 1/ These SPPs are still selling power to EGAT and will be terminated when contract is over

Appendix 9

Projection of Energy Generating Capacity Classified by Power Plant Types

Appendix 10

Projection of Energy Generation Classified by Fuel Types and Energy Purchase

Appendix 11

Transmission System Expansion Projects

DETAILS OF TRANSMISSION SYSTEM EXPANSION PROGRAM

(PDP 2007: Revision 2)

Items	Name of Transmission Lines and Substations	Length (km)	Number of Circuit	Voltage (kV)	Conductor Size (MCM)	Commissioning Date (Year)
A.	<u>TRANSMISSION EXPANSION PROJECTS ASSOCIATED WITH GENERATION PROJECTS</u>					
	<u>1. ONGOING PROJECTS</u>					
	<u>COMBID CYCLE POWER PLANT PROJECTS</u>					
	1.1 <u>North Bangkok Combined Cycle Power Plant Block #1 (1x670 MW)</u>					
	1.1.1 North Bangkok Substation Expansion	-	-	230	-	2009
	Subtotal					
B.	<u>TRANSMISSION SYSTEM EXPANSION PROJECTS</u>					
	<u>1. ONGOING PROJECTS</u>					
	<u>1.1 Transmission System Expansion Project No. 10</u>					
	1.1.1 Transformer Addition at Existing Substations	-	-	-	-	2009
	1.1.2 Shunt Capacitor Installation	-	-	-	-	2009
	1.1.3 Miscellaneous System Expansion	-	-	-	-	2009-2010
	Subtotal					

DETAILS OF TRANSMISSION SYSTEM EXPANSION PROGRAM (Continued)

(PDP 2007: Revision 2)

Items	Name of Transmission Lines and Substations	Length (km)	Number of Circuit	Voltage (kV)	Conductor Size (MCM)	Commissioning Date (Year)
1.2 500 kV Transmission System Project for Power Purchase from Nam Theun 2 Hydro Power Plant						
1.2.1	Thai/Lao Border (Mukdahan Province) - Roi Et 2	166	2	500	4x1272	2009
1.2.2	Roi Et 2 - Roi Et 1	^{1/} 20	2	230	4x1272	2009
Subtotal		186.0 km (or 372.0 circuit-kilometers)				
1.3 Bulk Power Supply for the Greater Bangkok Area Phase 2 Project						
1.3.1	Sai Noi and Bangkok Noi Substations Expansion	-	-	230	-	2009
1.3.2	Shunt Capacitor Installation	-	-	-	-	2009-2010
1.3.3	Miscellaneous System Expansion	-	-	-	-	2009-2010
1.3.4	Nong Chok - On Nuch	(18.0)	2	500 ^{3/}	4x1272	2010
1.3.5	Sectionalizing of 230 kV Bang Pakong - Bang Phli Line at Khlong ^{2/} Ban Substation and Bang Pakong - Khlong Dan - Bang Phli	^{1/} 44	2	230	2x1272	2010-2011
1.3.6	Transformer Addition at Existing Substations	-	-	-	-	2010-2011
Subtotal		44 km (or 88.0 circuit-kilometers) and 1 new substation				

^{1/} On the existing right-of-way

^{2/} New Substation

^{3/} Line conversion from 230 kV to 500 kV

DETAILS OF TRANSMISSION SYSTEM EXPANSION PROGRAM (Continued)

(PDP 2007: Revision 2)

Items	Name of Transmission Lines and Substations	Length (km)	Number of Circuit	Voltage (kV)	Conductor Size (MCM)	Commissioning Date (Year)
1.4 500 kV Transmission System Project for IPPs Power Plants						
1.4.1	Pluak Daeng - Nong Chok Junction # 3, 4	159	2	500	4x1272	2011
	Subtotal	159.0 km (or 318.0 circuit-kilometers)				
1.5 500 kV Transmission System Project for Power Purchase from Nam Nuegm 2 Hydro Power Plant						
1.5.1	Thai/Lao Border (Nong Khai Province) - Udon Than ^{3/}	80	2	500 ^{2/}	4x1272	2010
	Subtotal	80.0 km (or 160.0 circuit-kilometers) and 1 new substation				
1.6 Transmission System Expansion Project No.11						
Central Region						
1.6.1	Rayong 3 - Rayong 1	15.4 ^{3/}	2	115	2x795	2010
1.6.2	Kanchanaburi 1 - Kanchanaburi 2	14	2	115	2x795	2010
1.6.3	Sectionalizing Wang Noi - Saraburi 2 to Saraburi ^{1/} Substation	5	4 ^{4/}	230	2x1272	2011
1.6.4	Tha Wung - Lop Buri 1 and Tha Tako - Chai Badan	13 ^{3/}	2	115	2x795	2011
1.6.5	Ratchaburi 3 - Samut Sakhon 4 - Samut Sakhon 3 - Sam Phran 1 and Samut Sakhon 1 - Samut Sakhon 3 - Sam Phran 1	90	2	115	795	2011
		40/25.5/15.5 ^{3/}	2/4/4 ^{4/ 4/}	230/230	4x1272/2x1272 (Invar)	2011
		(7.1) ^{3/} /(15.5) ^{3/}	-	115/115	2x795	2011

Notes : ^{1/} New Substation

^{2/} Initially energize at 230 kV

^{3/} On the existing right-of-way

^{4/} Quadruple-circuit steel towers

DETAILS OF TRANSMISSION SYSTEM EXPANSION PROGRAM (Continued)

(PDP 2007: Revision 2)

Items	Name of Transmission Lines and Substations	Length (km)	Number of Circuit	Voltage (kV)	Conductor Size (MCM)	Commissioning Date (Year)
<u>Northeastern Region</u>						
1.6.6	Udon Thani 2 - Nong Bua Lam Phu and Nong Bua Lam Phu - Loei	(55.2)	1 ^{5/}	115	795	2010
1.6.7	Nam Phong 2 - Udon Thani 3	80	2	115	795	2011
1.6.8	Sectionalizing Lam Takhong - Nakhon Ratchasima 2 to Sikhiu Substation	85	2	500 ^{4/}	4x1272	2011
	Sikhiu - Nakhon Ratchasima ^{1/} ₃	5	4	230	2x1272 (GAP)	2011
1.6.9	Surin 2 - (Surin 1) - Buri Ram	45	2	230	2x1272	2011
1.6.10	Roi Et 1 - Mahasarakham	2/46 ^{2/}	2	230 ^{3/}	1272	2011
		38 ^{2/}	2	115	2x795	2011
<u>Southern Region</u>						
1.6.11	Krabi - Phangnga 2- Phukket 3 ^{1/}	2 ^{2/} 98/(76.9)	2/2	230/230 ^{6/}	2x1272/1272	2011

Notes :

- 1/ New Substation
- 2/ On the existing right-of-way
- 3/ Initially energized at 115 kV
- 4/ Initially energized at 230 kV
- 5/ Line stringing on the existing steel towers
- 6/ Line conversion from 115 kV to 230 kV

DETAILS OF TRANSMISSION SYSTEM EXPANSION PROGRAM (Continued)

(PDP 2007: Revision 2)

Items	Name of Transmission Lines and Substations	Length (km)	Number of Circuit	Voltage (kV)	Conductor Size (MCM)	Commissioning Date (Year)
<u>Nothern Region</u>						
1.6.12	Transformer Addition at Existing Substations	-	-	-	-	2010-2011
1.6.13	Shunt Capacitor Installation	-	-	-	-	2010-2011
1.6.14	Miscellaneous System Expansion ^{1/}	(78.8)	1 ^{4/}	115	2x795	2010-2011
1.6.15	Mae Moh 3 - Mae Moh 4 - Lamphun 2 ^{1/} and Mae Moh 3 - Lampang 1 and Lamphun 1 - Lamphun 2 ^{5/}	1/104 ^{2/}	2 ^{3/} 4 ^{3/}	230/230	4x1272/2x1272	2011
1.6.16	Sectionalizing Mae Moh 3 - Chiang Rai to Phayao Substation	1	4 ^{3/}	230	1272	2011
1.6.17	Sectionalizing Phitsanulok 2 - Nakhon Sawan to Phichit Substation	23	2 ^{6/}	230	1272	2011
	Subtotal	746.4 km (or 1,778.8 circuit-kilometers) and 6 new substations				

- Notes :**
- 1/ New Substation
 - 2/ On the existing right-of-way
 - 3/ Quadruple-circuit steel towers
 - 4/ Line stringing on the existing steel towers
 - 5/ On the existing right-of-way (Mae Moh 3 - Lampang 1 - Lamphun 1 - Lamphun 2)
 - 6/ Quadruple-circuit steel towers, initially double-circuit line stringing
 - 7/ Line conversion from 230 kV to 500 kV

DETAILS OF TRANSMISSION SYSTEM EXPANSION PROGRAM (Continued)

(PDP 2007: Revision 2)

Items	Name of Transmission Lines and Substations	Length (km)	Number of Circuit	Voltage (kV)	Conductor Size (MCM)	Commissioning Date (Year)
2. FUTURE PROJECTS						
2.1 Transmission System Development for Power Purchase from Theun Hinboun Expansion Hydropower Project						
2.1.1	Thai/Lao Border (Nakhon Phanom Province) - Nakhon Phanom 2 ^{1/}	(7.5)	2	230	1272 (Invar) ^{2/}	2012
2.1.2	Nakhon Phanom 2 - Nakhon Phanom Junction	2	2	230	1272	2012
2.1.3	Phang Khon - Sakon Nakhon 1	52 ^{3/}	2	115	477	2012
Subtotal		54.0 km (or 108.0 circuit-kilometers) and 1 new substation				
2.2.2	น้ำพูน - บ้านนาบะ 3 ^{3/}	165	2	500	4x1272	2555
2.2 Transmission System Project for IPPs Power Plants						
A) <u>GHECO-One Co., Ltd. (Coal), Nikom Map Ta Phut</u>						
2.2.1	Nikom Map Ta Phut Substation Expansion	-	-	230	-	2011
2.2.2	Nikom Map Ta Phut - Rayong 2	(11) ^{3/}	2	230	2x450mm ² (ZTACIR)	2011
2.2.3	Klaeng - Chanthaburi	56 ^{3/}	1 ^{4/}	115	795	2012
B) <u>Siam Energy Co., Ltd. (Gas), Bang Khla</u>						
2.2.4	Sectionalizing of Pluak Daeng - Nong Chok Double-circuit to Bang Khla Substation to be Pluak Daeng - Bang Khla - Nong Chok	0.1	4 (2 Routes)	500	4x1272	2012
2.2.5	Constructing from Bang Khla - Power Plant	0.3	2 (2 Routes)	500	4x795	2012
C) <u>National Power Supply Co., Ltd. (Coal), Phanom Sarakham</u>						
2.2.6	Sectionalizing of Pluak Daeng - Wang Noi (1 circuit) to Phanom Sarakham Substation to be Pluak Daeng - Phanom Sarakham - Wang Noi	0.1	2	500	4x1272	2013
2.2.7	Constructing from Phanom Sarakham - Power Plant	12	2	500	4x795	2013

Notes : 1/ New Substation

3/ On the existing right-of-way

2/ Reconducting to high capacity type (Invar)

4/ Constructing the single-circuit transmission line on the double-circuit steel tower

DETAILS OF TRANSMISSION SYSTEM EXPANSION PROGRAM (Continued)

(PDP 2007: Revision 2)

Items	Name of Transmission Lines and Substations	Length (km)	Number of Circuit	Voltage (kV)	Conductor Size (MCM)	Commissioning Date (Year)
D) Power Generation Supply Co., Ltd. (Gas), Non Saeng						
2.2.8	Sectionalizing of Tha Tako - Wang Noi Double-circuit to Pha Chi 2 Substation to be Tha Tako - Pha Chi 2 - Wang Noi	0.1	4 (2 Routes)	500	4x795	2013
2.2.9	Constructing from Pha Chi 2 - Power Plant	1	2	500	4x795	2013
2.2.10	Sectionalizing of Tha Tako - Nong Chok Single-circuit to Pha Chi 2 Substation	5	1	500	4x795	2013
2.2.11	Construction of Pha Chi 2 - (Pha Chi 2 Junction) - Wang Noi Junction Double-circuit	21	2	500	4x1272	2013
Subtotal		95.6 km (or 130.6 circuit-kilometers) and 3 new substations				
2.3 500 kV Transmission System Project for Upper Northern Area						
2.3.1	Mae Moh 5 ^{1/4} - Chiang Mai 4 ^{1/4}	145	2	500	4x1272	2018
Subtotal		145.0 km (or 290.0 circuit-kilometers) and 2 new substations				
Total		1,510.0 km (or 3,245.4 circuit-kilometers) and 14 new substations				

Notes : 1/ New Substation

