PDP2010: Revision 3
June 2012

SUMMARY

OF

THAILAND POWER DEVELOPMENT PLAN

2012 – 2030

(PDP2010: REVISION 3)

Energy Policy
and Planning Office
MINISTRY OF ENERGY

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1. Introduction

Thailand Power Development Plan 2010 - 2030 (PDP2010) was approved by the Nation Energy Policy Council (NEPC) on 12 March 2011, and then was endorsed by the Cabinet on 23 March 2011. The themes of PDP2010 substantially focused on security and adequacy of power system along with the policies of the Ministry of Energy (MoEN) on the aspects of environment concern, energy efficiency and renewable energy promotion to be in line with the 15-Year Renewable Energy Development Plan (REDP 2008 - 20212). Parenthetically, cogeneration system was recognized to promote as the efficient electricity generation.

In 2010, the recorded actual power demand (peak) of the country increased significantly higher than the forecast and tended to grow continuously. Additionally, the new power plant construction of Independent Power Producers (IPP) as plan has been delayed causing power system security to fall at risk influencing power reserve margin (RM) into the level of lower than the setting criteria or standards. Accordingly, the MoEN set a framework for a short-term urgent relief (2012 – 2019) by revising the power development plan (the PDP 2010) to be the one so called PDP2010: Revision 1 subsequently approved by NEPC on 25 November 2010, and endorsed by the Cabinet on 30 November 2010.

On 11 March 2011, an earthquake and tsunami occurred to strike the east coast of Japan, leading to severe damages on nuclear reactors as well as radiation leak and contamination on the Fukushima Daiichi Nuclear Power Plant. This disaster lessened public acceptance and trust in the Thailand’s nuclear power project development, encouraging the MoEN to contemplated the postponement of scheduled commercial operation date (SCOD) of the first unit on nuclear power project. Consequently, the PDP2010: Revision 2 was prepared and submitted to the NEPC, and accordingly was approved by the NEPC on 27 April 2011, and endorsed by the Cabinet on 3 May 2011 to shift SCOD of the first unit on nuclear power project forward by 3 years from 2020 to 2023 for the reasons of safety measures review, legislation framework, regulatory framework and stakeholder involvement review as well as additional supporting plans.

By the way, on 27 December 2011, the Cabinet approved the resolution of NEPC proposed on 30 November 2011 calling for Alternative Energy Development Plan: AEDP 2012– 2021 (by 25 percent instead of fossil fuels within the next 10 years) and also 20-Year Energy Efficiency Development Plan 2011 – 2030 (EE Plan 2011 – 2030).

The scope of the new government policies and the variation of current economic situation induce changes and fluctuation in both power demand and power supply. Therefore, to have clear vision on power supply acquiring, Thailand Power Development Plan 2010 – 2030 (PDP2010: Revision 3) is developed with crucial issues as the following:

1) Forecasted power demand results approved by the Thailand Load Forecast Subcommittee (TLFS) on 30 May 2012 are adopted within frameworks as the following.

- Refer to the projected Thai Gross Domestic Products (GDP) and projected Gross Regional Products (GRP) estimated by the Office of National Economic and Social Development Board (NESDB), and issued on 29 November 2011, covering the economic stimulation policies and flooding effects at the end of 2011
- Refer to the approved 20-Year Energy Efficiency Development Plan 2011 – 2030 (EE Plan 2011 – 2030) proposed by the MoEN

2) Alternative Energy Development is regarded according to Alternative Energy Development Plan: AEDP 2012-2021 to use renewable energy and alternative energy by 25 percent instead of fossil fuels within the next 10 years.

3) Energy supply security is taken into consideration of fuel diversification and suitable power reserve margin level.

2. Summary

The revised PDP or *"Thailand Power Development Plan 2010 – 2030 (PDP2010: Revision 3)"* is suggested within the scope of the new government's energy policies frameworks as listed below.

1) The 20-Year Energy Efficiency Development Plan 2011 – 2030 (EE Plan 2011 – 2030): this policy is targeting on 25 percent reduction of energy intensity (ratio of energy consumption to GDP) of the country within 20 years (2011 – 2030), resulting in the decrease of country's power demand projection on account of energy saving programs and energy efficiency promotions.

2) The 10-Year Alternative Energy Development Plan 2012 - 2021 (AEDP 2012 – 2021): this policy is targeting on increasing the share of renewable energy and alternative energy uses by 25 percent instead of fossil fuels within the next 10 years, resulting in replacement of some planned conventional (fossil fuels as coal-fired or gas-fired based) power plants by renewable power plants.

In addition, the government has set the new policies for economic stimulation, causing trajectory changes in GDP growth rate projection during the year 2012 – 2020. However, power demand forecast in terms of 2030 net peak demand is still stand at about 52,256 Megawatt (MW) lower than that of the previous version of the forecast around 3,494 MW (or 6.27 percent).

The total generating capacities during 2012 – 2030 can be summarized as the following:

- Total capacity (as of December 2011) 32,395 MW
- Total added capacity during 2012 – 2030 55,130 MW
- Total retired capacity during 2012 – 2030 -16,839 MW
- Grand total capacity (at the end of 2030) 70,686 MW

3. Thailand Electricity Overview and Power Demand Forecast

3.1 Electricity Overview

In 2012, the country's electricity demand grew at an a bit accelerating rate in tandem with the hot weather. Net peak generation requirement (on EGAT system) rose up to 26,121.1 MW on 26 April 2012 at 14.30 hours, higher than that of the preceding year (standing at 23,900.2 MW) by 2,220.9 MW or 9.24 percent.

Net energy generation requirement throughout the first five-month of the year 2012 (January – May 2012) grew in line with the peak demand growth rate, amounting to 71,698.4 GWh, higher than that of the prior year, month on month, (standing at 65,552.0 GWh) by 6,146.4 GWh or 9.38 percent.

3.2 Power Demand Forecast

The latest power demand forecast was approved by the Thailand Load Forecast Subcommittee (TLFS) on 30 May 2012 with considerable assumptions as the following.

1. Set a timeframe of the 20-year power demand forecast of 2012 – 2030
2. Implement the new model of load forecast developed by the Energy for Environmental Foundation (E for E) under the project of Energy Policy and Planning Office (EPPO) on "Thailand Future Load Forecast" submitted by April 2010
3. Refer to the trajectory GDP growth rate projection during 2011 – 2030 estimated by the Office of National Economic and Social Development Board (NESDB), and issued on 29 November 2011, taking into account economic stimulation policies and flooding effects faced at the end of 2011 (shown as Table 3.1)
4. Incorporate energy saving programs and energy efficiency promotions in accordance with the MoEN's 20-Year Energy Efficiency Development Plan 2011 – 2030 (EE Plan 2011 – 2030) approved by the NEPC on 30 November 2011 on intense thrust targeting on 25 percent reduction of the country's energy intensity (ratio of energy consumption to GDP) within 20 years (as the governmental policy statement declaration to the parliament on 23 August 2011 of the Prime Minister: Miss Yingluck Shinawatra)

Table 3.1 Trajectory GDP Growth Rate Projection (2011 – 2030)

Unit: Percent

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GDP	1.5	5.0	5.1	5.7	6.0	5.1	4.7	4.1	4.2	4.3

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
GDP	4.2	4.1	4.0	4.0	4.0	4.0	3.9	3.9	3.8	3.8

The two main purposes of Thailand power development plan formulation are to maintain power system security and to provide adequate and reliable electricity supply. Hence, in order to maintain power system security, avoid blackout risk and provide adequate electricity supply for future power demand growth (in line with economic stimulation policy), the Thailand PDP Review Subcommittee (Chaired by the Permanent Secretary of the MoEN) decided, as a risk adverse on EE Plan implementation, to adopt the high case of load forecast expected to achieve 20% of 20-Year EE Plan target called EE20% for PDP formulation.

As net peak generation requirement (on EGAT system) rose up to 26,121.1 MW on 26 April 2012 at 14.30 hours, the Load Forecast Working Group agreed to adjust load forecast by applying the actual power demand of the first 4-month as the starting point in the modeling of load forecast. The revised load forecast was approved by the TLFS on 30 May 2012 within 3 scenarios as the following:

- Base case (EE40%): expected to achieve the 40% of 20-Year EE Plan target
- High case (EE20%): expected to achieve the 20% of 20-Year EE Plan target
- Low case (EE60%): expected to achieve the 60% of 20-Year EE Plan target

As decided by the Thailand PDP Review Subcommittee to use the High case of EE20% for the revised PDP formulation, the High case of load forecast of the year 2030 net peak generation requirement is then adopted – about 52,256 MW, higher than that of the year 2011 by 1,483 MW or 4.16 percent per year. In terms of net energy generation

requirement, the High case reveals about 346,767 GWh of net energy generation requirement in 2030, higher than that of the year 2011 by 9,793 GWh or 4.13 percent per year.

By comparison of the latest 30 May 2012 load forecast of PDP2010: Revision 3 and the previous load forecast of PDP2010: Revision 2, it indicates that peak demand of the latest version is lower than that of the previous one by 3,494 MW or 6,27 percent. For the energy demand, the latest version is lower than that of the previous one by 20,497 GWh or 5.58 percent. Decreasing in projection comes from the effect of EE Plan, and the details are presented in Appendix 1.

4. Thailand Power Development Plan 2012 – 2030 (PDP2010: Revision 3)

4.1 Key Assumptions for PDP2010: Revision 3 Formulation

To formulate the revised PDP to be in line with the new government energy policies, several assumptions need to be reviewed and reconsidered. Key assumptions, made for PDP2010: Revision 3 formulation, are listed below.

1) **The power demand forecast or load forecast:** it is approved by the TLFS on 30 May 2012 to incorporate energy saving programs and energy efficiency promotions in accordance with the 20-Year Energy Efficiency Development Plan 2011 – 2030 (EE Plan 2011 – 2030) formulated by the MoEN, and approved by the NEPC on 30 November 2011.

2) **Thailand power system security:** Thailand should have the proper level of reserve margin to be not less than 15 percent of peak power demand. Moreover, to avoid the risk of the natural gas acquiring from sources in the western part of Thailand, in case of no natural gas supply, the appropriate level of reserve margin should be higher than 20 percent of the peak demand.

3) **The future electricity acquiring:** fuel type diversification in appropriate proportion is considered to reduce natural gas dependency in power generation.

4) **Electricity acquiring from renewable energy:** the MoEN targeted to increase the proportion of renewable energy for Thailand's electricity generation by not less than 5% from that of the previous PDP2010: Revision 2 within 2030 by taking into account the 10-Year Alternative Energy Development Plan 2012 - 2021 (AEDP 2012 – 2021). And then in 2022 – 2030, the generation from renewable energy will be expanded in accordance with its potential and advanced technology development.

5) **Electricity acquiring from nuclear power plant:** with the scope of the government's policy, a share of nuclear power generation should be not greater than 5 percent of total generating capacity. Additionally, the MoEN suggested shifting the scheduled commercial operation date (SCOD) of the first unit on nuclear power project forward by 3 years from 2020 to 2023.

6) **Electricity acquiring from coal-fired power plant:** the MoEN suggested considering coal-fired power plant development in an appropriate proportion as the necessity of Thailand power system except for considerations of other fuel types. Incidentally, for greenhouse gas emission reduction, CO_2 in particular, clean coal technologies should be recommended.

7) **Foreign power purchase:** the suggested proportion of power purchase from neighboring countries should be not greater than 15 percent of total generating capacity by emphasizing only on the projects that having been signed Tariff MOU already.

8) **Efficient power generation by cogeneration system:** it is suggested to promote cogeneration and to increase the amount of power purchases from cogeneration system as the following:

- During 2010 – 2014: conforming to the projects that have been settled
- During 2014 – 2019: scheduling the power purchases of SPP projects with Firm contract amounting 3,500 MW as the NEPC approval on 24 August 2009 and 25 November 2010,
- After 2020: planning to purchase more electricity from SPP cogeneration with Firm contract totaling 1,350 MW.

9) **CO_2 emission from power sector:** the target of CO_2 emission reduction (ton CO_2/kWh) of PDP2010: Revision 3 is still set to be not higher than that of the previous PDP2010.

4.2 Thailand Power Development Plan (PDP2010: Revision 3)

With the aforementioned key assumptions for PDP2010: Revision 3 formulation, Thailand Power Development Plan 2012 – 2030 (PDP2010: Revision 3) can be summarized as the following.

At the end of 2030, grand total capacity will be about 70,686 MW comprising total capacity (as of December 2011) amounting 32,395 MW, total added capacity of 55,130 MW and deduction of the retired capacity totaling 16,839 MW. The details of

generating capacity classified by power plant types are shown in Appendix 4; the details of estimation of energy generation by fuel types are presented in Appendix 5.

Total added capacity during 2012 – 2019 composes of all projects planned with commitment and agreement. The total added capacity will be about 23,325 MW detailed as the following:

- Power purchases from renewable energy (both domestic and neighboring countries) 8,194 MW
- Cogeneration 5,107 MW
- Combined cycle power plants 6,551 MW
- Thermal power plants (coal/lignite) 3,473 MW

Total added capacity during 2020 – 2030 comprises all projects planned for serving future power demand increasing annually and also replacement of the retired power plants. The total added capacity during this period will be about 31,805 MW summarized as the following:

- Power purchases from renewable energy (both domestic and neighboring countries) 6,387 MW
- Cogeneration 1,368 MW
- Gas turbine power plant (3 x 250 MW) 750 MW
- Combined cycle power plants (21 x 900 MW) 18,900 MW
- Thermal power plants (coal) (3 x 800 MW) 2,400 MW
- Thermal power plants (nuclear) (2 x 1,000 MW) 2,000 MW

The total capacities during 2012 – 2030 can be concluded as the following:

- Total capacity (as of December 2011) 32,395 MW
- Total added capacity during 2012 – 2030 55,130 MW
- Total retired capacity during 2012 – 2030 -16,839 MW
- Grand total capacity (at the end of 2030) 70,686 MW

The added capacity during 2012 – 2030 of 55,130 MW can be classified by power plant types as the following:

1. Renewable energy power plants	**14,580**	**MW**
– Power purchase from domestic	9,481	MW
– Power purchase from neighboring countries	5,099	MW
2. Cogeneration	**6,476**	**MW**
3. Combined cycle power plants	**25,451**	**MW**
4. Thermal power plants	**8,623**	**MW**
– Coal-fired power plants	4,400	MW
– Nuclear power plants	2,000	MW
– Gas turbine power plants	750	MW
– Power purchase from neighboring countries	1,473	MW
Total	**55,130**	**MW**

Details of Thailand power development plan 2012 – 2030 (PDP2010: Rev.3) and names of power plants to be completed during the planning period are listed in Table 4.1.

Table 4.1
Thailand Power Development Plan 2012-2030
PDP2010: Revision 3

Year	Peak Demand (MW)	Projects			Fuel Types	Contract Capacity (MW)	Minimum Reserve Margin (%)
2012	**26,355**	SPP-Renewables	498	MW	-		
		SPP-Cogeneration	254	MW	Gas		
		VSPP-Renewables	201	MW	-		
		VSPP-Cogeneration	8	MW	Gas		
		GHECO-ONE Co.,Ltd.	660	MW	Coal		
		Chao Phraya Dam #1-2	12	MW	Hydro		
		Naresuan Dam	8	MW	Hydro		
		Khun Dan Prakarnchon Dam	10	MW	Hydro		
		Power Purchase from Lao PDR (Theun Hinboun Ext.) (Jul)	220	MW	Hydro	**34,265**	**16.0**
2013	**27,443**	SPP-Renewables	249	MW	-		
		SPP-Cogeneration	1,170	MW	Gas		
		VSPP-Renewables	772	MW	-		
		VSPP-Cogeneration	16	MW	Gas		
		Mae Klong Dam #1-2	2x6	MW	Hydro		
		Pasak Jolasid Dam	7	MW	Hydro	**36,491**	**18.4**
2014	**28,790**	SPP-Renewables	420	MW	-		
		SPP-Cogeneration	270	MW	Gas		
		VSPP-Renewables	181	MW	-		
		VSPP-Cogeneration	16	MW	Gas		
		Renewable Energy (Additional)	60	MW	-		
		Gulf JP NS Co.,Ltd. #1-2 (Jun, Dec)	2x800	MW	Gas		
		Wang Noi CC #4 (Apr)	769	MW	Gas		
		Chana CC #2 (Apr)	782	MW	Gas		
		Thap Sakae Solar Cell	5	MW	Solar		
		Sirindhorn Dam Solar Cell	0.1	MW	Solar	**39,542**	**17.7**
2015	**30,231**	SPP-Renewables	369	MW	-		
		SPP-Cogeneration	540	MW	Gas		
		VSPP-Renewables	83	MW	-		
		VSPP-Cogeneration	17	MW	Gas		
		Renewable Energy (Additional)	230	MW	-		
		Gulf JP UT Co.,Ltd. #1-2 (Jun, Dec)	2x800	MW	Gas		
		North Bangkok CC#2 (Oct)	900	MW	Gas		
		Bang Lang Dam (Renovated)	12	MW	Hydro		
		Kwae Noi Dam #1-2	2x15	MW	Hydro		
		Khao Yai Thiang Wind Turbine (North)	18	MW	Wind		
		Chulabhorn Hydropower	1	MW	Hydro		
		Klong Tron Hydropower	3	MW	Hydro		
		Kiew Kohma Hydropower	6	MW	Hydro		
		Mae Karm Solar Cell	0.1	MW	Solar		
		Power Purchase from Lao PDR (Hongsa TH #1-2) (Jun, Nov)	2x491	MW	Lignite	**43,157**	**16.5**

Table 4.1 (Continued)
Thailand Power Development Plan 2012-2030
PDP2010: Revision 3

Year	Peak Demand (MW)	Projects			Fuel Types	Contract Capacity (MW)	Minimum Reserve Margin (%)
2016	**31,808**	SPP-Renewables	635	MW	-		
		SPP-Cogeneration	450	MW	Gas		
		VSPP-Renewables	79	MW	-		
		VSPP-Cogeneration	21	MW	Gas		
		Renewable Energy (Additional)	270	MW	-		
		National Power Supply Co.,Ltd. TH #1-2 (Nov)	270	MW	Coal		
		New Power Plant (South) (Jul)	900	MW	Gas		
		Phayaman Hydropower	2	MW	Hydro		
		Lam Pao Hydropower	1	MW	Hydro		
		Lam Ta Khong Hydropower	2	MW	Hydro		
		Bhumubol Dam Solar Cell	0.1	MW	Solar		
		Power Purchase from Lao PDR (Hongsa TH #3) (Mar)	491	MW	Lignite	**45,530**	**24.3**
2017	**33,263**	SPP-Renewables	153	MW	-		
		SPP-Cogeneration	900	MW	Gas		
		VSPP-Renewables	77	MW	-		
		Renewable Energy (Additional)	280	MW	-		
		National Power Supply Co.,Ltd. TH #3-4 (Mar)	270	MW	Coal		
		LamTa Khong Pumped Storage #3-4 (Jun)	500	MW	Hydro		
		That Noi Hydropower	2	MW	Hydro		
		Rawai Stadium Wind Turbine	3	MW	Wind		
		Rajjaprabha Dam Solar Cell	0.1	MW	Solar		
		Pha Chuk Hydropower	20	MW	Hydro	**47,240**	**21.4**
2018	**34,592**	SPP-Cogeneration	720	MW	Gas		
		VSPP-Renewables	86	MW	-		
		VSPP-Cogeneration	1	MW	Gas		
		Renewable Energy (Additional)	280	MW	-		
		Mae Moh TH #4-7 (Replaced) (600MW)			-		
		Yaso Thorn - Phanom Prai Hydropower	4	MW	Hydro		
		Khao Laem Hydropower # 1-2	2x9	MW	Hydro		
		Kra Seao Hydropower	2	MW	Hydro		
		Power Purchase from Lao PDR (Nam-Ngiep 1) (Jan)	269	MW	Hydro		
		Power Purchase from Lao PDR (Xe-Pian) (Aug)	390	MW	Hydro	**48,329**	**19.6**
2019	**35,869**	SPP-Renewables	60	MW	-		
		SPP-Cogeneration	720	MW	Gas		
		VSPP-Renewables	72	MW	-		
		VSPP-Cogeneration	5	MW	Gas		
		Renewable Energy (Additional)	310	MW	-		
		EGAT Coal-Fired TH #1 (Jun)	800	MW	Coal		
		Huai Sataw Hydropower	1	MW	Hydro		
		Bang Pakong Hydropower	2	MW	Hydro		
		Sirindhorn Dam Solar Cell	1	MW	Solar		
		Khao Yai Thiang Wind Turbine (South)	50	MW	Wind		
		Power Purchase from Lao PDR (Xaiyaburi) (Oct)	1,220	MW	Hydro	**51,386**	**18.7**
2020	**37,325**	SPP-Renewables	45	MW	-		
		SPP-Cogeneration (Additional # 1)	90	MW	Gas		
		VSPP-Renewables	81	MW	-		
		Renewable Energy (Additional)	310	MW	-		
		Mae Saruay Hydropower	2	MW	Hydro		
		Thatako Solar Cell #1	1	MW	Solar		
		Klong See Yud Hydropower	3	MW	Hydro	**50,389**	**18.1**

Table 4.1 (Continued)
Thailand Power Development Plan 2012-2030
PDP2010: Revision 3

Year	Peak Demand (MW)	Projects			Fuel Types	Contract Capacity (MW)	Minimum Reserve Margin (%)
2021	**38,726**	SPP-Cogeneration (Additional # 2-3)	180	MW	Gas		
		VSPP-Renewables	79	MW	-		
		VSPP-Cogeneration	1	MW	Gas		
		Renewable Energy (Additional)	360	MW	-		
		New Gas-fired Power Plant	900	MW	Gas		
		Bang Pakong CC #1 (Replaced)	900	MW	Gas		
		Chonnaboat Hydropower	2	MW	Hydro		
		Thatako Solar Cell #2	1	MW	Solar		
		Power Purchase from Neighbouring Countries	300	MW	-	**52,912**	**17.8**
2022	**40,134**	SPP-Cogeneration (Additional # 4-5)	180	MW	Gas		
		VSPP-Renewables	67	MW	-		
		VSPP-Cogeneration	5	MW	Gas		
		Renewable Energy (Additional)	220	MW	-		
		New Gas-Fired Power Plant	900	MW	Gas		
		Bang Pakong CC #2 (Replaced)	900	MW	Gas		
		EGAT Coal-Fired TH #2	800	MW	Coal		
		Mahasarakam Hydropower	1	MW	Hydro		
		Chulabhorn Dam Solar Cell	0.1	MW	Solar		
		Power Purchase from Neighbouring Countries	300	MW	-	**56,135**	**16.9**
2023	**41,567**	SPP-Cogeneration (Additional # 6-7)	180	MW	Gas		
		VSPP-Renewables	47	MW	-		
		Renewable Energy (Additional)	220	MW	-		
		New Gas-Fired Power Plant	900	MW	Gas		
		South Bangkok CC #1-2 (Replaced)	2x900	MW	Gas		
		Low Wind Speed Wind Turbine	10	MW	Wind		
		Huai Nam Sai Hydropower	2	MW	Hydro		
		Rasisalai Hydropower	2	MW	Hydro		
		Ubonrat Dam Solar Cell	0.1	MW	Solar		
		Power Purchase from Neighbouring Countries	300	MW	-	**56,732**	**16.4**
2024	**43,049**	SPP-Cogeneration (Additional # 8-9)	180	MW	Gas		
		VSPP-Renewables	53	MW	-		
		VSPP-Cogeneration	1	MW	Gas		
		Renewable Energy (Additional)	220	MW	-		
		New Gas-Fired Power Plant	900	MW	Gas		
		South Bangkok CC #3 (Replaced)	900	MW	Gas		
		Bang Pakong CC #3 (Replaced)	900	MW	Gas		
		Hua Na Hydropower	1	MW	Hydro		
		Lamtapearn Hydropower	1	MW	Hydro		
		Sirikit Dam Solar Cell	0.1	MW	Solar		
		Power Purchase from Neighbouring Countries	300	MW	-	**59,509**	**16.3**
2025	**44,521**	SPP-Cogeneration (Additional # 10-11)	180	MW	Gas		
		VSPP-Renewables	37	MW	-		
		VSPP-Cogeneration	5	MW	Gas		
		Renewable Energy (Additional)	220	MW	-		
		New Gas-Fired Power Plant	900	MW	Gas		
		Bang Pakong CC #4 (Replaced)	900	MW	Gas		
		EGAT Coal-Fired TH #3	800	MW	Coal		
		Pranburi Hydropower	2	MW	Hydro		
		Tabsalao Hydropower	2	MW	Hydro		
		Power Purchase from Neighbouring Countries	300	MW	-	**60,477**	**16.5**

Table 4.1 (Continued)
Thailand Power Development Plan 2012-2030
PDP2010: Revision 3

Year	Peak Demand (MW)	Projects			Fuel Types	Contract Capacity (MW)	Minimum Reserve Margin (%)
2026	**46,002**	SPP-Cogeneration (Additional # 12-13)	180	MW	Gas		
		VSPP-Renewables	32	MW	-		
		Renewable Energy (Additional)	220	MW	-		
		New Gas-Fired Power Plant	900	MW	Gas		
		Bang Pakong CC #5 (Replaced)	900	MW	Gas		
		EGAT Nuclear Power Plant #1	1,000	MW	Uranium		
		Kamalasai Hydropower	1	MW	Hydro		
		Numpung Dam Solar Cell	1	MW	Solar		
		Power Purchase from Neighbouring Countries	300	MW	-	**64,007**	**16.5**
2027	**47,545**	SPP-Cogeneration (Additional # 14-15)	180	MW	Gas		
		VSPP-Renewables	33	MW	-		
		VSPP-Cogeneration	1	MW	Gas		
		Renewable Energy (Additional)	220	MW	-		
		Wang Noi CC #1 (Replaced)	900	MW	Gas		
		Bang Pakong CC #6 (Replaced)	900	MW	Gas		
		EGAT Nuclear Power Plant #2	1,000	MW	Uranium		
		Mae Wong Hydropower	12	MW	Hydro		
		Vajiralongkorn Dam Solar Cell	0.1	MW	Solar		
		Chaiyaphum and Nakhon Ratchasima Wind Turbine	50	MW	Wind		
		Power Purchase from Neighbouring Countries	300	MW	-	**64,979**	**16.2**
2028	**49,114**	VSPP-Renewables	32	MW	-		
		VSPP-Cogeneration	5	MW	Gas		
		Renewable Energy (Additional)	220	MW	-		
		EGAT Coal-Fired TH #4	800	MW	Coal		
		Wang Noi CC #2-3 (Replaced)	2x900	MW	Gas		
		Gas Turbine #1	250	MW	Diesel		
		Mae Khan Hydropower	16	MW	Hydro		
		Huai Samong Hydropower	1	MW	Hydro		
		Mae Moh Solar Cell	1	MW	Solar		
		Power Purchase from Neighbouring Countries	300	MW	-	**67,012**	**16.4**
2029	**50,624**	VSPP-Renewables	32	MW	-		
		Renewable Energy (Additional)	220	MW	-		
		South Bangkok CC #4 (Replaced)	900	MW	Gas		
		EGAT New Combined Cycle Power Plant	900	MW	Gas		
		Gas Turbine #2	250	MW	Diesel		
		Ao Phai Wind Turbine	10	MW	Wind		
		Lam Dome Yai Hydropower	1	MW	Hydro		
		Kamphaeng Phet Solar Cell	3	MW	Solar		
		Power Purchase from Neighbouring Countries	300	MW	-	**69,358**	**16.4**
2030	**52,256**	VSPP-Renewables	33	MW	-		
		VSPP-Cogeneration	1	MW	Gas		
		Renewable Energy (Additional)	220	MW	-		
		EGAT New Combined Cycle Power Plant	900	MW	Gas		
		Gas Turbine #3	250	MW	Diesel		
		Solar Cell , Southern Part of Thailand	10	MW	Solar		
		Samut Sakhon Wind Turbine	30	MW	Wind		
		Klong Luang Hydropower	1	MW	Hydro		
		Power Purchase from Neighbouring Countries	300	MW	-	**70,686**	**16.2**

Total Contract Capacity as of December 2011	32,395	MW
Total Added Capacity	55,130	MW
Total Retired Capacity	- 16,839	MW
Grand Total Capacity at the End of 2030	**70,686**	**MW**

4.3 Renewable Energy Generation

With the government policy targeting on increasing the share of renewable energy and alternative energy uses by 25 percent instead of fossil fuels within the next 10 years, new projects of renewable energy development are initiated into PDP2010: Revision 3. Hence, at the end of 2030, total capacity of renewable energy will be around 20,546.3 MW (or 29 percent of total generating capacity in the power system) comprising total existing capacity amounting 6,340.2 MW, total added capacity of renewable energy of 14,580.4 MW and deduction of the retired capacity of renewable energy totaling 374.3 MW. The 20,546.3 MW capacity of renewable energy can be classified into domestic renewable energy of 13,688 MW and renewable energy from neighboring countries of 6,858 MW as the following.

Renewable Energy Power Projects during 2012 – 2021

In this period, renewable energy power projects should be in line with the 10-Year Alternative Energy Development Plan: AEDP 2012-2021 of the MoEN detailed as the following:

– Solar power	1,806.4	MW
– Wind power	1,774.3	MW
– Hydro power	3,061.4	MW
– (both domestic and neighboring countries)		
– Biomass	2,378.7	MW
– Biogas	22.1	MW
– Municipal solid waste (MSW)	334.5	MW
Total	**9,377.4**	**MW**

Renewable Energy Power Projects during 2022 – 2030

Renewable energy power project development during 2022 – 2030 will be considered in accordance with its potential detailed as the following:

– Solar power	1,995.7	MW
– Wind power	199.4	MW

– Hydro power (both domestic and neighboring countries)	2,742.5	MW
– Biomass	223.5	MW
– Biogas	24.1	MW
– Municipal solid waste (MSW)	17.8	MW
Total	**5,203.0**	**MW**

The lists of power plant types to be completed during 2012 – 2030 are presented in Table 4.2.

4.4 CO2 Emission from Power Sector

In 2011, an average greenhouse gas (CO_2) emission released from Power sector is about 0.505 kgCO_2/kWh. In response to the MoEN policies on clean energy development promotion, the 2030 target of CO_2 emission reduction (ton CO_2/kWh) of PDP2010: Revision 3 is set to be not higher than that of the previous PDP2010: Revision 2 by rearranging generation mix appropriately.

Estimation of CO2 emission amounts on PDP2010: Revision 3 is calculated with reference to the international principles as the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Details as shown in Table 4.3).

Table 4.2 Annual Capacity of Renewable Energy by Fuel Types

(Unit: MW)

Year	Fuel Types							
	Solar	Wind	Hydro	Biomass	Biogas	MSW	New energy form	Total
Capacity as of 2011	**138.0**	**3.0**	**5,322.5**	**747.3**	**106.0**	**21.4**	**2.0**	**6,340.2**
New Renewable Contract Capacity								
2012	164.9	246.9	250.5	280.5	4.2	1.0	-	948.1
2013	375.8	14.0	19.2	574.5	-	56.0	-	1,039.5
2014	181.1	263.6	0.5	206.8	1.2	12.8	-	666.0
2015	191.1	302.9	51.8	180.5	2.3	22.8	-	751.3
2016	130.1	641.8	5.2	176.8	2.3	32.8	-	989.0
2017	130.1	163.1	522.0	175.3	2.3	41.8	-	1,034.6
2018	130.0	7.4	682.6	184.5	2.4	41.8	-	1,048.8
2019	151.0	117.8	1,223.5	179.8	2.4	41.8	-	1,716.4
2020	151.0	8.2	4.7	234.0	2.5	41.9	-	442.2
2021	201.0	8.6	301.5	186.0	2.5	41.9	-	741.5
Total New Capacity 2012-2021	**1,806.4**	**1,774.3**	**3,061.4**	**2,378.7**	**22.1**	**334.5**	**-**	**9,377.4**
2022	220.1	9.0	301.3	53.7	2.5	1.9	-	588.5
2023	220.1	19.5	303.5	32.8	2.6	1.9	-	580.4
2024	220.1	9.9	302.2	38.6	2.6	1.9	-	575.4
2025	220.0	10.4	303.3	21.2	2.6	2.0	-	559.5
2026	221.0	11.0	301.0	16.8	2.7	2.0	-	554.4
2027	220.1	61.5	312.0	16.9	2.7	2.0	-	615.2
2028	221.0	12.1	317.3	14.4	2.8	2.0	-	569.5
2029	223.0	22.7	301.0	14.5	2.8	2.0	-	566.1
2030	230.0	43.3	301.0	14.7	2.8	2.1	-	594.0
Total New Capacity 2022-2030	**1,995.4**	**199.4**	**2,742.6**	**223.6**	**24.1**	**17.8**	**-**	**5,203.0**
Total New Capacity 2012-2030	**3,802.0**	**1,973.7**	**5,804.0**	**2,602.2**	**46.2**	**352.3**	**-**	**14,580.4**

Table 4.3 Estimation of CO_2 Emission Amounts

(Unit: $kgCO_2/kWh$)

Year	PDP2010: Revision 2		PDP2010: Revision 3	
	Annual Amounts	**Accumulative Amounts** (Base Year: 2012)	**Annual Amounts**	**Accumulative Amounts** (Base Year: 2012)
2012	0.488	0.488	0.478	0.478
2013	0.481	0.485	0.471	0.474
2014	0.467	0.479	0.468	0.472
2015	0.447	0.470	0.448	0.466
2016	0.422	0.460	0.430	0.458
2017	0.412	0.451	0.429	0.452
2018	0.401	0.443	0.413	0.446
2019	0.401	0.437	0.416	0.442
2020	0.405	0.433	0.412	0.438
2021	0.410	0.430	0.407	0.434
2022	0.404	0.427	0.410	0.432
2023	0.400	0.424	0.413	0.430
2024	0.382	0.420	0.406	0.427
2025	0.377	0.416	0.407	0.426
2026	0.391	0.414	0.403	0.424
2027	0.377	0.411	0.391	0.421
2028	0.382	0.409	0.395	0.419
2029	0.385	0.407	0.391	0.417
2030	0.386	0.405	0.385	0.415

Appendices

Power Demand Statistic and Load Forecast for PDP

(EGAT System and Purchase from VSPP)

Case : May 2012 (EE20%)

Year	Peak			Energy			Load Factor	Elasticity
	MW	Increase		GWh	Increase			
		MW	%		GWh	%	%	
Actual : NET Generation								
2008	22,093.7	56.4	0.26	145,816.5	2,002.9	1.39	75.14	0.56
2009	22,155.0	61.3	0.28	146,279.7	463.2	0.32	75.37	-0.14
2010	24,174.4	2,019.4	9.11	161,350.2	15,070.5	10.30	76.19	1.32
2011	24,069.6	-104.8	-0.43	160,705.5	-644.7	-0.40	76.22	-5.18
Forecast : NET Generation								
2012	**26,355**	2,285	9.49	**175,089**	14,383	8.95	75.84	1.38
2013	**27,443**	1,088	4.13	**183,283**	8,194	4.68	76.24	0.92
2014	**28,790**	1,348	4.91	**191,630**	8,348	4.55	75.98	0.80
2015	**30,231**	1,441	5.00	**200,726**	9,096	4.75	75.80	0.79
2016	**31,809**	1,577	5.22	**210,619**	9,893	4.93	75.59	0.96
2017	**33,264**	1,455	4.58	**219,616**	8,997	4.27	75.37	0.91
2018	**34,593**	1,329	4.00	**227,760**	8,144	3.71	75.16	0.90
2019	**35,869**	1,276	3.69	**236,408**	8,648	3.80	75.24	0.91
2020	**37,326**	1,457	4.06	**246,164**	9,756	4.13	75.29	0.97
2021	**38,726**	1,400	3.75	**255,591**	9,428	3.83	75.34	0.91
2022	**40,134**	1,409	3.64	**265,039**	9,448	3.70	75.39	0.91
2023	**41,567**	1,433	3.57	**274,672**	9,633	3.63	75.43	0.90
2024	**43,049**	1,482	3.57	**284,640**	9,968	3.63	75.48	0.90
2025	**44,521**	1,471	3.42	**294,508**	9,868	3.47	75.51	0.87
2026	**46,003**	1,482	3.33	**304,548**	10,040	3.41	75.57	0.86
2027	**47,545**	1,543	3.35	**314,925**	10,377	3.41	75.61	0.87
2028	**49,115**	1,570	3.30	**325,470**	10,544	3.35	75.65	0.87
2029	**50,624**	1,509	3.07	**335,787**	10,318	3.17	75.72	0.83
2030	**52,256**	1,632	3.22	**346,767**	10,979	3.27	75.75	0.87
Average Growth								
2008-2010	-	712	3.13	-	5,846	3.91	-	1.52
2011-2015	-	1,211	4.57	-	7,875	4.46	-	0.96
2016-2020	-	1,419	4.31	-	9,087	4.17	-	0.93
2021-2025	-	1,439	3.59	-	9,669	3.65	-	0.90
2026-2030	-	1,547	3.26	-	10,452	3.32	-	0.86
2012-2030	-	1,483	4.16	-	9,793	4.13	-	0.92

Remark : Power Purchase from VSPP is included.

Comparison of Load Forecast
(Including Power Purchase from VSPP)

YEAR	CASE : February (Adjusted) (1)		CASE : May 2012 EE20% (2)		Difference (2)-(1)			
	MW	GWh	MW	GWh	MW	%	GWh	%
2011	25,952	169,444	24,070	160,706	-1,882	-7.25	-8,738	-5.16
2012	27,367	177,584	26,355	175,089	-1,012	-3.70	-2,495	-1.41
2013	28,707	185,561	27,443	183,283	-1,264	-4.40	-2,278	-1.23
2014	29,917	193,803	28,790	191,630	-1,127	-3.77	-2,173	-1.12
2015	31,096	201,998	30,231	200,726	-865	-2.78	-1,272	-0.63
2016	32,451	211,248	31,809	210,619	-643	-1.98	-629	-0.30
2017	33,996	221,066	33,264	219,616	-732	-2.15	-1,450	-0.66
2018	35,536	231,079	34,593	227,760	-943	-2.65	-3,319	-1.44
2019	36,903	240,341	35,869	236,408	-1,034	-2.80	-3,933	-1.64
2020	38,320	250,210	37,326	246,164	-994	-2.60	-4,046	-1.62
2021	39,921	260,526	38,726	255,591	-1,195	-2.99	-4,935	-1.89
2022	41,443	270,776	40,134	265,039	-1,309	-3.16	-5,737	-2.12
2023	42,995	281,330	41,567	274,672	-1,428	-3.32	-6,658	-2.37
2024	44,527	292,214	43,049	284,640	-1,478	-3.32	-7,574	-2.59
2025	46,345	303,587	44,521	294,508	-1,824	-3.94	-9,079	-2.99
2026	48,093	315,392	46,003	304,548	-2,091	-4.35	-10,844	-3.44
2027	49,908	327,638	47,545	314,925	-2,363	-4.73	-12,713	-3.88
2028	51,693	340,340	49,115	325,470	-2,578	-4.99	-14,870	-4.37
2029	53,716	353,520	50,624	335,787	-3,092	-5.76	-17,733	-5.02
2030	55,750	367,264	52,256	346,767	-3,494	-6.27	-20,497	-5.58

Power Demand Statistic and Load Forecast

(EGAT System)

Case : May 2012 (EE20%)

Year	Peak			Energy			Load Factor
	MW	Increase		GWh	Increase		
		MW	%		GWh	%	%
Actual : NET Generation							
2008	22,018.0	8.8	0.04	145,227.5	1,486.5	1.03	75.09
2009	22,044.9	26.9	0.12	145,297.3	69.8	0.05	75.24
2010	24,009.9	1,965.0	8.91	160,189.5	14,892.2	10.25	76.16
2011	23,900.2	-109.7	-0.46	158,963.3	-1,226.2	-0.77	75.93
Forecast : NET Generation							
2012	**26,121**	2,221	9.29	**172,895**	13,932	8.76	75.56
2013	**26,950**	829	3.17	**178,962**	6,067	3.51	75.81
2014	**28,236**	1,286	4.77	**186,745**	7,783	4.35	75.50
2015	**29,641**	1,405	4.98	**195,482**	8,737	4.68	75.29
2016	**31,182**	1,541	5.20	**205,020**	9,538	4.88	75.06
2017	**32,613**	1,431	4.59	**213,717**	8,697	4.24	74.81
2018	**33,914**	1,301	3.99	**221,485**	7,768	3.63	74.55
2019	**35,165**	1,251	3.69	**229,806**	8,321	3.76	74.60
2020	**36,596**	1,431	4.07	**239,291**	9,485	4.13	74.64
2021	**37,971**	1,375	3.76	**248,456**	9,165	3.83	74.70
2022	**39,357**	1,386	3.65	**257,676**	9,220	3.71	74.74
2023	**40,777**	1,420	3.61	**267,166**	9,490	3.68	74.79
2024	**42,244**	1,467	3.60	**276,967**	9,801	3.67	74.84
2025	**43,704**	1,460	3.46	**286,722**	9,755	3.52	74.89
2026	**45,179**	1,475	3.37	**296,674**	9,952	3.47	74.96
2027	**46,714**	1,535	3.40	**306,960**	10,286	3.47	75.01
2028	**48,275**	1,561	3.34	**317,413**	10,453	3.41	75.06
2029	**49,778**	1,503	3.11	**327,648**	10,235	3.22	75.14
2030	**51,403**	1,625	3.26	**338,541**	10,893	3.32	75.18
Average Growth							
2008-2010	-	667	2.94	-	5,483	3.68	-
2011-2015	-	1,126	4.30	-	7,058	4.06	-
2016-2020	-	1,391	4.31	-	8,762	4.13	-
2021-2025	-	1,422	3.61	-	9,486	3.68	-
2026-2030	-	1,540	3.30	-	10,364	3.38	-
2012-2030	-	1,448	4.11	-	9,451	4.06	-

Figure of Thailand Power Development Plan (PDP2010: Revision 3)

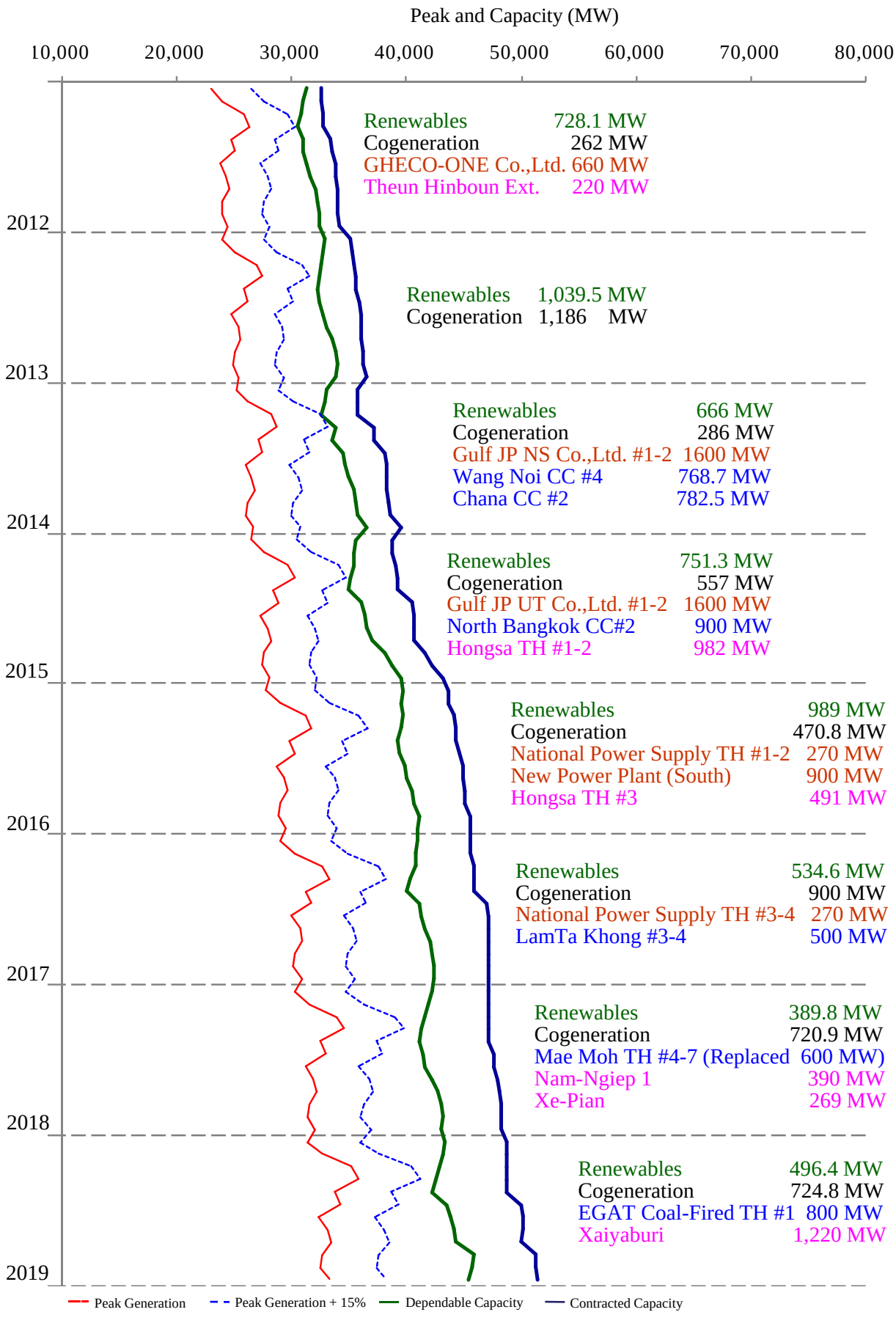
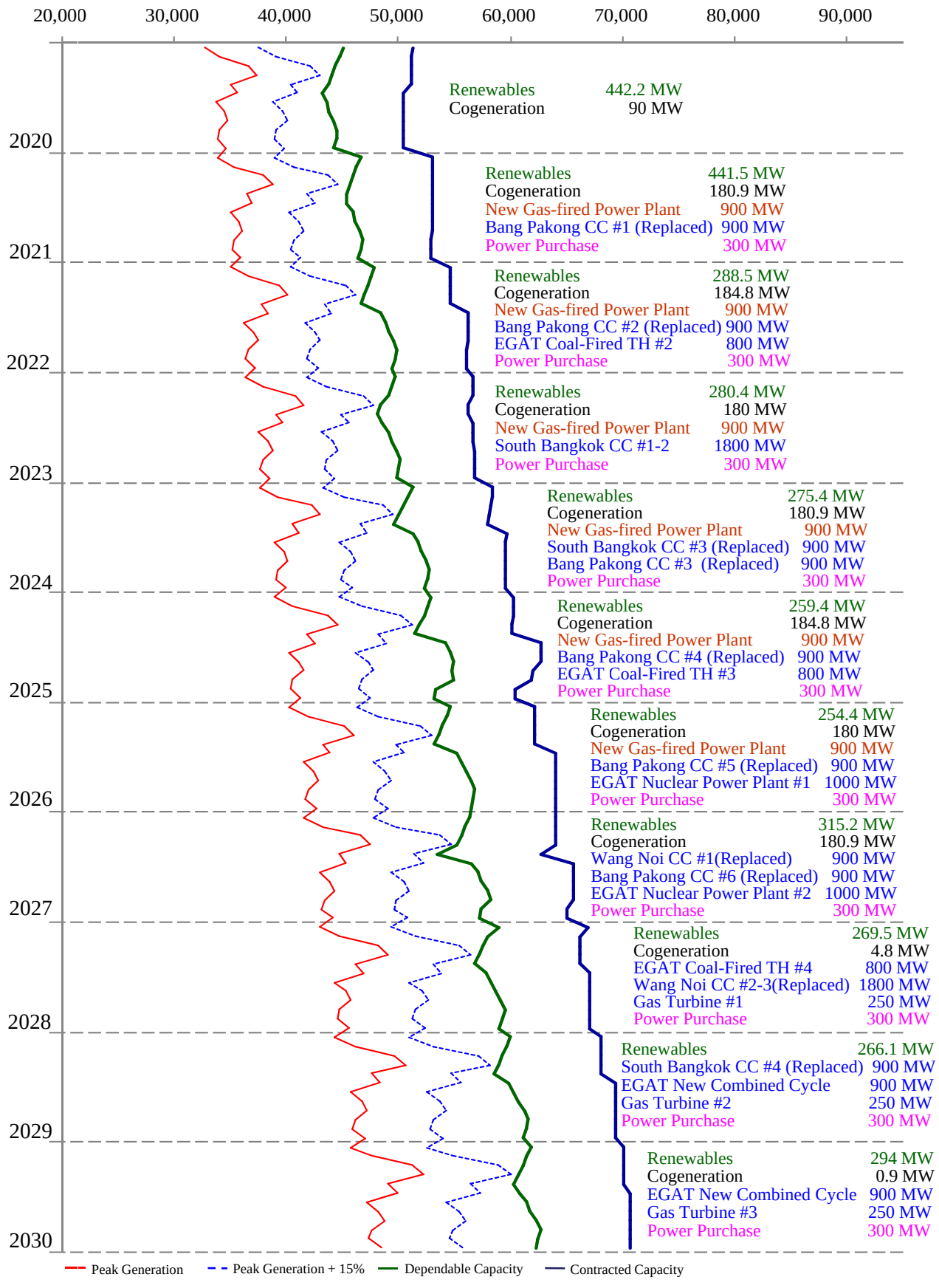


Figure of Thailand Power Development Plan (PDP2010: Revision 3)

Peak and Capacity (MW)



Comparison of Thailand Power Development Plans
(2012-2019)

Year	PDP2010 Revision 2 (NPEC 27 Apr 2011)		PDP2010 Revision 3 (NPEC 8 Jun 2012)	
	Projects	**MW**	**Projects**	**MW**
2012	Renewables	183.3	Renewables	728.1
	Cogeneration	434	Cogeneration	262
			GHECO-ONE Co.,Ltd.	660
	Theun Hinboun Ext.	220	Theun Hinboun Ext.	220
2013	Renewables	212.7	Renewables	1,039.5
	Cogeneration	996	Cogeneration	1,186
2014	Renewables	330.3	Renewables	666
	Cogeneration	361	Cogeneration	286
	Wang Noi CC #4 (Apr)	800	Wang Noi CC #4 (Apr)	768.7
	Chana CC #2 (Apr)	800	Chana CC #2 (Apr)	782.2
	Power Generation.#1-2(Jun-Dec)	2x800	Gulf JP NS Co.,Ltd. #1-2 (Jun, Dec)	2x800
2015	Renewables	181.5	Renewables	751.3
	Cogeneration	632	Cogeneration	557
	North Bangkok CC#2 (Apr)	800	North Bangkok CC#2 (Oct)	900
	Siam Energy #1-2 (Jun, Dec)	2x800	Gulf JP UT Co.,Ltd. #1-2 (Jun, Dec)	2x800
	Hongsa TH #1-2 (May, Oct)	2x491	Hongsa TH #1-2 (Jun, Nov)	2x491
2016	Renewables	228.3	Renewables	989
	Cogeneration	726	Cogeneration	470.8
	New Power Plant (South) (Jul)	800	New Power Plant (South) (Jul)	900
	National Power Supply TH #1-2 (Nov)	2x135	National Power Supply TH #1-2 (Nov)	2x135
	My Khot TH #1-3 (Jan, Apr, Jul)	3x123		
	Hongsa TH #3 (Mar)	491	Hongsa TH #3 (Mar)	491
2017	Renewables	299.1	Renewables	534.6
	Cogeneration	721	Cogeneration	900
	National Power Supply TH #3-4 (Mar)	2x135	National Power Supply TH #3-4 (Mar)	2x135
	LamTa Khong Pumped Storage #3-4	500	LamTa Khong Pumped Storage #3-4	500
	Nam-Ngum 3 (Jan)	440		
2018	Renewables	186.5	Renewables	389.8
	Cogeneration	723	Cogeneration	720.9
			Mae Moh TH #4-7 (Replaced) (600MW)	
	Nam-Ngiep 1 (Jan)	269	Nam-Ngiep 1 (Jan)	269
	Xe-Pian (Jan)	390	Xe-Pian (Aug)	390
2019	Renewables	183	Renewables	496.4
	Cogeneration	457	Cogeneration	724.8
	EGAT Coal-Fired TH #1 (Jun)	800	EGAT Coal-Fired TH #1 (Jun)	800
	Xaiyaburi (Jan)	1,220	Xaiyaburi (Oct)	1,220

Comparison of Thailand Power Development Plans
(2020-2026)

Year	PDP2010 Revision 2 (NPEC 27 Apr 2011)		PDP2010 Revision 3 (NPEC 8 Jun 2012)	
	Projects	**MW**	**Projects**	**MW**
2020	Renewables	193	Renewables	442.2
	Cogeneration	2	Cogeneration	90
	New Gas-fired Power Plant #1	800		
	Power Purchase	600		
2021	Renewables	134	Renewables	441.5
	Cogeneration	2	Cogeneration	180.9
			New Gas-fired Power Plant	900
	EGAT Coal-Fired TH #2	800	Bang Pakong CC #1 (Replaced)	900
	Power Purchase	600	Power Purchase	300
2022	Renewables	309.5	Renewables	288.5
	Cogeneration	367	Cogeneration	184.8
	New Gas-fired Power Plant #2-3	2x800	New Gas-fired Power Plant	900
			Bang Pakong CC #2 (Replaced)	900
			EGAT Coal-Fired TH #2	800
	Power Purchase	600	Power Purchase	300
2023	Renewables	148	Renewables	280.4
	Cogeneration	361	Cogeneration	180
	New Gas-fired Power Plant # 4-7	4x800	New Gas-fired Power Plant	900
	EGAT Coal-Fired TH #3	800	South Bangkok CC #1-2 (Replaced)	2x900
	EGAT Nuclear Power Plant #1	1,000		
	Power Purchase	600	Power Purchase	300
2024	Renewables	158	Renewables	275.4
	Cogeneration	362	Cogeneration	180.9
	EGAT Nuclear Power Plant #2	1,000	New Gas-fired Power Plant	900
			South Bangkok CC #3 (Replaced)	900
			Bang Pakong CC #3 (Replaced)	900
	Power Purchase	600	Power Purchase	300
2025	Renewables	165	Renewables	259.5
	Cogeneration	367	Cogeneration	184.8
	New Gas-fired Power Plant # 8-9	2x800	New Gas-fired Power Plant	900
			EGAT Coal-Fired TH #3	800
			Bang Pakong CC #4 (Replaced)	900
	Power Purchase	600	Power Purchase	300
2026	Renewables	160	Renewables	254.4
	Cogeneration	362	Cogeneration	180
	New Gas-fired Power Plant #10-11	2x800	New Gas-fired Power Plant	900
	EGAT Coal-Fired TH #4-5	2x800	EGAT Nuclear Power Plant #1	1,000
			Bang Pakong CC #5 (Replaced)	900
	Power Purchase	600	Power Purchase	300

Comparison of Thailand Power Development Plans
(2027-2030)

Year	PDP2010 Revision 2 (NPEC 27 Apr 2011)		PDP2010 Revision 3 (NPEC 8 Jun 2012)	
	Projects	**MW**	**Projects**	**MW**
2027	Renewables	241	Renewables	315.2
	Cogeneration	361	Cogeneration	180.9
	EGAT Nuclear Power Plant #3	1,000	EGAT Nuclear Power Plant #2	1,000
			Wang Noi CC #1 (Replaced)	900
			Bang Pakong CC #6 (Replaced)	900
	Power Purchase	600	Power Purchase	300
2028	Renewables	184	Renewables	269.5
	Cogeneration	365	Cogeneration	4.8
	EGAT Coal-Fired TH #6-7	2x800	EGAT Coal-Fired TH #4	800
	New Gas-fired Power Plant #12-13	2x800	Wang Noi CC #2-3 (Replaced)	2x900
	EGAT Nuclear Power Plant #4	1,000	Gas Turbine #1	250
	Power Purchase	600	Power Purchase	300
2029	Renewables	209	Renewables	266.1
	Cogeneration	360	South Bangkok CC #4 (Replaced)	900
	EGAT Coal-Fired TH #8	800	EGAT New Combined Cycle Power Plant	900
	New Gas-fired Power Plant #14	800	Gas Turbine #2	250
	Power Purchase	600	Power Purchase	300
2030	Renewables	226.5	Renewables	294
	Cogeneration	360	Cogeneration	0.9
	EGAT Coal-Fired TH #9	800	EGAT New Combined Cycle Power Plant	900
	New Gas-fired Power Plant #15	800	Gas Turbine #3	250
	Power Purchase	600	Power Purchase	300

Projection of Generating Capacity by Power Plant Types

PDP 2010 : Revision 3

Plant Types			Unit	Year																	
				2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Renewable Energy		- EGAT	MW	3,459	3,477	3,483	3,552	3,557	4,082	4,105	4,159	4,165	4,168	4,169	4,182	4,185	4,188	4,190	4,252	4,270	4,284	4,325
			%	10.1	9.5	8.8	8.2	7.8	8.6	8.5	8.1	8.3	7.9	7.4	7.4	7.0	6.9	6.6	6.5	6.4	6.2	6.1
		- SPP	MW	966	1,215	1,634	2,003	2,638	2,791	2,791	2,851	2,888	2,888	2,888	2,888	2,838	2,782	2,777	2,770	2,667	2,667	2,647
			%	2.8	3.3	4.1	4.6	5.8	5.9	5.8	5.6	5.7	5.5	5.1	5.1	4.8	4.6	4.3	4.3	4.0	3.9	3.8
		- VSPP	MW	759	1,531	1,712	1,795	1,875	1,951	2,038	2,110	2,191	2,270	2,338	2,384	2,438	2,474	2,507	2,540	2,571	2,603	2,636
			%	2.2	4.2	4.3	4.2	4.1	4.1	4.2	4.1	4.4	4.3	4.2	4.2	4.1	4.1	3.9	3.9	3.8	3.8	3.7
		- Plan RE	MW	-	-	60	290	560	840	1,120	1,430	1,740	2,100	2,320	2,540	2,760	2,980	3,200	3,420	3,640	3,860	4,080
			%	-	-	0.2	0.7	1.2	1.8	2.3	2.8	3.5	4.0	4.1	4.5	4.6	4.9	5.0	5.3	5.4	5.6	5.8
		- Import	MW	2,105	2,105	2,105	2,105	2,105	2,105	2,764	3,984	3,984	4,284	4,584	4,884	5,184	5,484	5,784	6,084	6,384	6,684	6,858
			%	6.1	5.8	5.3	4.9	4.6	4.5	5.7	7.8	7.9	8.1	8.2	8.6	8.7	9.1	9.0	9.4	9.5	9.6	9.7
		Subtotal	**MW**	**7,288**	**8,327**	**8,993**	**9,745**	**10,734**	**11,768**	**12,817**	**14,534**	**14,968**	**15,709**	**16,298**	**16,878**	**17,404**	**17,907**	**18,457**	**19,065**	**19,532**	**20,098**	**20,546**
			%	**21**	**23**	**23**	**23**	**24**	**25**	**27**	**28**	**30**	**30**	**29**	**30**	**29**	**30**	**29**	**29**	**29**	**29**	**29**
Combined Cycle		- EGAT	MW	6,866	6,866	8,417	9,317	9,317	9,003	8,364	8,364	7,723	8,623	9,523	8,851	10,651	11,551	12,451	14,251	16,051	17,851	18,751
			%	20.0	18.8	21.3	21.6	20.5	19.1	17.3	16.3	15.3	16.3	17.0	15.6	17.9	19.1	19.5	21.9	24.0	25.7	26.5
		- IPP	MW	9,225	9,225	10,825	11,250	11,472	11,472	11,472	11,472	10,772	11,672	12,572	13,122	14,022	14,222	15,122	13,081	12,368	12,368	12,368
			%	26.9	25.3	27.4	26.1	25.2	24.3	23.7	22.3	21.4	22.1	22.4	23.1	23.6	23.5	23.6	20.1	18.5	17.8	17.5
		Subtotal	**MW**	**16,091**	**16,091**	**19,242**	**20,567**	**20,789**	**20,475**	**19,836**	**19,836**	**18,495**	**20,295**	**22,095**	**21,973**	**24,673**	**25,773**	**27,573**	**27,332**	**28,419**	**30,219**	**31,119**
			%	**47**	**44**	**49**	**48**	**46**	**43**	**41**	**39**	**37**	**38**	**39**	**39**	**41**	**43**	**43**	**42**	**42**	**44**	**44**
Cogeneration		- SPP	**MW**	**2,340**	**3,510**	**3,780**	**4,320**	**4,770**	**5,490**	**6,169**	**6,704**	**6,614**	**6,594**	**6,624**	**6,763**	**6,313**	**6,313**	**6,493**	**6,673**	**6,673**	**6,673**	**6,673**
			%	6.8	9.6	9.6	10.0	10.5	11.6	12.8	13.1	13.1	12.5	11.8	11.9	10.6	10.4	10.1	10.3	10.0	9.6	9.4
		- VSPP	MW	27	43	59	76	96	96	97	102	102	103	108	108	109	113	113	114	119	119	120
			%	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		Subtotal	**MW**	**2,367**	**3,553**	**3,839**	**4,396**	**4,866**	**5,586**	**6,266**	**6,806**	**6,716**	**6,697**	**6,732**	**6,871**	**6,422**	**6,426**	**6,606**	**6,787**	**6,792**	**6,792**	**6,793**
			%	**7**	**10**	**10**	**10**	**11**	**12**	**13**	**13**	**13**	**13**	**12**	**12**	**11**	**11**	**10**	**10**	**10**	**10**	**10**
Thermal	**Gas Turbine/Diesel**	- EGAT	MW	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	254	504	754
			%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	1.1
	Heavy Oil	- EGAT	MW	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315
			%	0.9	0.9	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Heavy Oil/Natural Gas	- EGAT	MW	2,204	2,204	1,152	1,152	1,152	1,152	1,152	1,152	1,152	1,152	1,152	1,152	1,152	1,152	1,152	576	-	-	-
			%	6.4	6.0	2.9	2.7	2.5	2.4	2.4	2.2	2.3	2.2	2.1	2.0	1.9	1.9	1.8	0.9	-	-	-
		- IPP	MW	1,510	1,510	1,510	1,510	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	-	-	-	-	-	-
			%	4.4	4.1	3.8	3.5	3.2	3.1	3.0	2.8	2.9	2.7	2.6	2.5	2.4	-	-	-	-	-	-
	Lignite	- EGAT	MW	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	1,910	1,640
			%	6.4	6.0	5.5	5.1	4.8	4.6	4.5	4.2	4.3	4.1	3.9	3.8	3.7	3.6	3.4	3.4	3.3	2.8	2.3
		- Lao PDR	MW	-	-	-	982	1,473	1,473	1,473	1,473	1,473	1,473	1,473	1,473	1,473	1,473	1,473	1,473	1,473	1,473	1,473
			%	-	-	-	2.3	3.2	3.1	3.1	2.9	2.9	2.8	2.6	2.6	2.5	2.4	2.3	2.3	2.2	2.1	2.1
	Coal	- EGAT	MW	-	-	-	-	-	-	-	-	800	800	800	1,600	1,600	2,400	2,400	2,400	3,200	3,200	3,200
			%	-	-	-	-	-	-	-	-	1.6	1.6	1.5	2.9	2.8	2.7	4.0	3.8	3.7	4.8	4.6	4.5
		- IPP	MW	2,007	2,007	2,007	2,007	2,277	2,547	2,547	2,547	2,547	2,547	2,547	2,547	2,547	2,547	2,547	2,547	2,547	2,547	2,547
			%	5.9	5.5	5.1	4.7	5.0	5.4	5.3	5.0	5.1	4.8	4.5	4.5	4.3	4.2	4.0	3.9	3.8	3.7	3.6
	Nuclear	- EGAT	MW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,000	2,000	2,000	2,000	2,000
			%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	3.1	3.0	2.9	2.8
		Subtotal	**MW**	**8,220**	**8,220**	**7,168**	**8,150**	**8,841**	**9,111**	**9,111**	**9,911**	**9,911**	**9,911**	**10,711**	**10,711**	**10,711**	**10,071**	**11,071**	**11,495**	**11,969**	**11,949**	**11,929**
			%	**24**	**23**	**18**	**19**	**19**	**19**	**19**	**19**	**20**	**19**	**19**	**19**	**18**	**17**	**17**	**18**	**18**	**17**	**17**
EGAT - TNB , HVDC			**MW**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**
			%	**0.9**	**0.8**	**0.8**	**0.7**	**0.7**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.4**	**0.4**
Total			**MW**	**34,265**	**36,491**	**39,542**	**43,157**	**45,530**	**47,240**	**48,329**	**51,386**	**50,389**	**52,912**	**56,135**	**56,732**	**59,509**	**60,477**	**64,007**	**64,979**	**67,012**	**69,358**	**70,686**
			%	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Projection of Energy Generation by Fuel Types

PDP 2010 : Revision 3

Fuel Types		Unit	Year																	
			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Renewable Energy	- Domestic	GWh	13,843	14,823	14,709	16,322	17,620	20,080	21,284	22,378	23,472	24,441	24,937	25,367	25,587	25,685	25,814	26,184	26,343	26,298	26,673
		%	7.9	8.1	7.7	8.1	8.4	9.1	9.3	9.5	9.5	9.6	9.4	9.2	9.0	8.7	8.5	8.3	8.1	7.8	7.7
	- Import	GWh	12,605	12,306	11,527	11,073	12,346	11,120	13,269	15,959	19,990	21,530	23,070	24,040	26,150	27,689	29,229	30,769	32,309	33,279	34,205
		%	7.2	6.7	6.0	5.5	5.9	5.1	5.8	6.8	8.1	8.4	8.7	8.8	9.2	9.4	9.6	9.8	9.9	9.9	9.9
	Subtotal	**GWh**	**26,448**	**27,130**	**26,237**	**27,395**	**29,967**	**31,200**	**34,553**	**38,337**	**43,463**	**45,971**	**48,007**	**49,407**	**51,737**	**53,374**	**55,043**	**56,953**	**58,652**	**59,577**	**60,878**
		%	15.1	14.8	13.7	13.7	14.2	14.2	15.2	16.2	17.7	18.0	18.1	18.0	18.2	18.1	18.1	18.1	18.0	17.7	17.6
Natural Gas / LNG	- EGAT/IPP	GWh	102,387	103,846	108,810	109,754	106,569	104,598	104,573	101,125	101,624	108,483	112,351	118,087	126,606	132,603	133,073	132,997	131,500	143,147	154,873
		%	58.5	56.7	56.8	54.7	50.6	47.6	45.9	42.8	41.3	42.4	42.4	43.0	44.5	45.0	43.7	42.2	40.4	42.6	44.7
		MMCFD	2,166	2,178	2,217	2,211	2,102	2,051	2,039	1,978	1,974	2,096	2,173	2,279	2,435	2,551	2,568	2,576	2,539	2,763	2,975
	- SPP/VSPP	GWh	10,627	17,350	21,250	24,823	28,756	32,859	37,475	42,475	43,789	43,971	44,115	43,917	43,865	44,225	45,013	45,751	46,286	46,286	46,288
		%	6.1	9.5	11.1	12.4	13.7	15.0	16.5	18.0	17.8	17.2	16.6	16.0	15.4	15.0	14.8	14.5	14.2	13.8	13.4
	Subtotal	**GWh**	**113,013**	**121,197**	**130,060**	**134,577**	**135,325**	**137,456**	**142,048**	**143,600**	**145,412**	**152,454**	**156,466**	**162,004**	**170,470**	**176,828**	**178,086**	**178,748**	**177,786**	**189,434**	**201,161**
		%	64.6	66.1	67.9	67.1	64.3	62.6	62.4	60.8	59.1	59.6	59.0	59.0	59.9	60.1	58.5	56.8	54.6	56.4	58.0
		MMCFD	**2,166**	**2,178**	**2,217**	**2,211**	**2,102**	**2,051**	**2,039**	**1,978**	**1,974**	**2,096**	**2,173**	**2,279**	**2,435**	**2,551**	**2,568**	**2,576**	**2,539**	**2,763**	**2,975**
Import Coal	- EGAT/IPP	**GWh**	14,429	14,350	15,274	15,004	15,936	19,002	19,356	22,699	25,446	25,403	28,804	31,492	31,625	34,893	37,570	37,389	43,623	43,616	43,693
		%	8.2	7.8	8.0	7.5	7.6	8.7	8.5	9.6	10.3	9.9	10.9	11.5	11.1	11.9	12.3	11.9	13.4	13.0	12.6
		MTons	6	6	6	6	6	7	7	9	10	10	11	12	12	13	14	14	17	17	17
	- SPP	**GWh**	2,168	2,123	2,055	2,027	2,132	2,589	2,528	2,523	2,523	2,523	2,523	2,523	1,472	158	-	-	-	-	-
		%	1.2	1.2	1.1	1.0	1.0	1.2	1.1	1.1	1.0	1.0	1.0	0.9	0.5	0.1	-	-	-	-	-
	Subtotal	**GWh**	**16,596**	**16,473**	**17,328**	**17,032**	**18,068**	**21,591**	**21,884**	**25,221**	**27,969**	**27,926**	**31,326**	**34,015**	**33,097**	**35,051**	**37,570**	**37,389**	**43,623**	**43,616**	**43,693**
		%	9.5	9.0	9.0	8.5	8.6	9.8	9.6	10.7	11.4	10.9	11.8	12.4	11.6	11.9	12.3	11.9	13.4	13.0	12.6
		MTons	**5.66**	**5.63**	**6.07**	**5.89**	**6.32**	**7.35**	**7.49**	**8.74**	**9.77**	**9.75**	**11.02**	**12.03**	**12.08**	**13.31**	**14.31**	**14.24**	**16.57**	**16.57**	**16.60**
Lignite	- EGAT	GWh	16,749	16,696	16,736	16,738	16,614	17,120	17,030	17,024	17,077	17,031	17,031	17,039	17,090	17,041	17,037	17,019	17,078	14,910	12,786
		%	9.6	9.1	8.7	8.3	7.9	7.8	7.5	7.2	6.9	6.7	6.4	6.2	6.0	5.8	5.6	5.4	5.3	4.4	3.7
		MTons	16	16	16	16	16	16	14	14	14	14	14	14	14	14	14	14	14	12	10
	- Lao PDR	GWh	-	-	-	4,612	10,292	11,253	11,252	11,248	11,281	11,249	11,249	11,247	11,283	11,254	11,252	11,236	11,278	11,249	11,245
		%	-	-	-	2.3	4.9	5.1	4.9	4.8	4.6	4.4	4.2	4.1	4.0	3.8	3.7	3.6	3.5	3.4	3.2
	Subtotal	**GWh**	**16,749**	**16,696**	**16,736**	**21,349**	**26,906**	**28,373**	**28,282**	**28,273**	**28,358**	**28,280**	**28,281**	**28,286**	**28,374**	**28,296**	**28,289**	**28,255**	**28,356**	**26,159**	**24,031**
		%	9.6	9.1	8.7	10.6	12.8	12.9	12.4	12.0	11.5	11.1	10.7	10.3	10.0	9.6	9.3	9.0	8.7	7.8	6.9
		MTons	**16.04**	**15.99**	**16.03**	**16.03**	**15.92**	**16.00**	**13.81**	**14.02**	**14.16**	**14.12**	**14.12**	**14.13**	**13.87**	**13.74**	**13.62**	**13.61**	**13.66**	**11.84**	**9.78**
Nuclear	- EGAT	**GWh**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**4,600**	**12,620**	**16,090**	**16,042**	**16,046**
		%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	4.0	4.9	4.8	4.6
		Tons	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**9**	**25**	**32**	**32**	**32**
Heavy Oil		**GWh**	**1,944**	**1,366**	**876**	**168**	**166**	**32**	**32**	**16**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		%	1.11	0.75	0.46	0.08	0.08	0.01	0.01	0.01	-	-	-	-	-	-	-	-	-	-	-
		MLiters	**499.43**	**353.32**	**222.08**	**36.18**	**36.06**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Diesel	- EGAT	**GWh**	**130**	**133**	**172**	**75**	**55**	**26**	**23**	**23**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**
		%	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		MLiters	**29.10**	**31.86**	**40.60**	**20.92**	**13.47**	**7.00**	**6.30**	**6.30**	**5.61**	**5.60**	**5.60**	**5.60**	**5.61**	**5.60**	**5.60**	**5.60**	**5.61**	**5.60**	**5.60**
EGAT - TNB , HVDC		**GWh**	**209**	**290**	**221**	**131**	**132**	**939**	**939**	**939**	**941**	**939**	**939**	**939**	**941**	**939**	**939**	**938**	**941**	**938**	**938**
		%	0.1	0.2	0.1	0.1	0.1	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total		**GWh**	**175,089**	**183,283**	**191,630**	**200,726**	**210,619**	**219,616**	**227,760**	**236,408**	**246,164**	**255,591**	**265,039**	**274,672**	**284,640**	**294,508**	**304,548**	**314,925**	**325,470**	**335,787**	**346,767**