

Power Development and Future Plan

To cope with the forecasted increasing power demand, the Power Development Plan (PDP) was revised by the Ministry of Energy as PDP 2010: third revision (2012-2030). The themes of PDP 2010 substantially focus on the adequacy of power system to enhance various infrastructure development projects in accordance with the National Economic and Social Development Plan. The PDP 2010: third revision (2012-2030) is also in line with the Alternative Energy Development Plan (AEDP) (2012-2021) and the 20-Year Energy Efficiency Development Plan (EEDP) (2011-2030) approved by the National Energy Policy Council (NEPC) on November 30, 2011 and endorsed by the Cabinet on December 27, 2011.

Important issues of the PDP 2010: third revision (2012-2030) are as follows:

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

- 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) on November 29, 2011, covering the economic stimulation policies and flooding effects at the end of 2011.
- The approved 20-Year Energy Efficiency Development Plan (EEDP) (2011-2030) proposed by the Ministry of Energy.

2. Energy supply security takes into account the fuel diversification and appropriate power reserve margin level.

3. Clean energy and efficient utilization, including the Alternative Energy Development Plan (AEDP) (2012-2021), the 20-Year Energy Efficiency Development Plan (EEDP) (2011-2030), and cogeneration system are to be promoted.

The PDP 2010: third revision (2012-2030) was approved by the National Energy Policy Council (NEPC) on June 8, 2012 and endorsed by the Cabinet on June 19, 2012. According to the PDP 2010: third revision (2012-2030), EGAT's new power projects during 2013-2019 are as follows:





EGAT's Power Projects

The following new power plants of EGAT with a total contractual capacity of 3,899.9 MW will be constructed during 2013-2019.

Project	Location (Province)	Fuel	Contractual Capacity (MW)	Scheduled Commercial Operational Date (SCOD)
1. Wang Noi Combined Cycle Block 4	Ayutthaya	Natural Gas	768.7	Apr. 2014
2. Chana Combined Cycle Block 2	Songkhla	Natural Gas	782.2	Apr. 2014
3. North Bangkok Combined Cycle Block 2	Nonthaburi	Natural Gas	848.3	Oct. 2015
4. Krabi Clean Coal Thermal Power Project	Krabi	Coal	800.0	Jun. 2019
5. Renewable Energy Power Projects	Several sites	Wind, solar, hydro	700.7	2013-2019
Total			3,899.9	

Power Purchase

• Independent Power Producer (IPP) Projects

During 2013–2019, a total power supply of 4,640 MW will be purchased from the 3 existing IPP projects which is targeted to start commissioning during 2014-2017 and from a new power plant proposed by the Electricity Generating Public Company Limited (EGCO) and approved by the National Energy Policy Committee (NEPC) to replace the power plant of which the supply contract will expire in 2016.

Project	Location (Province)	Fuel	Contractual Capacity (MW)	Scheduled Commercial Operational Date (SCOD)
1. Gulf JP NS Co., Ltd. Blocks 1-2	Saraburi	Natural Gas	1,600	Jun. - Dec. 2014
2. Gulf JP UT Co., Ltd. Blocks 1-2	Ayutthaya	Natural Gas	1,600	Jun. - Dec. 2015
3. Electricity Generating Plc.	Nakhon Si Thammarat	Natural Gas	900	Jul. 2016
4. National Power Supply Co., Ltd. Unit 1-4	Chachoengsao	Coal	540	Nov. 2016 - Mar. 2017
Total			4,640	

• Small Power Producer (SPP) Projects

The PDP 2010: third revision (2013-2030) includes 6,655 MW of power supply to be purchased during 2013-2019 from small power producers (SPPs) consisting of 4,770 MW of power from firm energy contract SPPs using cogeneration system and 1,885 MW from SPPs using renewable energy.

• Power Imported from Neighboring Countries

Currently, EGAT imports electricity with a total capacity of 2,111 MW from neighboring countries under 5 hydroelectric power projects. According to the PDP 2010: third revision (2013-2030), additional power supply of 3,316 MW will be purchased from neighboring countries during 2013-2019. In this connection, two projects of 2,693 MW have reached a power purchase agreement (PPA), and a Tariff Memorandum of Understanding (Tariff MOU) has been signed for another two projects of a total capacity of 623 MW.

Project	Fuel	Contractual Capacity (MW)	Scheduled Commercial Operational Date (SCOD)
PPA-Signed Projects (under construction)			
1. Hong Sa Unit 1-3	Lignite	1,473	Jun.- Nov. 2015, Mar. 2016
2. Xayaburi	Hydro	1,220	Oct. 2019
Tariff MOU-Signed Projects			
3. Xe-Pian Xe-Namnoy	Hydro	354	Aug. 2018
4. Nam Ngiep 1	Hydro	269	Jan. 2018
Total		3,316	

Power Project Development

1. Construction of New Power Plants

1.1 Chana Combined Cycle Power Plant Block 2

The power project of a total capacity of 800 MW using natural gas as fuel is located in the area of the existing Chana Power Plant, Chana District, Songkhla Province. The project received approval from the Cabinet on February 22, 2011 and approval on environmental impact assessment from the National Environment Board on May 4, 2011. This project has an investment cost of 22,434 million Baht. The constructor is the Consortium of Siemens Aktiengesellschaft, Siemens Limited, and Marubeni Corporation. The construction started in December 2011, and it is expected to complete in April 2014.



Chana Combined Cycle Power Plant Block 2

1.2 Wang Noi Combined Cycle Power Plant Block 4

The power project of 800 MW capacity using natural gas as fuel is located in the area of the existing Wang Noi Power Plant, Wang Noi District, Ayutthaya Province. The project was approved by the cabinet on February 22, 2011, with environmental impact assessment approved by the National Environment Board on September 27, 2010. This project has an investment cost of 21,747 million Baht. The constructor is the Consortium of Siemens Aktiengesellschaft, Siemens Limited, and Marubeni Corporation. The construction started in December 2011, and it is expected to complete in April 2014.



Wang Noi Combined Cycle Power Plant Block 4

1.3 Preparation for the North Bangkok Combined Cycle Power Plant Block 2

As the power demand of the country has become higher than the power forecast which was used as the basis in the preparation of the PDP 2010: third revision (2012-2030) coupled with the delay in Independent Power Producer projects (IPPs) and the renewable energy projects of the Small Power Producers (SPPs-Renewable) resulting in an inability to supply energy to the system as planned, the power reserve in 2014 will be 9.7 percent lower than the standard level. In an attempt to solve this problem as a matter of emergency, the project of North Bangkok Combined Cycle Power Plant Block 2 with a total capacity of 800 MW and to be located in the northern area of the existing North Bangkok power plant was proposed to the Cabinet. The project received the approval of the Cabinet on November 30, 2010 and is expected to be able to supply power to the commercial system by 2015.



North Bangkok Combined Cycle Power Plant Block 2

2. Renewable Energy Power Plant Development

In response to the strategy in renewable energy development (2008-2013) of the Ministry of Energy and the condition in the renewable portfolio standard (RPS), 5 percent of renewable energy power plant development would be conducted in 2011. There are the 89.7 MW renewable energy power plant projects which cost a total of 5,948 million Baht consisting of the following.

Renewable Energy Power Project	Location	Capacity (MW)	Scheduled Commercial Operational Date (SCOD)
Naresuan Dam	Baan Had Yai Sub-district, Phrom Phiram District, Phitsanulok Province	1x8 = 8	Apr. 2012
Khun Dan Prakanchol Dam	Hin Tang Sub-district, Mueang District, Nakhon Nayok Province	1x10 = 10	Jun. 2013
Mae Klong Dam	Muang Chum Sub-district, Tha Muang District, Kanchanaburi Province	2x6 = 12	Jul. 2013
Pasak Jolasid Dam	Phatthana Nikhom District, Lop Buri Province	1x6.7 = 6.7	Dec. 2013
Kwae Noi Bamrungdan Dam	Kan Chong Sub-district, Wat Bot District, Phitsanulok Province	2x15 = 30	Jun. 2015
Lam Ta Khong Wind Turbine Power Plant, Phase 2	Klong Pai Sub-district, Sikhio District & Nong Sarai Sub-district, Pak Chong District, Nakhon Ratchasima Province	12x1.5 = 18	2014 (approved by the Cabinet and awaiting approval from the National Environment Board)
Solar Power Plant	Na Hu Kwang Sub-district, Tab Sakae District, Prachuap khiri khan Province	1x5 = 5	2014 (during the designing process)

3. Renovation of the Existing Hydropower Plants

EGAT has been implementing the renovation projects with the following hydropower generators which have already been used for more than 30 years to extend their life cycle and to increase their performance efficiency for the readiness and stability in power generation and reduction of the maintenance cost.

Hydropower plant	Location	Capacity (MW)	Scheduled Commercial Operational Date (SCOD)
Ubol Ratana Dam	Khon Kaen Province	3x8.4 = 25.2	Unit 1: Dec. 2012 Unit 2: Feb. 2016 Unit 3: Feb. 2016
Nam Phung Dam	Sakon Nakhon Province	2x3 = 6	Unit 1: Jul. 2015 Unit 2: Jul. 2015
Sirindhorn Dam	Ubon Ratchathani Province	3x12 = 36	Unit 1: May 2015 Unit 2: May 2015 Unit 3: May 2015
Chulabhorn Dam	Chaiyaphum Province	2x20 = 40	Unit 1: Feb. 2015 Unit 2: Feb. 2015
Kaeng Krachan Dam	Petchaburi Province	1x17.5 = 17.5	March 31, 2010

4. Clean Coal Technology Power Project

The Clean Coal Technology Power Project, an extension project of Krabi Power Plant, is located in the area of existing Krabi Power Plant, Klong Kanan Sub-district, Nuea khlong District, Krabi Province. Being a power plant of a total capacity of 800 MW which has been incorporated in the PDP 2010: third revision (2013-2030) using imported coal as fuel, the project is expected to be completed by 2019.

The Environmental Health Impact Assessment (EHIA) of the power plant and the loading pier construction for this project have been conducted by a consultant for 12 months (May 2012 - May 2013).

5. Replacement of Mae Moh Power Plant, Units 4-7

In response to EGAT's policy in increasing the efficiency in power generation while decreasing the production cost, a feasibility study was conducted, revealing that it is appropriate to construct a new lignite power plant of a total capacity of 600 MW to replace the existing Mae Moh Power Plant, Units 4-7. The result of the feasibility study was submitted to the Permanent Secretary of Energy on December 20, 2012 to be further submitted for approval of the Cabinet. It is expected that the new units will be able to supply power to the commercial system in January 2018. Meanwhile, the existing Mae Moh Power Plant, Units 4-7 have continued their normal operation during the construction of the new power plants.

6. Nuclear Power Plant Project

On May 3, 2011, the Cabinet endorsed the resolution of the National Energy Policy Committee (NEPC) to postpone the development of Nuclear Power Plant for 3 years from the original schedule of 2020 to 2023 due to the radioactive leak incident of the nuclear power plant in Japan.

Transmission System Development and Expansion Projects

Transmission system planning and development is one of EGAT's main responsibilities and has been continuously conducted to cope with the rising demand in energy and to efficiently interconnect the domestic power plants and the power plants in the neighboring countries with the EGAT's power system to ensure the security and the reliability in the power system. Furthermore, in preparing for the incoming ASEAN Economic Community (AEC) in the year 2015, a study on ASEAN regional electric interconnection system is being conducted by EGAT.

Major transmission system development and expansion projects are as follows:

• On-going Transmission System Projects

1. Bulk Power Supply for the Greater Bangkok Area Project, Phase 2 (BSB2)

The BSB2 is a successive project of the BSB1. BSB2 comprises several subprojects involving the construction of new transmission lines and the upgrade of existing lines totaling 89.025 circuit-kilometers, installation of transformers totaling 9,600 MVA and voltage control equipment totaling 384.0 MVar. This project has an investment cost of 9,170 million Baht, and its scheduled completion date is in 2015.

2. 500 kV Transmission Line Project for Power Purchase from IPP Projects in the Eastern Area

This transmission system project involves the construction of main transmission grid system to receive electric power from the IPP projects, which are situated in the eastern region of Thailand (along the Gulf of Thailand). The project consists of the construction of 500 kV double-circuit lines, totaling approximately 159 kilometers distance, from Pluak Daeng Substation to Nong Chok-Wang Noi Junction (3rd and 4th circuits). The project will enhance system reliability and accommodate future grid connection of the new IPP projects. This 4,985 million Baht project was scheduled for operation in 2012. As of November 2012, the progress of the project was 99.54 percent.

3. Transmission System Expansion Project No. 11 (TS.11)

The TS.11, a successive scheme of the TS.10 consists of the construction of transmission lines totaling approximately 1,922.7 circuit-kilometers distance, 12 new substations, and the installation of transformers of 14,575 MVA and voltage control equipment of 1,741.2 MVar. As of November 2012, the overall project achieved 70.88 percent progress. The project has an investment cost of 23,000 million Baht, and it is scheduled to be online in 2014.

4. Transmission System Development for the Power Purchase from IPPs

This transmission system project is to accommodate the power purchase from 4 awarded IPP power plants, totaling installed capacity of approximately 4,400 MW. The investment cost of the project is 7,985 million Baht. Progress of each sub-projects is as follows:

- 4.1 As of November 2012, the transmission system sub-project for the power purchase from the Gheco-One Power Plant Project reached 95.32 percent progress and would be due in 2012.
- 4.2 The sub-project for the power purchase from the National Power Supply Power Plant Project is currently pending due to the power plant rescheduling.
- 4.3 The sub-project for the power purchase from the Gulf JP UT Power Plant Project is currently in the process of land acquisition. It is planned to be in service in 2014.
- 4.4 The sub-project for the power purchase from the Gulf JP NS Power Plant Project reached 20.97 percent progress. It is expected to be completed in 2014.

5. Transmission System Development for the Power Purchase from Theun Hinboun Expansion Hydroelectric Power Plant Project

This transmission system project is intended to accommodate the power purchase from Theun Hinboun Expansion Hydroelectric Power Plant Project in Lao PDR. The project includes the construction of a new 230 kV Nakhon Phanom 2 Substation and the transmission lines with a total distance of approximately 108 circuit-kilometers. This 665 million Baht project is scheduled to be completed in 2013. As of November 2012, the progress of the project was 96.77 percent.

6. Transmission System Development for the Power Purchase from Hongsa Lignite-Fired Thermal Power Plant Project

This project is intended to accommodate the power purchase from Hongsa Lignite-Fired Thermal Power Plant Project in Lao PDR, which will supply 1,473 MW of power to Thailand. This transmission system project consists of 500 kV transmission lines from Mae Moh 3 Substation





to Thai/Lao border (Nan Province) and other transmission system expansion in northern area with a total length of approximately 1,192 circuit-kilometers, a new substation, and the installation of transformers of 1,150 MVA. The scheduled completion date of this 21,160 million Baht project is in 2014. As of November 2012, the progress of the project was 3.13 percent.

7. Transmission System Development for the Power Purchase from Nam Ngum 3 and Nam Theun 1 Hydropower Plant Project

This transmission system project is to accommodate the power purchase from Nam Ngum 3 and Nam Theun 1 and/or other potential projects in Lao PDR. The project consists of the new 500 kV transmission lines Nam Phong 2 - Chaiyaphum 2 - Tha Tako connected to Ban Na Bong (Lao PDR) - Udon Thani 3 - Nam Phong 2 (currently operating at 230 kV) forming the 500 kV Ban Na Bong - Udon Thani 3 - Chaiyaphum 2 - Tha Tako line including 230 kV Chaiyaphum 2 - Chaiyaphum line with a total length of approximately 728 circuit-kilometers, a new substation, and installation of transformers of 4,000 MVA. This 17,550 million Baht project is now in the process of engineering design and is scheduled for operation in December 2016.

8. Transmission System Development in the Area of Loei, Nongbua Lamphu, and Khon Kaen Provinces for the Power Purchase from Lao PDR Project

This transmission system project is to receive the imported electric power from the Xayaburi Hydroelectric Power Plant Project in Lao PDR, which will supply power of 1,220 MW to Thailand. The project involves the construction of 500 kV double-circuit transmission lines from Thai/Lao Border in Loei Province to the new Loei 2 Substation and the new Khon Kaen 4 Substation, with the distance of approximately 52 and 173 kilometers, respectively. This project consists of 450 circuit-kilometers of transmission lines (only in Thai Territory), two new substations, and transformers of 1,000 MVA. This 12,060 million Baht project is planned for completion in 2017.

9. Transmission System Development for Chana Power Plant Block 2 Project

This project is a new transmission system project to receive 800 MW power from EGAT's new Chana Power Plant Project, Block 2. It comprises the construction of 230 kV Chana - Chana Junction - Khlong Ngae transmission system, with a total distance of 90 circuit-kilometers and the construction and expansion of 2 existing substations. As of November 2012, the progress of this 1,290.50 million Baht project was 3.48 percent, and the scheduled completion date of the project is in 2014.

10. Transmission System Development for Wang Noi Power Plant Block 4 Project

This project consists of the construction of 500 kV transmission lines from Wang Noi Power Plant, Block 4 - Wang Noi, with a total distance of 1.2 circuit-kilometers. As of November 2012, the 68 million Baht project had its progress of 19.27 percent and is planned to be completed in 2013.

11. Transmission System Expansion and Renovation Project, Phase 1: Substation

This project involves the improvement and/or replacement of aged substation equipment and control systems of 15 substations and other miscellaneous transmission system expansion. This 3,815 million Baht project is now in the process of engineering design and is scheduled for operation in 2015.

12. New Transmission System Interconnection Project between Su-ngai Kolok Substation (EGAT) and Rantau Panjang Substation (TNB)

This new interconnection system project is intended to strengthen energy security and reliability in Narathiwat Province by allowing for more imported power from Malaysia via the new transmission system and promote the cooperation between Thailand and Malaysia. The investment cost of the project is 535 million Baht. The project is planned to be in service in 2014 under the condition that the construction process can be commenced only after the Interconnection Agreement between EGAT and Tenaga Nasional Berhad (TNB) is achieved.

13. Main Transmission System Expansion Project for Power Purchase from SPP Cogeneration Power Plant, based on Request for Proposal 2010

This project involves the construction of new 230 kV lines linking Ayutthaya 4 and Si Kheu 2 Substations, improvement of related transmission lines with the distance of 482 circuit-kilometers, a new substation, the installation of transformers of 2,650 MVA, and other miscellaneous improvement of transmission system. The investment cost of the project is 10,610 million Baht. The project is now in the process of engineering design and is scheduled for operation in 2015.

14. Transmission System Expansion and Renovation Project, Phase 1: Transmission Line

This project involves the replacement and upgrade of aged transmission lines and their related equipment of 15 line routes and other miscellaneous transmission system expansion. This 9,850 million Baht project is planned to be completed in 2014-2016.





- **Transmission System Development Projects Submitted for Approval**

1. Transmission System Development in the area of Ubon Ratchathani, Yasothon, and Amnat Charoen Provinces for the Power Purchase from Lao PDR Project

This project is intended to accommodate the power purchase from Xepian-Xenamnoy Hydropower Plant Project which has the generating capacity of 3x130 MW and any additional power from other potential projects from the Southern Lao PDR. The project consists of the construction of new 500 kV transmission lines from Thai/Lao Border (Ubon Ratchathani) to Ubon Ratchathani 3 (new substation) with the distance of 90 km and renovation of the relevant transmission system with a total of 440 circuit-kilometer lines (in Thai territory only), a new substation, and installation of transformers of 400 MVA. This 7,300 million Baht project is expected to be completed in 2018.

2. Transmission System Expansion and Renovation Project, Phase 2

This project involves the renovation and expansion of 19 substations, 11 transmission lines, and other miscellaneous systems. The project has an investment cost of 21,900 million Baht and is scheduled to be completed in 2015-2017.

3. Transmission System Improvement Project in the Eastern Region for System Security Enhancement

The project consists of the construction of transmission line of 358 circuit-kilometers, 2 new substations, and installation of transformers of 4,000 MVA. This 12,000 million Baht project is scheduled for operation in 2019.

4. Bulk Power Supply for the Greater Bangkok Area, Phase 3 (BSB3)

The project comprises the construction and renovation of 27 circuit-kilometer transmission lines, 2 new substations, installation of 4,200 MVA transformers, and voltage control equipment of 288.0 MVA. The investment cost of this project is 12,100 million Baht. The project is planned to be in operation in 2018.

Research and Development

In 2012, EGAT instigated the research and development roadmap to be used as a framework in supporting and promoting the research for the development of generation system and power sales together with the environmental protection with participation of the community and the sustainable well-being of the community in the vicinity of EGAT's power plants. At present the roadmap is being reviewed before the implementation.

EGAT has continuously supported educational institutions, outside research institutions, and its own research and development unit in the research and development projects. In 2012, EGAT funded 33 new research and development projects which were 11 projects more than the preceding year. From 2006 up to present, 158 research and development projects have been funded by EGAT with the total amount of 1,001.26 million Baht.

In addition, EGAT in cooperation with the Thailand Research Fund has provided support on a co-funding basis. By this, more channels are provided for researchers to use their ability for the country development.

In 2012, 21 EGAT-funded projects were completed. Among these projects are the following:

• Development of Photovoltaic Floating Plant with Water Weighted Tracking System

Realizing that the development of photovoltaic floating plant with water weighted tracking system may help to solve the problem of installation space and believing that installation of photovoltaic plant on the water surface which has lower temperature than the ground surface will help to upgrade the efficiency of the system as the efficiency of the system will become lower with the higher temperature, a research and development on photovoltaic floating plant with water weighted tracking system was conducted. The aim of the project was to prepare a model of photovoltaic floating plant with water weighted tracking system and to study the impact of the system.

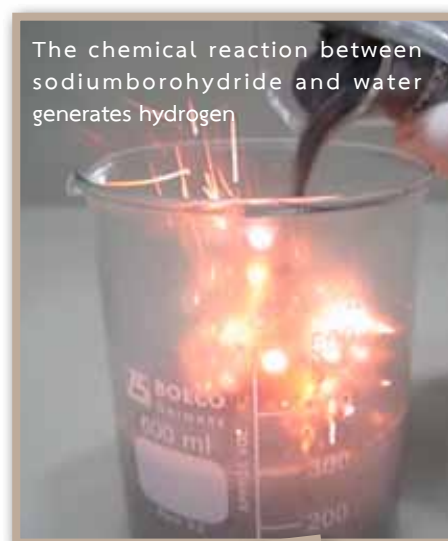
A floating plant equipped with 30.24 kW solar cells which could rotate in accordance with the direction of the sun together with weighted tracking equipment was designed and constructed by EGAT. The test of the photovoltaic floating plant was conducted at the reservoir of Srinagarind Dam in Kanchanaburi Province.

From the test, it was found that the solar cell using the tracking system could produce more electrical power than the fixed installation by 28 percent and had higher performance ratio of approximately 16.86 percent. Regarding the impact on the environment, there was no effect on the water quality in the installation area. The quality of the water in the reservoir still complied with the standard of surface water.

From the result of the research, EGAT was sure that the photovoltaic floating plant with water weighted tracking system could be effectively used in any other reservoirs, which could reduce the land use as an installation area as well as the construction cost.

• Development of Sodiumborohydride Production Processes for Hydrogen Generation and Storage Purposes

The EGAT-funded R&D project on development of sodiumborohydride production processes for hydrogen generation and storage purposes focuses on the study of the generation of hydrogen in the form of solvent and its storage at low pressure, which is safer and cheaper than the high-pressure storage. This study can lead to the development of a new source in energy production in the future.



The chemical reaction between sodiumborohydride and water generates hydrogen



The prototype of 1 kW-hydrogen generator developed in the laboratory



A model system developed in the laboratory could generate hydrogen from the chemical reaction between sodiumborohydride and water with the use of a mixture of cobalt and ruthenium-coated alumina which was also developed from this research as a reactor.

It was found that the sodiumborohydride could also be produced from sodium hydroxide at normal pressure. The result can be regarded as an early stage of finding appropriate methods to produce sodiumborohydride in a large amount using local raw materials.

This project is among several R&D projects supported by EGAT in an attempt to acquire new energy sources which are environmental-friendly and suitable for the community so as to provide them with another opportunity to learn and keep abreast of new technology.

• **The Study and Development of Boiler Water Circulation Control Process for Reliability and Optimization Case Study of Mae Moh Power Plant, Unit 11**

The project was a study and analysis of the appropriate rate of water circulation in a boiler by means of an inverter to control the frequency of the electricity supplied to the motor of the boiler water circulating pump (BWCP) to correspond to the circulation of the water in the boiler.

The result of the study of Mae Moh Power Plant, Unit 11, can be applied with other power plants to save the energy in the power production process.

• **Development of Condition-Based Maintenance for Calcium Carbonate Slurry Pump in Flue Gas Desulfurization System at Mae Moh Power Plant, Units 4-7**

Presently, two desulfurization systems are available at Mae Moh Power Plant, Units 4-7. A system is for use of Units 4-5, and the other is for Units 6-7. In the operation, calcium carbonate is supplied to the burning system to cause reaction with sulphur dioxide by the 24-hour operation of the calcium carbonate slurry pump to prevent the hardening of calcium in the 2 km long tube. It was found that the amount of 200 cubic meters per hour of calcium carbonate coming from the pump and returning to the storage was excessive and required a lot of energy. Moreover, motor pump trips occurred several times resulting in the reduced stability of the production system.

The result of the study revealed that the installation of an inverter and control equipment could save 1,613,529 kWh/year while reducing the carbon dioxide emission from the energy production process by 936 ton/year. Moreover, the motor pump trip problem could be reduced. The inverter could contribute to the soft start of the calcium carbonate slurry pump and reduce its maintenance cost

The result of the study can be applied with other calcium carbonate slurry pumps which have similar working process.

