Forecast a Shortage of Power in Thailand

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Abstract

Thailand may experiencing The Dark World within 12 years in the future as the UK has revealed that could be found Crisis of Dark World after power not enough for The entire country in this Winter.[1] Thailand has to plan Thailand's power capacity development within The National Energy Policy Committee (NEPC) The Cabinet in June 2007 assigned to the Ministry of Energy. Then Energy Policy and Planning Office (EPPO) and Electricity Generating Authority of Thailand (EGAT) have to plan Thailand's power capacity development known as "PDP 2007(Power Development Plan)" Since 2007-2021 .Then first thing should take to forecast a shortage of power in Thailand.

The Research found that Thailand may experiencing fuel shortages that will bring electricity such as Natural Gas in Gulf of Thailand will run out within 20 years, Oil prices higher, deterioration of the power plant about 5 plants. Current energy sources used to produce electricity to most of Thailand about. 66.19% of energy from natural gas, remaining list is lignite approximately 12.60% coal 8.39% water energy 5.43% bought for 3.06% furnace oil 2.66% renewable energy 1.64% diesel oil 0.03% [2] The forecast demand of electricity since 2008-2021 is found since 2016 get start problem about Thailand's capacity to produce electricity is 44,562.8 MW but domestic demand is 44,585.40 MW that mean capacity of energy is not enough for demand that lack approximately 295.6 MW. Thailand has to consider fuel source to bring electricity what be produced at lower costs to compete in international markets such as nuclear power plants, etc.

Keywords : PDP 2007(Power Development Plan)

INTRODUCTION

Currently important problem in the world has to face the same problem is the shortage of energy because the world's energy resources becoming to reduce. But demand of energy is growing every year and it seems not ever to be down it for Thailand also. Increasingly demand from economic growth in 2007. Including existence of economic by important country exports of Thailand is grew high and support to main of Thailand economic , expedite the disbursement of government budget and investment budget of state enterprises by incessantly , Interest rates low in the first half of the year. Confidence of consumers. And business began to recover in end of a year. And general inflation averaged 2.3 in first year.

In 2007 although affected by various factors quite severe such as oil prices high over record , Bath is continued higher , Situation of political uncertainty , Government policies regarding private investment that affected to consumer confidence and private investment cause domestic demand and investment in the private sector slowed down sharply in the first half of the year. But Thailand's overall economy is also stable. Growth from a more balanced and better signal recovery in end of a year. Such as Household spending has risen, Private investment in equipment and construction machinery increased, Government budget disbursements increased, important markets export can adapt better to new markets and help to offset traditional markets that slow down, Tourism industry to improve , Imports of capital goods started to recover in end of 2007 year and adjustment of power make the Thai economy to adapt to conditions better than expensive oil in the past. Energy sources used to power most of Thailand is approximately 66.19% of energy from natural gas. remaining list is lignite approximately 12.60% coal 8.39% water energy 5.43% bought for 3.06% furnace oil 2.66% renewable energy 1.64% diesel oil 0.03%

Now is the time to study the process of power in Thailand from now until the future for energy shortages.

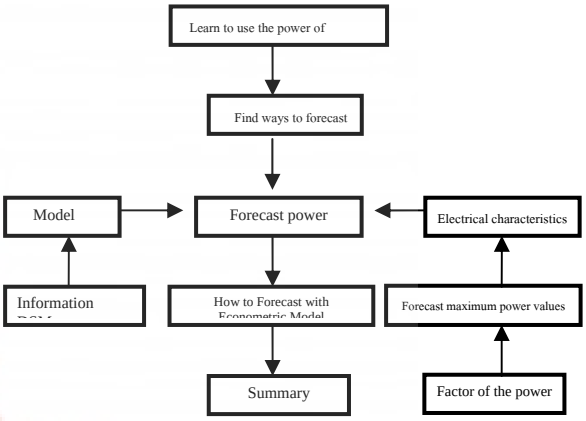


Figure 1. Chart of process research.

1. Development Plan of Thailand's electricity capacity

Thailand has to plan Thailand's power capacity development within The National Energy Policy Committee (NEPC) The Cabinet in June 2007 assigned to the Ministry of Energy. Then Energy Policy and Planning Office (EPPO) and Electricity Generating Authority of Thailand (EGAT) have to plan Thailand's power capacity development known as "PDP 2007(Power Development Plan)" Since 2007-2021. Management for this plan receive comments suggestions to adjust such as PTT Public Company Limited on 24 February 2007 and Thammasat University on 8 March 2007

1.1 Process of plan development, power generation capacity in Thailand

plan development, power generation capacity in Thailand first step is to forecast demand for electricity in Thailand in each year. Therefore, the Committee approved the forecast since 2007 – 2021 for instance

1. The scope of forecasting electricity demand.
2. Assumptions used in forecasting.
3. The management of electricity use.
4. Value forecast electricity demand.

1.1.1 The scope of forecasting electricity demand

- forecast since 2007 – 2021
- made a choice for 3 case in planning such as low case , base case , high case
- Forecast electricity demand of EGAT and total volume of electricity sales to neighboring countries. But excluding demand for electricity outside system such as amount of electricity small generators SPP and very small VSPP

1.1.2 Assumptions used in forecasting

- Assumptions used in forecasting to forecast demand for electricity in the future. Must set the rate of economic growth of Thailand's GDP . National Bureau of Economic Planning and National Economic and Social Development (NESDB) has been assessing economic trends during 2006-2021 to operating budget for electricity demand and the growth of GDP then use Development Plan No. 10,11, with a growth rate of 5.0 and 5.6 per year. However, to bring the Dubai crude oil price must not exceed 60 dollars/year for compared to the value of GDP as table 1 the case is divided into 3 levels, low case , base case , high case.

Table 1 estimates that the Thai economy likely to forecast demand for electricity

year	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
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

- Energy costs LOSS in export systems and distribution systems

In forecasting demand for electricity monthly release in January 2007 has set the following values LOSS

1. LOSS configured as 2.5 percent of total sales volume of electricity export systems of EGAT as a fixed proportion of the forecast period between the years 2007-2021.
2. LOSS configured as 3.64 percent of total volume of electricity export systems of Metropolitan Electricity Authority with a constant ratio over the forecast period between the years 2007-2021
3. LOSS configured as 5.0 percent. Electricity supply in all export systems of Provincial Electricity Authority to continue to contribute throughout the forecast period between the years 2007-2021.

1.1.2.1 The management of electricity use

Processing power required to manage the visibility and national consciousness in electricity savings from DSM programs in the past such as using electric equipment Air-Conditioner refrigerator must be number 5 etc. Set rates for electricity based on actual cost rate is determined by the TOU and TOD Elasticity decline in future. The Elasticity of Metropolitan Electricity Authority to set lower rates steady in the last 5 years and Elasticity of Provincial Electricity Authority to set the lower rate. In addition, The new project by the Ministry of Energy to change tube lamp to energy saving lamp. This new program is expected to reduce electricity demand by about 330 million units.

1.2 Amount of electricity purchased from VSPP

Because the government has a policy to promote electricity from renewable energy by VSPP that make VSPP increase in the future. Plus Metropolitan Electricity Authority and Provincial Electricity Authority to buy electricity from VSPP has been made of the amount of electricity Metropolitan Electricity Authority and Provincial Electricity is purchased from EGAT down and the amount of electricity VSPP expected sales to Metropolitan Electricity Authority and Provincial Electricity Authority is as follows

VSPP in county Metropolitan Electricity Authority is divided into 2 groups

1. Combined Heat and power (CHP), a group of power users type a large presence of MEA was near vertical pipeline natural gas to produce hot water or cold water, which can generate electricity out simultaneously. The amount of electricity produced will be used in factories making volume purchase power from MEA decreased and a plentiful supply of electricity to sell to the MEA then reducing the electricity purchased from EGAT. It is expected that in 2021 manufacturers of electric type CHP will reduce purchases of electricity from EGAT to 311 million units and will be able to sell electricity to the MEA of 1351 million units.

2. Renewable in MEA is the type of residential electricity use is primarily installed Solar Cell on the roof to own homes and then left to sell to MEA. It is expected that this type VSPP is growing 5 percent per year and in 2021 to purchase power from MEA reduced of 3 million units while sales to the MEA of 17 million units. The VSPP in MEA to reduce the purchase of electricity from the MEA total of 314 million units and makes MEA reduces to purchase power from EGAT about 1369 million units, or the maximum power of 231 MW as Table 1.

1.3 How to forecast

Forecast power demand of MEA and APE have 3 ways

1. Use a forecast Econometric Model With Error Correction Model having regard to savings and efficiency measures that make use of electric power rate increase at the rate of increase of GDP in the future are likely to decrease and set the Elasticity of MEA, which make the already low rate continues to decline in plan10-11 (2007-2016) and set to continue in the plan 12 (2017-2021). Strategic to the MEA with the ordinary constraints allow the growth of electricity consumption in industry is relatively constant while PEA can also expand its manufacturing industry has a large and efficient measures should be functional in the PEA. Then Elasticity of PEA is set to decline in the rate over the forecast period.
2. Calculate the rate of GDP increase of energy required to set the required assumptions.
3. Calculate the rate of increase energy in 2, that is power supply of electricity sell to MEA and PEA's customers
4. Calculate power of MEA and PEA have to buy from electricity Then calculate value of LOSS that defined in the assumptions.

1.3.1 forecast of EGAT's power customers use electricity demand direct inquiries from customers of EGAT.

1.3.2 Forecast of EGAT's power and energy from the MEA and PEA, and customers will buy from EGAT which will get power from EGAT production.1) power loss in the export system which requires a constant ratio of 2.5 per cent Total EGAT Sales.2) amount of electricity used in manufacturing processes EGAT and within the power plant.3) amount of electricity used to pump water back and EGAT will need to provide electricity to sell to the MEA and PEA and customers.

1.3.3 Thailand's energy forecasting by combining with the amount of electricity of MEA and PEA purchase from VSPP and amount of electricity of PEA purchase from Department of Alternative Energy Development and Efficiency (DEDE) and amount of electriccity of PEA's production

1.3.4 Forecast demand maximum power (Peak).

Peak value of the forecasting methodology MEA and PEA to electrical characteristics by the Load Profile of each user to calculate power and energy cost adjustment to equal the energy cost forecast in each category of electricity use. When the Load Profile of all electricity users total together then result will be Load Profile. Overall of MEA and PEA can calculate to be Peak value of MEA and PEA.

Forecast Peak Value of EGAT's customers by the primary Load Profile and adjust Load Profile of each customer to equal to the forecast and then take the Load Profile of all customers total to determine the Peak's customers.

Forecast Peak Value of EGAT's customers with Load Profile of MEA and PEA adjust to total all of customers to calculate Peak Value of Customers system that happen in same time with EGAT system.

Forecast Peak Value of EGAT's customers total with Peak Value of VSPP

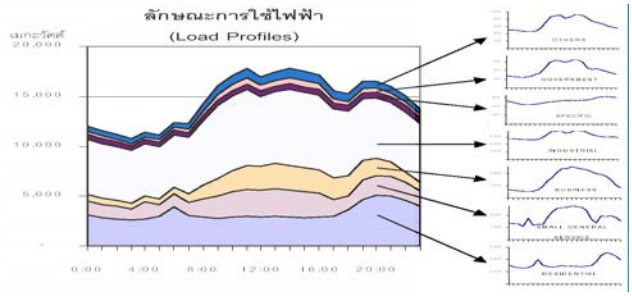


Figure 1 The electrical characteristics

1.4 Forecasting demand of electricity

procedure of forecasting demand of electricity divided GDP value into 3 cases are base low and high case in each case include value of forecasting demand of eletricity of EGAT and sell to MEA and PEA. And National Economic and Social Development (NESDB) forecasts Economic tendency in 2006-2016 for manage budget of demand of electricity in that time and have information of Estimated such as

1. Thailand's Economic tendency in 2006 growth of approximately 4.6% inflation rate equals 4.5% and current account balance over a small balance of approximately 0.9% of GDP. in the first half of year 2006 Thai economy to grow about 5.5%, but the quarterly growth is slowing from 6.1%.
2. Estimates of 2007 economic growth of approximately 4.8% inflation rate is equal to 3.0-3.5% and the balance of current account balance of slightly more than approximately 0.4% but the improvement is depends on oil prices.

3. Estimate of economic in 2008-2016 is the economic restructuring begun to be more concrete. Especially on labor costs , oil price at Dubai is equal to 55-60 dollars per barrels. Therefore concluded that the Plan No. 11 and No. 10 and No. 12. as The Table 2

Table 2 Estimates economic in 2006-2016

YEAR	49	50	51	52	53	54	55	56	57	58	59
GDP%	4.6	4.8	5.0	5.2	5.0	5.0	5.3	5.5	5.5	5.8	5.8
inflation	4.5	3.5	3.2	3.0	3.0	3.0	2.8	2.8	2.7	2.6	2.6

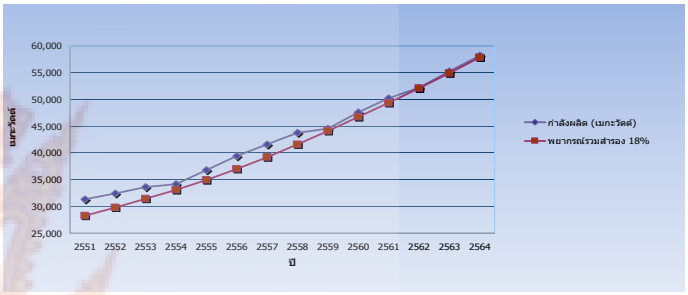
Committee on the forecast electricity demand for 2007-2021 was a problem with errors in some points. It plans to align the forecast demand for electricity by 2007-2021 set the following new assumptions.

1. Value forecast electricity demand conducted to forecast electricity demand based on the month in March 2007 (base case, lower case, high case)
2. Considering fuel prices.
3. The displacement of electricity from the system.

The need for electrical power backup is required because the electricity purchased from abroad in current ratio of approximately 20% of electricity demand increased.If have problems about buying - selling then need 15-20% power backup will not affect the stability of the electrical system within domestic.

Table 3 Forecast of electricity demand since the year 2008-2021 reserve by 18%

YEAR	Capacity (MW)	Forecast 18% as reserves (MW)
2551	31,373.3	28,748.40
2552	32,456.4	30,270.00
2553	33,642.4	31,429.30
2554	34,194.1	33,595.28
2555	36,819.1	35,550.50
2556	39,369.1	37,660.00
2557	41,533.1	39,859.20
2558	43,711	42,301.20
2559	44,562.8	44,858.40
2560	47,564.3	47,472.00
2561	50,178.2	50,154.00
2562	52,189.2	52,898.40
2563	55,199.6	55,777.20
2564	58,199.6	58,749.60



SUMMARY

about electricity demand forecasts that forecast electricity demand since 2007-2021 and the result of Electricity consumption of Thailand is 58,749.60 MW. In 2021 Domestic's capacity is 58,199.6 MW that mean it not enough for demand then we have to analyze about the result of forecast then found shortages since 2019. Then Thailand must build nuclear power plant before 2021, it will not take the shortage of power.

Reference.

[1] WWW.News Sanook .com
[2] Annual Report 2007 of EGAT
[3] Development Plan of Thailand's electricity capacity release January 22, 2009
[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Management of High Enriched Uranium for

Peaceful Purpose: Status and Trends, IAEA-TECDOC-1452, IAEA, Vienna (2005).
[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, INFCIR/546, IAEA, Vienna (1997).
[6] INTERNATIONAL ATOMIC ENERGY AGENCY, Status and Trends in Spent Fuel Reprocessing, IAEA-TECDOC-1467, IAEA, Vienna (2005).
[7] INTERNATIONAL ATOMIC ENERGY AGENCY, Essential elements of safeguards, Technical Reports Series No. 392, IAEA, Vienna (1998).
[8] INTERNATIONAL ATOMIC ENERGY AGENCY, Code of Conduct on the Safety and Security of Radioactive Sources: Guidance on the Import and Export of Radioactive Sources, IAEA, Vienna (2005).
[9] INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for Facilities and Activities Safety Requirements, IAEA Safety Standards Series No.GS -R-3, IAEA, Vienna (2006).
[10] INTERNATIONAL ATOMIC ENERGY AGENCY, Basic Infrastructure for a Nuclear Power Project, IAEA-TECDOC-1513, IAEA, Vienna (2006).
[11] INTERNATIONAL ATOMIC ENERGY AGENCY, Application of The Management System for Facilities and Activities Safety Guide, IAEA Safety Standards Series No. GS-G-3.1, IAEA, Vienna (2006).

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