

SECTOR OVERVIEW

A. Sector Framework

1. The energy sector in Thailand is governed by the Ministry of Energy and managed by the National Energy Policy Council (NEPC). The NEPC's main duties are to recommend a national energy policy and energy management and development plans to the government through the cabinet and to establish the tariff structure for energy sales in Thailand. The NEPC's secretariat, the Energy Policy and Planning Office, is responsible for drafting all energy-related policies and proposing development plans to the NEPC. The sector is regulated by the independent Energy Regulatory Commission, which monitors energy market conditions, reviews tariffs, issues licenses, approves power purchases, and reviews development planning and investment in the electricity industry. Thailand has adopted a single-buyer model in the power subsector, under which the state-owned utility allows limited private sector participation in electricity generation while maintaining control over system planning, operating, and pricing.

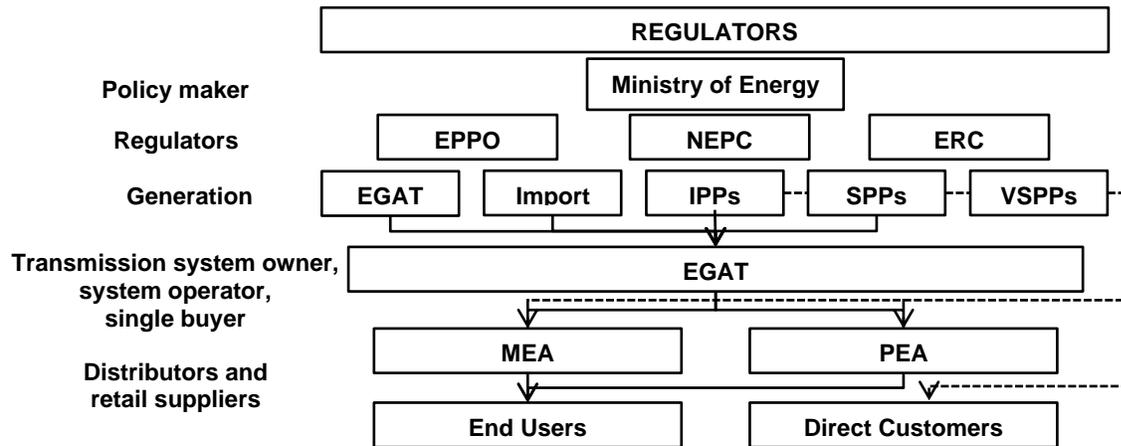
2. The Electricity Generating Authority of Thailand (EGAT), a state-owned utility, owns and operates most of the country's power generation capacity and the entire transmission network. It is the principal purchaser of electricity and sells essentially all the power it generates or purchases (from private power producers and neighboring countries) to two state-owned enterprises: the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA). MEA and PEA distribute power to retail, commercial, and industrial consumers throughout Thailand and own the electricity distribution networks in the regions where they operate. MEA has the exclusive rights to distribute and sell power to end users in the Bangkok metropolitan area, and PEA has these rights in all other areas. EGAT sells electricity to MEA and PEA at a regulated rate, which is set by the Energy Policy and Planning Office. Thailand imports electricity from the Lao People's Democratic Republic and Malaysia and exports electricity to neighboring utilities in Cambodia, the Lao People's Democratic Republic, and Malaysia. Figure 1 illustrates the current organizational structure of Thailand's power system.

3. The Thai government promotes private investment in the electricity generation business through the independent power producer (IPP) program, which was set up in 1994 and allows private developers to build, own, and operate power plants with generating capacity greater than 90 megawatts (MW) and to enter into long-term (20–25 years) power purchase agreements with EGAT. As of May 2019, 14 IPP projects were in development or operation totaling more than 19,000 MW, and IPPs accounted for 35% of Thailand's total generating capacity.

B. Electricity Demand

4. The demand for electricity increased by an average annual 3.5% during 2009–2018. Total electricity consumption in 2018 was 184,577 gigawatt-hours (GWh), a 1.4% increase from 181,989 GWh in 2017. Peak demand in 2018 was 28,338 MW—a 0.8% slight decline from 28,578 MW in 2017. Peak demand hit a record high of 30,120 MW in April 2019, largely caused by hot weather. Figure 2 illustrates Thailand's energy consumption.

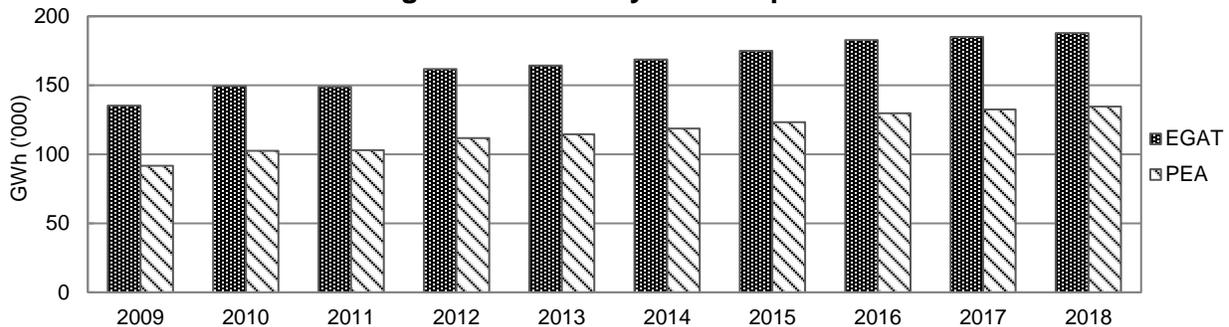
Figure 1: Organization of Thailand's Power System



EGAT = Electricity Generating Authority of Thailand, EPPO = Energy Policy and Planning Office, ERC = Energy Regulatory Commission, IPP = independent power producer, MEA = Metropolitan Electricity Authority, NEPC = National Energy Policy Council, PEA = Provincial Electricity Authority, SPP = small power producer, VSPP = very small power producer.

Source: Energy Regulatory Commission. 2012. *Thailand: Energy Regulation and the Promotion of Energy Conservation*. Bangkok.

Figure 2: Electricity Consumption



EGAT = Electricity Generating Authority of Thailand, GWh = gigawatt-hour, PEA = Provincial Electricity Authority.

Source: Energy Policy and Planning Office. 2019. *Thailand Energy Statistics*. Bangkok.

5. Electricity demand in Thailand has predictable seasonal and daily cycles. Annual peak demand is generally during the period with high temperatures, March–May. The lowest loads are generally during the coolest months, December–January.

6. Industry has historically been the largest electricity consumer, accounting for 47% of the total, followed by business at 25% and residences at 24%. Electricity consumption by sector during 2009–2018 is shown in Table 1.

Table 1: Electricity Consumption by Sector, 2009–2018
(gigawatt-hour)

Year	Residential	Business	Industry	Government & Nonprofit	Agriculture	Others	Total	Change from Previous Year (%)
2009	30,257	27,855	67,723	4,677	318	4,352	135,182	(0.3)
2010	33,214	29,958	75,433	5,049	335	5,312	149,301	10.4
2011	32,799	30,611	75,364	4,888	297	4,896	148,855	(0.3)
2012	36,447	34,784	80,386	3,799	377	5,986	161,779	8.7
2013	37,657	38,873	81,188	149	354	6,120	164,341	1.6
2014	38,993	40,026	82,624	152	414	6,476	168,685	2.6
2015	41,286	42,466	83,984	179	387	6,532	174,834	3.6
2016	43,932	44,639	86,878	201	267	6,929	182,846	4.6
2017	44,374	45,100	87,772	198	298	4,247	181,989	(0.5)
2018	45,205	46,764	87,829	204	365	4,210	184,577	1.4

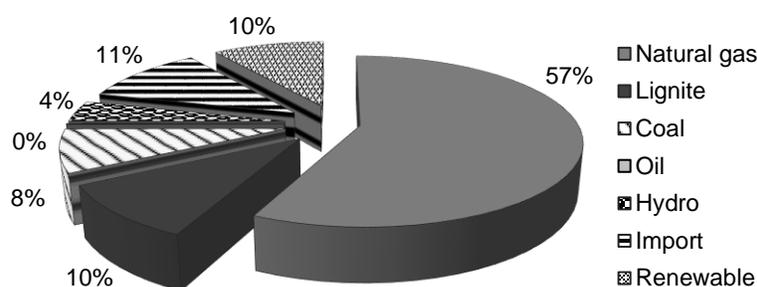
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Source: Energy Policy and Planning Office. 2019. *Thailand: Energy Statistics*. Bangkok.

C. Electricity Supply

7. As of May 2019, Thailand (including imports) had installed generation capacity of 42,835 MW, of which 14,566 MW (34%) was accounted for by EGAT's power plants, 14,949 MW (35%) by IPPs, 9,443 MW (22%) by small producers, and 3,878 MW (9%) by foreign producers of imported power. Power production depends heavily on fossil fuels, with 57% generated from natural gas, 10% from lignite, and 8% from coal (Figure 3). Renewable energy sources contribute only 10%, but several factors—fluctuating prices for fossil fuel, fuel shortages, and the government's promotion of alternative energy—are expected to increase the share of renewable energy.

Figure 3: Electricity Production by Fuel Source, April 2019



Source: Electricity Generating Authority of Thailand. 2019. *Thailand: Installed Generating Capacity (April 2019)*. Bangkok.

D. Electricity Supply and Demand Forecast

8. Electricity load forecasts are generated to predict future energy demand and form the basis for long-term planning to determine when and where to build centralized power plants. According to Thailand's Power Development Plan, 2018–2037 (PDP 2018), the total installed capacity is expected to be 77,211 MW by 2037, including 56,431 MW of added capacity, which will help replace the 25,310 MW of capacity that is expected to retire. The PDP 2018 takes into account the changing power demand-supply situation because of the rising number of

independent power supply projects supported by new technology (e.g., energy storage system, blockchain). The PDP 2018 focuses on (i) security to ensure an adequate power supply capacity level to maintain the system's stability to serve demand in each of the six regions of Thailand; (ii) economy to support low-cost fuel generation capacity; and (iii) ecology to reduce the environmental impact by supporting renewable energy and energy efficiency (for generating and consuming). Thailand's new power demand forecast was made in relation to the revised long-term economic growth projection of 3.8%. Thailand's net electricity demand forecast is projected to increase 3.13% annually from 2018 to 2037, and the peak demand is expected to increase 2.93% annually during the same period.¹ In 2037, the expected energy demand is 367,458 GWh and the peak power demand is 53,997 MW.

9. According to the PDP 2018, electricity demand for Eastern Thailand will increase at an average rate of 3.5%. The total capacity needed by 2037 is 14,707 MW for the eastern part of Thailand (the 2018 total capacity was 10,156 MW) with a total retired capacity of 5,282 MW during the same period.

10. The PDP 2018 aims to diversify fuel sources by increasing the use of renewable energy and energy efficiency. It projects that by 2037, 53% of power generation will be generated by natural gas, 34% by renewable energy (including hydropower) and energy efficiency, and 13% by clean coal (including lignite) (Table 2).

Table 2: Thailand Power Development Plan–Electricity Production by Fuel Source

Fuel Source	PDP 2015 2036	PDP 2018 2037
Natural gas	37%	53%
Coal (including lignite)	23%	13%
Renewable energy	18%	18%
Hydropower	18%	10%
Nuclear	5%	0%
Energy efficiency	0%	6%
Total	100%	100%

PDP = Thailand's Power Development Plan.

Source: Government of Thailand, Ministry of Energy. 2019. *Thailand Power Development Plan, 2018–2037*. Bangkok.

E. Tariff Structure

11. The electricity tariffs of EGAT, MEA, and PEA are closely regulated by the independent Energy Regulatory Commission; the NEPC and the cabinet have ultimate approval authority. The tariff structure aims to (i) reflect economic costs and promote the efficient use of electricity; (ii) secure the financial health of these three state-owned power utilities; (iii) reduce subsidies between different categories of consumers; and (iv) adjust electricity tariffs through a flexible, automatic mechanism.

12. The tariff is divided into a base tariff and a fuel adjustment charge. The base tariff is a bulk supply tariff, comprising the wholesale tariff that EGAT charges MEA and PEA and the fixed retail tariff that MEA and PEA charge power consumers during each regulatory period. The factors used to calculate the base tariff include forecasts of the demand for electricity; fuel prices; and

¹ Government of Thailand, Ministry of Energy. 2019. *Thailand Power Development Plan, 2018–2037*. Bangkok.

expenses for power generation, transmission, and distribution. They also take into account capital expenditures by EGAT, MEA, and PEA, as well as returns on invested capital.

13. The fuel adjustment charge is an automatic mechanism. It modifies tariffs to reflect changes in the base-case assumptions that are beyond the control of EGAT, MEA, and PEA (e.g., a higher-than-forecasted fuel price increase). The fuel adjustment charge effectively passes unexpected increases and decreases in costs to end users. It is added to base tariffs for the subsequent 4-month period to try to keep tariffs reasonably stable for consumers. The base component generally remains the same throughout a particular tariff regulation period, but the fuel adjustment charge is subject to revision every 4 months.