

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 main duties of the NEPC are to recommend, through the cabinet, national energy policy and energy management and development plans to the government 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 under which the state-owned utility allows limited private sector participation in electricity generation while maintaining control over system planning, operation, and pricing.

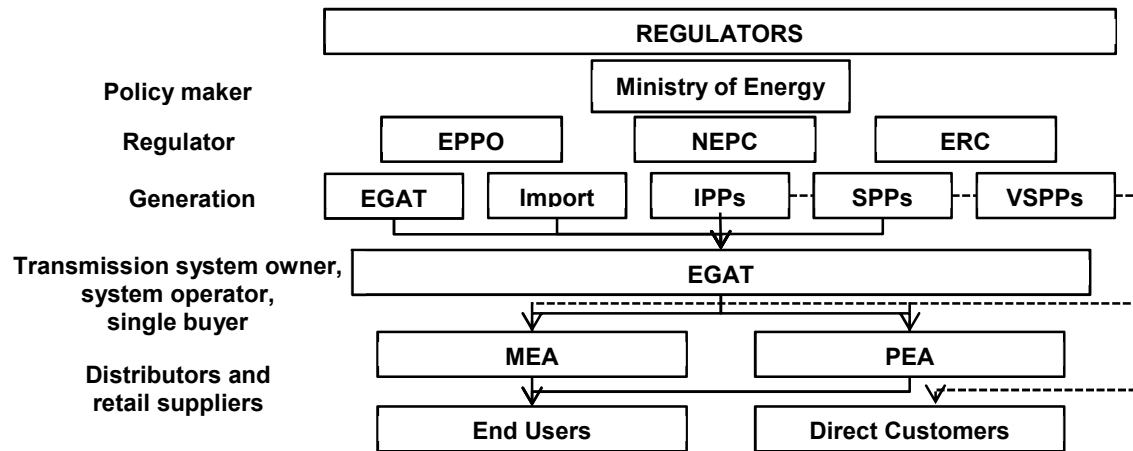
2. The Electricity Generating Authority of Thailand (EGAT), a state-owned utility, owns and operates most of the country's power generation capacity and the entire transmission network. It operates the system and is the principal offtaker. It sells essentially all the power it generates or purchases (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.

3. The government has allowed the private sector to engage in power generation from renewable energy sources. The Small Power Producer Program allows private developers to build, own, and operate renewable energy projects in the 10–90 megawatt (MW) capacity range and to enter into power purchase agreements with EGAT. Under a separate program for very small power producers, private firms generating up to 10 MW of renewable energy can sell power to MEA or PEA. Small and very small power producers using renewable energy sources are eligible for a feed-in tariff on top of the wholesale electricity price. 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.

B. Electricity Demand

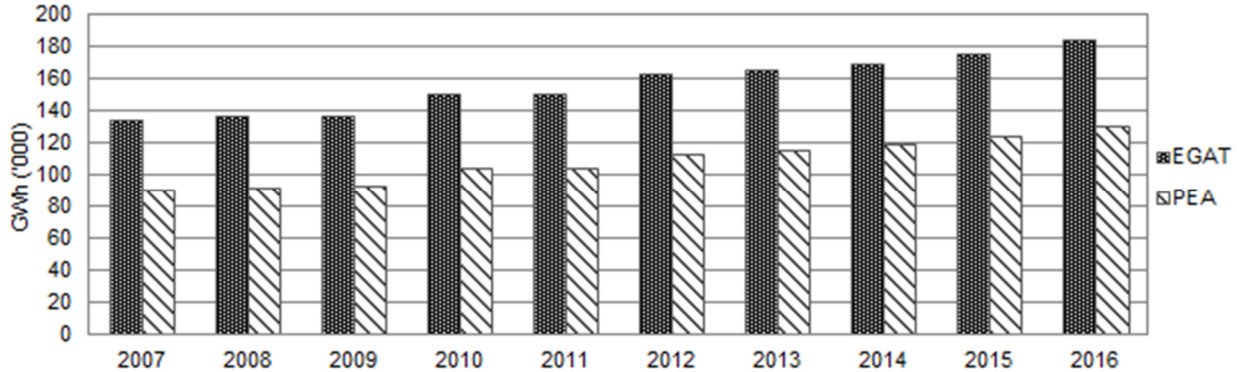
4. The average demand for electricity increased by 3.6% per year during 2005–2016. Total electricity consumption in 2016 was 182,846 gigawatt-hours (GWh), a 4.6% increase from 174,834 GWh in 2015. Peak demand reached a record 29,619 MW in 2016, an 8.3% increase from 27,346 MW in 2015 (Figure 2). The overall growth in electricity consumption resulted from the economic recovery (mainly an increase in manufacturing activities thanks to the government's stimulus program), while the rise in peak demand was largely caused by hot summer weather. The Ministry of Energy expects electricity demand in 2017 to exceed the 2016 total by 2.9%.

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. 2017. *Thailand Energy Statistics*. Bangkok.

5. Electricity demand in Thailand has fairly predictable seasonal and daily cycles. Annual peak demand is generally from March to May, during periods of high temperature. The lowest loads are generally during the coolest months, in December and January.

6. Industry has historically been the largest electricity consumer, accounting for 48% of the total, followed by business at 24% and residences at 24%. Electricity consumption by segment during 2009–2016 is shown in Table 1.

Table 1: Electricity Consumption by Segment, 2009–2016
(gigawatt-hours)

Year	Residential	Business	Industry	Government & Non-Profit	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

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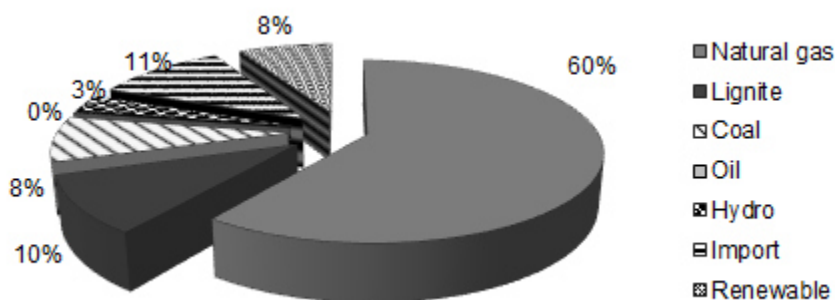
Source: Energy Policy and Planning Office. 2017. *Thailand: Energy Statistics*. Bangkok.

C. Electricity Supply

7. As of April 2017, Thailand and its suppliers had installed generation capacity of 41,393 MW, of which 16,071 MW (39%) was accounted for by EGAT power plants, 14,949 MW (36%) by independent producers, 6,496 MW (16%) by small producers, and 3,878 MW (9%) by foreign producers of imported power. Five operators manage 76% of Thailand's electricity generation: Ratchaburi Electricity Generating Holdings (12%), Gulf Group (11%), Glow Energy (7%), Electricity Generating Public Company (7%), and EGAT (39%).

8. The national reserve margin increased from 27% in 2004 to 37% in 2016, which is well above the minimum reserve margin of 15% set by the Ministry of Energy. Power production depends heavily on fossil fuels, with 60% generated from natural gas, 10% from lignite, and 8% from coal (Figure 3). Renewable energy sources contribute only 8%, 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 2017

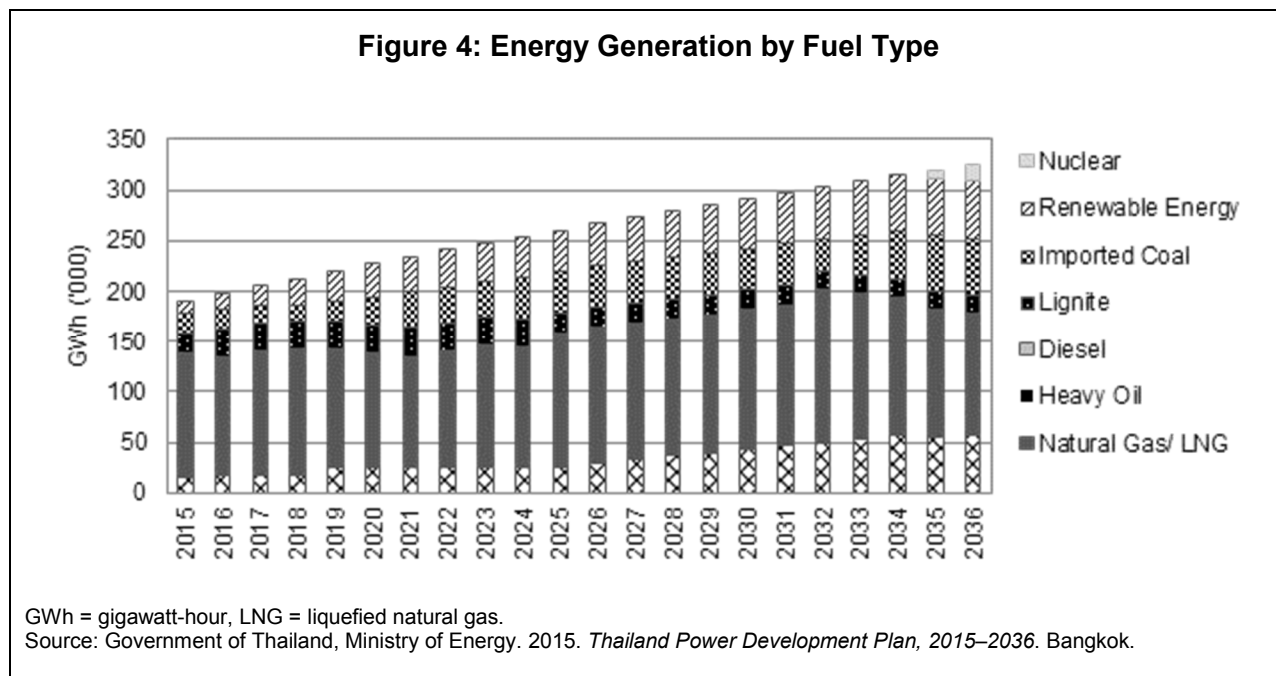


Source: Electricity Generating Authority of Thailand. 2017. *Thailand: Installed Generating Capacity (April 2017)*. Bangkok.

D. Electricity Supply and Demand Forecast

9. 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 (PDP), 2015–2036, EGAT is projecting average annual growth of 2.68% in net electricity demand and 2.67% in peak demand during 2015–2036.¹ EGAT forecasts 326,119 GWh in consumption by 2036, and peak generation of 49,655 MW. The PDP, approved by the NEPC in June 2015, projects 6% lower energy demand and 5% lower peak demand than in the previous plan. This is based on the expectation that the government's PDP will succeed in improving energy efficiency in the country. The PDP assumes total installed capacity to be 70,335 MW by 2036, including 57,459 MW of added capacity (more than double the 24,736 MW of capacity that is expected to be retired).

10. To mitigate the risk of overdependence on natural gas and sustain national energy security and economic growth, the PDP aims to diversify fuel sources by increasing the use of renewable energy, coal, hydropower, and nuclear power. It projects that by 2036, 30%–40% of power will be generated by natural gas, 15%–20% by renewable energy (including hydropower), 20%–25% by clean coal (including lignite), and up to 5% by nuclear power. The PDP estimates that 15%–20% of electricity will be imported from neighboring countries (Figure 4). Small and very small power producers are expected to generate 22% of the country's total power supply by 2036.



11. The PDP incorporates two frameworks: (i) the Energy Efficiency Development Plan, 2015–2036,² which aims for a 30% reduction in energy intensity—i.e., 30% less energy consumed for each baht of gross domestic product—by 2036, and would lower the country's long-term power demand needs; and (ii) the Alternative Energy Development Plan, 2015–2036,³ which seeks to increase the share of renewable energy and alternative energy used for power generation to 30%

¹ Government of Thailand, Ministry of Energy. 2015. *Thailand Power Development Plan, 2015–2036*. Bangkok.

² Government of Thailand, Ministry of Energy. 2015. *Energy Efficiency Development Plan, 2015–2036*. Bangkok.

³ Government of Thailand, Ministry of Energy. 2015. *Alternative Energy Development Plan, 2015–2036*. Bangkok.

by 2036, and build renewable energy power plants rather than some of the conventional power plants already planned. The Alternative Energy Development Plan, 2015–2036 aims for a total installed capacity of alternative energy of 19,684.4 MW in 2036. This target includes 6,000 MW from solar power alone. To reach this target, the plan calls for the encouragement of private sector participation in the development and use of new technologies. Thailand’s targets for renewable energy power generation under this plan are summarized in Table 2.

Table 2: Target for Power Generation from Renewable Energy by 2036

Type	Existing Capacity^a (MW)	AEDP Target (MW)
Solar	2,582.0	6,000.0
Wind	548.9	3,002.0
Large hydro	2,906.4	2,906.4
Small hydro	182.1	376.0
Municipal solid waste	151.7	550.0
Biomass	2,943.2	5,570.0
Biogas	440.2	1,280.0
Total	9,754.5	19,684.4

AEDP = Alternative Energy Development Plan, 2015–2036; MW = megawatt.

^a As of March 2017.

Source: Government of Thailand, Ministry of Energy. 2015. *Thailand Power Development Plan, 2015–2036*. Bangkok.

E. Tariff Structure

12. The EGAT, MEA, and PEA electricity tariffs are closely regulated by the independent Energy Regulatory Commission; the ultimate approval rests with the NEPC and cabinet. 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.

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

14. 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-forecast 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, in an effort 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.