SECTOR OVERVIEW

A. Sector Framework

1. **Roles and responsibilities.** 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 national energy policies as well as 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 (ERC), which monitors energy market conditions, reviews tariffs, issues licenses, approves power purchases, and reviews development planning and investment in the electricity industry.

2. Thailand has adopted a single-buyer model in the power sector, under which the state-owned utility allows private sector participation in electricity generation while maintaining control over system planning, operation, and pricing. Electricity Generating Authority of Thailand (EGAT), a state-owned utility, owns and operates more than 30% of the country's power generation capacity and the entire transmission network. It is the principal purchaser of electricity in Thailand and sells all the power it generates or purchases (from private power producers and neighboring countries) to two state-owned enterprises: Metropolitan Electricity Authority (MEA) and Provincial Electricity Authority (PEA). MEA and PEA distribute power to retail, commercial, and industrial consumers throughout Thailand, and own the electricity transmission and 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 set by the Energy Policy and Planning Office.

3. **Private sector participation.** Thailand's electricity generation industry has been deregulated since 1992 to allow private sector investment in power generation projects. These private sector companies are regulated by the amount of electricity each facility can produce, as shown in Table 1. For independent power producer (IPP) and small power producers (SPP), the electricity is sold directly to EGAT under the terms of the long-term contracts they have arranged. In the case of very small power producers (VSPP), the electricity can be sold to PEA and MEA using the applicable feed-in tariff (FIT) depending on the type of renewable energy, size and location. In some cases, private electricity companies may have a transmission system directly to the industrial estates which they service.

Table 1: Types of Private Power Producers

Type of Power Producer	Buyer	Contracted Capacity
Independent Power Producer	EGAT	Over 90 MW
Small Power Producer	EGAT	Over 10 MW up to 90 MW
Very Small Power Producer	PEA and MEA	Not exceeding 10 MW

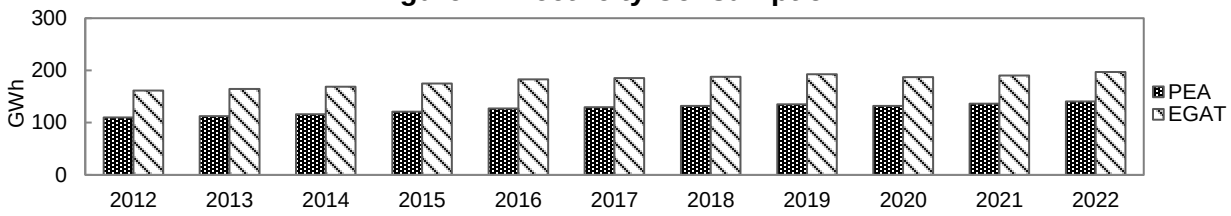
EGAT = Electricity Generation Authority of Thailand, MEA = Metropolitan Electricity Authority, MW = megawatt, PEA = Provincial Electricity Authority.
Source: Thailand Board of Investment. 2023.

B. Electricity Demand

4. Demand for electricity increased by an annual average of 2.0% during 2012–2022. In 2022, total electricity consumption was 197,256 gigawatt-hours (GWh), 3.6% higher than the previous year's total of 190,468 GWh. Peak demand reached a record 34,131 megawatts (MW)

in 2023, a 6.0% increase from 32,255 MW in 2022. The rise in electricity consumption stems from higher economic activities after the coronavirus disease (COVID-19) pandemic, mainly in tourism and services. The rise in peak demand was largely caused by extremely hot summer weather. Electricity consumption in the PEA area closely tracks but consistently exceeds the growth in total electricity consumption.

Figure 1: Electricity Consumption



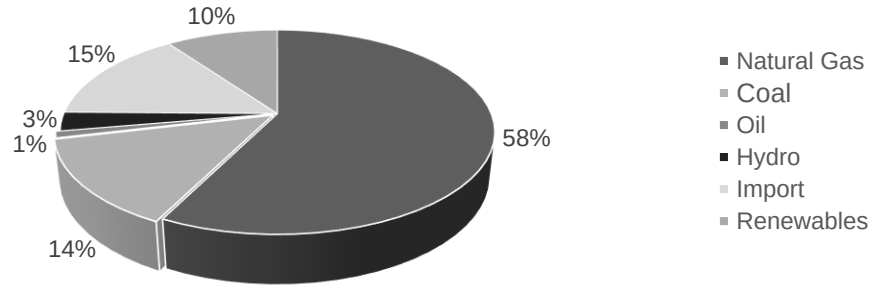
EGAT = Electricity Generating Authority of Thailand, GWh = gigawatt-hour, PEA = Provincial Electricity Authority.
Source: Energy Policy and Planning Office. 2022. *Thailand Energy Statistics*. Bangkok.

5. Electricity demand in Thailand has fairly predictable seasonal and daily cycles. Annual peak demand is generally from March to May when the temperature is highest. The lowest loads are generally in the coolest months, December and January. In 2023, summer heat brought record peak demand of 34,131 MW in May. Industry has historically been the largest electricity consumer, accounting for 45% of total consumption, followed by residences at 27% and businesses at 23%.

C. Electricity Supply

6. As of November 2023, Thailand had an installed generation capacity of 50 gigawatts (GW) out of which 16 GW (33%) was accounted for by EGAT power plants; 35% by independent power producers; 19% by small producers; and 13% through imported power.[1] The domestic electricity generation mix is dominated by natural gas with a share of 58% followed by coal with 14% share. Renewable energy sources (including hydropower) contribute only 13%.

Figure 2: Electricity Generation by Fuel Source, November 2023



Source: Energy Policy and Planning Office, 2024. *Thailand: Energy Statistics*. Bangkok.

7. Thailand began promoting increased renewable energy development in 2007, when is introduced the Adder scheme (an additional payment on top of wholesale tariffs over a limited period) for SPP and VSPP renewable energy projects. The Adder scheme was later replaced by the FIT scheme (guaranteed fixed purchase price throughout the applicable term), which was first implemented in 2013 for solar and in 2015 for all other renewable energy types. Thailand has

[1] Energy Policy and Planning Office. 2024. Energy Statistics: Electricity Statistic. *Table 5.1-1: Capacity*. Bangkok.

since become one of the largest renewable energy markets in Southeast Asia, with 13 GW of renewable energy capacity, including 3.3 GW of solar power and 1.5 GW of wind power, online as of October 2023.[2] However, the overall share of renewables in the energy mix is still low and at about 10% of total generation in 2023.[3] The country recently renewed its focus on developing renewable energy to meet rising energy demand, offset declining natural gas reserves and reduce reliance on non-indigenous sources of energy.

D. Electricity Demand and Supply Forecast

8. Annual electricity demand in Thailand is projected to increase at an average of 4.0% from 2021 to 2037. At the same time, peak demand is expected to increase by 4.5% annually.[4] The Thailand Power Development Plan PDP 2018–2037 Revision 1 (PDP) aims to increase generating capacity from 46,090 MW to 77,211 MW by 2037. Out of 46,090 MW of operational electricity capacity at the end of 2017, Thailand plans to retire 25,310 MW by 2037. This means that it must add 56,431 MW of new capacity to the current deployment.

E. Renewable Energy

9. To mitigate the risk of overdependence on natural gas and sustain national energy security and economic growth, the PDP targets the diversification of fuel sources by increasing the use of renewable energy, coal, hydropower, and nuclear power (Table 2). Further, according to the National Energy Plan 2022, Thailand proposed to achieve carbon neutrality by 2065–2070 which could result in renewable energy accounting for a 50% share of the new power generation capacity.

Table 2: New Capacity by Plant Type

Plant Type	Additional Capacity (MW)	Additional Capacity (%)
Renewable power plant	18,833	33
Community power plant	1,933	3
Pump-storage hydro plant	500	1
Cogeneration power plant	2,112	4
Combined cycle power plant	15,096	27
Coal / lignite power plant	1,200	2
Import	5,857	10
New / replacement power plant	6,900	12
Energy efficiency	4,000	7
Total	56,431	**100**

MW = megawatt.
Source: Thailand Power Development Plan 2018–2037, Revision 1.

10. The PDP contains two energy policy frameworks: the (i) Energy Efficiency Development Plan, 2018–2037, which targets a 30% reduction in energy intensity by 2036—i.e., 30% less energy consumed for each baht of gross domestic product—and would lower the country's long-term power demand needs; and (ii) Alternative Energy Development Plan (AEDP), 2018–2037, which seeks to increase the share of renewable energy for power generation to 34% by 2037. The AEDP aims for a total installed capacity from renewables of 30,000 MW by 2037. This target

[2] Department of Alternative Energy Development and Efficiency. 2024. Energy Statistics & Information. Bangkok.
[3] Energy Policy and Planning Office. 2024. Energy Statistics: Electricity Statistic. *Table 5.2-2: Power Generation Classified by Fuel Type*. Bangkok.
[4] International Energy Agency. 2023. *Thailand's Clean Electricity Transition*. Paris.

includes 14,864 MW from solar power alone. To reach it, the AEDP 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 the AEDP are summarized in Table 3.

Table 3: Electricity Production by Fuel Source

Fuel Source	Existing Capacity[a] (%)	Target by 2037 (%)
Natural gas	64	53
Coal (including lignite)	20	12
Renewable energy and hydro	15	29
Energy efficiency	0	6
Other (oil)	1	<0.1
Total	**100%**	**100%**

[a] As of 2020.

Source: Government of Thailand, Ministry of Energy. 2022. *Thailand Power Development Plan, 2018–2037, Revision 1.* Bangkok.

11. The ERC manages the promotion of non-conventional energy sources in Thailand. In 2022, it announced regulations regarding the FIT for electricity sales by renewable energy projects to the electricity authorities until 2030. FIT is a policy developed to support renewable energy sources by providing a guaranteed price for producers. The total capacity target of the 2022 renewable energy FIT program is 5 GW (5,000 MW), including 335 MW for biogas, 1,500 MW for wind, 2,368 MW for ground-mounted solar, and 1,000 MW for solar with integrated battery energy storage systems (BESS) technology.

12. EGAT dispatches power generation assets based on the "3 Ms" concept: must run, must take, and merit order. "Must run" has the top priority and includes power generation assets that are essential to grid stability and must run for technical reasons. Of second priority are the "must take" projects, those that EGAT must take for economic reasons, typically because of contractual obligations. The third-priority "merit order" means that EGAT will dispatch the power generation assets based on its tariff with EGAT (akin to a lowest marginal cost dispatch approach). Under this category, the projects with the lowest generation cost to EGAT would rank first, however, it is also a national policy that renewable power would be dispatched first, followed by conventional power generation assets.

F. Battery Energy Storage Systems

13. Battery energy storage is widely seen as a vital technology to allow for higher levels of intermittent renewable energy (e.g., wind and solar) use within electricity grids. Deploying BESS technology at scale will be necessary for Southeast Asia to achieve its targets for carbon neutrality and integrate a growing share of renewables in the energy sector. The cumulative installed BESS capacity in Southeast Asia was about 1 GWh in 2023, and it is estimated to be close to 16 GWh by 2030.[5]

14. Although Thailand is a regional leader in renewable energy, its deployment of BESS it still limited. It currently has just one utility-scale solar–BESS project with 49 MW of solar capacity and 136 MW-hours of BESS. As Thailand increases the share of intermittent renewable energy sources (solar and wind), BESS will become an important technology to underpin the grid, providing such services as frequency support, voltage support, ramping support, peak shaving,

[5] Bloomberg New Energy Finance. 2023. *1H 2023 Energy Storage Market Outlook: Ambitious targets, ambiguous outlook*.

load shifting, and transmission deferral. The 2022 renewable energy FIT program envisages 1,000 MW of solar–BESS, making it the first program to support BESS at scale in Southeast Asia.

G. Theory of Change

15. Thailand predominantly relies on fossil fuel for its power generation (para 6). However, rising energy demand coupled with declining natural gas reserves and a goal to reduce reliance on non-indigenous sources of energy, has led the Government of Thailand to focus on developing renewable energy. The Government of Thailand has set a target for renewables to supply 30% of the electricity consumed by 2037, and 50% by 2050, to achieve its carbon neutrality targets by 2050. The Power Development Plan 2018–2037 Revision 1 includes a target to build an additional 18 GW of renewable energy capacity, including 10 GW of solar power between 2018 and 2037. As Thailand increases its share of intermittent renewable energy sources (solar and wind), energy storage will also become an increasingly important technology.

16. The proposed project will address these challenges by supporting Thailand's 5 GW renewable energy FIT program (para 11) which will double Thailand's wind and solar capacity. ADB will provide and mobilize construction bridge financing to cover the financing gap until the underlying projects, which are part of the FIT program, achieve commercial operations date. The project will promote the deployment of BESS technology which is critical to the integration of a growing share of renewable energy capacity and the decarbonization of the energy sector. It will be the first large-scale solar–BESS procurement in Southeast Asia, providing a precedent and demonstration effect for future BESS programs of this type in the region.

Figure 3: Theory of Change Analysis

Development Gap	Project Activities	Project Outputs	Project Outcomes	Long term Outcomes
• Dependency on fossil fuels for power generation • Rapid demand growth for electricity • Limited financing until project achieves commercial operations date	• Renewable (solar and battery energy storage system) energy supply by Public-Private Partnership or Independent Power Producers • Bridge financing mobilized by ADB as mandated lead arranger	• Portfolio of solar power projects and solar power projects with battery energy storage system installed • Private capital mobilized	• Electricity generated supplied by the Project into the grid • Greenhouse gas emissions avoided • Strengthening of security of supply and saving gas resources • Clean Energy transition	• Promotion of new renewable generation capacities to reach carbon neutrality and net-zero GHG emission target • Promote deployment of battery energy storage system • Increased energy security by reducing reliance on fossil fuels

Source: Asian Development Bank.