ENERGY
CATALYST

Country Guide: Thailand

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Thailand is a multi-ethnic nation with a population of 69.8 million, located in the heart of mainland Southeast Asia. Thailand is a country of mountains, hills, plains and a long coastline along the Gulf of Thailand and the Andaman Sea. It shares borders with the Laos People's Democratic Republic (Laos PDR) to the north/east, Cambodia to the southeast, Malaysia to the south, and Myanmar to the west. Thailand's climate ranges from the subtropical to zones with three distinct seasons: a hot and dry season from February to May, a monsoon season from June to October, and a cooler, dry season from November to January. Average seasonal temperatures vary between 23.0 degrees Celsius (ºC) and 32.2 °C.

The majority of Thais (over 90%) are Buddhists, although other major religions are practiced. These include Christianity, Hinduism, Islam, and Sikhism. Thailand is a parliamentary (bi-cameral) democracy with a constitutional monarchy, with the military playing a significant role in Thai politics.

Figure 1: Map of Thailand. Source: d-maps

Economy

Thailand is Southeast Asia's second-largest economy with a nominal gross domestic product (GDP) of around USD $500 billion. The Thai economy is well integrated into the global marketplace, with exports accounting for over 70% of the country's GDP. Thailand also has a strong industrial sector (40% of GDP) and a robust and growing services sector centered on the tourism and financial services industries (50% of GDP).

While accounting for over 30% of the country's employment and utilizing over 40% of the country's land, the agricultural sector accounts for only approximately 10% of the country's GDP.

Thailand's ranking in the World Bank's Ease of Doing Business 2020 list has edged up from 27th to 21st this year, out of 190 countries surveyed. Thailand's score is 80.10, which is an increase of 1.65 points and its highest rank in the past six years. The country has improved in protecting minority investors, rising to third place in that category from 15th last year.

Figure 2: The ease of doing business scores and rankings of ASEAN countries in The World Bank's Doing Business 2020 report

The energy sector in Thailand

Electricity production in Thailand reached 17,311 gigawatt-hours (GWh) in January 2020, compared with 15,920 GWh in the previous month. Thailand's electricity production data is updated monthly, averaging at 9,586 GWh from January 1986 to January 2020. The data reached an all-time high of 19,491 GWh in May 2019 and a record low of 1,814 GWh in Feb 1986.

Regarding government policies on electricity, the framework of the Thailand Power Development Plan 2015-2036 (PDP2015), which was formulated in line with the Energy Efficiency Development Plan (EEDP) and the Alternative Energy Development Plan (AEDP), was approved by the National Energy Policy Council (NEPC) on December 17, 2014. Its framework is as follows:

Table 1: Thailand at a glance	
Capital	Bangkok
Total Area	513,120 km2
Population	69.8 million
Official Language	Central Thai
Rural population	50.05 percent
GDP	$504,993 million (2018)
GDP Per Capita	$7,273.56 (2018)
Currency	Thai Baht
Exchange rate 01/03/2020	1 GBP = 41.2353 THB
Exchange rate 30/03/2018	1 GBP = 40.32 THB
Access to Electricity	100.00 (2019)
On grid electricity access	N/A
Off grid electricity access	N/A

1. Energy Security: dealing with an increase in power demand, and exploring fuel diversification to lessen the dependency on one particular fuel
2. Economy: maintaining appropriate costs of power generation and ensuring energy efficiency
3. Ecology: reducing environmental and social impacts by lessening the carbon dioxide intensity of power generation

PDP2015 was formulated in line with the social and economic development direction addressed by the office of the National Economic and Social Development Board (NESDB). The average growth of projected long-term Thai GDP, estimated by the NESDB, was 3.94%. With the integration of the PDP2015 and the EEDP to foster energy efficiency, the expected energy saving would be 89,672 GWh by 2036. Renewable energy will also be encouraged according to the AEDP. Investments in the transmission and distribution systems will accommodate renewable energy and smart-grid development.

Table 2: Key stakeholders in the Thai energy sector	
Institution	**Role**
Energy Policy and Planning Office (EPPO), The Ministry of Energy (MOE)	Supervise, monitor and evaluate the implementation of national energy policies and energy management plans
The Department of Alternative Energy Development and Efficiency (DEDE), MOE	Develop, promote and support the production and use of clean energy and energy conservation
The Office of the Board of Investment (BOI)	Promote valuable investment to enhance Thailand's competitiveness in the sustainable energy sector
Energy Regulatory Commission (OERC)	Regulate energy industry operations in compliance with the policy framework of the government
The National Energy Policy Council (NEPC)	Determine policies on energy industry management
The Association of Private Power Producers (APPP)	Represent a group of good governance for private power producers
The Electricity Generating Authority of Thailand (EGAT)	Responsible for Thailand's power system, serving the rising power demand resulting from economic and social growth
Provincial Electricity Authority (PEA)	Manage the sale and distribution of electricity in all areas across Thailand, except in Bangkok, Nonthaburi and Samut Prakan
Municipal Electricity Authority (MEA)	Manage the sale and distribution of electricity in Bangkok, Nonthaburi, and Samut Prakan

Hydropower

In 2019, facilities for the production of energy from hydropower with a total capacity of approximately 3,050 MW were installed in Thailand (including large power plants operated by the EGAT with a capacity of approx. 2,900 MW). The AEDP foresees a capacity increase of small-scale hydropower plants from the current 150 MW to 376 MW by 2036.

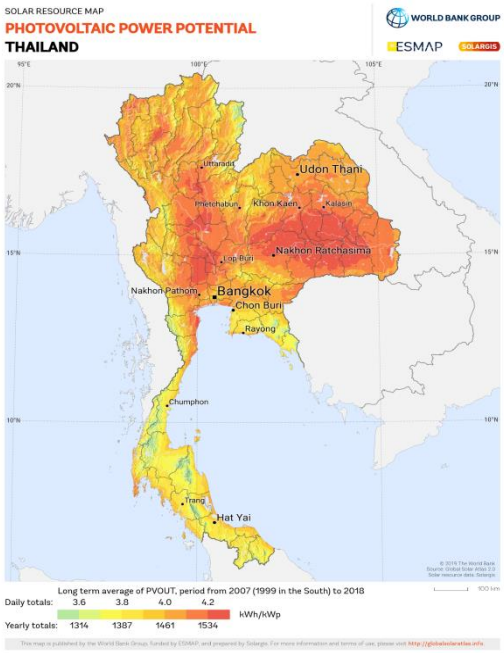

Figure 3 PV solar potential for Thailand. (2019 The World Bank, Source: Global Solar Atlas 2.0, Solar resource data: Solargis)

Solar Power

Thailand is located in a tropical area and, therefore, contains abundant solar power sources from solar heat. The country has several areas with great solar power potential, including southern and northern parts of the northeastern region at Udonthani province, and certain areas in the central region. The combined solar potential area accounts for around 14.3% of the country, gaining average daily solar exposure at around 19 – 20 megajoule per square meter per day (MJ/m^2/day), while the other 50 percent the country gains around 18 – 19 MJ/m^2/day.

Peak density of direct radiation in Thailand is approximately 1,350 – 1,400 kWh per square meter per year (kWh/m^2/yr), covering 4.3% of the country's area in the central region and southern part of the northeastern region (See Figure 3), while 19.5% of the country's area has approximately 1,200 – 1,300 kWh/m^2/yr. The density of direct radiation in Thailand usually escalates from January and peaks in April, before descending to its lowest point in December.

Solar power in Thailand is targeted to reach 6,000 MW by 2036. In 2013, installed photovoltaic capacity nearly doubled and reached 704 MW by the end of the year. In 2019, with a total capacity of 3,300 MW, Thailand had more solar power capacity than the rest of Southeast Asia combined.

Biomass Energy

The main target of the Alternative Energy Development Plan is to increase the portion of biomass energy generation from 2,541.8 MW in 2014 to 5,570.0 MW in 2036.

Several studies have projected that biomass wastes can cover up to 15 % of the energy demand in Thailand. These estimations are primarily made from biomass waste from the extraction part of agricultural activities in large-scale agricultural processes, and do not include biomass wastes from Small and Medium Enterprises (SMEs) in Thailand. The major biomass resources in Thailand include:

- Woody biomass residues from forest plantations
- Agricultural residues (rice husk, bagasse, etc)
- Wood residues from wood and furniture industries (bark, sawdust, etc)
- Biomass for ethanol production (cassava, sugar cane, etc)
- Biomass for biodiesel production (jatropha oil, etc)
- Industrial wastewater from agro-industry
- Livestock manure
- Municipal solid wastes and sewage

Thailand's vast biomass potential has been partially exploited through the use of traditional as well as more advanced conversion technologies for biogas, power generation, and biofuels.

Rice, sugar, palm oil, and wood-related industries are the major potential biomass energy sources in Thailand.

Geothermal

Thailand's government sets a geothermal policy to increase the power generation to be 1 MW in 2021. As of 2006, a study by the Department of Alternative Energy Development and Efficiency found a total of 112 hot brine sources in every region of Thailand except the northeastern. Water temperatures on the surface level range between 40 – 100 ºC and most of the hot springs originate from granite, especially along the fault line, in the northern provinces such as Mae Jan in Chiangrai and Fang in Chiangmai.

The Department of Mineral Resources had test-run a 300kW power production with the underground water temperature of 130ºC from the geothermal project at Fang in Chiangmai. The power production cost of the project was eight times less than production from fossil fuel, with several times cheaper maintenance cost and longer durability. However, the project was suspended due to limited resource availability.

Microgrid sector development

As of 2016, The National Energy Policy Council has approved the Master Plan for Thailand Smart Grid Development (2015-2036), which is expected to involve a total investment of about 200 billion THB for the 20-year period.

According to the timeframe of the PDP2015, the Transmission System Development Plan includes:

- Transmission interconnection project (grid to grid): To connect Thailand to neighboring countries grid to grid, and expand to accommodate ASEAN Power Grid (APG)
- Smart grid system development: To enhance the security and efficiency of the power system and accommodate power from renewable energy sources and reduce environmental impact.

The 200-billion-THB project will be used to fund the deployment of up to five smart grid pilot projects under the guidance of Thailand's Ministry of Energy.

EGAT has chosen Muang district of Mae Hong Son province to trial its first smart grid project, while PEA has selected Mae Sariang in the same province and Betong in Yala province (a province in the deep south of Thailand). Meanwhile, MEA is targeting some industrial estates in its coverage area, namely Bangkok, Nonthaburi, and Samut Prakan. These pioneer smart grid projects are expected to reduce peak power demand by a total of 350 MW by 2036.

Industry associations

The Association of Private Power Producers

The key objectives of APPP are to cooperate with the government in the development of the power sector, including the rules and the regulations associated with the industry, to be the center of information for the members, and to promote technologies and research within the generation industry. The main policy is to provide support and good cooperation to all government agencies to ensure the sustainable growth of the power generation industry in Thailand.

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