



THAILAND



COUNTRY OVERVIEW

Following rapid economic development and urbanisation, Thailand faces rising energy demand coupled with increasing reliance on non-indigenous sources of energy. As a result, since 2018, the Thai government has been implementing Thailand 4.0, a value-based economic model driven by innovation, creativity and technology focused on social and environmental sustainability.

Thailand, as a signatory to the Paris Climate Agreement and the UN Sustainable Development Goals, is firmly committed to transitioning to greener economy through developing the cleantech sector. In 2014, the country launched the Thailand Integrated Energy Blueprint (TIEB), comprising five different energy plans, of which the Alternative Energy Development Plan (2015-2037) includes a target to achieve 30% of total consumption from renewable energy by 2037. With an even more forward-looking vision, Thailand is also working on the National Energy Plan (NEP), which will address the country's carbon neutrality by 2065-2070 by integrating all five energy plans under TIEB into a single all-encompassing course of action.

A report by the International Renewable Energy Agency predicts that energy demand in Thailand will increase by 78% by 2036 and GDP by 126%, adding further strain on the current state of technology development, infrastructure and policies, but also creating numerous business opportunities for both domestic and foreign companies and investors.



SECTOR OVERVIEW

As of 2019, hydropower contributed 30% of the existing renewable capacity, solar 28%, biomass 27% and wind 15%. This allows Thailand to not rely too heavily on any single renewable energy source and benefit from innovations on different fronts. Thailand currently has installed renewable energy capacity of over 15 GW, accounting for approximately a third of the overall power mix, that is forecast to rise to 63 Gigawatts and a 39% share by 2030 (source: Bangkok Post). Additionally, to reduce the country's dependency on coal, oil and natural gas across different sectors, and to anticipate the sustainability challenges of the future, Thailand is putting great emphasis on the production of sustainable biofuels. Some of the major players, focusing on different types of renewables in Thailand are Energy Absolute (solar and wind), SPCG (solar), Gunkul (solar, wind and biomass), TPC Power Holdings (TPCH) (biomass), Thai Solar Energy (solar and biomass), and Power Solution Technologies (PSTC) (solar, biomass and biogas).

Renewable energy

According to Bangkok Post, since 2010, solar energy, as Thailand's renewable pioneer, has grown by 89% and is predicted to grow by 10% every year leading up to 2030, creating multiple opportunities for businesses. The market is still largely dominated by multinationals like Schneider Electric, and large domestic corporations. Solar energy is driven by the national Power Development Plan and the Alternative Energy Development Plan that strongly aim to increase the country's installed solar capacity and consumption, with self-consumption, as well as small and medium-sized projects generating a lot of interest, and attracting private investors, operators, and innovation. The government has ensured that the import and export of infrastructure is easy, and the cost of solar panels and battery storage is affordable. The government has also eased the regulations for solar rooftops, aiming to draw in individual households and commercial businesses to contribute to generating solar energy. Therefore, solar is a lucrative sector also for SMEs and as of 2020, small power producers owned 27.4% of the market (source: Krungsri). Small noteworthy solar firms are Solar Power, Bangchak Solar Energy, Equator Solar, Siam Solar Energy, Rang Ngam Solution, among others.

Hydropower is an important source of renewable energy in Thailand, and used to dominate the renewables market, until the rise of solar. However, hydropower is dominated by the Electricity Generating Authority of Thailand (EGAT) and is also protected by strict laws and regulations, with large domestic, such as CK Power, and foreign companies, such as Andritz, carrying out the contracts. While that is important to ensure both economic and social viability of these projects, it makes it difficult for new and smaller businesses to enter the market, as the state rarely purchases electricity from small-scale hydropower projects. While hydropower will remain, growth in renewables is coming from elsewhere.

Supported by the strong agriculture industry, Thailand's main sources of biomass energy are bagasse, rice husk, wood chips, livestock, and municipal waste, while waste from SMEs is not generally considered as a raw material. Most biomass energy is generated by large and centralised plants, some with focus only on own production side streams. This is contrasted by, largely rural, domestic households and small farms or community-based plants using biomass as a source of heat, often simultaneously generating air pollution. Most small-scale projects are driven by government incentives, without much input from the private sector. However, there is a gap in the market for mapping of biomass availability, and technologies that allow for more value to be extracted from biomass before energy is generated, as well as for a structured and regulated system of upstream and downstream stakeholders, companies, and plants, where biomass processing, value extraction and energy generation can be done by a much larger group of companies. Therefore, the potential of this sector is considerable, with the application of right technologies and logistics. Notable companies in this sector are A.T. Power, Khanburi Power Plant, Mitrphol Bio-Power, Buayal Bio Power, Gulf Yala Green. The sector also contains several successful small companies, such as Erawan Power, Songkhla Biomass, Thip Kamphangphet Bioenergy and others.

Wind energy has not received the same amount of attention as solar, with largely a single market player, Wind Energy Holdings, dominating the market, while actively branching out to seek renewable investment opportunities in other countries. Although the government plans to increase its wind-generated energy purchases from 2024, the trend is still favouring larger suppliers, especially those who have access to what are considered prime spots for wind energy generation - national parks. Small stakeholders are Wind Development, Theppana Wind Farm and Lam Takhong Wind.

Green transport

By 2036, Thailand is also aiming to lower energy consumption of the transport sector by 45% from 2019 levels. To do this, the government is planning to promote more energy saving engines, encourage people to move from private transport to public transport and from road to rail, transport oil through pipelines, replace 1.2 million vehicles with electric vehicles (EV) and increase the use of biofuels up to 4-fold, accompanied by a network of charging stations and energy storing technologies, such as vehicle-to-grid energy generation and distribution (source: International Energy Cooperation Center). As part of the goal to

become a bigger player in the EV and EV parts production industry, the National Electric Vehicle Policy Committee is promoting the Zero Emission Vehicle (ZEV) under the 30@30 policy, promoting domestic production of EV up to 30% of total production by 2030. In addition to investing in a network on up to 12,000 (fast) charging stations around the country, the policy also aims to create a regulatory framework to apply for licences, develop EV data platforms, and reach a 40GWh EV battery storage capacity by 2030, with lowered tariffs to boost usage.

Waste and water management, and recycling

Thailand is following the “Roadmap on plastic waste management 2018-2030”, which aims to replace the use of plastic with more environmentally friendly materials and reduce landfill space. One of the goals of the roadmap is that by 2027, 100% of plastic waste will be reusable, although as of 2020, the country’s recycling capacity was only 25%, with approximately 22% of urban waste recycled. The roadmap has been put into use on several occasions already. In 2020, Thailand banned the use of single-use plastic bags by large retailers and convenience stores. This was preceded by the 2018 ban on import of most types of plastic and electronic waste. At the same time, it has been argued that there is still the need to import some plastic waste, as manufacturers cannot solely rely on domestic plastic waste, which, due to improper and insufficient sorting, cannot be used as raw materials.

Improved recycling and waste to energy practices are needed, not only to ensure domestic supply of used plastics, but that enough plastics domestically do get re-used, as well as to limit the environmental damage of household, commercial and municipal waste. As of 2021, the quality of waste separation is either lacking or in many cases non-existent in rural areas. While the Thailand Power Development Plan targets the purchase of 400 MW of electricity from waste-to-energy plants, many local communities are reluctant to support them, due to concerns about air pollution. In this sector, there are several companies that are considered small stakeholders, such as PJT Technology, C&G Environmental Protection, Super Earth Energy and Ratchaburi-EEP Renewable Energy.

During the rainy season in Thailand, May–October, there is a large amount of rainfall replenishing most Thai water stores, although increasing urban populations are putting higher demands on fresh water supplies. Very little water is recycled in Thailand and less than 1/3 of municipal districts have facilities for treating sewage. This is resulting in contamination of ground and surface waters which further increases the need to recycle water. Water management is one of the government’s top priorities and in 2020, a long-term water management plan covering 53 water development projects was approved by the government. The market for wastewater treatment is expected to grow continuously over the next few years, driven by to the real estate, industrial and agriculture sectors. In general, Thailand expects to see an annual increase of 10% in the wastewater treatment capacity. (Source: Envilience Asia / AngloInfo / Bangkok Post / DEDE)



REGULATION

Since the second half 2010's, the Thai government has been open and welcoming of the renewable energy sector, creating legislation to make it easier for the private sector to get involved in energy production, as well as to get smaller projects off the ground. **Feed-in-Tariffs (FIT)** include all types of renewables, solar, biomass, biogas, wind, hydro and waste-generated energy and the tariffs are calculated based on each individual energy source, as they all have different production costs. This is a step up from 2018, when the price paid for renewable energy was level with fossil-fuels, thereby decreasing the attraction of building new renewable plants. Now, due to the changes in FIT and increased prices, small scale renewable plants are much more incentivised to sell to the grid. Additionally, as the cost of many renewable energy technologies reaches grid parity, part of FIT was changed to competitive bidding through an auction.

Private power purchase agreements enable private sector players in the solar sector to sell electricity directly to each other with the help of blockchain technologies, in addition to the state grid. In January 2021, the government, aiming to increase the uptake of "rooftop solar", raised the price paid per kilowatt and begun to ease tax issues related to these investments, making small-scale private solar energy projects more attractive. The Thai government is also planning to expand the power distribution network to support the increasing generation capacity, which is likely to bring new players, especially smaller projects, to the market.

The government is also driving renewable energy developments in bio-waste under the Community Power Plants for Local Economy programme as the main method to stimulate the local economy using distributed renewable energy generation, mainly from agricultural wastes.

In practice, certain **challenges** still need to be solved before renewables play the major role in powering the grid. These include overcoming technology gaps, impacts of fluctuations in power output on supply to the grid, removing technological restrictions on energy storage, and overhauling the electricity grid and related systems.

Blockchain is one such method to facilitate user management, purchases and distribution of energy and peer-to-peer (P2P) power trading. Blockchain started with a renewable energy trading platform launched in 2019, based on blockchain distributed ledger technology to simplify the purchasing process in the energy sector between buyers and sellers, with different industries. An example is project T77 which establishes a cross-industry collaboration on a deep level between the country's real estate and renewable energy sectors, relying on real-time blockchain driven peer-to-peer electricity trading. Power trading is envisaged to not only include solar, but also biomass, biogas and waste.

The Board of Investment (BOI) of Thailand offers various **investment promotions**. For example, the exemption of corporate income tax for up to eight years, exemption from import duties on machines and raw materials, as well as the possibility for foreigners to own land and to facilitate the employment of foreign experts. Recognising the importance of alternative energy to the country, BOI has listed alternative energy production projects as a priority concession. This includes the use of alternative energy sources such as agricultural materials, industrial waste and wind energy to produce electricity or steam power, the manufacture of alcohol or fuel from agricultural products such as agricultural and municipal waste, and using energy-saving machinery, manufacturing fuel cells and so on.

Thailand also has a very active and developed **green bond** market, the strength of which is enforced with the issuance of certified climate bonds designed to finance and refinance green projects, with the Asian Development Bank as a prominent investor. Thailand's green bonds comply with International Capital Markets Association's Green Bond Principles and Climate Bond Initiative standards and are regularly used by both private and public companies.



MARKET ENTRY

The main issues facing renewable energy in Thailand are high costs and technological development. Currently, most renewable energy technologies in Thailand are imported with a small portion of components produced locally, so there are many opportunities for foreign investors and technology developers, looking for distributors or technology adapters. However, there is no priority given to foreign renewable companies entering Thailand, and renewable energy companies and investors need to follow the same rules and processes as companies in other industries.

Presence in the country can work wonders for business prospects, making local connections and finding business partners, which are often required for many investments and business ventures.

Thailand has several relevant industry associations that will be able to make introductions and provide detailed information:

- <https://www.thaiwindenergy.org/> - Thai Wind Energy Association
- <https://www.tpvathailand.com/> - Thai Photovoltaic Industries Association
- <https://re-fti.org/en/english-homepage/>
- Federation of Thai Industries Renewable Energy Industry Club
- <http://www.evat.or.th> - Electric Vehicle Association of Thailand (EVAT)
- <https://www.depa.or.th/en/article-view/depa-smart-city-alliance-2-60/>
- <https://www.facebook.com/ThaiSmartCity/>
- Smart City Alliance Thailand by DEPA (Digital Economy Promotion Agency).

Thailand also hosts several recurring international trade fairs (COVID-19 permitting) that can be used for market research and networking in renewables and related sectors:

- <https://www.asew-expo.com/2021/en/index.asp> - ASEAN Sustainable Energy Week
- <https://www.futureenergyasia.com/> - Future Energy Asia
- <https://www.futureenergyasia.com/> - Smart Energy Technology Asia
- <https://www.agritechnica-asia.com/> - Agritechnica Asia
- <http://www.thai-marine.com/> - Thailand Marine & Offshore Expo

The Thai Chamber of Commerce <https://thaichamber.org/home> and 32 countries that are the members of the Joint Foreign Chambers of Commerce of Thailand <http://www.jfcct.org/> will also be able to help with introductions.



RECOMMENDATIONS AND TRENDS

As Thailand is actively pursuing the development of its green economy, there are investment opportunities across the whole renewables and the 'bio' sector. However, solar could be seen as the easiest place for newcomers to start, due to its popularity, steadily falling installation and operation costs and sizeable earnings potential, as well as and favourable regulations. Investment areas could include off-market solar farms, which are outside public procurement, self-consumption schemes for business owners, solar rooftops, floating solar farms, power trading and Internet of Energy. In most areas, cooperation with a Thai partner is required or recommended.

Energy storage is still an issue, and although the Phi Sua House in Chiang Mai features an impressive hybrid hydrogen-battery storage system and hydrogen fuel cells developed by the company Enapter, technologies that improve energy storage or allow for greater amounts of energy to be stored, for longer, would benefit many areas and are in demand. Energy storage systems would also enable continuous and uninterrupted supply of renewable energy to consumers, while evening out fluctuations between seasons. Thai companies, such as EGCO on the public side and JinkoSolar, BanpuNext, PTT in the private sector, are actively forming partnerships with foreign developers of energy storage systems to meet the needs of municipal, residential and transport sectors.

Both biomass and biogas from waste and energy crops are growing steadily. Biomass investors and technology provider should investigate community level power production projects, alongside small power producers. Additionally, know-how from foreign business can go towards plugging the gap in the upstream biomass supply chain to ensure continuous supply of raw material. Regarding biogas, investments will primarily be made by companies producing energy from their own on-site waste with insufficient waste for commercially viable 100% biogas production operations.

In waste to energy, best investment and technology sales opportunities are within waste collection and sorting facilities to ensure a steady supply of usable input materials.

With the entry of small and micro producers of renewable energy, and community and household level solar producers, competition and the level of technological advancement is expected to increase. This is expected to open doors to foreign companies with relevant technologies and know-how.

Wind energy is also seeing steady growth, although the market is more favourable to large-scale investors, with access to suitable areas and transmission lines. Hydropower is even less favourable to small companies, with an added reason of the dominant role played by EGAT in hydropower generation.

In summary, Thailand, not without environmental challenges and shortcomings, is making strong headway towards a more sustainable development path, with focus on turning the country from one with high air pollution and plastic-covered countryside to a hub of renewable energy, with sustainable practices and technologies applied in as many areas as possible. Legislation is creating favourable conditions for new entrants and innovations and increasing FiT and reliance on imported technologies make Thailand a great investment and business destination, not only to sell new technologies, but also to contribute to the country's technological know-how and increase national innovation levels.



CLEANTECH SECTOR BRIEF