
AN INDUSTRY PERSPECTIVE ON STRENGTHENING ONSHORE WIND DEVELOPMENT IN THAILAND



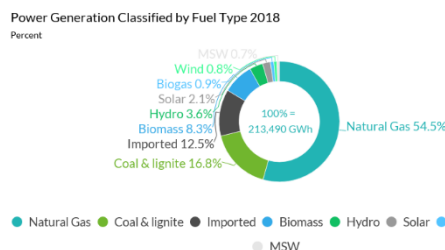
GWEC
GLOBAL WIND ENERGY COUNCIL

An Industry Perspective on Strengthening Onshore Wind Development in Thailand

The GWEC South East Asia Task Force and ThaiWEA published this position paper as a guiding document for the industry, with the aim of providing a course of action to grow the onshore wind sector in Thailand.

As a hub of steady economic and population growth, South East Asia is poised to become a decisive actor in the energy transition. Urbanization and rising income levels are fueling the region's demand for electricity, which has increased by an average of 6.1 percent each year since 2000. However, South East Asia's energy generation mix continues to be dominated by fossil fuels, and particularly coal-fired generation, with damaging socioeconomic, health and environmental impacts.

Thailand, the region's second-largest economy, reflects this scenario: Its generation mix (in GWh) in 2018 was highly dominated by natural gas (54.4%), followed by coal (16.8%) and non-hydro renewable energy (12.7%), the majority of which is biomass (8.2%), according to the Ministry of Energy (MOE).¹ Wind and solar account for only 2.9 percent of total power generation.



Wind and other renewables can play a far larger role in resolving the main challenges facing Thailand's energy system: 1) energy security, by diversifying fuel sources, reducing dependence on energy imports and improving the balance of trade; 2) energy economy, or the need to generate power at reasonable costs and maintain economic competitiveness; and 3) ecology, or the need to decarbonize the power, industrial and transport sectors.

As of October 2019, installed onshore wind capacity in Thailand is 1.5 GW – half of the 3 GW target set by the government for 2037. Wind power has the potential for a much larger, cost-competitive contribution to the future energy mix; however, an unclear roadmap for future procurement are restraining the ability of wind power market to contribute to Thailand's sustainable (both economic and environmental) future.

In the EU, the share of renewables in power production has exceeded expectations, reaching almost 50 percent in Germany for the first six months of 2019.² By 2017, 11 EU countries sailed past their 2020 targets for the share of renewables in final energy consumption, three years early.³ This trend has been driven by technological innovation and the increasing cost-competitiveness, volumes and industrial scale of wind power and other renewables, which have set many such markets on a development path with lower emissions.

¹[http://www.eppo.go.th/index.php/en/en-energystatistics/electricity-statistic?orders\[publishUp\]=publishUp&issearch=1](http://www.eppo.go.th/index.php/en/en-energystatistics/electricity-statistic?orders[publishUp]=publishUp&issearch=1) &

http://www.dede.go.th/download/stat62/Thailand_Alternative_Energy_Situation_2018.pdf

²<https://www.ise.fraunhofer.de/de/presse-und-medien/news/2019/solar-und->

[windenergieanlagen-erzeugen-im-ersten-halb-jahr-2019-mehr-strom-als-kohlekraftwerke.html](http://www.windenergieanlagen-erzeugen-im-ersten-halb-jahr-2019-mehr-strom-als-kohlekraftwerke.html)

³https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Share_of_energy_from_renewable_sources_2017_infograph.png

Wind has proven itself as a clean and cost-competitive source of power, nearing grid parity with the price of coal-fired power and other fossil fuels in markets like China and the UK. As energy systems around the world approach this significant turning point to transit from fossil fuel energy to clean energy sources, stronger collective efforts from the government, with a strong message to spur the investors, are needed to enable wind power in Thailand to follow this trend of cost reductions and to reach grid parity. Energy cost dynamics have evolved to the point where renewables can assume a far greater role in supporting the kingdom's sustainable development. Global Wind Energy Council (GWEC) and ThaiWEA, together with the industry stakeholders represented among GWEC's South East Asia Task Force and ThaiWEA members, are presenting this position paper to urge the Government of Thailand to take action to resolve the barriers inhibiting growth of the wind sector.

Leading South East Asia's wind power expansion

Thailand reflects strong fundamentals for macroeconomic growth, with GDP growth above 4 per cent in the past two years. Although economic growth is forecast to slow to below 3 per cent in the years ahead, the country's industrial and service sectors are still on track to continue expanding – as will the appetite for electricity.⁴ The recent issuance of the country's first green bond, announcement to set up battery production factories, the buildup of mass rapid transit systems and campaigns for the automobile sector to invest in electric vehicles are reflections of the effort to balance energy security with low-carbon development.

More action is required to reactivate the renewable energy sector. Power consumption at the current rate would deplete Thailand's proven domestic reserves of natural gas and oil within five years – and further exposure to import ratios and commodity market volatility is not the answer. Coupled with the diminishing credibility of coal-fired power plants –

public opposition to coal projects is especially vocal in the country's south – the time for scaling up renewables is now.

Apart from the current 1500 MW wind installation, another 1.5 GW of new onshore wind can be easily achieved by 2023 at competitive price at grid parity, provided the necessary policy clarity and grid capacity. And further capacity of another 5-10 GW can be realized if proper government target is set up to further spur wind development. Thailand is the current leader in onshore wind installations in South East Asia, positioning it at the vanguard of the region's wind power buildup and clean energy transition. The wind development over the last decade has led to a mature Thai wind industry, with several strong local and international industry players. Thai wind industry players are now building on this experience to invest in wind opportunities elsewhere in Southeast Asia, notably in Vietnam and the Philippines.

This position has been achieved due to the sophisticated financing models pioneered by Thai investors in the region, setting a strong example for renewable energy investment. Banks and lenders in Thailand have a mature outlook on renewable energy, and have displayed greater willingness to underwrite clean energy assets when well supported. These achievements should be celebrated in the broader context of South East Asia's energy transition; however, Thailand's leading position in wind, and any long-term sector growth, is being restrained by challenges in policy direction, procurement and grid expansion.

Thailand Installed Wind Power Plant Capacity (MW)
*2019 in construction/ commissioning stage

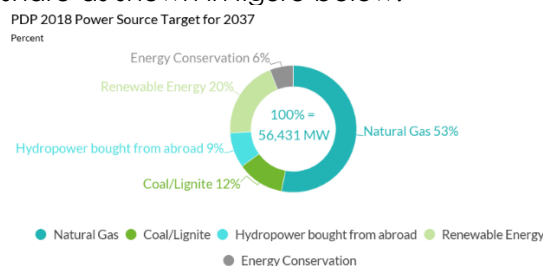


⁴<https://www.bangkokpost.com/business/1769404/world-bank-joins-ranks-of-gdp-naysayers>

An opportunity to accelerate wind power deployment in Thailand

Wind power in Thailand has come a long way from the first pilot program of 150 kW on Phuket Island in the early 1980s. In the last decade, favorable pricing mechanisms have generated strong interest from both domestic and foreign developers, manufacturers and service providers. These mechanisms include the 2007 Adder Program of feed-in premiums for small power producers (SPPs) and very small power producers (VSPP) from 2006 to 2014 – the first such scheme in South East Asia – and the current system of Feed-in-Tariffs (FITs).

In January 2019, the National Energy Policy Council approved the latest version of the Power Development Plan (PDP) (2018-2037), a vital compass which guides the development of Thailand's energy system. While capacity targets for all non-fossil fuels including hydro were revised upwards to 35 per cent by 2037, the targets for wind power remained untouched from the last edition. In addition, the new PDP doesn't foresee any new wind capacity before 2034. The vision for the country's generation mix nearly 20 years down the road relies heavily on natural gas, at a time when domestic gas reserves are rapidly depleting, and still allots coal a 12 per cent share as shown in figure below.



The International Energy Agency (IEA) conducted a study in 2018 with support from the Thai Ministry of Energy and EGAT on the integration of renewable energy into the grid. This study concluded that Thailand's grid is sufficiently robust and flexible to handle higher levels of solar and wind, but that institutional and contractual arrangements are a bigger constraint. In addition, it concluded that solar and wind resources have highly complementary generation profiles in Thailand, which

means that both sources could contribute significantly to midday peak demand and evening peak demand, particularly during the annual peak period. With higher levels of solar foreseen in the PDP (an additional 10,000 MW by 2036), an increase in wind capacity is warranted in this regard.

The fast-moving dynamics of the global energy transition require any national energy strategy to be updated with regularity, in line with international commitments⁵, market trends, technological developments and political objectives. All of these factors should convene to transform the state's approach to power market design and future energy systems planning, with periodic reviews of the PDP and horizon-scanning exercises. Thailand has strong fundamentals for wind power to take off, including a mature investment environment for clean energy and sizable volumes of wind installed and in the pipeline. Focusing efforts on long-term system integration will allow it to build upon the progress achieved to date.

In order to deliver the vision of a high-income, low-carbon Thailand 4.0, the government must adapt its energy blueprint to account for the market-tested knowledge surrounding wind power: increasing cost-competitiveness; proven routes to market; technological innovations which act as enablers for system integration; and technical research which scales up the potential deployment in the country.

Key challenges and calls to action

1. Clear and ambitious targets of at least an additional 7 GW of wind power in the next PDP.

The current target of 3,002 MW of wind power capacity to be installed by 2037 is conservative, given the ample technical feasibility for wind power in the country, the installation scale required to generate local/regional supply chain activity and the investment potential at stake (an estimated USD 6-10 billion over the next 20 years). The government should revise its wind power targets

⁵ Thailand has pledged to reduce greenhouse gas emissions by 20-25 per cent by 2030

upward to 5-10 GW, which would provide long-term policy stability and investment confidence in the sector.

Overview: It is estimated that between 13-17 GW of onshore wind capacity could be developed in Thailand, given the appropriate regulatory and policy environment. A 3 GW long-term target is exceptionally low when compared with the technically feasible wind potential across the country, which ranges from 13 GW (a figure endorsed by the MOE and DEDE) to 17 GW (according to external studies).⁶ Correcting the mismatch between ambition and potential will provide policy stability and send a strong signal of the government's commitment to growing the sector.

More ambitious long-term targets also provide industry with sufficient time to plan and develop project pipelines. A typical onshore wind project requires at least 2-3 years for feasibility studies, planning and permitting, and another 1-2 years for construction.⁷ Revising the targets sooner will provide industry with the necessary time to anticipate scale and make the necessary additional investments in local/regional supply chains. In Europe, clear political support for sizable long-term sector growth has spurred economic activity among developers, manufacturers and service-providers which make financial commitments to building local facilities, modernizing infrastructure and upskilling local workforces. Economies of scale coupled with technological innovation drives down costs, making wind energy cheaper and more competitive.

The greatest wind potential is concentrated in the northeast, west, south and east regions of Thailand, which are less developed.⁸ More ambitious targets will drive development in these regions, which are far from large urban centers, and create opportunities for community investment, local job creation and improvements to quality of life. An estimated USD 6-10 billion of investment could be generated by the wind sector over the next 10 years, if targets reached 5-10 GW.⁹

The latest revisions to the PDP (2018-2037) take a step in the right direction by de-emphasizing reliance on coal in future power capacity. But the problems of depleting natural gas reserves on the horizon, reliance on imports which expose national capital accounts to volatile gas/LNG prices and Thailand's pledge for emissions reductions are all impending risks. Wind power can and should play a greater role in complementing the future energy system's large base of gas power plants – but needs the right targets and policy framework to set the pace and scale.

2. **Create a supportive and transparent policy structure for procurement and a clear PPA application process.**

A strong wind sector can generate jobs, capital, economic activity and power which is cheap, clean and reliable. But this requires a transparent and predictable procurement framework that allocates risks appropriately and gives industry a strong understanding of the timelines and requirements to enable financial commitments. A clearly defined PPA application process, wherein

⁶https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Nov/IRENA_Outlook_Thailand_2017.pdf

⁷<https://www.iwea.com/images/files/iwea-onshore-wind-farm-report.pdf>;
<https://www.climateinvestmentfunds.org/sites/ci>

[f_enc/files/knowledge-documents/cif_case_study_thailand_dtp3.pdf](#)

⁸https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Nov/IRENA_Outlook_Thailand_2017.pdf

⁹ Based on ThaiWEA Wind Energy White Paper

power producers must meet relevant technical and financial conditions, will also help prevent grid capacity from being allocated to projects that will not be implemented.

Overview: The European experience has demonstrated that FITs are an efficient avenue for development of a strong wind industry, providing fixed and predictable revenues to power producers. The recent shift in many markets from FITs to competitive mechanisms, such as auctions or reverse auctions that are viewed as markets for “true price discovery,” has seen wind power achieve incredibly low bid prices in places like the UK and India.

However, functioning auctions mechanisms generally take time a period of 2-3 years to be implemented. Given the current stage of development in Thailand and the level of cost reduction of the wind energy, it is advisable for Thailand to continue with a grid parity competitive FIT price to maintain the current experienced contractors and investment in rural areas, contributing to the development and welfare of local communities. If there is a government appetite for designing auction system, it should continue the FIT while developing auction system, which will take another 2-3 years to come into shape.

Since April 2017, when the Minister of Energy announced that within the next five years, Thailand would not contract any new RE generation, unless it would be able to generate at the wholesale tariff level of 2.4 THB/kWh, the appropriate tariff level for renewable energy in Thailand has become an issue of debate. Since 2014 Thailand has been piloting versions of competitive bidding schemes, with the FIT level as the ceiling, for biomass and biogas projects in the south, with an eye to

potentially implementing this model nationwide.

A transition from FITs to competition requires transparency and dedication. Communication to industry must be clear and timelines must be adhered to, particularly in emerging markets seen as riskier targets for private capital. In general, outlining downward increments of FITs in regulated stages will allow industry time to prepare and make adjustments. Appropriate auction designs with well-defined pre-qualification requirements and a concrete schedule for bid submission, selection, construction and COD are then necessary to provide policy stability. Larger bid volumes are encouraged by scheduling multiple, regular competition rounds, which provide developers with more lead time for planning.

A successful procurement mechanism also requires bankable PPAs with technical and financial conditions that guarantee awarded capacity is financeable and can be delivered. Projects which apply for connection to the grid through the Electricity Generating Authority of Thailand (EGAT) must meet these conditions at application process, in order to prevent any grid capacity from being occupied by non-viable projects.

More certainty in the application process will also provide greater investor confidence. Having a well-defined and efficient process of approvals will reduce the time and money spent in pre- construction development. The specific recommendations for the wind power PPA application process are in Annex of this paper.

3. **Optimize the FIT.**

GWEC and ThaiWEA understand that it is the intention of the Thai Ministry of Energy to aim for a Feed-in-Tariff for wind power of less than 2.99 THB/kWh. The Thai Industry is

able to deliver the FiT below 2.99THB/kWh with current technology. The industry is also able to deliver project at even more ambitious level of 2.5 THB/kWh, if further government support is given to facilitate wind development. Such support could include, but is not necessarily limited to, streamlining of the permitting process, clarification of land use issues, loosening of setback regulations and more preferential access to the electricity network. Here are some proposals from the industry. The differentiated FiT Level, depending on regions and wind resources: For example, to incentivize investment in remote, or less developed area, where there is less infrastructure; Or a stabilized FiT with certain contributions channelling back to the local community to build up the local economy.

4. Grid and transmission infrastructure planning must introduce flexibility and integration.

Wind and other renewable energy sources will require long-term grid development roadmaps in order to facilitate their integration into the power grid. EGAT must be proactive in upgrading and building out its transmission infrastructure at a pace which can accommodate greater and more diversified generation. Authorities should also introduce flexibility into the grid which can make optimal use of the potential complementarity of wind and solar power and match load profiles where possible.

Overview: While Thailand's transmission grid is generally assessed as stable and robust, authorities should prepare for and optimize the increasing penetration of renewable energy by enhancing grid flexibility. This work will need to be undertaken on a region-by-region basis, depending on available infrastructure and resources, but has the potential to lower electricity tariffs and pay

dividends in overall efficiency and reliability.

The areas with the strongest wind potential are in the northeast, west and south – far from load centers in the country. Transmission network planning should account for investments in transmission assets for these locations which are more suitable to wind power, with a long-term view to reducing the grid costs incurred by transmission constraints and losses.

The Thai government has already recognized the potential upsides of disruptive technologies like intelligent control systems, demand-side management schemes and smart grids. Looking further ahead, the potential application of storage facilities like batteries and hydrogen fuel cells can take advantage of electricity generated at night by wind power, when demand is generally lower, and reduce operational costs.

5. Update national knowledge on wind resources and feasibility.

The wind power targets set in national strategy have been driven by the understanding of Thailand's wind resources. However, the studies used to develop wind maps date back to studies in the 1970s, 2001 and 2010-2011, each of which used different methodologies and turbines of a certain model to determine technical feasibility. A recent effort to harmonize these studies found that the potential when using turbines specifically designed for low wind speeds was as high as 17 GW. The approach to wind feasibility should account for a greater range of turbine technology, which can optimize low wind speeds and capture larger volumes of wind power.

Overview: The most recent wind potential assessment that has been endorsed by the MOE's Department of Alternative Energy Development and Efficiency (DEDE) reflects average wind

speed of 5-7 m/s at heights of 90 meters. This assessment found that Thailand had 13 GW of technical potential across 21 areas, with the most favourable winds in the northeast, west and south regions of the country.

However, a recent study (Manomaiphinon et al, 2017) shows that technical potential can reach up to 17 GW if the turbines deployed are a modern model adapted for low wind speeds, and only 5 GW of potential could be realized with conventional turbines.¹⁰ The large gap in the 3 GW by 2036 target for wind power and this high potential can be partially attributed to assessments which have not accounted for turbine innovation. It is necessary that wind turbine technology, hub height and location be accounted for in official wind maps, in order to accurately reflect the technical feasibility for wind power in Thailand.

6. Review land location rules to enable greater deployment of wind power.

The wind turbine setback regulations introduced by the Energy Regulatory Commission (ERC) in 2015 have created challenges in implementation, primarily due to interpretations which fall short of international standards. These setback rules should be relaxed in order to enable smoother project development and optimize the available land area for wind power.

Overview: The setback regulations introduced by the ERC determine the distance between a wind power plant and other structures. However, the language used in these rules has been interpreted in practice in ways that fall short of international standards. Two areas stand out for recommended review:

- A “house” must be clearly defined, as interpretations of different types of buildings as houses or not directly affects the layout of the turbine and the road design for the project. According to the Civil Registration Act, a “house” is defined as the residence of the people registered with a registrar with a house number.
- A “highway” should be defined in accordance with international standards, which determines the existence of a highway according to its traffic density. As setback rules require the distance between the turbine and highway to be equal to not less than 1.2 times the sum of the height and blade radius for all types of highway, this implies that low-traffic roads and throughways built for project access should also be included. Given land plots in Thailand are already very small, this interpretation is adversely affecting projects by limiting the number of turbines which can be deployed per plot.

Modifying the language in the ERC's setback rules (Clauses 4 and 5 in the original notification) to be more specific and in line with international standards will enable greater deployment of turbines on leased land area, and therefore more productive wind power projects.

¹⁰https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Nov/IRENA_Outlook_Thailand_2017.pdf;

https://www.climateinvestmentfunds.org/sites/cif_enc/files/knowledge-documents/cif_case_study_thailand_dtp3.pdf

Annex 1: PPA Application: Technical Requirements (Source: ThaiWEA 2018 Position paper)

PPA Application: Technical Requirements	
Section	Recommendation
Project Boundary	Any Project Application should include a map showing a well-defined project boundary (polygon) officially approved and registered by Local Subdistrict Administrative Organizations (SAOs) to avoid project overlap.
Wind Monitoring Mast Installed	Proper financing will be obtained only with proprietary project wind data recorded at the site. Given Thailand wind characteristics, only projects with 90 m or higher wind monitoring masts with a suitable height in accordance with the selected hub height for the project as per international best practice (eventually through supplementary data from Lidar or Sodar) and with more than one year of measurements should be considered for installation of turbines within 2 to 5 km radius around the wind recording equipment depending on the turbine layout and site complexity. Proof of a signed and paid-for met mast land lease must be required.
Land Lease	To be able to be financed and constructed, the project will have to sign a long-term lease (25 years or in agreement with PPA period) with all parcels inside the project boundaries. Any project application must have, at the moment of application, a signed lease contract or a signed commitment to enter into a leasing agreement which covers the PPA duration with 80 per cent of the parcels owners and users within the project boundaries (boundaries as defined by the regulation).
Community Support	Any Project Application must have, at the moment of application, a written letter of support by the SAO within the project boundaries (boundaries as defined by the regulation) and a commitment to implement some community funds over the life of the wind farm.
Environmental Assessment	Any Project Application must have, at the moment of application, an Initial Environmental Evaluation for the wind turbines installation. The site boundaries will have to be clear from watershed protection areas as well as protected forests.
Grid Availability Confirmation	To be able to get connected to the grid, the project will have to get confirmation of the grid capacity availability at the expected connection point. To be able to be financed, the construction budget of the grid connection to be borne by the applicant must also be known before the application. Any Project Application must have, at the moment of application, a Grid Availability Confirmation with a clear expected point of connection and capacity available by EGAT (for SPP) or PEA (for VSPP) as well as an estimated construction budget from EGAT (for SPP) or PEA (for VSPP).

Construction Schedule and Turbine Manufacturer Support	Any Project Application must include, at the moment of application, a detailed construction schedule as well as a Letter of Support from a turbine manufacturer.
PPA Application: Financial Requirements	
Section	Recommendation
Financing Term Sheet and Credentials	The contenders will have to prove their ability to finance their wind project by showing credentials in wind power development and construction, and by showing in-principle support by reputable financial institutions. Any Project Application must include, at the moment of application, a presentation of the developer's credentials in wind power and a financing term sheet by a reputable financial institution.
Application Bond	In order to cover the application review costs and to prevent from non-credible applications, a bid bond will have to be presented by any applicants. The Energy Regulatory Commission (ERC) will have the ability to draw upon it to cover its processing costs. Any project application must include, at the moment of application, a bid bond from a reputable bank for THB 500,000 per MW. If the application is successful and a PPA signed or if the application is not successful, the full bond is released to the bidder.
PPA Time Limits	To ensure real project completion, PPA contract should include a COD limit date within 2 years from date of PPA signing and any delays beyond that limit is under the project applicant responsibility through the reduction of the PPA duration. In case no tangible progress has been made with the project development within the set time limits, ERC has the right to revoke the PPA.