

Country Profile

THAILAND

GENERAL OVERVIEW

Thailand is one of the ASEAN founders. With a population of over 67.6 million¹ in 2017 and the second largest GDP in Southeast Asia after Indonesia (455.7 billion USD¹), Thailand is an important key player in the region. In 2017, Thailand's GDP per capita of USD 6,735 is the fourth in ASEAN region. Thailand's economy is driven mainly by two sectors: industry and agriculture. Central of the government and business is in Bangkok, which is the capital city. Thai is the official language; however, English is gaining in importance and is widely used in business and industry nowadays.

ENERGY SECTOR

ENERGY POLICIES

AEDP 2015-2036 set the plan for Thailand RE development with the goal of 30% share in 2036.

Thailand relies significantly on energy imports, especially from crude oil and coal. Considerable natural gas resources are available domestically and used as the main source of power generation (almost 70% of total electricity generation). However, as around 50% of natural gas demand is imported, it raises concerns about the security of supply.

The main driver for Thailand's energy policy is to diversify energy mix ensuring the security of energy supply. Thailand's Ministry of Energy has developed the Thailand Integrated Energy Blueprint (TIEB), in which five energy master plans are reviewed for the period 2015 – 2036, in consistent with the national economic and social development plan. The five master plans are: The Power Development Plan (PDP), The Energy Efficiency Development Plan (EEDP), The Alternative Energy Development Plan (AEDP), The Oil Development Plan and The Gas Development Plan.

The AEDP 2015 was developed with the focus on promoting energy production within the full potential of domestic renewable energy resources and developing appropriate

¹ ASEAN Secretariat. ASEAN Statistical Leaflet 2018

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renewable energy production in consideration to the benefit in social and environmental dimensions in the community.

Other relevant bodies include: National Energy Policy Committee (NEPC) that operates at ministerial level, Energy Policy and Planning Office (EPPO) – a national agency responsible for policy formulation, and Department of Department of Alternative Energy Development and Efficiency (DEDE) aiming at promoting and supporting sustainable energy production and consumption.

ENERGY MIX

Conventional fuel contributes a significant share to Thailand's final energy consumption as shown in **Figure 1**. Petroleum products, imported and domestically refined, are consumed mainly in the transportation sector and some industrial processes. Natural gas and coal are the main energy sources for electricity generation. The government has tried to promote utilization of natural gas in transportation sector to replace the costly petroleum. The other RE sources such as solar (396 ktoe), wind (95 ktoe), biomass (7,970 ktoe), biogas (780 ktoe), and waste (150 ktoe) contribute to 6.58% (9,391 ktoe) in the energy mix.

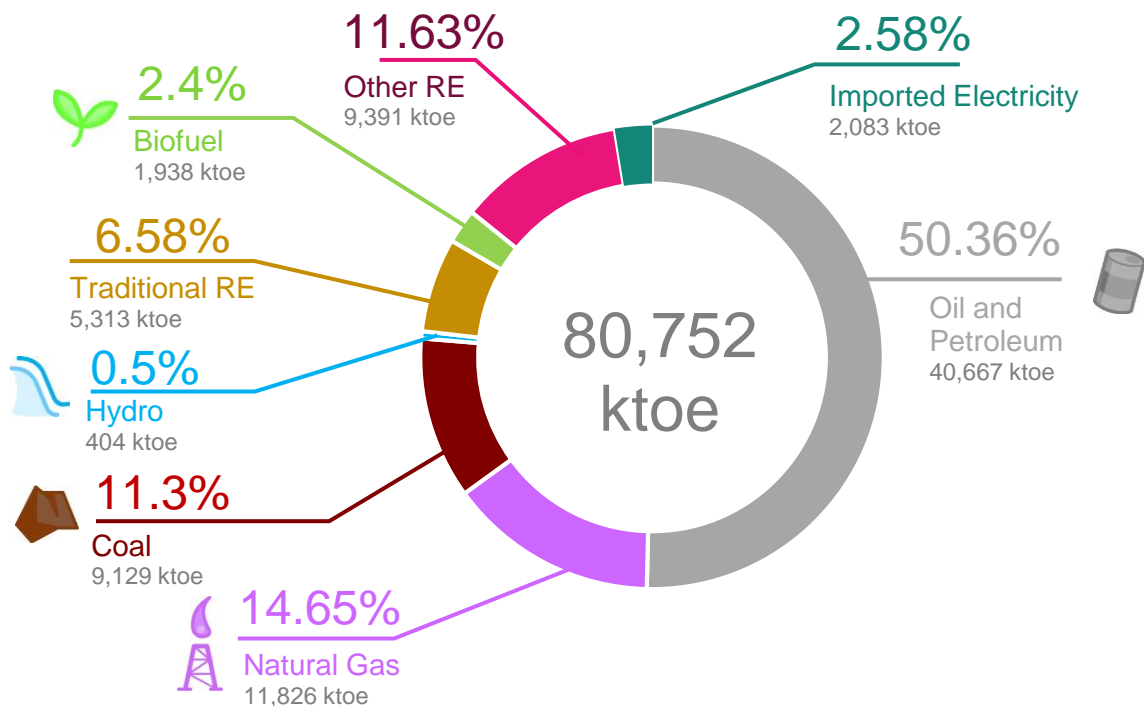


Figure 1: Final Energy Consumption (2017)

Source: Department of Alternative Energy Development and Efficiency (DEDE). Thailand Energy Situation 2017

Although a large portion of electricity can be generated domestically, the electricity sector still relies on imported fossil fuels. **Figure 2** summarizes the generation of electricity by source – 60.17% of electricity is generated from natural gas and around 18% from coal/lignite. An almost negligible portion of oil is used for electricity generation. At present, renewable energy sources (i.e. hydro, geothermal, wind, solar PV and bioenergy) already have a significant increase in the share with 9.76% from total electricity mix.

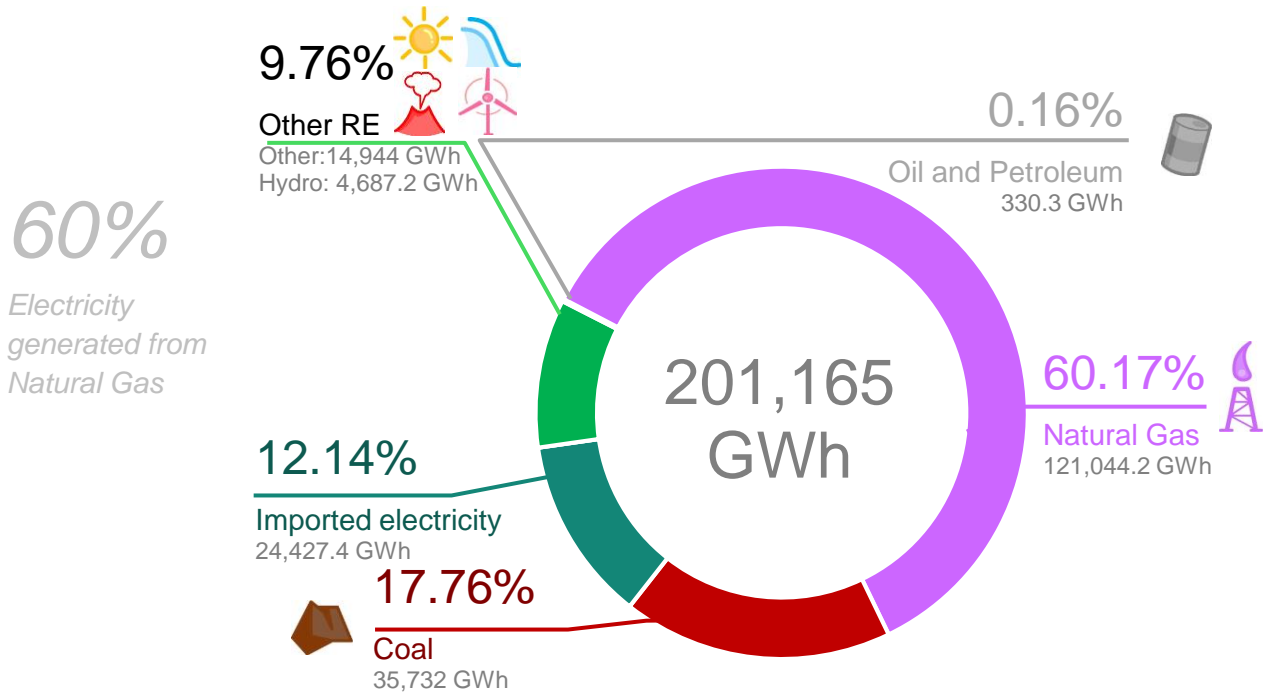


Figure 2: Electricity Mix (2017)

Source: Thailand Energy Policy and Planning Office (EPPO)

Note: Most electricity imports come from Laos PDR which is generated by hydropower.

ELECTRICITY TARIFF & ELECTRIFICATION RATE

The electricity tariff in Thailand is regulated by ERC. There are eight different tariffs, charged according to the client type, consumption level or voltage level.

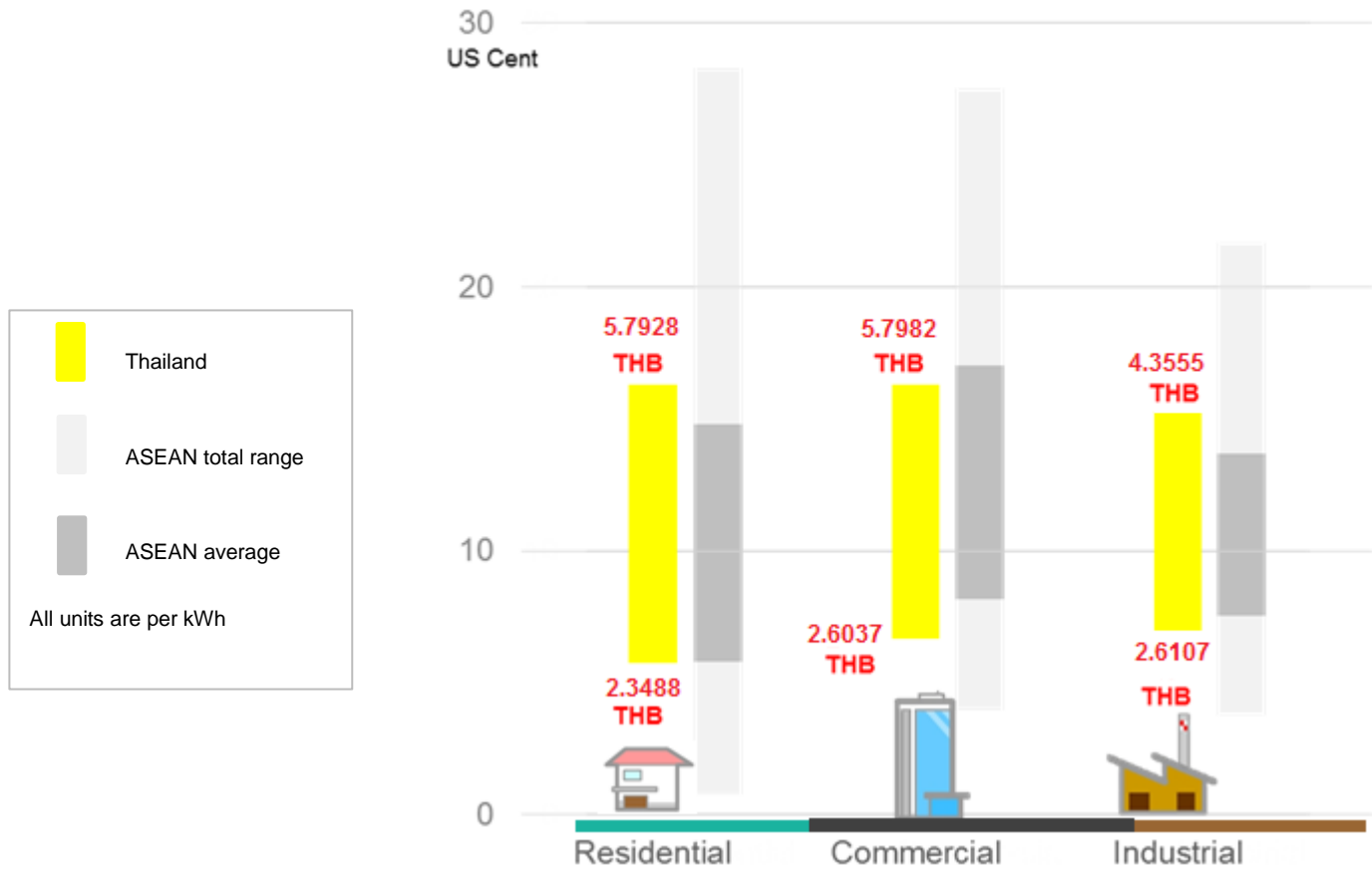


Figure 3: Electricity Tariff in Thailand (effective per November 2015)

Source: PEA and MEA

Note: The exchange rate from Thai Bath (THB) to US-Dollar (USD) is 0.031 (as of December 2018)

99.9%
Electrification
Ratio

Thailand's electricity tariff is divided into three sectors: residential, commercial, and industrial (see **Figure 3**). For the residential sector, the tariff is set according to the consumption level [kWh] – the more electricity consumed, the more expensive the tariff. On the other hand, for commercial and industrial sectors, the tariff is determined according to the voltage level [V]. A user connected to a higher voltage level pays a cheaper tariff. For the industrial sector, the time of use also affects the tariff i.e. it is much more expensive during peak time than for off-peak usage. The tariffs consist of two components: i) base tariff, which is adjusted every year and ii) fuel adjustment value, adjusted every four months.

Importantly, electricity is subsidised for the lowest consumption households, with the aim of relieving the poorest part of the population. The subsidies cover either the whole or half of the tariff.

Thailand has very high rate of electrification. According to the ASEAN Centre of Energy (ACE), access to electricity rate in Thailand has reached 99.9% in 2018.

RENEWABLE ENERGY SECTOR

RENEWABLE ENERGY TARGETS

The AEDP 2015-2036 is an important roadmap for Thailand’s Renewable Energy (RE) development. The overall RE target to be achieved is a 30% share in final energy consumption by 2036; including electricity, heat and fuel consumption. For electricity, the target is to have 20% of final energy consumption from RE, which is supposed to be equal to the total RE installed capacity of 19,684.4 MW (including hydro power). Thailand formulated these targets by addressing two types of power production, namely: 18% from Very Small Power Producer (VSPP) and 2% from domestic large hydro power plants. While the roadmap also sets the target of the provincial RE development by zoning of electricity demand and RE potential, it is also one way of Thai government to encourage on promoting power generation from Municipal Solid Waste (MSW), biomass and biogas to benefit both farmer and communities.

The target for electricity generation compared to the existing installed capacity in 2014 is defined in term of capacity [MW] and can be seen in **Figure 4** below.

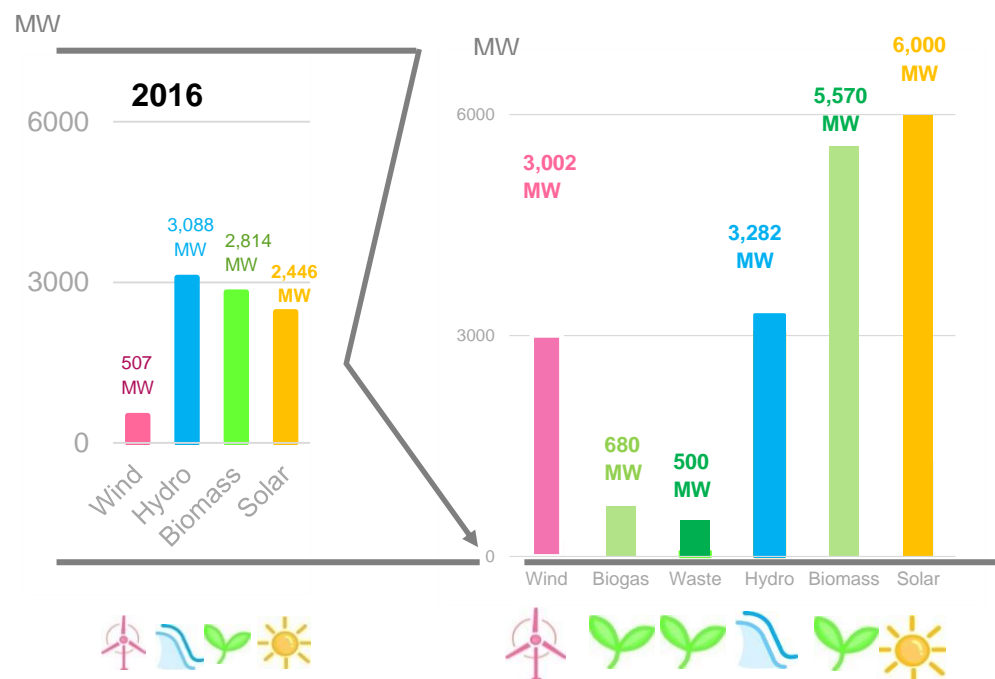


Figure 4: RE Target in the power sector

Source: AEDP 2015-2036 (target) and DEDE website (2016)

Note: In order to represent the data clearly, the scale of ocean energy and geothermal are different from the rest

INSTALLED CAPACITY OF RENEWABLE ENERGY

The total installed capacity of RE in 2017 is 10,238 MW. Large hydropower contributes the most to this installed capacity (**Figure 5**). The solar energy in Thailand has gained its significance over the recent years and contributes to 26% of RE installed capacity. The wind farm at Huay Bong in Nakhon Ratchasima is the largest wind farm in South East Asia.

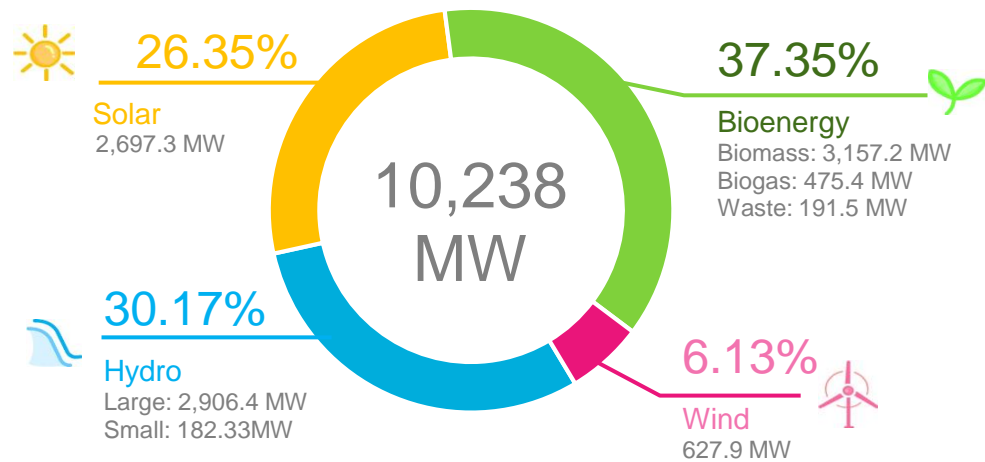


Figure 5: RE installed capacity (2017)

Source: Thailand Alternative Energy Situation 2017, Department of Alternative Energy Development and Efficiency

RENEWABLE ENERGY GENERATION

In 2017, the total power generation from RE is reported at 19,631 GWh (**Figure 6**). Electricity generation from RE source in Thailand is mainly from Hydropower, Biomass and Waste. The number of Hydropower includes the production from pumped storage plants. With strong agricultural economy, Thailand generates large amount of agricultural wastes and residuals that can be used for power generation. The share of RE generation from solar is growing significantly to 23% of total RE generation.

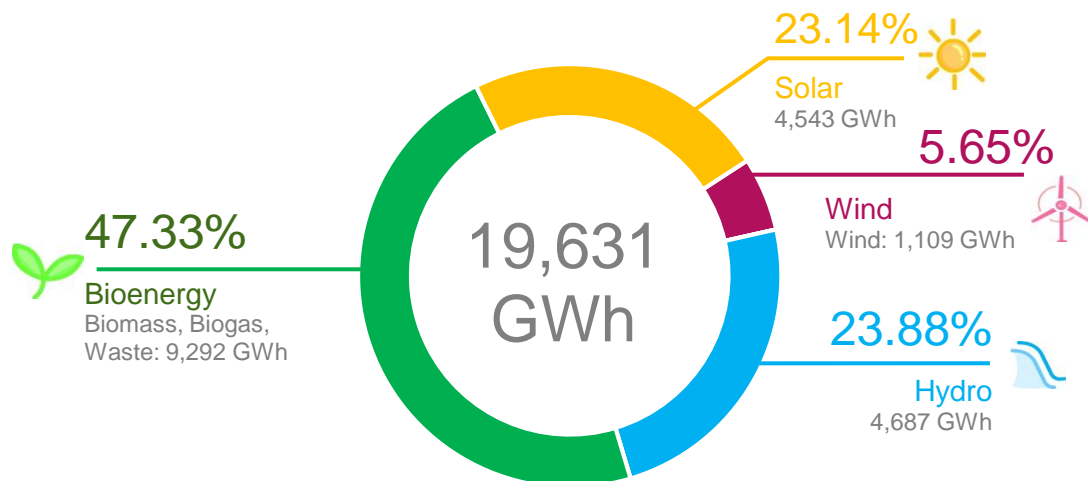


Figure 6: Electricity Generation from RE (2017)

Source: Department of Alternative Energy Development and Efficiency

RENEWABLE ENERGY MARKET

Thai government has introduced several incentives and mechanisms to promote investment in the renewable energy. These includes, but are not limited to, Feed-in Tariff (FIT), investment grants, Board of Investment (BOI) incentives e.g. tax holiday, import duty reduction, land ownership rights for foreign investor etc.

The latest version of Thailand's Feed-in Tariff can be seen in **Figure 7**. The FIT for Solar PV, Municipal Solid Waste (hybrid management) and Biomass are varies depending on the capacity. The period of subsidy for almost all technologies is 20 years, except for Municipal Solid Waste (sanitary landfill) with 10 years subsidy period.

An important legislative document in the energy sector constitutes the Energy Industry Act (2007), which sets a regulatory framework for private sector involvement in power generation (e.g. encouraging local communities and the general public to manage and monitor energy-related operations). Moreover, this legislation established Energy Regulatory Commission (ERC) – an independent regulatory agency, which is responsible for electricity and natural gas industry. Every private sector player in the energy business is obliged to obtain a license from the ERC.

The Energy Conservation Act 1992 leads to the establishment of the Energy Conservation (ENCON) Fund. This fund aims to provide financial support in introducing and promoting renewable energy and energy efficiency and conservation (EE&C) technologies. The fund was built from levies on petroleum products. In addition to that, The Energy Service Company Revolving Fund (ESCO Fund) was established in 2008 by DEDE with the purpose to encourage investment in renewable energy and EE&C projects. The fund shall be used for following activities: equity investment, equipment leasing, ESCO venture capital, GHG project facility, credit guarantee facility and technical assistance. The fund has been managed by the Energy for Environment Foundation.

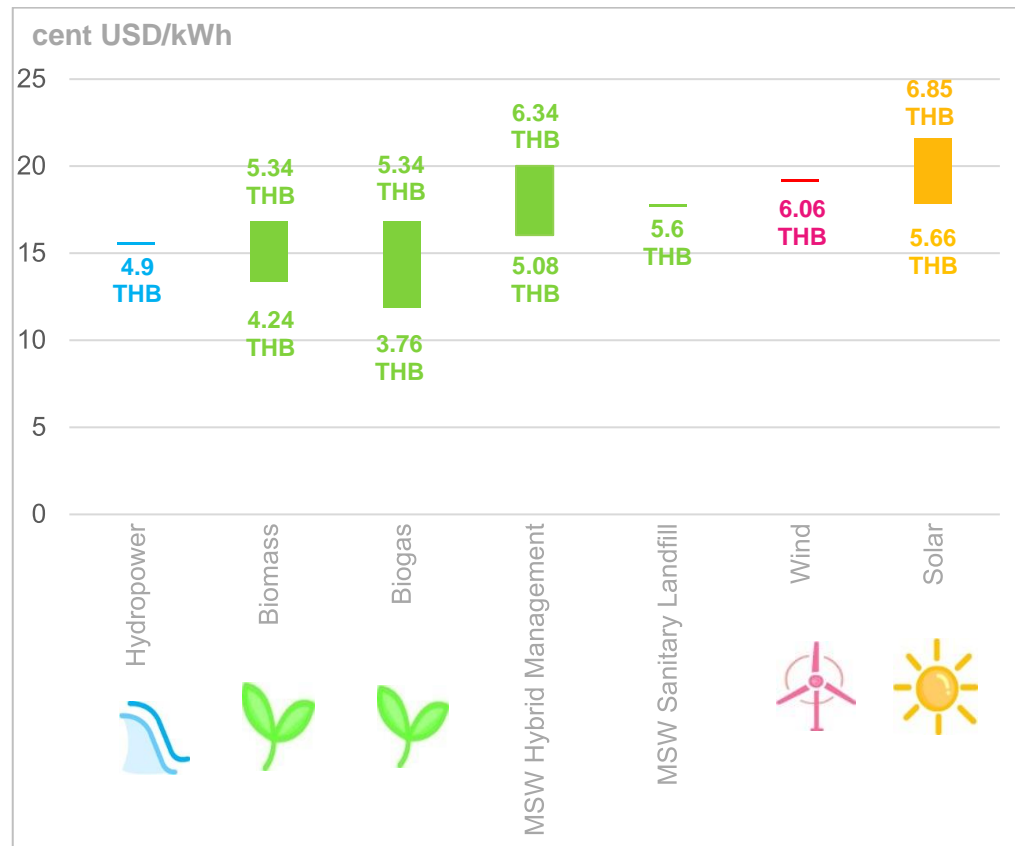


Figure 7: Feed-in Tariff (FIT) Scheme in Thailand (2016)

Source: Presentation of Mr. Achawangkul in RE-SSN meeting 2017

Note: The exchange rate from Thai Bath (THB) to US-Dollar (USD) is 0.031 (as of December 2018)

ENERGY EFFICIENCY AND CONSERVATION (EE&C) SECTOR

EE&C TARGET

The Government of Thailand has defined their energy saving target in Energy Efficiency Development Plan (EEDP 2015) for 2015 - 2036 period, the official targets which has been defined as shown below:

- To reduce energy intensity (EI) by 30% in 2036, in comparison with 2010
- To accomplish the APEC agreed target aiming to reduce EI by 25% in 2030 when compared with 2005
- To achieve the GHG emission reduction target according to the pledge submitted to UNFCCC in COP 20, which aims to reduce 7% from transport and energy sector in 2020, compared with 2005.

If the target monetarized, the energy reduction is equal from 8.54 ktoe per billion baht (2010) to 5.98 ktoe per billion baht (2036). It is also expected that at the end of the plan (year 2036), the implementation of energy efficiency measures will reduce the final energy consumption from 187 Mtoe in Business as Usual (BAU) scenario to 131,000 Mtoe and avoidance of about 177 million tons of CO₂ emission .

EE&C POLICY

The government identified EE&C as an effective strategy to meet the rising demand for energy in the early 1990s. In 1992, the Energy Conservation Promotion Act was passed and the government created the Energy Conservation Promotion Fund (ECPF). Since then, Thailand developed a comprehensive EE strategy including the development of the National Demand-side Management plan (DSM), the establishment of multiple funds to support EE&C, the introduction of several tax incentives across different sectors and the recent 20-Year Energy Efficiency Development Plan (EEDP).

As part of the EEDP, the government of Thailand aims to reduce energy intensity by 30% compared to 2010 baseline. This plan has a strong focus on improving electricity security and prioritizes the industry and transport sectors. Cumulative benefits from the EEDP are expected to result in the saving of 289,000 ktoe and avoidance of about 976 million tons of CO_{2e}. The plan will be initially financed by the Energy Conservation Promotion Fund (ECPF), which will provide about USD 0.9 million to support activities during the first five years of implementation (2011-2015).

The EEDP addresses the following components: (i) mandatory requirements via rules, regulations and standards, (ii) energy conservation promotion and support, (iii) public awareness creation and behavioral change, and (iv) promotion of technology development. Five years later, the EEDP 2015-2036 was released with updates on energy efficiency targets. The Plan outlines the strategies to achieve the energy efficiency targets, which are classified into compulsory measures (building energy code on new buildings and energy labelling on equipment, among others), voluntary measures (support financial tools to accelerate the change to more energy efficient equipment, such as Light-Emitting Diodes/LEDs) and complementary measures (support human resource development, public awareness, and technology research and development on energy efficiency).

EE&C ACTIVITIES AND INVESTMENT

According to the Energy Efficiency Development Plan (EEDP 2015) for 2015 - 2036 period, there are several activities which have been defined to achieve energy efficiency target, as stated in **Table 1** below:

Table 1: Actions Plan for Energy Efficiency Development Thailand (2015)

Source: Energy Efficiency Development Plan for 2015 - 2036

No	Strategies	Actions	Total (ktoe)
1.	Compulsory	1. Energy management system in designed factory/building	5,156
		2. Building Energy Code	1,166
		3. Energy standard labelling (HEPS & MEPS)	4,149
		4. EE Resource Standard (EERS)	500
2.	Voluntary	1. Financial Incentive	9,524
		2. Promotion of LED (Light Emitting Diode)	991

		3. Promotion of EE in transport sector	30,213
		4. R&D in EE technologies	-
3.	Complementary	1. Human Resources Development	-
		2. Promotion of Public Awareness on Energy Conservation	-
Total saving in ktoe by 10 Actions			51,700

To finance the EE&C programs, Thailand has actively generated policies to bolster administrative and economic elements associated with EE&C. Thailand has worked together with national and international stakeholders to unlock local and international finance from the public and private sector such as Energy Conservation and Promotion Fund (ENCON Fund), Energy Efficiency Revolving Fund (EERF), and Energy Service Company (ESCO) Fund. In addition, Thai government has introduced both subsidies and taxes as incentives for EE&C projects.

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