

# IEA-Advanced Motor Fuels ANNUAL REPORT 2015



**THAILAND**



## Thailand

### Introduction

Thailand's high dependency on foreign energy puts its energy security at risk. In 2015 (January through November), final energy consumption was 71,898 kilotonnes (ktoe), an increase of 2.8% from 2014 [1]. The total value of the final energy consumption was 943,275 million baht (\$26,951 million US). Thailand's imported energy consumption amounted to 66,099 ktoe, accounting for 785,830 million baht, an increase of 3.0% from 2014. Thailand's final energy consumption covers all energy supplied to the final consumer for all energy uses. Petroleum products represent the major portion of energy consumption, as shown in Figure 1. The final energy consumption by economic sector covers all energy consumed in five main sectors — agricultural, commercial, residential, industrial, and transportation. In 2015, transportation had the greatest portion of total energy consumption at 36.8%, followed by industrial at 35.7%, residential at 15.1%, commercial at 7.2%, and agricultural at 5.2% [2] (Figure 2).

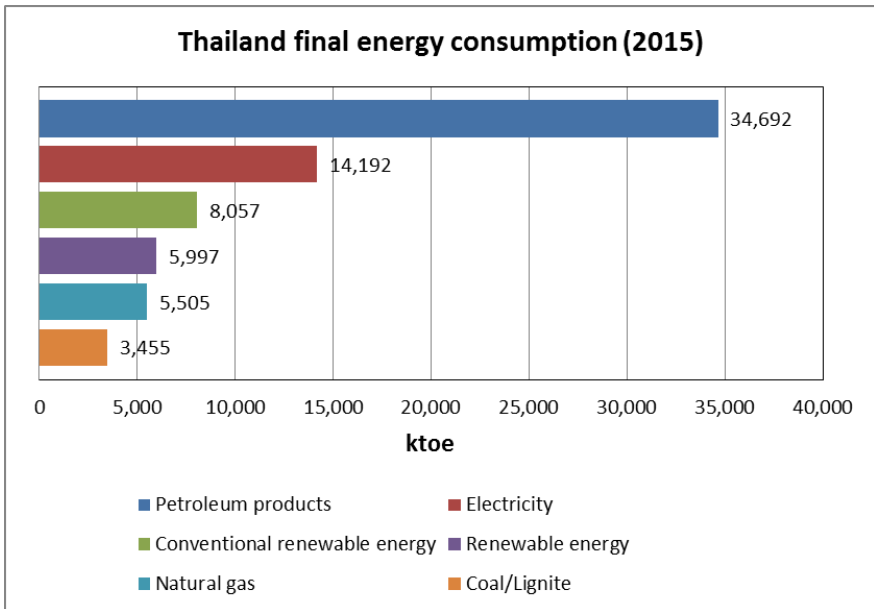


Fig. 1 Energy Consumption in Thailand, January–November 2015 [1]

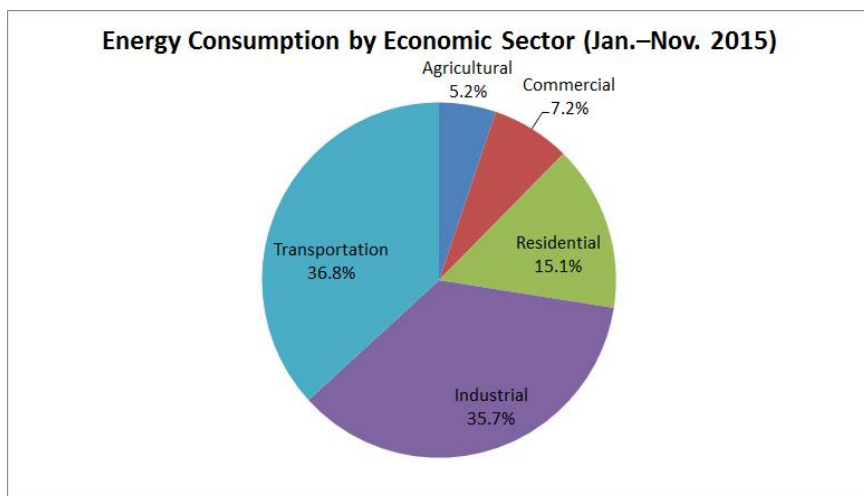


Fig. 2 Final Energy Consumption by Economic Sector in Thailand, January–November 2015 [1]

By the end of December 2015, there were 36,731,023 vehicles in Thailand. Of this number, 2,772,269 were newly registered. Gasoline vehicles accounted for 25,248,828 units, corresponding to 68.74% of the total. Diesel vehicles accounted for 9,507,343 units or 25.88% of the total, and bi-fuel vehicles (gasoline or diesel with liquid petroleum gas [LPG]) accounted for 1,224,539 units or 3.33% of the total. Table 1 shows the total number of vehicles in Thailand, by fuel, as of December 2015 [3].

Table 1 Number of Vehicles, by Fuel, in Thailand as of December 31, 2015 [3]

Fuel Type	Units	Percentage of Total
Gasoline	25,248,828	68.74
Diesel	9,507,343	25.88
Bi-fuel (gasoline or diesel with LPG)	1,224,539	3.33
B-fuel (gasoline or diesel with compressed natural gas [CNG])	350,604	0.95
Hybrid	70,285	0.19
Mono-fuel CNG	65,600	0.18
Mono-fuel LPG	24,136	0.07
Electric	1,820	0.65
Non-fuel and others	237,868	0.01
Total	36,731,023	100.00

The Thai Government has implemented measures and policies to promote the increasing use of alternative energy. By 2015 (January–November), Thailand’s alternative energy consumption was 9,096 ktoe, an increase of 9.9% from 2014. At the time this report was prepared, alternative energy consumption as electricity, heat, and biofuel (ethanol and biodiesel) shared 12.65% of the total final energy consumption. Biofuel consumption as biodiesel was 877 ktoe (+3.4% from 2014), while biofuel consumption as ethanol was 849 ktoe (+ 6.4% from 2014) (Figure 3).

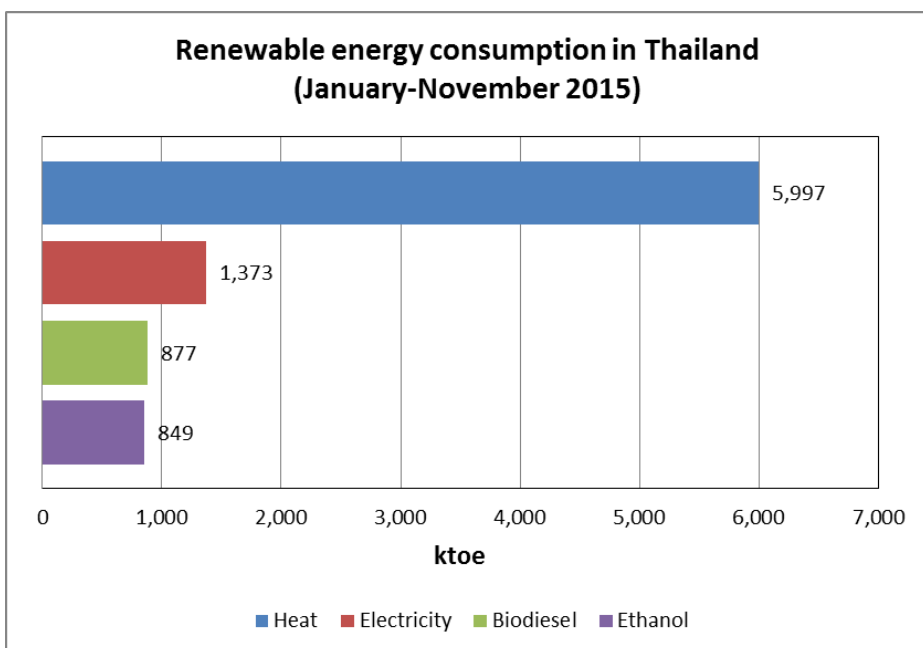


Fig. 3 Renewable Energy Consumption in Thailand, January–November 2015

### Policies and Legislation

Climate change and high energy demand have led most countries, including Thailand, to launch national policies and plans to promote the use of renewable energy. Thailand has implemented a Long-term Energy Development Plan 2015–2036. Under this plan, are five plans with the goal of sustaining and supporting the country’s mission of a low-carbon society: Power Development Plan (PDP 2015), Energy Efficiency Plan (EEP 2015), Alternative Energy Development Plan (AEDP 2015), Oil Plan 2015, and Gas Plan 2015.

With regard to the EEP, fuel management has been implemented using the following five guidelines to support energy savings.

- Eleven measures, complying with the EEP, support fuel savings for the transportation sector's target of 46% energy savings in 2036:
  - Cancel or review subsidized fuel prices
  - Promote the use of eco-cars
  - Label the energy efficiency of tires
  - Use logistics and transportation management to save energy
  - Train drivers to be eco-drivers
  - Promote the circulating fund for energy conservation in the transportation sector
  - Promote the results of energy savings in the transportation sector
  - Develop infrastructure for mass transportation and a transit system
  - Develop infrastructure for a double-track railway to cover all 3,165 kilometers (km)
  - Expand the oil pipeline route
  - Use electric vehicles for energy savings
- Fuel types, including LPG, which the Government does not promote, are being managed. The Government is promoting the use of natural gas vehicles (NGVs) for heavy trucks and public transportation. The price of LPG has started to increase much higher than it used to be.
- The fuel price structure is being adjusted in order to reflect the actual cost by using a pricing mechanism.
- The use of biofuels with 11.30 million liters per day (11.30 million L/d) of ethanol consumption and 14 million L/d of biodiesel consumption by 2036 is being advocated.
- Investment in the fuel infrastructure, including the oil pipeline route and oil reserve, is being supported.

Before January 2016, new vehicles from the automakers or the importers were taxed based on engine size and horsepower. In addition, the tax structure was divided into several rates according to different types of fuels in order to promote the use of alternative fuels (i.e., E10, E20, E85, compressed natural gas [CNG], and hybrid). However, it was found that the tax structure was complex and gave fewer benefits to vehicles with large engines, but that emit lower emissions. Moreover, it did not cover carbon dioxide (CO<sub>2</sub>) emissions, an issue of much interest from an environmental perspective. As a result, the Thai Government enacted a new tax structure on January 1, 2016, that taxes vehicles based on CO<sub>2</sub> emissions, especially vehicles with an engine capacity not exceeding 3,000 cubic centimeters (cc). Table 2 summarizes a comparison of the old and new tax structures [4]. The

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new tax structure depends on new technology and innovation of alternative energy usage. It also implements the CO<sub>2</sub> emission-based tax that enables automakers to produce vehicles with clean technologies, as well as encourages buyers to go green.

Table 2 Comparison of the Old and New Excise Tax Structures for New Vehicles Sold in Thailand [4]

Vehicle Type	Old Tax Structure (before 2016)				New Tax Structure (Jan. 1, 2016)			
	Engine (cc)	Rate (%)			CO <sub>2</sub> (g/km)	Rate (%)		
		E10	E20	E85		E10/E20	E85/NGV	Hybrid
Passenger car	≤ 2,000	30	25	22	≤ 100	– <sup>a</sup>	–	10
	2,001–2,500	35	30	27	101–150	30*	25	20
	2,501–3,000	40	35	32	151–200	35	30	25
					> 200	40	35	30
> 3,000	50							
Pickup passenger vehicle/double cab/space cab/single cab pickup	≤ 3,250	20/12/-/3.18			≤ 200	25 <sup>b</sup> /12/5/3.18		
					> 200	30/15/7/5.18		
> 3,250	50							
Eco-car (petrol/diesel)/E85	< 1,300	17			≤ 100	14 <sup>b</sup> /12		
					101–120	17		
Electric vehicle/fuel cell/hybrid	≤ 3,000	10/10				10 <sup>c</sup>		
	> 3,000	50						
NGV-original equipment manufacturer (OEM)	≤ 3,000	20				c		
	> 3,000	50						

<sup>a</sup> A dash indicates no tax rate.

<sup>b</sup> The rate is applicable if the required safety standards are met.

<sup>c</sup> Based on CO<sub>2</sub> only.

## **Implementation: Use of Advanced Motor Fuels**

### **Ethanol**

The Thai Government indicated that the AEDP (2015–2036) with ethanol remains in place. The plan is still set to increase ethanol consumption up to 11.30 million L/d by 2036. Ethanol consumption sharply increased to 3.18 million L/d in April 2014, up from an average of 2.6 million L/d in 2013, when the Government terminated the sale of octane-91 regular gasoline. The Government is still promoting the use of E20 and E85 gasohol consumption through price incentives. The subsidies make ethanol blends 10% to 85% cheaper than gasoline E0 (ULG95). The price subsidies are paid by the State Oil Fund. In 2016, the Government still provides gasoline station marketing subsidies totaling 2.40 baht/L (approximately \$0.23 US/gallon [gal]) and 9.23 baht/L (\$0.98 US/gal) [5] to entice stations to expand sales of E20 and E85 gasohol. In addition, the Government continues to support manufacturers of flex-fuel vehicles (FFVs). The excise tax rate for the manufacturing of eco-cars with engines less than 1,300 cc and CO<sub>2</sub> emissions of less than 100 g/km is 14%, compared with 30% for E10 vehicles. In addition, if the eco-car can run with E85, the excise tax will be further reduced to 12%. With regard to feedstock, the plan focuses on improving existing feedstock supplies of molasses and cassava. The target is to increase the cassava and molasses harvest areas by up to 1,360,000 ha and 2,560,000 ha, respectively, with the total ethanol production up to 11.30 million L/d by 2036 [6].

### **Biodiesel**

In its AEDP (2015–2036), the Thai Government's policy is to increase biodiesel consumption, with a target of 14 million L/d by 2036. The plan focuses on both supply and demand. On the supply side, the Government will promote the expansion of the oil palm harvest area up to 1,632,000 ha, with average biodiesel production of 14 million L/d by 2036. On the demand side, the Government anticipates balancing its compulsory production of biodiesel with domestic palm oil supplies. The Plan also introduces pilot projects for using B10 or B20 blends in fleet trucks and fishery boats. Nonetheless, B100 producers — especially those that are not part of those integrated with crude palm oil processors and petroleum oil refineries — are struggling to survive, primarily because of higher production costs [6].

The list that follows shows the historical implementation of mandatory use for specific biodiesels since 2007 [6]:

- June 2007: Implement mandatory use of B2 and voluntary use of B5,
- June 2010: Implement mandatory use of B3 and voluntary use of B5,



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- March 2011: Implement mandatory use of B2 and voluntary use of B5,
- May 2011: Implement mandatory use of B3–B5,
- July 2011: Implement mandatory use of B4,
- January 2012: Implement mandatory use of B5,
- July 19, 2012: Implement mandatory use of B3.5,
- November 1, 2012: Implement mandatory use of B5,
- April 2013: Cabinet agrees to implement mandatory use of B7 commencing on January 1, 2014,
- January 1, 2014: Implement mandatory use of B7,
- February 17, 2014: Adjust mandatory use from B7 to B3.5,
- May 14, 2014: Implement mandatory use of B7,
- January 22, 2015: Adjust mandatory use from B7 to B3.5, and
- April 16, 2015: Return to implement mandatory use of B6.0–7.0.

The Government also intends to support the research and development of other alternative energies, for example, bio oil and hydrogen. Table 3 shows the average sale volume of diesel and gasohol from 2011 through 2015.

Table 3 Average Sale Volume of Diesel and Gasohol in Thailand, 2011–2015 [6]

Fuel	Sale-Quality (million L/d)				
	2011	2012	2013	2014	2015
	(avg.)	(avg.)	(avg.)	(avg.)	(avg.)
Gasohol 95	5.82	5.27	8.28	7.38	8.92
Gasohol 91	5.09	5.74	9.12	9.05	10.88
Gasohol E20	0.61	1.00	2.63	3.78	4.02
Gasohol E85	0.02	0.10	0.38	0.93	0.85
High-speed-diesel (HSD)	52.58	55.99	53.34	55.44	58.57

#### Alternative Energy

As a result of government policy on alternative energy development, alternative energy consumption is continuing to increase. This, in turn, encourages the private sector to invest in alternative energy projects. In 2014, total investment in alternative energy by the Thai Government and private sectors was 84,588 million baht. Wind energy played a major role at

30.4%, followed by biomass at 22.5%, biofuels at 18.0%, municipal solid waste at 10.5%, biogas at 9.6%, solar at 8.7%, and small hydro power at 0.3%.

## **Outlook**

In addition to biofuel production, logistics and transport management (LTM) is another approach to mitigating fossil fuel consumption [7]. The Institute of Industrial Energy conducted the LTM Project with support from the Energy Policy and Planning Office. The aim of the project is to encourage (and consult with) the transportation sector to increase fuel efficiency and fuel economy and decrease the cost of energy for transport. The expert team conveys advice on how to improve transportation management in terms of four dimensions— engineering and technology, management, driving, and task force.

Bioethanol and biodiesel are promising fuels for vehicles, as are LPG and CNG. However, according to the National Oil Plan 2015, the Government has stopped promoting the use of LPG in transportation by cancelling the subsidies to the LPG fund and allowing the price of LPG to vary according to the real market price. The Thai Government prefers to promote the use of CNG rather than LPG in transportation, especially in public and fleet transports [8]. As a result, the demand for natural gas will increase, while exploration and production in Thailand will decrease. The goal of the National Gas Plan 2015 is to manage the level of domestic natural gas consumption and prolong exploration and production [9]. To reduce domestic consumption, the Government has plans to decrease the use of natural gas for producing electricity by increasing the amount of alternative energy used, as described in PDP 2015, AEDP 2015, and EEP 2015. Moreover, to preserve the domestic source of natural gas, it is necessary to import liquefied natural gas (LNG). The National Gas Plan 2015 also explains the management of LNG exploration and logistics in order to optimize domestic need for natural gas.

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#### **Major Changes**

As a result of the Thai Government’s policy on energy efficiency, a Long-term Energy Development Plan 2015–2036 has been implemented to meet the target of reducing 30% energy intensity (EI) by 2036 (base year 2010). There are five plans under the Long-term Energy Development Plan — Power Development Plan (PDP 2015), Energy Efficiency Plan (EEP 2015), Alternative Energy Development Plan (AEDP 2015), Oil Plan 2015, and Gas Plan 2015. All of these plans have been developed based on the concepts of security, wealth, and sustainability. The goal is to provide supply security, cost competitiveness, and environmental energy to support sustainability, while supporting the socioeconomic needs of the people of Thailand and the transportation sector.

In terms of security, the aim is to maintain electricity and natural gas reserves at a stable and adequate level with a margin of approximately 15% and 2P reserve in 11 to 12 years. Under the concept of wealth, Thailand's energy prices are not expensive compared with neighboring countries, with a target of a 30% reduction in EI by 2036. In terms of sustainability, the Thai Government's policy is to reduce greenhouse gases and use less energy, as well as continuously and strongly increase the use of renewable energy up to 30% of final energy consumption by 2036. With regard to renewable energy, the goal is to continue to use biofuels up to 11.30 million L/d of ethanol consumption and 14 million L/d of biodiesel consumption by 2036 [1].