

# Alternative Energy in Thailand

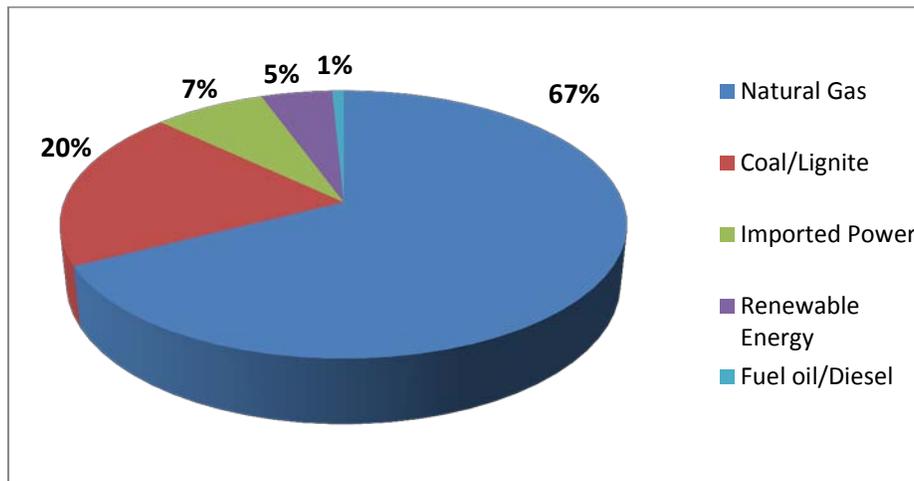
July 2013

In order to stay competitive in a rapidly globalizing economy, Thailand has emerged as one of the first countries in Asia to encourage alternative energy investment. In an effort to maintain the sustainability and security of energy in Thailand, the Government of Thailand developed the 10-Year Alternative Energy and Development Plan-AEDP (2012-2021), with the target of increasing alternative energy consumption from 7,413 ktoe (kilo tonnes of oil equivalent) in 2012 to 25,000 ktoe in 2021.

With solid governmental commitment to develop a clean energy society, the Department of Alternative Energy Development and Efficiency (DAEDE) was established under the Ministry of Energy, to support, promote, and develop clean energy production and consumption cost-effectively and sustainably. In addition, it aims to develop the country as an energy knowledge base society, as Thailand recently has established the School of Renewable Energy Technology – an institute at Naresuan University – to train students and scholars in this field.

Thailand’s commercial energy consumption in 2012 was 1.97 million barrels of oil equivalent per day. The country is highly dependent on imported energy; in 2012, over 67% of energy was imported. Total energy expenditure in 2012 was US\$71 billion, 10% higher than in 2011. The manufacturing and transportation sectors were the largest energy consumers in 2012: absorbing 37% and 36%, respectively.

**Power Generation by Energy Sources, 2012**



*Source: Energy Policy and Planning Office, Ministry of Energy*

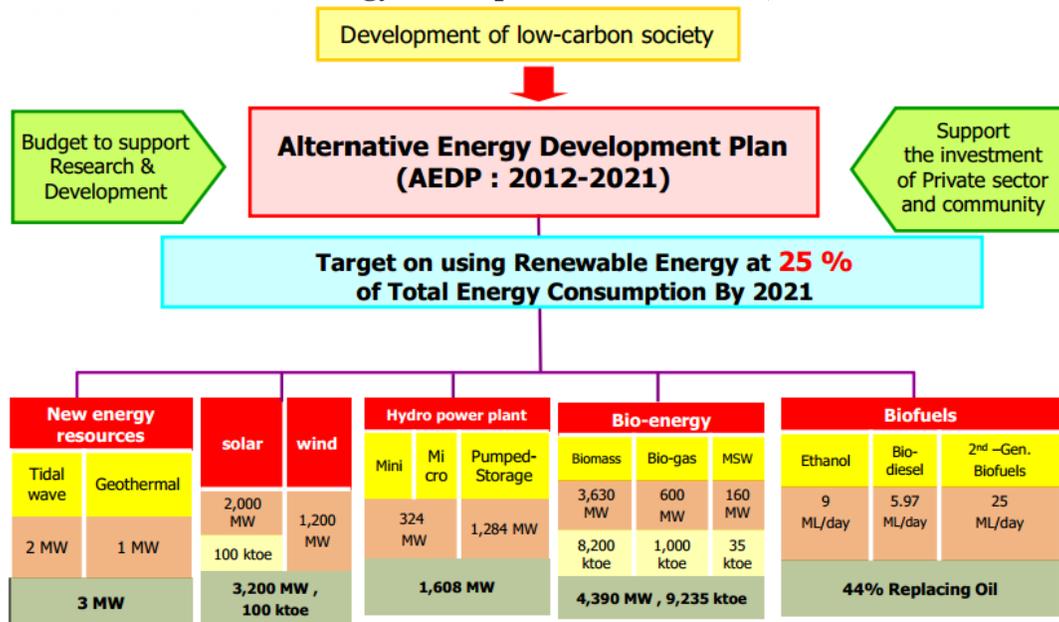
Natural gas fuels the majority of Thailand’s power generation, 67% in 2012. In the same year, renewable energy sources accounted for only 5%, although this figure will increase as Thailand continues to implement its Alternative Energy Development Plan (AEDP).

## Energy Savings and Targets – The Renewable and Alternative Energy Development Plan (AEDP), 2012-2021

Energy consumption in Thailand is continually increasing. In 2012, the previously noted commercial energy consumption of 1.97 million barrels of oil equivalent per day represents a 6% increase from the previous year. The Ministry of Energy forecasts the demand in 2021 to be 99,838 ktoe, a 40% increase from the present level.

The energy sector in Thailand has relied primarily on imports. In 2012, energy supplied by imports accounted for over 55% of the primary commercial energy demand. Thailand’s oil sector was even more reliant on imports, reaching 80% of total domestic oil consumption. To reduce dependency and imports of oil and other unsustainable energy resources, the government assigned the Ministry of Energy to establish the Renewable and Alternative Energy Development Plan for 10 years (AEDP 2012-2021) to identify the framework and direction of Thailand’s renewable energy development strategy. The AEDP 2012-2021 has goals to transform the country into a low-carbon society and a target to increase the use of renewable energy to 25% of total energy consumption by 2021. A significant portion of this target is to seek substitutes for natural gas power generation, with emphasis on wind energy (wind turbine farms), hydro power, biomass, biogas and waste & garbage.

### Alternative Energy Development Plan (AEDP), 2012 – 2021



Source: Department of Alternative Energy Development and Efficiency, Ministry of Energy

### The AEDP Renewable Energy Consumption Target in 10 years

Type of Energy	Unit	Target 2021	As of 2012
Electricity	MW	9,201	2,786
	ktoe		1,138
Solar	MW	2,000	376.72
Wind	MW	1,200	111.73
Small Hydro Power	MW	1,608	101.75
Biomass	MW	3,630	1,959.95
Biogas	MW	600	193.40
MSW	MW	160	42.72
New Energy	MW	3	-
Heat	ktoe	9,335	4,886
Solar	ktoe	100	4
Biomass	ktoe	8,200	4,346
Biogas	ktoe	1,000	458
MSW	ktoe	35	78
Biofuels	million litres/day	39.97	3.5
	ktoe		1,270
Ethanol	million litres/day	9	1.4
Biodiesel	million litres/day	5.97	2.7
New Energy Replacing Diesel	million litres/day	25	-
<b>%Alternative Energy</b>		<b>25%</b>	<b>9.9%</b>

Source: Department of Alternative Energy Development and Efficiency, Ministry of Energy

## Biomass

Biomass is organic and renewable material originated primarily from agricultural waste or by-product, including rice husks, sugarcane wastes, oil palm wastes, cassava wastes, rubber, wood wastes, corncobs, distillery slop, coconut fibers and shells. In 2012, Thailand produced 2,000 megawatts from biomass. According to the AEDP 2012-2021, Thailand aims to produce 3,630 megawatts from biomass by 2021.

## Biogas

Biogas is a mixed gas, mainly composed of methane and inert carbonic gas produced from anaerobically digested organic matter. The main raw materials in the production of biogas are industrial waste, farm waste, waste water, and Municipal Solid Waste (MSW). The installed capacity of Thai biogas power plants was 193 megawatts in 2012. AEDP aims for 600 megawatts of biogas utilization by 2021.

## **Municipal Solid Waste (MSW)**

In 2012, Thailand generated approximately 14.5 million tons of MSW composed of food waste, paper and plastic. In 2012, Thailand produced 43 megawatts of power through MSW. Thailand's AEDP aims to produce 160 megawatts from MSW by 2021.

## **Biodiesel and Ethanol**

Biodiesel is a diesel fuel produced from plant oil, which is abundant in Thailand. In 2012, 13 biodiesel manufacturers obtained the quality standards set by the Department of Energy Business, with a total capacity of 5.21 million liters per day. The goal of AEDP is to increase the consumption to 5.97 million liters per day by 2021.

Ethanol is an alcohol made by fermenting plant materials such as sugar cane or molasses, tapioca, paddy straw, cassava and corn, all of which are widely available in Thailand.

Thailand's AEDP forecasts cassava and sugarcane production will reach 35 and 105 million tons per-year, respectively, by 2021. Furthermore, the consumption of ethanol is estimated to reach the target of 9 million liters per day by 2021. In 2012, there were 21 factories producing ethanol in Thailand with a total capacity of 3.89 million liters per day.

## **Solar Energy**

*“Over 20 years of experience working in the solar energy sector makes me see the potential of the intensity of sunlight, which Thailand possesses more than many other countries.”*

-Wandee Khunchornyakong, Chairman & CEO, SPCG Public Company Limited-

Solar is one of clean natural energy sources that can be transformed into heated and electricity. There are two main methods for generating electricity from solar energy. One is photovoltaic (PV) cells, which generate power by converting solar radiation into direct current (DC) electricity using semiconductors. The other method is a concentration system, using lenses or mirrors to focus sun radiation. The concentrated sunlight heats water or other fluids to generate steam for use in steam turbines to generate electricity.

In 2012, Thailand had solar power production capacity of 377 megawatts. Thailand's AEDP targets a solar energy capacity of 2,000 megawatts in 2021.

## **Wind power**

There is potential for utilization of wind turbines for power generation throughout Thailand, particularly along the sea shores and on islands either in the Thai Gulf or Andaman Sea. Thailand has an annual average wind speed of 4-5 meters per-second at an elevation of 90 meters above sea level. Higher wind speeds of 6-7 meters per second can be found in mountain ranges in the south and the northeast during the period of the monsoons.

By 2012, Thailand had commercial wind power capacity of 112 megawatts and aims to reach 1,200 megawatts by 2021.

## **Hydropower**

Hydropower is a renewable energy source with significant potential and relatively low cost of production. In Thailand, hydropower is available in any part of the country in which there is water flow. Thailand has abundant seasonal rainfall and reservoirs providing suitable locations to generate electricity by hydropower.

In 2012, Thailand's small hydropower energy production totaled 102 megawatts. Thailand's AEDP has a target to increase power generation from hydropower to 1,608 megawatts by 2021.

## **Natural Gas Vehicles**

Natural gas is one of the cleanest-burning alternative transportation fuels. Natural Gas Vehicles are more efficient, produce fewer emissions and cost less when compared to oil. In 2012, Thailand consumed 278 million cubic feet per-day of NGV, a 21% increase from the previous year.

## **Clean Development Mechanism (CDM)**

The Clean Development Mechanism is an arrangement under the Kyoto Protocol which aims to reduce carbon dioxide gas emissions. The CDM allows foreign firms to invest in less-expensive emission reductions in foreign markets, while collecting Certified Emission Reduction (CER) credits. The Thailand Greenhouse Gas Management Organization (TGO) has currently issued a Letter of Approval (LoA) for 211 CDM projects, with expected average annual CERs of 12.7 megaton carbon-equivalent.

## Support for Investors

The Energy Policy & Planning Office resolution offers additional value to the normal purchasing rate from power plants using renewable energy through the Adder Program. Detailed rates for the Adder Program are shown in the table below.

Adder Program				
Type of renewable energy	Adder rate (Baht/kWh)	Special Adder for Diesel Replacement (Baht/kWh)	Special Adder for 3 Southernmost Province and 4 districts in Songkhla* (Baht/kWh)	Year supported
<b>1. Biomass</b>				
- Installed Capacity ≤ 1 MW	0.50	1.00	1.00	7
- Installed Capacity >1 MW	0.30	1.00	1.00	7
<b>2. Biogas</b>				
- Installed Capacity ≤ 1 MW	0.50	1.00	1.00	7
- Installed Capacity >1 MW	0.30	1.00	1.00	7
<b>3. Waste (MSW and Industrial Waste, excluding Hazardous Waste and Organic Waste)</b>				
- Landfill and Digester	2.50	1.00	1.00	7
- Thermal Process	3.50	1.00	1.00	7
<b>4. Wind</b>				
- Installed Capacity ≤ 50 kW	4.50	1.50	1.50	10
- Installed Capacity > 50 kW	3.50	1.50	1.50	10
<b>5. Small/Hydropower</b>				
- 50 kW ≤ Installed Capacity ≤ 200 kW	0.80	1.00	1.00	7
- Installed Capacity < 50 kW	1.50	1.00	1.00	7
<b>6. Solar</b>	<b>6.50</b>	<b>1.50</b>	<b>1.50</b>	<b>10</b>

\* 4 districts in Songkhla province including Chana, Thepha, Saba Yoi and Na Thawi

Source: Energy Policy and Planning Office, Ministry of Energy as of 2012

Rooftop Solar Feed-in Tariff (FIT) Program				
Classification	Scale	Quota	FIT (Baht/kWh)	Year Supported
Residential	0-10 kWp	100 MW	6.96	25
Small Enterprise	>10-250 kWp	100 MW	6.55	25
Medium and large Enterprise	>250-1,000 kWp		6.16	25

Source: Department of Alternative Energy Development and Efficiency, Ministry of Energy as of 2013

The Ministry of Energy (MOE) has planned to shift the Adder program to a Feed-in Tariff (FIT) arrangement. FIT offers a guaranteed purchase price for electricity generated from renewable energy sources for a specified period of time, typically based on the cost of generation of each technology. Recently, the MOE is studying FIT implementation measures for electricity generated from alternative energy in Thailand.

*“Thailand has a very attractive and modern scenario for investment. The Board of Investment’s incentives on renewable energy are many and generous. Thailand is a regional leader in many sectors, thanks largely to BOI promotion.”*

-Martin Klose, Director, Roedl & Partner, Ltd.-