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Thailand Alternative Fuels Update 2016

September 2016

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Thailand Alternative Fuels Update 2016

Introduction

With oil prices at historic lows, Thailand is challenged to maintain momentum in its ambitious renewable energy agenda, especially in the area of transportation. While the country is a global leader in alternative fuel production and a top 5 country in natural gas fueled vehicles, several factors, including the sluggish Thai economy, a severe drought affecting fuel stocks, as well as continuous pressure to reduce subsidization of ethanol and natural gas for transport are threatening the viability of Thailand's plans for alternative fuels providing a greater share of the transportation sector's needs. Yet while political upheaval, changes in leadership as well as weather and climate challenges have shaken the country, demand for ethanol and biodiesel is growing. Conversely, the low oil price and changes in subsidy policies have led to a decline in natural gas vehicle sales, gas station deployment and demand for natural gas in the vehicle sector.

Economy

Since the 2009 recession, Thailand's economy has been on a roller coaster ride with GDP growth annually fluctuating between strong growth years in 2010 and 2012, moderate growth in 2013 and 2015, and close to no growth in 2011 and 2014. The general downward trend is informed by reduced government spending, consumption, exports and private sector activities.^{1,2} According to the World Bank, the outlook for GDP growth in 2016 is 2.5 percent.

The automotive sector remains a strong pillar of the country's economy, providing about 12 percent of GDP and employing over half a million workers in 2013.³ For 2016, the country is expected to produce in excess of 750,000 cars, trucks and busses for the domestic market, while exports are slated to exceed 1.2 million.⁴

Thailand's Alternative Fuel Policy

Thailand has continued to increase the national targets for low carbon and renewable energy including the use of alternative transport fuels. Late 2015 saw the release in Thailand of the most recent Alternative Energy Development Plan (AEDP) covering the years 2015-2036. The previous AEDP, which was reviewed in the September 2015 report "Natural Gas Vehicles in Thailand: A market Overview" (PNNL-24719) covered the period 2012-2021 and had an overall target of 25% renewables as a percentage of total energy consumption by 2021. As shown in Figure 1, the revised AEDP covers the period of 2015-2036 and has increased the target to 30%

¹ <http://www.worldbank.org/en/country/thailand/overview>

² <http://www.adb.org/countries/thailand/economy>

³ http://www.boi.go.th/upload/content/BOI-brochure%202015-automotive-20150325_70298.pdf

⁴ <http://www.nasdaq.com/article/thailands-automotive-industry-detects-sign-of-domestic-recovery-in-april-20160525-00018#ixzz4EKePid00>

renewables as a percentage of the total energy consumption by 2036. Alternative transport fuels included ethanol, biodiesel, pyrolysis oil, and compressed biogas (CBD).

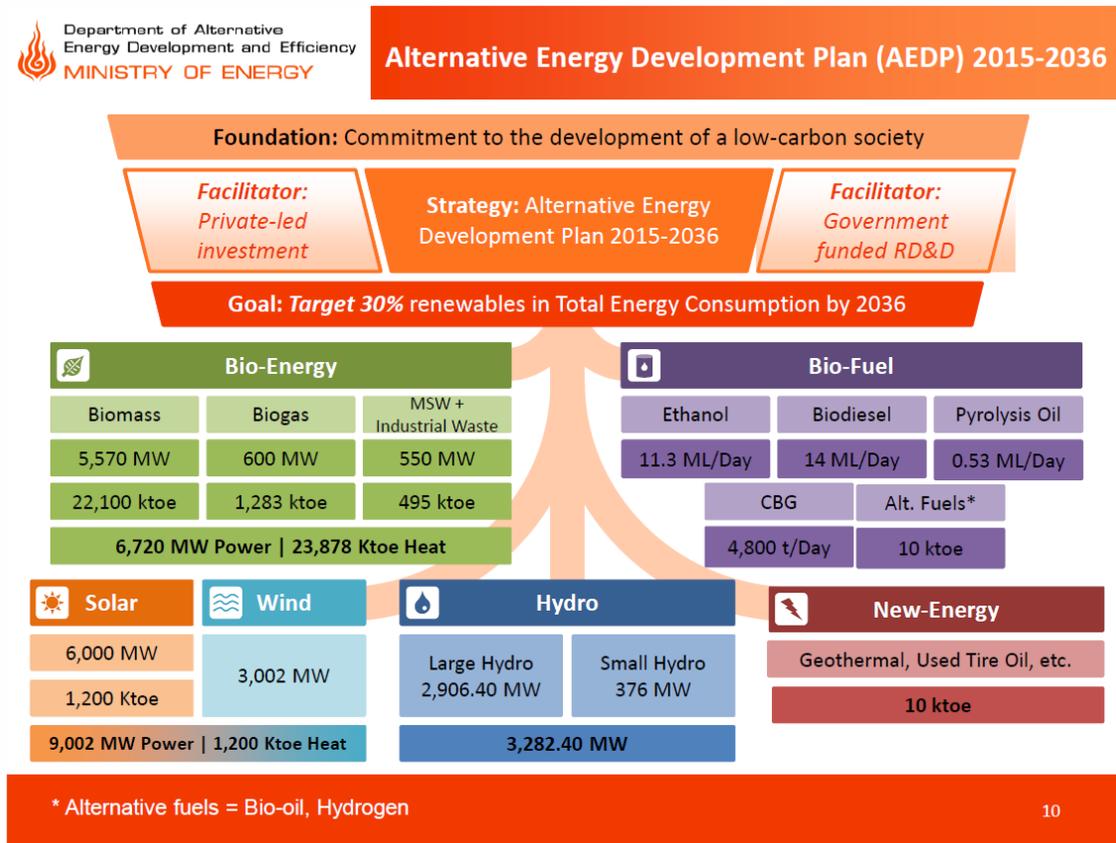


Figure 1: Thailand Alternative Energy Development Plan (2015-2036)*

The alternative fuel focus is on four general areas:

- Promotion of biodiesel as B10 and B20 in both the transportation and industrial sectors
- Promotion of gasohol (ethanol blends) E10, E20, and E85
- Promotion of compressed biogas for vehicles and industry
- Promotion of biofuel production efficiency improvement

The status in 2014 and targets for 2036 for alternative fuels are shown in Figure 2.

Biofuel – Target

Target : Increase the share of biofuel utilization from 7% at present to be 20-25% of total domestic fuel demand in year 2036

Biofuel	Status at 2014		Target in 2036	
	Million litre/day	ktoe	Million litre/day	ktoe
1. Ethanol	3.21	872.88	11.3	2,103.50
2. Biodiesel	2.89	909.28	14.0	4,404.82
3. Pyrolysis-Oil			0.53	170.87
4. Compressed biogas (CBG) (ton/d)			4,800	2,023.24
5. Other Alternative Fuel*				10
Total		1,782.16		8,712.43
% of RE share	6.65%		25.04%	

* Other alternative fuel are hydrogen, etc.



Figure 2: Thailand Alternative Fuel Targets for 2036*

The new alternative fuel targets show a significant increase in share of biofuel utilization which is projected to increase from 7% in 2014 to 20-25% by 2036. It is also interesting to note that the overall share of biodiesel is expected to about double that of ethanol by 2036 and the share of compressed biogas (CBG) is expected to grow from a minor share to equal that of ethanol by the 2036 target date. The progress in moving towards these aggressive new goals and the alternative fuel infrastructure needed to support them will be discussed in future updates. Other goals of the AEDP are: strengthening of domestic energy security, promotion of integrated green energy utilization in communities, development of alternative energy industries, and increase competitiveness of Thai R&D in renewable energy technology for in the global market.⁵

*Presented at the 46th APEC Expert Group on New and Renewable Energy Technologies (EGNRET) meeting in Xiamen, China, November 16-19, 2015
([http://www.egnret.ewg.apec.org/meetings/egnret45/economy%20presentation/%5bThailand%5d%20AEDP%202015 Thailand EGNRET Xiamen.pdf](http://www.egnret.ewg.apec.org/meetings/egnret45/economy%20presentation/%5bThailand%5d%20AEDP%202015%20Thailand%20EGNRET%20Xiamen.pdf))

⁵ Department of Alternative Energy Development and Efficiency. 2011. The Renewable and Alternative Energy Development Plan for 25 Percent in 10 Years (AEDP 2012-2021). Available at: http://www.dede.go.th/dede/images/stories/dede_aedp_2012_2021.pdf

Ethanol Support

The Thai government uses several incentives to increase demand for both ethanol blends as well as flex fuel vehicles. These include price incentives, support for increased gasohol (blended fuels consisting of gasoline and ethanol) service coverage, as well as public relations. The fuel subsidies for E20 and E85 – the higher blends of ethanol fuel containing 20 and 85 percent ethanol, respectively- lower the price for by up to 40 percent compared to lower blends, such as E10, or non-blended 95 RON gasoline. Gas stations also receive a marketing subsidy for each liter of ethanol blends sold, ranging from 1-2 baht/liter (12-23 US cent/gallon) to 2-3 baht/liter (58-70 US cent/gallon), depending on the fuel grade. Subsidies come from the government’s State Oil Fund. Table 1 lists the Retail Prices of Gasoline, Gasohol and Diesel (baht/L) in Bangkok & Vicinities.

Table 1. Retail Prices of Gasoline, Gasohol and Diesel (baht/L) in Bangkok & Vicinities

	<u>PTT</u>	<u>BCP</u>	<u>Shell</u>	<u>Esso</u>	<u>Chevron</u>	<u>IRPC</u>	<u>PTG</u>	<u>Susco</u>	<u>Pure</u>
Gasoline RON									
95	31.76	-	-	32.21	32.21	-	32.26	31.76	31.76
Gasohol 95	24.65	24.65	-	24.65	24.65	24.65	24.65	24.65	24.65
Gasohol 91	24.38	24.38	24.38	24.38	24.38	24.38	24.38	24.38	24.38
Gasohol E20	22.14	22.14	22.14	22.14	22.14	-	22.14	22.14	22.14
Gasohol E85	17.99	17.99	-	-	-	-	-	17.99	17.99
Diesel	24.19	24.19	24.19	24.19	24.19	24.19	24.19	24.19	24.19
Premium									
Diesel	27.19	-	27.68	27.68	27.68	-	-	-	-

Source: Eppo.go.th

Additionally, the government supports manufacturers of high blend flex fuel vehicles with tax subsidies in an effort to drive manufacturing and sales of E20 vehicles which are compatible with E20 and E85 gasohol.

The government is also incentivizing farmers to grow more ethanol feedstock, which has to increase significantly to meet future consumption targets. Policies here include increasing the planted area of sugarcane and increase cassava yield per acre, as well as raising sugarcane acreage and yields to about 94 tons/hectare (about 13 tons per acre) compared to the current

average yield of 75 tons/hectare.⁶ The Agricultural Restructuring Program also encourages rice farmers with unproductive areas to switch to sugarcane.⁷

In January 2016, Thailand restructured its excise tax regime, basing rates on carbon dioxide emissions, E85-gasohol compatibility and fuel efficiency. Consequently, cars that emit less than 100 grams of CO₂ per kilometer face the lowest tax rates, and no excise tax levered on cars with E85 compatible engines, CNG vehicles and passenger cars with engines smaller than 3 liters that emit less than 100 grams of CO₂ per kilometer.⁸ Pickup passenger vehicles, the segment with the largest sales growth in 2015, saw excise tax increases between 5 to 10 percent, leading to downward projections of Thailand’s car market for 2016. Figure 3 shows the proposed ecolabel detailing emissions information.



Figure 3. Proposed Eco-Sticker for Cars. Source:
<https://www.fiafoundation.org/blog/2015/august/thailand-introducing-new-eco-sticker-and-co2-based-taxation-scheme-to-promote-fuel-economy#>

⁶ Preechajarn, S., Prasertsri, P. 2015. Thailand Biofuels Annual. F.A. Service. United States Department of Agriculture, Ed. Bangkok, 2015

⁷ <http://www.agribusiness-insight.com/industry-trend-analysis-sugar-output-boosted-changes-agricultural-policy-may-2015>

⁸ http://www.thaiauto.or.th/2012/news/news-detail.asp?news_id=3198

There are also private sector efforts to increase ethanol use in vehicles, such as conversion kits that can help cars run on higher grades of ethanol blends. One example is [Fuel Flex International LLC](#), a Meridian, Idaho-based company that has tested its technology around the U.S. and the world, including in the wintry conditions of northern Idaho and the tropical climate of Thailand, where the company tested vehicle components for eight months under extreme driving.⁹

Biodiesel Support

Several policies support the larger consumption of biofuel in Thailand, including support for developing vehicles that can run on higher biodiesel blends, tax incentives for buyers and manufacturers of vehicles that are able to run on a high percentage of biofuel blends, a mandate on universal B10 adoption by 2026, promotion of B10 usage in transport and industrial sectors and B100 usage in agricultural machineries.¹⁰ Other support policies include promoting the development and improvement of new feedstock, advanced biofuel production and consumption of higher-blend biodiesel.

Natural gas vehicle Promotion

The Thai government has over the past several years developed policies that pushed for increased market adoption, including subsidizing the cost of natural gas at gas stations. Other incentives include financial support for vehicle owners, low interest loans for engine conversions, and several tax exclusions and reductions for NGVs, such as excise tax, municipal tax, and the oil fund and energy conservation fund levies.¹¹

Apart of direct financial incentives, there are other measures, including a website by the Thai Department of Energy Business that provides information to car owners interested in shifting to natural gas vehicles.¹² On the website, prospective buyers of cars can find listings of certified mechanics that can help with engine conversions, as well example calculations to help establish payback periods.

Car market

With over 1.9 million cars manufactured in 2015, Thailand remains Southeast Asia's automotive manufacturing hub. The domestic market absorbed 799,632 vehicles while 1.2 million cars were exported.¹³

⁹ <http://ethanolproducer.com/blog/article/2015/12/blog-company-helps-non-ffv-vehicle-owners-use-e85>

¹⁰ Department of Alternative Energy Development and Efficiency. 2015. Biofuel Status and Policy. Available at https://www.mtec.or.th/files/chanpen/1_DEDE.pdf

¹¹ <http://www.iangv.org/category/country/thailand/>

¹² http://www.doeb.go.th/v5/ngv/knowledge/NGV_price.htm

¹³ https://www.marklines.com/en/statistics/flash_sales/salesfig_thailand_2015

Flex fuel sales

Since 1995, the majority of cars sold in Thailand are E10 compatible and E20 compatibility exists in most cars since 2008.¹⁴ Over the years, several car manufacturers have increased the availability of models that can run on E85 fuels, including Honda, Ford, Volvo and Toyota, among others. As shown in Table 2, as of May 2015, there were 2,836 gas stations that sold E20 and 678 that sold E85.

Table 2. Gas stations selling E20 and E85 in Thailand

	June 2015	June 2016
E20	2,861	3,118
E85	690	875

Source: <http://www.doeb.go.th/2016/stat.html>

CNG vehicle Sales

While the amount of natural gas powered vehicles has risen dramatically since their introduction in in 1970's, sales have recently flattened out. As of March 2015, there were 466,845 CNG vehicles registered in Thailand, of which 393,315 were passenger cars.¹⁵ In 2014, the number stood at and 388,743 cars, reflecting a 1 percent year on year growth.¹⁶ Figure 4 shows sales of all CNG vehicles between 2005 and 2015.

The percentage of vehicles running on natural gas in Thailand has started to decline in 2014. Penetration levels stood at 2.8 percent, the lowest since 2011.¹⁷

The slow growth trend in vehicle sales is mirrored by a minimal expansion of the gas station coverage. In September 2014, Thailand had 497 CNG stations in 54 cities and 60 new stations were slated for construction the following year.^{18,19,20} Yet by March of 2015, only 2 more

¹⁴ https://www.mtec.or.th/files/chanpen/1_DEDE.pdf

¹⁵ <http://www.ngvjournal.com/wp-content/uploads/2016/03/ASIAN108febreroWEBok.pdf>

¹⁶ <http://www.ngvjournal.com/wp-content/uploads/pdfmags/asian94-011214.pdf>

¹⁷ Stratas Advisors. Increased conversion to natural gas in Asia. March 2016. Available at <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwje4b31KXOAhVI7GMKHVS2DEoQFggI MAE&url=https%3A%2F%2Fstratasadvisors.com%2F~%2Fmedia%2FMarketing%2520Images%2FNewsroom%2520Items%2FNaturalGasaFuelAsia-031716.pdf%3Fla%3Den&usg=AFQjCNEa4Hivq78vY1pJBXnAKPbbrJbMlw&sig2=AY3bWjKyToQoXUVVo2vtXw&cad=rja>

¹⁸ Asia and worldwide NGV market movements, and end-year review. 2014. *Asian NGV Communications*. Number 94 December 2014, p.31

¹⁹ <http://www.ngvglobal.com/blog/thailand-commences-cng-pricing-correction-1003#more-32838>

²⁰ Asia and worldwide NGV market movements, and end-year review. 2014. *Asian NGV Communications*. Number 94, December 2014, p.29. Available at <http://www.ngvjournal.com/wp-content/uploads/pdfmags/asian94-011214.pdf>

stations had been added. There also have been fewer conversions of gasoline and diesel vehicles to NGV vehicles.²¹

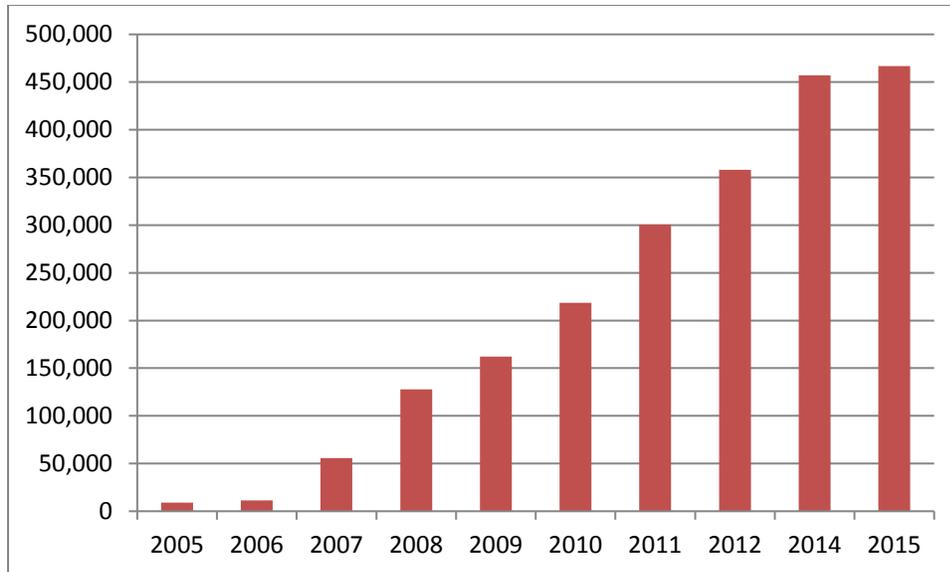


Figure 4 CNG Vehicle Sales 2005-2015.

Sources: <http://www.iangv.org/current-ngv-stats/> (2002-2012); <http://wp.ngvjournals.com/wp-content/uploads/pdfmags/asian83-012014.pdf> (2013); <http://www.ngvjournals.com/wp-content/uploads/pdfmags/asian94-011214.pdf> (2014); <http://www.ngvjournals.com/wp-content/uploads/2016/03/ASIAN108febreroWEBok.pdf> (2015)

Fuel Sources

Ethanol

Over the past five years, the phasing out of unblended gasoline fuels has increased pressure on ethanol producers to deliver fuels to the market. Table 3 shows that since 2010, Thailand has added two additional ethanol refineries and increased production capacity from 2.9 million liters per day (mL/day) to 4.8 mL/day.

²¹ Stratas Advisors. Increased conversion to natural gas in Asia. March 2016. Available at <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwje4b3l1KXOAhVI7GMKHVS2DEoQFggIIMAE&url=https%3A%2F%2Fstratasadvisors.com%2F~%2Fmedia%2FMarketing%2520Images%2FNewsroom%2520Items%2FNaturalGasaFuelAsia-031716.pdf%3Fla%3Den&usg=AFQjCNEa4Hivq78vY1pJBXnAKPbbrJbMlw&sig2=AY3bWjKyToQoXUVVo2vtXw&cad=rja>

Table 3. Ethanol Refineries, Production Capacity and National Fuel Consumption

	2010	2011	2012	2013	2014	2015
Number of Refineries	19	19	19	21	21	21
Nameplate Capacity (mL/day)	2.9	2.9	3.2	3.9	4.4	4.8
Production (mL)	486	471	950	1,058	1,265	1,400
Consumption (mL)	456	454	509	949	1,053	1,270

Source: USDA

Of the 21 refineries, 11 are molasses plants with 2.26 mL/day capacity, 7 cassava plants with 1.455 mL/day, and 4 are molasses and cassava plants with 1.25 mL/day capacities. While the country is able to cover domestic ethanol demand with domestic supplies, ethanol exports have decreased substantially over the years. Most exports are industrial grade ethanol destined for the Philippines.

The main feedstock for ethanol is sugar cane. Thailand's farmers grow sugarcane on an area of 8.46 million Rai- about 3.3 million acres, harvesting a yield of 12.3 tons per Rai with a total output of 104 million tons.²² Droughts across Southeast Asia have affected many of the feedstocks for ethanol. In Thailand, lack of rainfall has led to the worst drought in twenty years, with thirty of Thailand's 77 provinces declaring drought emergencies over the past months.^{23,24} Because of the drought across major sugar producing countries, including Thailand, sugar prices have increases by 44 percent between August of 2015 and January of 2016. According to the office of the Cane and Sugar Board in Thailand, sugar production was only 10 million tons in 2015, 14 percent lower than estimated.²⁵ Cassava, the second most popular feedstock for ethanol in Thailand, is grown on an area of 8.7 million Rai and yields about 3.6 tons per Rai with an output of 31 million tons.

There are also other feedstocks under consideration- most notably rice and bagasse. Yet with production costs far exceeding the costs of sugar cane based ethanol and global oil prices

²² Department of Alternative Energy Development and Efficiency. 2015. Biofuel Status and Policy. Available at https://www.mtec.or.th/files/chanpen/1_DEDE.pdf

²³ <http://www.aljazeera.com/news/2016/03/thailand-hit-worst-drought-decades-160330102123735.html>

²⁴ <http://thediplomat.com/2016/06/thailands-drought-struggle/?img=10#postImage>

²⁵ Platts Kingsman, a unit of McGraw Hill Financial Inc. <http://www.bloomberg.com/news/articles/2016-01-22/thailand-trims-sugar-output-estimate-as-drought-shrivels-crops>

remaining low, neither has proven economically viable.²⁶ Secondly, the government is trying to discourage the use of rice as feedstock, as this could lead to downward pressure on domestic cassava prices.²⁷

The Thai government is also supporting biodiesel as an alternative fuel. Palm oil is the predominant feedstock for biodiesel and growth on plantations covering 7,520 km² (about 2,900 square miles) all over the south and east of Thailand. Of the 2.24 million tons produced in 2014, 0.83 million tons was processed into biodiesel. In 2015, there were 11 biodiesel production plants in Thailand, producing 4.9 mL/day. With the new B7 biodiesel mandate that went into effect in 2015, demand is expected to rise beyond the 2.89 mL/day used in 2014. In May 2015, consumption of regular diesel stood at 60.08 mL/day of diesel.

All in all, the policies of the Thai government have increased the share of fuels containing biofuel to 92% of all transportation fuels sold.²⁸

Natural gas

Thailand is a country with ample natural gas reserves. In 2015, Thailand produced 1.4 trillion cubic feet (Tcf) of natural gas. Additionally, the country has 8.4 trillion cubic feet of proven natural gas reserves in the Gulf of Thailand, enough for seven years of power production.²⁹ Thailand also possesses significant unconventional natural gas reserves, yet better data and analysis is needed to evaluate the shale resources in the Khorat, Northern Intermontane and Central Plains basins.³⁰

Demand for natural gas has been steadily growing in Thailand since 1999, when consumption began to outpace production for the first time. In 2015, consumption stood at 1.7 Tcf of natural gas, according to Thai government data. Thailand has offset the imbalance by importing dry natural gas from its neighboring countries as well as setting up the Map Ta Phut LNG terminal for imports from Qatar. Imports from neighboring offshore fields in Myanmar resulted in 460

²⁶ Phoonphongphiph, Apornrath. 2014. Thailand looking to produce ethanol from rotten rice stocks – officials. Reuters UK. Accessed 8/2/2016 at: <http://uk.reuters.com/article/2014/08/13/uk-thailand-rice-ethanol-idUKKBN0GD0KT20140813>

²⁷ Preechajarn, S., Prasertsri, P. 2015. Thailand Biofuels Annual. F.A. Service. United States Department of Agriculture, Ed. Bangkok, 2015

²⁸ http://aperc.iecej.or.jp/file/2016/2/1/Final_Report_Follow-up_PREE_in_Thailand_20160128_pub2.pdf, p.77

²⁹ <http://asia.nikkei.com/Politics-Economy/Economy/Facing-a-natural-gas-shortage-Thailand-looks-to-coal-and-hydropower>

³⁰ P.XXII-1 http://www.adv-res.com/pdf/A_EIA_ARI_2013%20World%20Shale%20Gas%20and%20Shale%20Oil%20Resource%20Assessment.pdf

billion cubic feet (Bcf) in 2015.³¹ In 2014, 4,669 MMSCF of natural gas were used in Thailand. Of that amount, seven percent, or 317 MMSCFD, went to transportation.³²

As Thailand is facing increasing demand for natural gas, the combination of depleting domestic resources, lack of investments and limited storage capacity is leading to a predicted annual shortfall of 9 million tons of LNG by 2021, which could translate into 6,300 MW of electricity shortage.³³

Thailand has started to implement reforms in the gas sector to decrease subsidies. Since 2015, the price for natural gas has been moving towards one determined by market forces, with full liberalization of NGV retail prices expected at the end of July, 2016. This is welcome news for PTT, Thailand's energy conglomerate, which had been struggling to keep the company profitable with low global oil and gas prices and upwards of \$36 million per quarter spent to subsidize natural gas prices for vehicles.³⁴ However, the government plans to keep subsidizing the NGV price for public vehicles, which account for around 25% of total NGV volume consumed in Thailand, at 10 Thai Baht per kg.³⁵

After years of growth, demand for natural gas in the vehicle sector started to decline from 20.8 percent in 2012 to 10.2 percent in 2013 and dropping to 3.1 percent in 2014. In 2015 and the first five months of 2016, consumption of natural gas in the transportation sector posted negative growth rates of 4.1 and 7.3 percent, respectively.³⁶ Some reasons for the decline in demand are the combination of price increases for natural gas in 2015 that closed the gap between the actual market value and the government's subsidized rates, as well as the continuously low oil prices that made gasoline and diesel fueled vehicles relatively cheaper.

Evaluation

With the 2008 Renewable Energy Development Plan and its 2015 Alternative Energy Development Plan, Thailand has demonstrated its determination to change its energy system into a more sustainable one, employing renewable energy and setting consumption targets for renewable fuels. These policy decisions have endured several challenges, including changes in government, as well as a recession and economic turmoil. Yet in spite of these obstacles, the government of Thailand has continued its support for ethanol production and consumption in the vehicle sector. The result of these policy measures are reflected in the growth of ethanol

³¹ <https://www.eia.gov/beta/international/analysis.cfm?iso=THA>

³² <http://www2.eppo.go.th/info/cd-2015/pdf/cha3.pdf>

³³ <http://www.bangkokpost.com/news/general/1017485/thailand-risks-facing-serious-lng-shortage>

³⁴ <http://www.asianews.network/content/natural-gas-vehicle-price-be-floated-july-thailand-7909>

³⁵ <https://www.fitchratings.com/site/pressrelease?id=998375>

³⁶ Energy Policy and Planning Office. Consumption of Natural Gas by Sector. Accessed 08/03/2016 at: [http://www.eppo.go.th/index.php/en/en-energystatistics/ngv-statistic?orders\[publishUp\]=publishUp&issearch=1](http://www.eppo.go.th/index.php/en/en-energystatistics/ngv-statistic?orders[publishUp]=publishUp&issearch=1)

refineries- almost doubling the amount since 2008, the growth in ethanol consumption- almost tripling over the last five years, or the increased number of E85 gas stations, which grew from 8 in 2008 for E85 fuel blends to 678 in 2015. At the same time, flex fuel vehicles now dominate the vehicle market and most cars manufactured since 2008 being E20 compatible.

Thailand has over the same timeframe made similar policy commitments to natural gas use in vehicles. Subsidized natural gas at gas stations, financial support for vehicle owners, low interest loans for engine conversions, several tax exclusions and reductions for NGVs, such as excise tax, municipal tax, and the oil fund and energy conservation fund levies are all tools the government successfully used to increase market adoption from 9,000 in 2005 to close to 470,000 in 2015. Yet several factors have dampened the interest in natural gas vehicles recently- starting with demand for natural gas rising across all sectors of the Thai economy- thereby pressuring the government to end subsidies in the NGV sector, as well as global oil prices decreasing, thereby making natural gas vehicles relatively more expensive. Lastly, the lack of investments into further development of existing gas fields and exploration of new ones, or the shortage of infrastructure, including sufficient storage facilities, as well as the limited investigations into the country's unconventional oil and gas resources appear to further reduce chances of a renaissance of natural gas fueled transportation. Consequently, sales of natural gas vehicles and conversions of gasoline and diesel vehicles have decreased over the past two years, calling into question the long term viability of mass adoption of natural gas fueled transport in Thailand. A significant upswing in global oil prices could change this dynamic relatively quickly, making gas relatively cheaper and raise ethanol fuel costs by default as well. Yet the current global supply situation, as well as the static economic outlook for major users, including China and Europe, is making this scenario unrealistic in the short run.

While the NGV market is competing with other users of natural gas, including the growing electricity sectors, ethanol has remained available as a fuel source dedicated almost exclusively to the transportation sector. This is one of the factors supporting the government's commitment to ethanol, further indicating that Thailand's prospects for increased adoption of ethanol fuel blends seem bright.