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Indonesia

Biofuels Annual

2014

Approved By:

Ali Abdi

Prepared By:

R. Thomson Wright/I Edy Wiyono

Report Highlights:

Indonesian Ministry of Energy and Mineral Resources (MEMR) Regulation No. 25/2013 is an ambitious biofuel program that aims to diversify domestic biodiesel consumption beyond the transportation sector (Indonesia's main biodiesel consumer). Challenges to expand biodiesel expansion include inadequate infrastructure, producer and blender disagreement on biofuel price index formulation, and the absence of strong political will to remove or cut fuel subsidies.

Post:
Jakarta

I. Executive Summary:

Indonesian Ministry of Energy and Mineral Resources (MEMR) Regulation No. 25/2013 is an ambitious biofuel program that aims to diversify domestic biodiesel consumption beyond the transportation sector (Indonesia's main biodiesel consumer). Challenges to expand biodiesel expansion include inadequate infrastructure, producer and blender disagreement on biofuel price index formulation, and the absence of strong political will to remove or cut fuel subsidies.

II. Policy and Programs

The GOI enacted Indonesia's National Energy Policy (Presidential Regulation No. 5/2006 (regulation 5) in early 2006. Regulation 5 formalized the development of biofuels in Indonesia, (ethanol and biodiesel), and established a five percent biofuel mandate by 2025. According to regulation 5, biofuel development, as well as other new and renewable energies¹, will help diversify and secure energy supplies and support sustainable economic development.

MEMR also issued Regulation No. 32/2008 in conjunction with regulation 5. Regulation 32 establishes a progressive set of targeted biofuel mandates during the 2008-2025 timeframe.

Table 1. Indonesian Biofuel Mandatory Target

BIOETHANOL (Minimum)						
Sector	2008	2009	2010	2015	2020	2025
Transportation, Public Service Obligation (PSO)	3% (Existing)	1%	3%	5%	10%	15%
Transportation, Non PSO	5% (Existing)	5%	7%	10%	12%	15%
Industry		5%	7%	10%	12%	15%

BIODIESEL (Minimum)						
Sector	2008	2009	2010	2015	2020	2025
Transportation, Public Service Obligation (PSO)	1% (Existing)	1%	2.5%	5%	10%	20%
Transportation, Non PSO		1%	3%	7%	10%	20%
Industry	2.5%	2.5%	5%	10%	15%	20%
Electricity	0.1%	0.25%	1%	10%	15%	20%

Note: Public Service Obligation (PSO) refers to subsidized fuels.

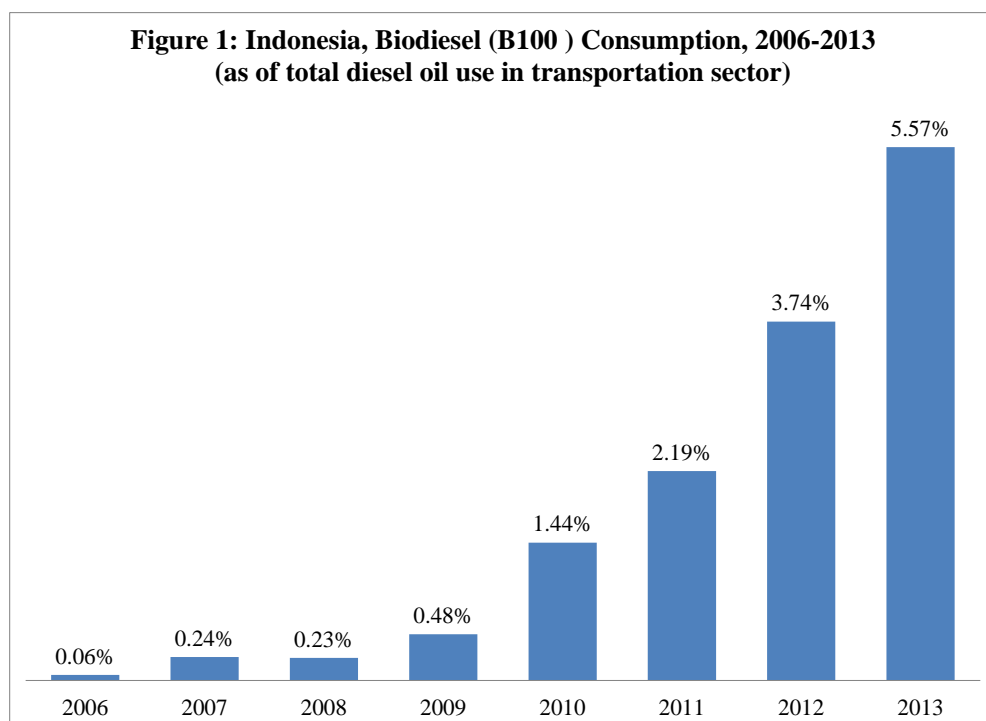
¹ Wind, solar, geothermal, coal-bed methane, hydrogen, liquefied and gasified coal, biomass, biogas, and nuclear

Table 1 show the biofuel mandate targets for several key Indonesian sectors, including transportation, industry, and electricity by 2025. Biodiesel consumption in the transportation sector (PSO) is expected to increase from a minimum of one percent in 2008 to a minimum of 20 percent of total fuel consumption in the sector by 2025.

MEMR has included the following measures in regulation 32 to increase biofuel use in the abovementioned key economic sectors:

- The establishment of a Directorate General of New & Renewable Energy (DG EBTKE) in August 2010. One of the new DG's primary objectives is to develop strong Indonesian biofuel production and consumption.
 - An updated biofuel price index to include transportation costs from producers to blending plants and new ethanol price benchmarks that better reflect domestic costs of producing ethanol.
 - An increase in biofuel subsidies from IDR 2,000 per liter to IDR 3,500 per liter in fiscal year (FY) 2012 and FY 2013.
 - An increased blending rate for subsidized biodiesel from 5 percent to 7.5 percent in 2012. MEMR has proposed to parliament to further increase the blending rate to 10 percent this year.
 - MEMR required Indonesian gas retailers, including PERTAMINA and foreign-operated gas stations such as Shell, Total, and PETRONAS, to blend PME with non-subsidized diesel fuel as of May 1st, 2012. EBTKE may impose punitive actions for non-compliance, including:
 - A written reprimand;
 - Suspension of operating license for three months; and
 - Revocation of operating license.
 - Indonesian coal and mineral mining companies are required to use at least two percent biofuels in their total fuel consumption as of July 1, 2012.

The aforementioned requirements are being implemented, particularly in the transportation sector, creating the most significant new demand for Indonesian biodiesel since 2006. Biodiesel's contribution to total diesel oil use in the transportation sector has gradually increased from 0.06 percent in 2006 to 5.57 percent in 2013 (see figure 1). Conversely, biodiesel consumption in the electric and industrial sectors is almost nonexistent.



Source: MEMR (recalculated)

Indonesian fuel imports are increasing as fuel consumption outpaces Indonesian production. This contributes to Indonesia's widening trade account deficit and weakens the exchange value of Indonesian currency. The GOI believes that enhancing consumption of locally-produced biofuels can help maintaining fuel imports at manageable levels, thereby narrowing the trade deficit and stabilizing the exchange rate. The GOI therefore urgently wants to accelerate the biofuel mandatory program by enacting MEMR Regulation No. 25/2013 (regulation 25). Regulation 25 amends MEMR Regulation No. 32/2008 and sets a more ambitious target for biofuel use (*see tables below*).

Table 2: Indonesia, Comparative view of biodiesel mandatory program, 2015 – 2025

Biodiesel (B100)	Old Biofuel Mandatory Program (MEMR Regulation 32/2008)			New Biofuel Mandatory (MEMR Regulation 25/2013)		
	2015	2020	2025	2015	2020	2025
Transportation (PSO)	5%	10%	20%	10%	20%	25%
Transportation (Non-PSO)	7%	10%	20%	10%	20%	25%
Industry	10%	15%	20%	10%	20%	25%
Electricity	10%	15%	20%	25%	30%	30%

Note: the percentage refers to total diesel oil use in the sector

Table 3: Indonesia, Comparative view of bioethanol mandatory program, 2015 – 2025

Ethanol (E100)	Old Biofuel Mandatory Program (MEMR Regulation 32/2008)			New Biofuel Mandatory (MEMR Regulation 25/2013)		
	2015	2020	2025	2015	2020	2025
Transportation (PSO)	3%	10%	15%	1%	5%	20%
Transportation (Non-PSO)	7%	12%	15%	2%	10%	20%
Industry	7%	12%	15%	2%	10%	20%
Electricity	-	-	-	-	-	-

Note: Total gasoline use (%) per sector

Table 4: Indonesia, Comparative view of pure plant oil mandatory program, 2015 – 2025

Pure Palm Oil (O100)	Old Biofuel Mandatory Program (MEMR Regulation 32/2008)			New Biofuel Mandatory Program (MEMR Regulation 25/2013)		
	2015	2020	2025	2015	2020	2025
Industry	-	-	-	10%	20%	20%
Sea Transportation	-	-	-	10%	20%	20%
Air Transportation	-	-	-	-	-	-
Electricity	-	-	-	15%	20%	20%

Note: Total diesel oil use (%) per sector

The first measure under the framework of Regulation 25 was to increase the blending rate of biodiesel from 7.5 percent to 10 percent in September 2013. This measure raised average monthly biodiesel use from 62 million liters (Jan-Aug 2013) to 140 million liters (Sept-Dec 2013). Average monthly biodiesel use at a 10 percent blending rate suggests that Indonesia can hit the 1.644 billion liters target for biodiesel consumption in the transportation sector in 2014.

Table 5. Indonesia, Fuel Use Projections (Million Kilo Liters), 2015 - 2024										
Calendar Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Gasoline Total	31.00	33.00	35.00	37.00	39.00	42.00	45.00	48.00	51.00	54.00
Diesel Total	28.13	29.42	30.83	32.34	33.93	35.64	37.46	39.40	41.48	43.70
On-road	20.61	21.95	23.38	24.90	26.51	28.24	30.07	32.03	34.11	36.07
Agriculture	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Construction/mining	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Shipping/rail	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Industry	6.87	6.88	6.90	6.93	6.95	6.96	6.98	7.00	7.02	7.30
Heating	0.65	0.59	0.55	0.52	0.47	0.44	0.41	0.37	0.35	0.33
Jet Fuel Total	6.81	6.68	7.23	7.82	8.46	9.14	9.89	10.69	11.56	12.36
Total Fuel Markets	65.95	69.11	73.06	77.16	81.39	86.78	92.35	98.09	104.05	110.06

Source: Center for Energy and Mineral Resources Data and Information

The Indonesian transportation sector will consume 20.61 billion liters of diesel oil in 2015, of which 10 percent (2.061 billion liters) is targeted to be biodiesel (see table 1 and table 4). Post believes this target is rational and acceptable due to the following considerations:

- Biodiesel consumption in the transportation sector is expected to increase from 1.048 billion liters in 2013 to 1.644 billion liters in 2014 using a 10% blending rate.
- An additional 420 million liters of biodiesel consumption is required to hit the 10 percent biodiesel share target for the transportation sector in 2015. PERTAMINA's ongoing program to expand biodiesel distribution to Kalimantan and Sulawesi will make this achievable.

Industrial diesel oil use is predicted to grow at a slower pace as industry's fuel use is diversified and includes coal, gas, biomass, and briquette. Strong growth in the Indonesian air transportation sector (driven by new low-cost air carriers) will raise jet fuel use to 9.14 billion liters by 2020.

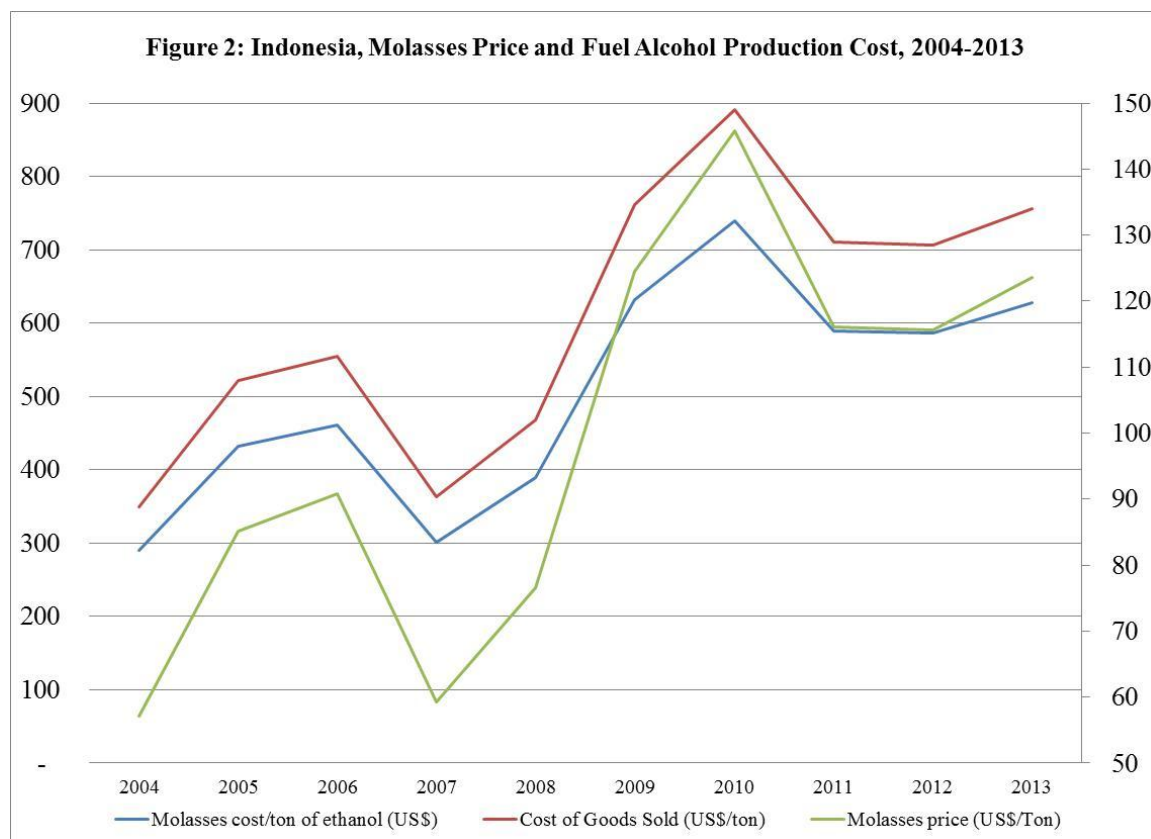
III. Ethanol

Production

The Indonesian bioethanol program was ended in 2010. According to PERTAMINA, bioethanol distribution was ended due to inconsistent supply and price volatility. Fuel ethanol (FE) producers indicate PERTAMINA's uneconomical set purchase price.

The government-set FE price index has been in place since 2010, and is based on the Argus Thailand Ethanol Price FOB formula (raised by a factor of 1.05). FE production costs can be estimated assuming the following, (see Figure 2):

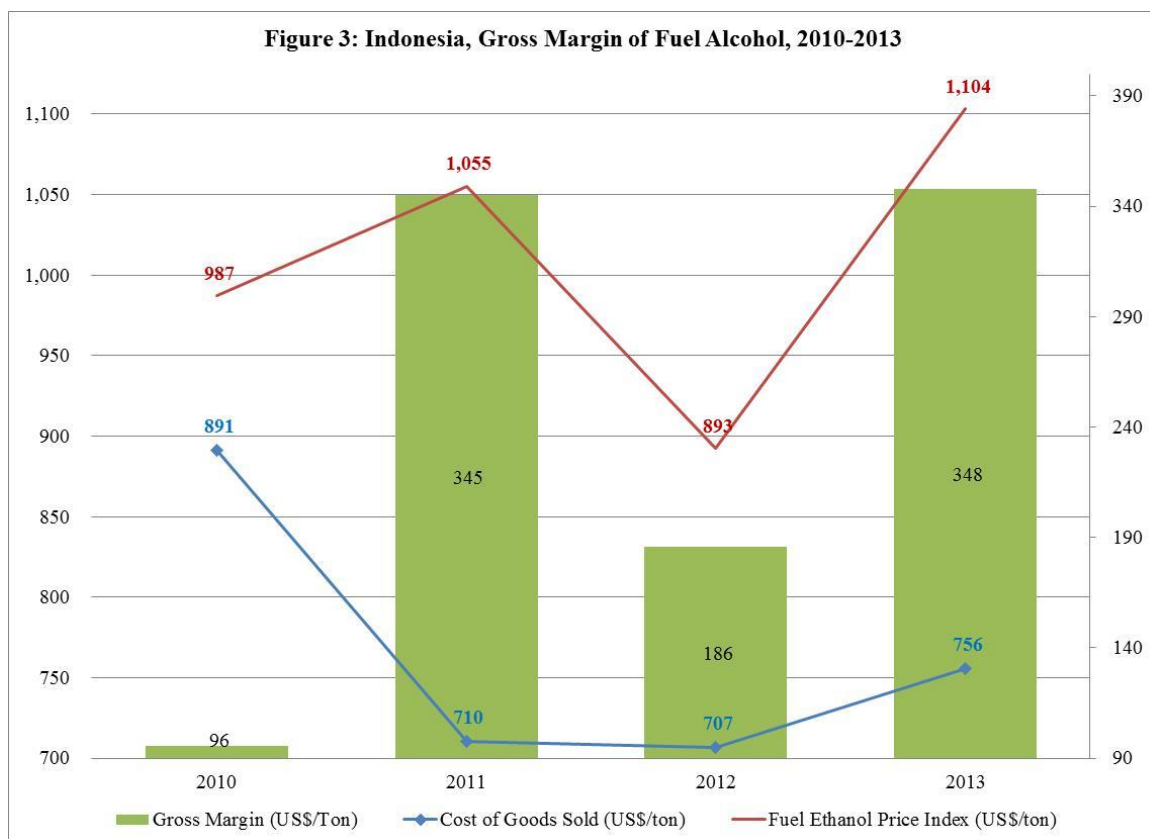
- Molasses price derived from value and quantity of Indonesian molasses 2004-2013 exports.
- Molasses-to-FE conversion rate: 4 kg of molasses = 1 liter of fuel ethanol
- Molasses accounts for 83 percent of total FE production cost
- One ton of ethanol is equal with 1,269 liters of FE
- Thailand Ethanol Price Reference 2010-2013 average.



Source: LICHT and GTIS

Molasses price fluctuation is a determining factor for FE production cost volatility (see figure 2). The steep uptrend of molasses prices in the 2007-2010 timeframe significantly inflated FE production costs. In 2011, production costs sharply declined from US\$ 891 per ton in 2010 to US\$ 710 per ton, and were relatively stable in the 2011-2013 periods due to stable molasses prices. Domestic molasses demand is competitive due to strong demand from feed, food, ethanol industry, and overseas markets.

The comparison between FE production costs and the FE price index demonstrates that FE producers were enjoying positive gross margins (see figure 3). FE producers, however, may find the gross margin insufficient to cover overhead costs, distribution costs from their plant to PERTAMINA's blending point, tax and interest expenses, depreciation, and profit margins. This resulted in the decision to stop supplying FE to PERTAMINA.



Source: LICHT and GTIS (recalculated)

MEMR has come up with new a bioethanol price index that is expected to be more favorable for FE producers. According to FE industry sources, the new index will still use the Argus Thailand Ethanol Price as a reference, but it will raise the multiplication factor from 1.05 to 1.32. Indonesia's Ministry of Finance has not yet given green light for MEMR to put the new price index in place.

There are currently four companies producing industrial grade ethanol (IE). Limited penetration of overseas markets has helped limit production growth. Indonesia is expected to produce 220 million liters of IE in 2014 and 230 million liters in 2015.

Consumption

Consumer goods manufacturers, including pharmacy, food, cosmetics, cigarette, and chemical solvent producers, are Indonesia's main IE consumers. IE consumption is growing at two to three percent per year due to mature demand from the abovementioned sectors.

Trade

After registering a 27 percent drop in 2012, IE exports increased by 46 percent to 86 million liters in 2013. IE exports are expected to remain consistent at 86 million liters in 2014 and 2015.

Stock

IE stocks are predicted to stay below the 2013 level at 16 million liters in 2014 and 18 million liters in 2015.

Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)										
Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Beginning Stocks	10	27	33	32	43	37	23	34	21	16
Fuel Begin Stocks	0.05	0.30	0.64	0.03	0.47	0	0	0	0	0
Production	163	166	169	172	175	200	205	210	220	230
Fuel Production	0.30	1.00	1.20	1.70	0	0	0	0	0	0
Imports	0.05	2.6	0.11	0.11	0.23	0.63	0.15	0.46	0.46	0.48
Fuel Imports	0	0	0	0	0	0	0	0	0	0
Exports	32	35	47	33	49	81	59	86	86	86
Fuel Exports	0	0	0	0	0	0	0	0	0	0
Consumption	114	128	124	128	132	134	135	137	139	142
Fuel Consumption	0.05	0.66	1.81	1.26	0	0	0	0	0	0
Ending Stocks	27	33	32	43	37	23	34	21	16	18
Fuel Ending Stocks	0.3	0.64	0.03	0.47	0	0	0	0	0	0
Production Capacity										
Number of Refineries	15	15	19	20	20	20	20	20	20	20
Nameplate Capacity	219	235	465	495	513	513	513	573	573	573
Capacity Use (%)	74%	71%	36%	35%	34%	39%	40%	37%	38%	40%
Co-product Production (1,000 MT)										
Co-product A										
Co-product B										
Feedstock Use (1,000 MT)										
Feedstock A - Molasses	652	664	676	688	700	800	820	840	880	920
Feedstock B										
Feedstock C										
Feedstock D										
Market Penetration (Liters - specify unit)										
Fuel Ethanol	0	1	2	1	0	0	0	0	0	0
Gasoline	16,449	17,500	19,470	21,389	23,062	25,392	28,790	31,188	33,786	36,601
Blend Rate (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

IV. Biodiesel

Production

In contrast with the stagnant condition of Indonesian FE, Indonesia's biodiesel sector maintained healthy growth in 2013. Biodiesel production increased from 2.2 billion liters in 2012 to 2.45 billion liters in 2013. Growth is attributable to an ambitious new biofuel mandatory program. The program will continue driving Indonesian biodiesel production through 2014 and 2015, despite unfavorable biodiesel markets overseas. Indonesian biodiesel production is expected to reach 3.65 billion liters in 2014, and it will further increase to 4.15 billion liters in 2015.

If the new biofuel mandatory program is successful, MEMR expects Indonesia will face biodiesel supply shortages starting in 2016. MEMR is therefore encouraging industry to expand production capacity from the current level of 5.67 billion liters per year. Business-as-usual biodiesel supply expansion growth, according to MEMR calculation, will result in the situation of annual excess demand for biodiesel at 2 billion liters within 2016 – 2020 timeframe.

Jatropha oil, candle nut (reutealis) oil, calophyllum oil, and coconut oil are alternate domestically available feedstocks for Indonesian biodiesel production. Limited availability and low oil extraction rates make them less competitive when compared to palm oil. Indonesian researchers are trying to increase their economic value by breeding high yielding varieties and increasing their byproducts' value. Expanding research results from laboratory and pilot scale to commercial production remains challenging, however.

Post believes there are no viable non-palm oil fuel stocks able to be used as biodiesel feedstocks on a nation-wide scale. Local application of palm oil-alternative plants may be more effective. Calophyllum, for example, is usually cultivated in coastal areas and may be developed for use on a small scale.

Consumption

MEMR, following the new biofuel mandatory program, is targeting 4 billion liters of biodiesel consumption for 2014. MEMR assumes the following in order to calculate this estimate:

1. PERTAMINA is expected to blend 1.644 billion liters of biodiesel with subsidized diesel oil in the transportation sector.
2. The state-owned electricity company (PLN) is targeted to use 0.80 billion liters of biodiesel in its power plants.

PERTAMINA and private gas stations such as SHELL and TOTAL are expected to mix 1.57 billion liters of biodiesel with non-subsidized diesel oil.

Post estimates that biodiesel consumption will be below MEMR's estimate, at 2.625 billion liters in 2014 and 3.13 billion liters in 2015, due to the following:

- Post believes that the 2014 target of 1.64 billion liters of biodiesel consumption is feasible due to the application of B-10 for all of 2014. Biodiesel will grow to 2.06 billion liters in 2015 due to subsidized diesel oil blending.
- Post believes the power generation target is too ambitious, as the electricity sector hasn't adopted biodiesel despite GOI programs promoting it since 2006. PLN procured 130 million liters of biodiesel during Sep-Dec 2013 as its initial effort to hit the above-mentioned target set by MEMR. PLN faces some challenges using biodiesel such as finding price competitive suppliers, upgrading/creating blending facilities, and assuring that biodiesel will perform financially. With these factors in place, post expects the electricity sector will procure no more than 390 million liters of biodiesel in 2014, or 48 percent of the target. PLN will procure 490 million liters in 2015, or 60 percent of the initial target.
- Non-subsidized diesel oil consumption stands at around 5.8 to 5.9 billion liters per year. The 10 percent blending rate suggests that 580 to 590 million liters of biodiesel will be mixed with non-subsidized diesel oil in 2014 and 2015.

Trade

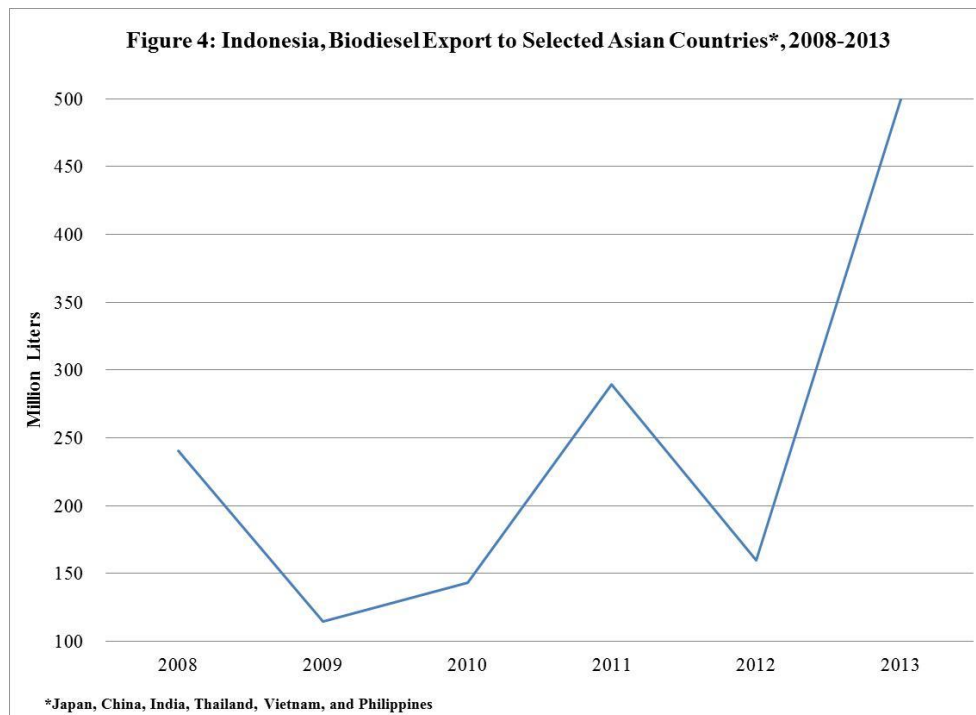
Europe became a growing export market for Indonesian biodiesel exports during 2008 – 2012.

Indonesian biodiesel exports to Europe, however, dropped 60 percent from 1.29 billion liters in 2012 to 0.521 billion liters in 2013 due to non-tariff trade barriers imposed by the European Commission.

Indonesia faces several challenges to expand biodiesel export outside of Europe due to the following:

- Europe is the world's largest biodiesel producer followed by the United States and Canada. European countries, however, have limited feedstock supplies compared to North America. As a result, Europe is Indonesia's most important biodiesel export market.
- Environmental issues, combined with ample supplies in North America discourage Indonesian biodiesel exports to the United States.
- Indonesia exports some biodiesel to India, China, The Philippines, Thailand, and Japan. These markets remain small and highly variable.

Post expects Indonesian biodiesel exports will stay constant at 1 billion liters in 2014 and 2015 due to the above-mentioned factors.



Source: GTIS

Stocks

Strong biodiesel production growth has outpaced consumption growth and exports. Consequently, Indonesian stocks have risen from 2010 to 2013. Biodiesel stocks are expected to continue increasing to 126 million liters in 2014 and 146 million liters in 2015 since the situation is not expected to change.

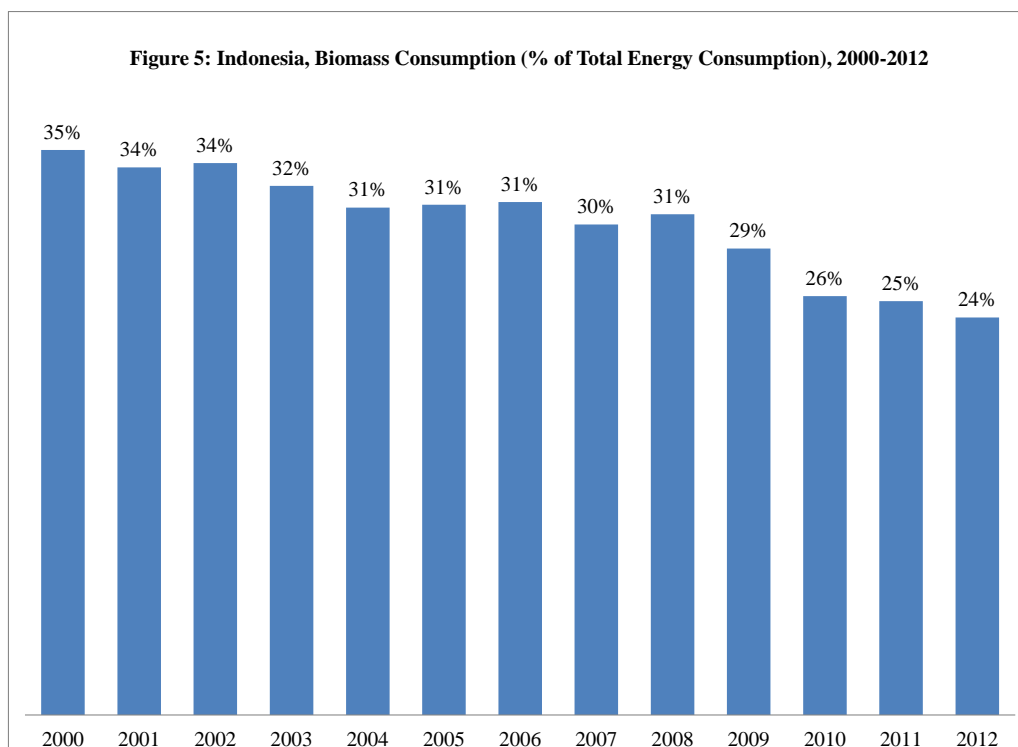
Biodiesel (Million Liters)										
Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Beginning Stocks	0	27	18	15	81	38	40	55	101	126
Production	65	270	630	330	740	1,800	2,200	2,450	3,650	4,150
Imports	0	0	0	0	0	0	0	0	0	0
Exports	33	257	610	204	563	1,440	1,515	1,356	1,000	1,000
Consumption	5	22	23	60	220	358	670	1,048	2,625	3,130
Ending Stocks	27	18	15	81	38	40	55	101	126	146
Production Capacity										
Number of Biorefineries	2	7	14	20	22	22	26	26	26	26
Nameplate Capacity	215	1,709	3,138	3,528	3,936	4,281	4,881	5,670	5,670	5,670
Capacity Use (%)	30.2%	15.8%	20.1%	9.4%	18.8%	42.0%	45.1%	43.2%	64.4%	73.2%
Feedstock Use (1,000 MT)										
Feedstock A (CPO)	64	265	619	324	727	1,769	2,163	2,408	3,588	4,079
Feedstock B										
Feedstock C										
Feedstock D										
Market Penetration (Liters - specify unit)										
Biodiesel, on-road use	5	22	23	60	220	358	670	930	1,644	2,060
Diesel, on-road use	9,059	9,400	10,311	12,781	15,291	16,383	18,690	20,727	22,986	25,492
Blend Rate (%)	0.1%	0.2%	0.2%	0.5%	1.4%	2.2%	3.6%	4.5%	7.2%	8.1%
Diesel, total use	15,636	15,575	17,001	20,158	23,049	22,921	24,611	26,257	28,014	29,888

V. Advanced Biofuels

The Indonesian Science Institute (LIPI) is researching second generation ethanol production using non-food feedstocks. Indonesia's first generation ethanol production costs are still very expensive as they compete with food uses (i.e. cassava and sugarcane). LIPI is researching oil palm stems as a possible ethanol feedstock. Oil palm stems could become a cheap feedstock due to their ample supply, if the cost of enzymes used in the fermentation process decline. The required enzyme is expensive and is not produced locally.

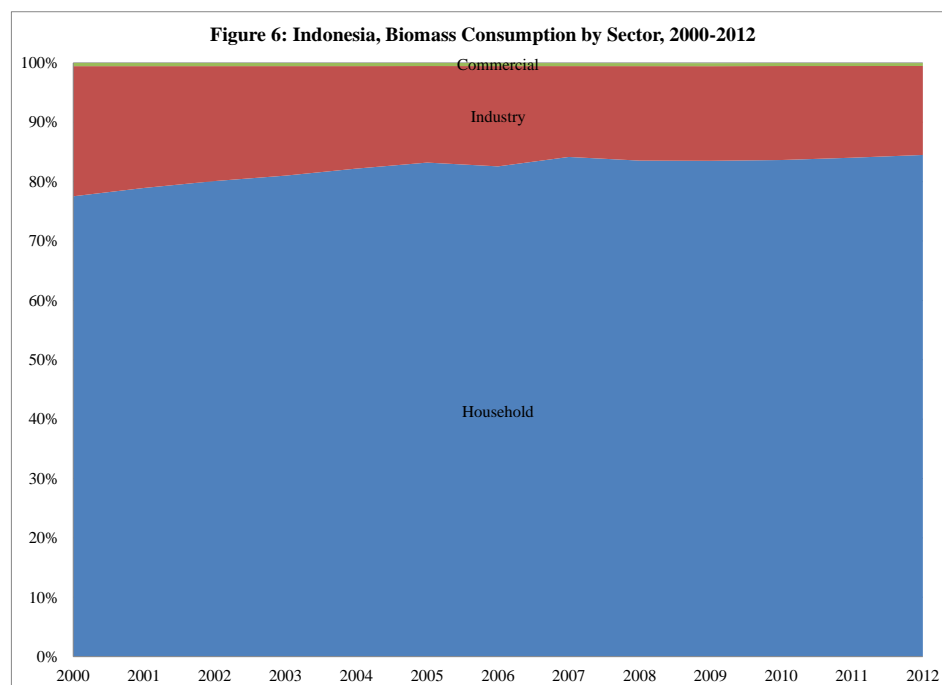
VII. Biomass for Heat and Power

Although Indonesian biomass consumption grew .33 percent from 2000 until 2012, its contribution to the Indonesian energy mix has steadily declined during the same time period (see Figure 5).



Source: Indonesian Energy Handbook 2013

Indonesia's largest biomass user for energy is households, with approximately 84 percent of total biomass consumption. Firewood, forest and agricultural waste are the most common type of biomass used by Indonesian households.



Source: Indonesian Energy Handbook 2013

VII. Notes on Statistical Data

- Crude Palm Oil to Fatty Acid Methyl Ester (FAME) conversion rate: one metric ton of palm oil is equal to 1,087 liters of palm oil, and the yield of Fatty Acid Methyl Ester (FAME) from a kilogram of CPO ranges from 83.3 to 93.5 percent. The conversion rate suggests that one metric ton of CPO can produce 905-1,016 liters of FAME. Further references on FAME yield can be read at <http://scialert.net/fulltext/?doi=jas.2009.3166.3170> and http://eprints.usm.my/13217/1/palm_oil_as_feedstocks.pdf.
- Molasses is the major feedstock to produce FE and IE in Indonesia. One metric ton of molasses yields 246 liters of FE/IE. Annual molasses production in Indonesia tends to fluctuate, depending on sugarcane production (please see the table below).

Calendar Year	Production (1000 MT)	
	Sugarcane	Molasses
2006	29,167	1,458
2007	25,676	1,284
2008	28,571	1,429
2009	25,346	1,267
2010	25,132	1,257
2011	24,000	1,200
2012	25,900	1,295
2013	26,700	1,335

Source: Post and USDA