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Biofuels Annual

Japan Focuses on Next Generation Biofuels

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Report Highlights:
Japan's current renewable energy policy focuses on generating power from solar, wind, and geothermal sources. For biofuels, the Government of Japan (GOJ) maintains its 2010 plan to introduce 500 thousand kilo liters (kl) (oil basis) of biofuels by 2017. Due to the increase in food prices during the past few years, there is a broad debate within Japan about the use of food crops to produce biofuels. This is a major reason that Japan is focusing research efforts on technology to produce biofuels from sources that do not compete with food.

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I. Executive Summary

Japan's current renewable energy policy focuses on generating power from solar, wind, and geothermal sources. For biofuels, the Government of Japan (GOJ) maintains its 2010 plan to introduce 500 thousand kilo liters (kl) (oil basis) of biofuels by 2017.

Although two different types of biofuels, E3 and bio- Ethyl Tert-Butyl Ether (ETBE) blended gasoline, compete in the market in Japan, bio-ETBE blended gasoline is more prevalent as it is widely distributed. In 2012, the GOJ permitted sales of E10 and ETBE 22 gasoline and vehicles designed to use these biofuels; however, this change will have a limited effect on the market as the supply of E3 and E10 remains small compared to that of bio-ETBE gasoline, and the Japanese petroleum industry does not have any plans to supply ETBE22 gasoline.

Due to the increase in food prices during the past few years, there is a broad debate within Japan about the use of food crops to produce biofuels. This is a major reason that Japan is focusing research efforts on cellulosic ethanol technology that is not seen to compete with food.

Japan has established its own sustainability standards for biofuels and only allows for bioethanol with a CO2 emission of less than 50 percent of that of gasoline. The GOJ used the Life Cycle Assessment (LCA) to calculate the CO2 emissions of the entire chain, from the initial cultivation of the raw material to the transportation of the final product to the end consumer and concluded that only Brazilian sugarcane ethanol meets Japan's sustainability standards. Based on available sources, Japan's imports of ethanol for fuel in 2013 were estimated to be about 47 thousand kl, all of which was imported from Brazil.

All nuclear power reactors are currently shut down. Power companies in Japan are forced to rely on other methods to generate power, such as hydro and coal. The power companies also increasingly use wood pellets as a renewable energy source. Hence, imports of wood pellets are expected to increase further.

II. Policy and Programs

Major Ministries Involved in Biofuel Policy

A number of ministries collaborate on Japan's biofuels policy, but three ministries, the Ministry of Economy, Trade and Industry (METI), the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Ministry of Environment (MOE), play major roles in developing and implementing biofuels policies.

MOE's main concerns are preventing global warming and meeting Japan's commitment to reduce its greenhouse gas (GHG) emissions. Last year, Japan announced its commitment to reduce its 2005 levels of GHG emissions by 3.8 percent by 2020. In terms of energy security, METI is interested in biofuels as a supplemental source of fuel and collaborates with the energy industry to introduce the fuels in the market and is interested in analyzing the cost-benefit of shifting to renewable fuels and their impact on automobiles and infrastructure. MAFF's goal is to revitalize rural communities by producing biofuels domestically from existing sources (e.g. sugarcane, sugar beet, rice, and rice straw). However, the focus has shifted to the use of sources that are not used for food, e.g., cellulosic materials.

Policy Goals

On April 11, 2014, Japan published its Basic Energy Plan for the next five years. This strategy considers renewable energies as important sources of energy mainly for three reasons: (1) Japan needs to increase its domestic production of renewable energy to ensure a stable supply. This has become especially important since the 2011Great East Japan Earthquake, as Japan's imports of energy for generating power have increased by approximately three trillion yen (approximately $30 billion); (2) To prevent global warming; and (3) To promote a dispersed power system to revitalize regional economies.

Japan will accelerate the introduction of renewable energies into the market and aims to increase the share of its power supply from renewable energy sources to more than 20 percent by 2030. For biofuels, the Basic Energy Plan states that "Concerning biofuels, which are mostly imported, Japan continues to introduce the fuels in light of international trends and technical development of the next generation of biofuels." According to sources, this statement indicates GOJ's belief that biofuels from sources that do not compete with food, e.g., cellulosic ethanol, are to be considered as part of Japan's energy supply. Under the Sophisticated Methods of Energy Supply Structure Act, the GOJ requires oil refiners to supply 500 thousand kl (oil basis) of biofuels by 2017; discussions to set a target for after 2017 may start this year.

Government Incentives

In 2008, the GOJ introduced tax incentives to encourage the use of bioethanol by amending the Quality Control of Gasoline and Other Fuels Act. The gas tax is usually ¥53.8 per liter (approximately $0.55). Under the special measure, if a fuel contains 3 percent bioethanol, the gas tax is lowered by ¥1.6 per liter (about $0.02). It is a fixed-term special measure; last year, it was extended to March 31, 2018.

In 2008, the Law to Promote the Usage of Biomass Resources to Produce Biofuels came into force. The legislation includes tax breaks and financial assistance for biofuel manufacturers and farmers producing feedstock, such as agricultural cooperatives and private businesses. The government encourages collaboration of those two groups, and their plans will be monitored by MAFF in order to qualify for the benefits. Under the scheme, newly built biofuel facilities that are approved for the program by 2016 will have their fixed property tax reduced by half for three years. The redemption period for interest-free loans for farmers will be extended by two years to a total of 12 years for farmers producing feedstock.

Sustainable Standards

The increase in food prices in 2008 caused governments around the world to re-think their biofuels

strategies. European policy makers started to consider the feasibility of biofuels using an evaluation tool called the Life Cycle Assessment, which aims to calculate the environmental impact of a good, a process or a service "from cradle to grave." The impact includes all relevant environmental aspects, such as cumulative energy demand, climatic change, acidification, nitrification, land occupation, photochemical oxidation, eco-toxicity, human health, etc. After quantifying the energy and substances flows occurring at each step of the product/service life cycle (Life Cycle Inventory or LCI), the Life Cycle Impact Assessment (LCIA) transposes these flows into a potential impact, as per the main damage categories listed above. The results are mainly used in comparative approaches, in order to compare several scenarios ending with the same functional unit. In line with global trends, MOE released the first version of the "LCA Guideline for Biofuels" in 2010 to allow manufacturers and importers of biofuels in Japan to assess their biofuels businesses.

In 2010, the GOJ established its own sustainability standards for biofuels. METI, in cooperation with MAFF and MOE, set up a Study Panel to Discuss the Introduction of Sustainable Biofuels. In a March 2010 report, the panel recommended that: 1) Japan set the LCA's CO2 reduction level at 50 percent; 2) Japan increase its domestic production of biofuels, currently three percent of the total supply, to more than 50 percent (this would include biofuels produced in other Asian countries, partially supported by GOJ funding); and 3) Japan emphasize cellulosic or other non-food materials to produce biofuels in order not to compete with the food supply. Based on the panel's recommendation, METI notified oil distributors that, in light of the LCA, GHG emissions from bioethanol they procure must be less than 50 percent compared to that of gasoline, and the bioethanol must not compete with the food supply. According to METI's LCA analysis, the only source of bioethanol which can fulfill Japan's GHG emission requirements is from sugar cane grown on existing farmland in Brazil.

Feed-in Tariff System

In the wake of the nuclear power plant accident in Fukushima in 2011, the GOJ reviewed its energy policies. One highlight was the introduction of a feed-in tariff (FIT) system for electricity from renewable energy sources such as solar and wind power. Under the system, which came into force on July 1, 2012, power companies are obliged to buy electricity at set rates, for example, at ¥32 (approximately $0.32) per kilowatt-hour for solar power, ¥22 for wind power, ¥26 for geothermal power, and ¥24 to ¥32 for biomass derived power. The rates are reviewed annually and are expected to lower as the costs incurred by power companies to buy electricity from renewable energy sources are passed on to consumers through increased electricity rates. Since the system was introduced, the number of power generating facilities using renewable energies has steadily increased.

In 2013, renewable energy accounted for 10.7 percent of Japan's total power supply (although hydropower accounts for 8.5percent). Although the GOJ aims to increase the proportion of renewable energies to more than 20 percent, this goal may be challenged by the high cost of generating power from renewable energies. For example, the amount of charge born by consumers in 2014 for the FIT system was ¥0.75 per kilowatt-hour for a total of ¥650 billion (approximately $6.4 billion). This issue of high-costs was addressed by the METI Minister during the first meeting of the Council of Ministers for Renewable Energies in April 2014, where member ministers agreed that the high cost of renewable energies needed to be reduced in order to expand their use.

Trends in Fuel Use

The GOJ estimates that gasoline and diesel demands will continue to decrease, mainly due to three factors: (1) the decrease in the number of automobiles as a result of the decline in Japan's population, (2) improved vehicle fuel efficiency, and (3) the increase of energy-saving automobiles, such as hybrid cars. In 2012, demand for gasoline was 56 million kl, and the demand for diesel was 33 million kl. By 2020, Japan's gasoline and diesel demands are estimated to decrease to 49 million kl and 32 million kl respectively. Demand for jet fuel is expected to increase over the next few years to 4.9 million kl due to the expansion of departure and arrival slots at Tokyo's Haneda Airport.

Japan's overall oil demands in the future are estimated to decrease as its population decreases. Japan's transportation sector (excluding railways) depends on fossil fuel for 98 percent of its energy, followed by electricity (two percent) and natural gas (0.1 percent). In its 2014 Basic Energy Plan, the GOJ states that it will promote diversification of energy sources in the transportation sector. Biofuels are considered to be an important energy source along with electricity, natural and LP gases, and hydrogen. In the plan, the GOJ also states that the use of biofuels for jet fuel is expected to increase further in the future.

Fuel Use Projections (Kilo Liters)										
Calendar Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Gasoline Total	53,942,000	52,729,000	51,677,000	50,634,000	49,621,000	48,629,000	47,656,000	46,703,000	45,769,000	44,854,000
Diesel Total	33,660,000	33,309,000	33,015,000	32,734,000	32,472,000	32,212,000	31,954,000	31,698,000	31,444,000	31,192,000
On-road	33,660,000	33,309,000	33,015,000	32,734,000	32,472,000	32,212,000	31,954,000	31,698,000	31,444,000	31,192,000
Jet Fuel Total	4,910,000	4,886,000	4,875,000	4,870,000	4,836,000	4,802,000	4,768,000	4,735,000	4,702,000	4,669,000
Total Fuel Markets	92,512,000	90,924,000	89,567,000	88,238,000	86,929,000	85,643,000	84,378,000	83,136,000	81,915,000	80,715,000
Source: Ministry of Economy, Trade and Industry										
Note: Numbers for 2019 onwards are forecast by Post.										

III. Ethanol

Production

In Japan, there are four refineries producing bioethanol for fuel. Production in 2013 was 24,000 kl and is likely to continue at the same level for the coming years.

Three refineries are producing bioethanol for fuel under MAFF's supervision. Two of those refineries are located in Hokkaido, Japan's agricultural heartland, and the other is in Niigata Prefecture. One of the refineries in Hokkaido is run by Oenon Holdings, Inc., a holding company of several sake breweries, and is using rice. The other facility in Hokkaido is run by Hokkaido Bioethanol Co., Ltd. and is using off-spec wheat and sugar beets. It is a public-private partnership between local private companies and Hokuren, the federation of agricultural cooperatives in Hokkaido. The annual production capacity for Oenon Holdings and Hokkaido Bioethanol is 15,000 kl each. Approximately 24,000 kl of ethanol is produced by the two facilities, and the ethanol is sold to Japan Biofuels Supply LLP, a company established jointly by PAJ member companies, to produce ETBE. Approximately 180,000 metric tons (mt) of sugar beets, 23,000 mt of wheat, and 24,000 mt of rice are used to produce this ethanol.

The facility in Niigata is operated by JA Zen-noh, a federation of agricultural cooperatives. It uses high yield rice grown specifically for biofuel production (800 kg/1,000 m^2 compared to 500 kg/1,000 m^2 in

table rice yield). The project began in 2006 using fallow land set aside in MAFF's acreage reduction plan. In 2009, the facility began to produce 1,000 kl of bioethanol using approximately 2,250 mt of rice. The ethanol is used as part of an E3 blend, and the E3 gasoline is sold at 20 affiliated gas stations around the Niigata Prefecture.

Recently, MAFF's program review committee for these ethanol projects published a report. According to the report, without the government support, continuation of their business is extremely difficult, mainly due to high production costs, including an increase in feedstock prices. The review committee suggests that MAFF examine these projects carefully and decide whether to continue providing assistance after 2017.

The fourth ethanol facility in Japan is supervised by MOE. The facility is run by a local oil supplier on Miyakojima Island, Okinawa Prefecture using molasses, obtained from the process of making sugar from sugarcane, to produce ethanol. It produces 90 kl of bioethanol per year from approximately 3,000 metric tons of molasses. The ethanol is used as part of an E3 blend and is sold at gas stations on the island.

When considering biofuels, there are two significant issues that Japan takes into account: 1) food-vs-fuel and 2) carbon emissions.

Japan states in its 2014 Basic Energy Plan that "Concerning biofuels, which are mostly imported, Japan continues to introduce the fuels in light of international trends and technical development of the next generation of biofuels." Sources indicate that this means that only biofuels from sources that do not compete with food (e.g. cellulosic ethanol) are to be considered as part of Japan's energy supply.

Japan has a low food self-sufficiency rate; imports comprise the majority of the food it consumes. As a result, Japanese people are highly sensitive to issues of rising food prices and the issue of food versus fuel. Ever since the food price spikes of 2008, Japan has shifted its ethanol focus – R&D, production and consumption – to ethanol that is not derived from a potential food source, i.e., they have focused primarily on development of cellulosic ethanol.

Although biofuels are treated as zero-emission fuels under the Kyoto Protocol, Japan calculated the CO2 emissions based on its LCA Guideline and concluded that the only source of bioethanol which can fulfill Japan's GHG emission requirements is sugar cane grown on current farmland in Brazil.

Consumption

Two Blending Methods in Japanese Market

There are two methods for blending bio-ethanol with gasoline: "direct blending" and "ETBE." In Japan, MOE promotes direct blending, while METI supports the ETBE method. The reason for the latter is that it is more costly for oil distributors to renovate the facilities for direct blending. MAFF supports

both methods to secure the distribution channel for domestically produced bio-ethanol.

Biofuels Blend Rates

Japan's direct blend limit for ethanol is regulated in the Gasoline Quality Assurance Law at three percent. The blend rate of ETBE into gasoline is seven percent. In April 2012, the law was revised to allow the sale of types of gasoline blended with 10 percent of ethanol (E10) or 22 percent of ETBE (ETBE22). The E10 or ETBE22 gasoline is allowed to use only with vehicles designed to use E10/ETBE 22 fuel. Japanese automakers have started to introduce some new automobile models that can run on E10 or ETBE22.

Consumption and Distribution Channel

Japan's consumption of ethanol for fuel is very small due mainly to the distribution channel for ethanol blended gasoline being very limited compared to that for bio-ETBE gasoline. E3 gasoline is available only in a few prefectures, e.g., Okinawa, Osaka, and Niigata. However, ETBE blended bio-gasoline is available throughout the nation. Consumption of bio-ETBE gasoline is expected to increase for next few years because the PAJ is mandated to introduce 1.94 million kl of bio-ETBE (500 thousand kl on oil basis) by 2017.

Trends in Engine Technology

In order to help reduce its GHG emissions, the Japanese auto industry is promoting so called "clean energy vehicles," which include electric, hybrid, and natural gas fueled cars. Japanese auto companies will start to sell fuel cell vehicles this year. Since the GOJ introduced subsidies and tax incentives for "clean energy vehicles" in 2009, the number of these kinds of vehicles has been increasing, with the total number of "clean energy vehicles" in Japan exceeding four million in 2013. Although clean energy vehicles still only account for 5.4 percent of the total number of automobiles in Japan, their numbers are expected to increase further.

Number of Clean Energy Vehiles					
	2009	2010	2011	2012	2013
Hybrid cars					3,870,000
Plug-in hybrid cars					30,000
Battery cars					54,000
Natual gas fueled cars					41,000
Clean diesel cars					145,000
Total	1,030,000	1,480,000	2,110,000	3,020,000	4,140,000
Source: Japan Automobile Manufacturers Association					

Development in Vehicle Fleet Efficiency

In 2012, a new standard for vehicle fleet efficiency was established for gasoline fueled passenger vehicles. The goal of the new standard is to attain vehicle fleet efficiency of 20.3 km per liter by 2020, compared to the 2009 level of 16.3 km per liter. The auto industry is putting more effort into developing technologies to improve efficiency to achieve this goal.

Trade

Japan's imports of ethanol for transportation are small. Joint ventures established between Japanese and Brazilian companies started imports of ethanol for fuel in 2010. According to available information, all imported ethanol for fuel comes from Brazil. Because Japan's domestic fuel ethanol market is small, imports are not expected to increase substantially.

Imports of ETBE are greater than those of ethanol for fuel. In 2013, Japan imported nearly 790 thousand kl of bio-ETBE from the United States. Imports of bio-ETBE are expected to increase further, because the PAJ aims to supply 1.94 million kl of bio-ETBE, all of which is expected to be imported from the United States, by 2017.

Since 2008, to further encourage the use of ETBE, the GOJ reduced its tariff on ETBE imports from 3.1 percent to zero. Under the 2014 Temporary Measures concerning Customs Act, imports of ETBE derived from biomass continue to be a zero tariff through March 31, 2018.

Imports of Bio-ETBE (Kilo Liters) HS2909.19-010										
Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Imports	0	7,500	6,694	56,923	699,533	692,837	678,983	787,465	976,456	1,210,805
Calculated volume of bioethanol		3,214	2,869	24,396	299,800	296,930	290,993	337,485	418,481	518,916
Source: The World Trade Atlas										
Note: Numbers for 2014 onwards are forecast by Post.										

PS&D – Ethanol

Ethanol Used as Fuel and Other Industrial Chemicals (Kilo Liters)										
Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Beginning Stocks										
Fuel Begin Stocks	0	0	0	0	0	0	0	0	0	0
Production *	30	90	200	15,000	25,000	25,000	25,000	25,000	25,000	25,000
Fuel Production *	30	90	200	15,000	25,000	25,000	25,000	25,000	25,000	25,000
Imports	341,657	321,390	322,309	372,761	403,160	393,610	403,046	416,336	420,000	420,000
Fuel Imports *	0	0	0	0	2,511	24,446	24,367	47,414	60,000	60,000
Exports	156	193	194	10,787	4,820	4,667	1,010	127	178	178
Fuel Exports	0	0	0	0	0	0	0	0	0	0
Consumption	358,185	361,583	372,141	418,528	417,900	443,825	451,872	480,199	487,890	489,393
Fuel Consumption *	30	90	200	15,000	27,811	52,146	56,067	79,114	91,700	91,700
Ending Stocks										
Fuel Ending Stocks	0	0	0	0	0	0	0	0	0	0
Production Capacity										
Number of Refineries	28	29	33	34	34	34	34	34	34	34
Nameplate Capacity	555,336	622,163	606,501	638,647	656,397	656,397	656,397	656,397	656,397	656,397
Capacity Use (%)	0%	0%	0%	2%	4%	4%	4%	4%	4%	4%
Co-product Production (1,000 MT)										
Co-product A										
Co-product B										
Feedstock Use (1,000 MT)										
Sugar beet	1	1	1	113	180	180	180	180	180	180
Off-spec wheat	1	1	1	14	23	23	23	23	23	23
Rice for non-food purpose	1	1	1	17	26	26	26	26	26	26
Molasses	1	3	3	3	3	3	3	3	3	3
Market Penetration (Kilo Liters)										
Fuel Ethanol	30	90	200	15,000	27,811	52,146	56,067	79,114	91,700	91,700
Gasoline	60,840,334	59,805,380	57,246,818	57,447,164	58,379,483	56,684,148	57,094,189	55,960,000	54,881,000	53,942,000
Blend Rate (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.2%

Sources: Ministry of Economy, Trade and Industry; Ministry of Agriculture, Forestry and Fisherires; The World Trade Atlas;
* Post's estimates.

Ethanol Used as Fuel and Other Industrial Chemicals (Kilo Liters)										
Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production according to METI	375,624	354,319	360,243	398,862	400,649	369,164	378,679	368,922		

Note: Japan's Ministry of Economy, Trade and Industry (METI) provides Japan's ethanol production data. METI has counted "refining" as "production." According to a source, Japan produces only a minimal amount of ethanol and ethanol in Japan is almost all imported.

IV. Biodiesel

Production

Japan's production of biodiesel is small, estimated at 14,000 kl. Post estimates that the production will remain stable at this level, as the consumption of biodiesel is not expected to grow. The most common feedstock for bio-diesel production in Japan is used cooking oil. It is said that the total amount of used cooking oil discharged annually in the country is about 450 thousand metric tons, from which about 410 thousand kl of bio-diesel could be produced if there was sufficient demand.

Municipal governments and regional non-profit organizations are participating in small-scale bio-diesel projects called "Rapeseed Project." Currently, there are about 118 projects. The projects involve growing rapeseed to produce cooking oil, collecting the used oil, and recycling it as biodiesel fuel. The biodiesel fuel is sold, for example, at stores of consumer cooperative societies who are participating in the project for about ¥90 (approx. $0.91) per liter.

There is another project by the City of Kyoto to collect used vegetable oil from restaurants and

individual households. The oil is processed into biodiesel fuel at the city's refinery, which produces 5 kl per day. Approximately 1,300 kl of biodiesel fuel is produced annually in the refinery and used for the city's garbage trucks (B100) and municipal buses (B20).

In Kyoto, there is also a private company producing bio-diesel fuel from used vegetable oil. The firm started from a citizen's group whose activities included collecting used cooking oil for the purpose of environmental protection. To date, the firm has established its own network to collect used cooking oil from individual households, restaurants, and any public or private organizations nationwide. Its refinery in Kyoto can produce 30 kl of biodiesel fuel per day. According to the company, it is the largest biodiesel fuel refinery in Japan by capacity. In 2011, the company started exports of bio-diesel fuel to the Netherlands. Its exports are expected to increase further in the future.

Consumption

In 2013, Japan's gasoline consumption was 56 million kl, while that of diesel was 34 million kl in the transport sector.

Japan's blend rate for biodiesel is five percent (B5). By receiving a special approval from METI, operators are able to use biodiesel with a blend rate higher than five percent for their trucks and buses, as is the case for the City of Kyoto.

According to the Japan Organic Recycling Association, approximately 94 percent of biodiesel in Japan is used for trucks and buses, and the rest is used for generating power.

According to an industry source, consumption of biodiesel is not expected to increase further for a variety of reasons, such as the fact that the distribution channels are not established and the national blend rate has remained at a low five percent due to concern that fuel with a higher blend rate may cause engine trouble.

Trade

In 2011, a private company in Kyoto started to export biodiesel to Netherlands. According to an industry source, as consumption of biodiesel in Japan is not expected to increase much, the company may need to continue to find opportunities in overseas markets.

In 2013, Japan imported 492 kl of biodiesel, 85 percent of which was from Malaysia. The import tariff for biodiesel from Malaysia is zero due to the economic partnership agreement between Japan and Malaysia. Otherwise, the import tariff is 3.9 percent.

PS& D – Biodiesel

Biodiesel (Kilo Liters)										
Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Beginning Stocks		0	0	0	0	0	0	0	0	0
Production *	5,000	7,000	7,500	9,000	10,000	12,000	14,000	14,000	14,000	14,000
Imports							82	492	500	500
Exports							2,340	3,060	3,000	3,000
Consumption *	5,000	7,000	7,500	9,000	10,000	12,000	11,742	11,432	11,500	12,300
Ending Stocks										
Production Capacity										
*	22	50	75	70	70	70	70	70	70	70
Nameplate Capacity *	22,000	50,000	75,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000
Capacity Use (%)	22.7%	14.0%	10.0%	11.5%	12.8%	15.4%	17.9%	17.9%	17.9%	17.9%
Feedstock Use (1,000 MT)										
Used cooking oil **	20	28	30	36	40	48	56	59	60	60
Feedstock B										
Feedstock C										
Feedstock D										
Market Penetration (Kilo Liters)										
Biodiesel, on-road use	4,700	6,580	7,050	8,460	9,400	11,280	13,237	13,622	13,630	13,630
Diesel, on-road use	36,778,726	35,937,542	34,246,289	32,246,936	33,063,802	32,657,646	33,401,662	33,895,545	33,763,000	33,660,000
Blend Rate (%)	0.01%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.04%
Diesel, total use	36,778,726	35,937,542	34,246,289	32,246,936	33,063,802	32,657,646	33,401,662	33,895,545	33,763,000	33,660,000

Sources: Japan Organic Recyling Association; Ministry of Agriculture, Forestry and Fisheries; Ministry of Economy, Trade and Industry; The World Trade Atlas;

* Post's estimates based on available information.

** Post's estimates with the average recycle rate of 90.4%

Note: Numbers for 2014 onwards are forecast by Post.

V. Advanced Biofuels

Research and Development

Japan's scientific community, including universities and public and private research institutions, has been expending significant effort toward basic and applied research related to biofuels. The focus of this research is cellulosic sources and technologies in light of discussion on the sustainability of biofuels.

In 2010, MAFF started a joint research project with private firms and universities to produce biofuel from algae. The research is designed to extract oil produced by Pseudochoricystis algae and to develop mass production technology. The goal is to commercialize the fuel as a substitute for diesel by 2020. If the effort is successful, it is estimated that algae-based biofuel could meet 10 to 20 percent of domestic demand for diesel. Another research project on producing biofuel from algae is conducted by a joint venture established by a major heavy machinery manufacturer and two bio-venture firms. The joint venture firm aims to produce jet fuel from algae and commercialize it by 2020.

In 2010, the U.S. Government and the GOJ agreed to start a joint research project on new production methods of biofuels to contribute to the reduction of greenhouse gas emissions. In 2011, the U.S. National Science Foundation and Japan Science Technology Agency announced that four joint U.S. and Japanese research teams were awarded funding totaling approximately $12 million. Each project will last three years, but could be extended for another two years based on the results of an evaluation to be conducted during the third year. Those evaluations are currently being carried out. The projects include a study on effective methods to produce fuel from algae.

Production and Consumption

The Bioethanol Division of a private company in Osaka City that operates facilities to process waste products and materials to recycle started to produce ethanol from wood and lumber wastes in 2007. Its annual production capacity is 1,400 kl. According to a source, for the first several years, the company supplied the ethanol to a couple of oil distributors who make E3 gasoline and then sell at the distributors' affiliated gas stations. However, because E3 gasoline has not come into wider use, the ethanol is not supplied to the oil distributors. The company is currently using most of the ethanol it produces to generate power to use at its facility, and it sells the rest of the ethanol to an industrial alcohol distributor.

VI. Biomass for Heat and Power

Production and imports of wood pellets are increasing in Japan. Since the GOJ's Biomass Nippon Strategy was unveiled in 2002, introduction of pellet boilers and stoves in public facilities and ordinary households has expanded. Accordingly, the number of plants and production of pellets have increased significantly. In 2003, Japan's production of wood pellets was 3.8 thousand metric tons, and there were ten plants. By 2012, the production of wood pellets increased about 26-fold to 98 thousand metric tons and more than 100 plants.

Power companies started to use wood pellets as a stable source for thermal power generation, though coal is still the main source. The companies use imported wood pellets, as prices are lower compared to those produced domestically. Japan's import tariff for wood pellets (HS4401.31) is free. In 2013, Japan's imports of wood pellets were 84 thousand metric tons. Of these, 72 thousand metric tons, or 86 percent, were imported from Canada, followed by China (6%) and Vietnam (4%).

In Japan, all 48 nuclear power reactors are currently shut down due to the national debate on the safety of nuclear power generation that began in the wake of the nuclear power plant accident in Fukushima. Power companies now are forced to rely on other methods to generate power. Hence, imports of wood pellets are expected to increase further.

Wood Pellets (1,000 MT)										
Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Beginning Stocks		0	0	0	0	0	0	0	0	0
Production*	25	30	36	51	58	78	98	117	141	169
Imports**	14	14	42	59	73	74	72	84	103	127
Exports**	4	4	4	3	3	4	4	5	7	9
Consumption	35	40	74	107	129	147	166	196	237	287
Ending Stocks										
Production Capacity										
Number of Plants*	38	47	63	75	85	108	109	110	111	112
Nameplate Capacity										
Capacity Use (%)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Sources: Ministry of Agriculture, Forestry and Fisheries; Japan Wood Pellets Association; The World Trade Atlas										
* Numbers for 2013 onwards are forecast by Post.										
** Numbers for 2014 onwards are forecast by Post.										

Since the introduction of the FIT program in 2012, the number of biomass power generation facilities

has been increasing. As of February 2014, there are 31 facilities that generate power from forest thinning and wood waste and are certified by ANRE, with a total generation capacity of approximately 620,000 kW. Currently, the amount of electricity generated from biomass power generation facilities is approximately 43,000 kW. Sources indicate that more such facilities are under construction, and power generation from wood materials is expected to increase further.

VII. Notes on Statistical Data

Table – Fuel Use Projections (Unit: Kilo Liters)

Source: Ministry of Economy, Trade and Industry

Note: Numbers for 2019 onwards are forecast by Post.

Table – Number of Clean Energy Vehicles

Source: Japan Automobile Manufacturers Association

Table – Imports of Bio-ETBE (Unit: Kilo Liters) HS2909.19-010

Source: The World Trade Atlas

Note: Numbers for 2014 onwards are forecast by Post.

Table – Ethanol Used as Fuel and Other Industrial Chemicals (Unit: Kilo Liters)

Sources: Ministry of Economy, Trade and Industry; Ministry of Agriculture, Forestry and Fisheries; The World Trade Atlas

*Post's estimate by information available.

Table – Ethanol Used as Fuel and Other Industrial Chemicals – Production according to METI

Source: Ministry of Economy, Trade and Industry (METI)

Note: Japan's Ministry of Economy, Trade and Industry (METI) provides Japan's ethanol production data. METI has counted "refining" as "production." According to a source, Japan produces only a minimal amount of ethanol and ethanol in Japan is almost all imported.

Table – Biodiesel (Unit: Kilo Liters)

Sources: Japan Organic Recycling Association; Ministry of Agriculture, Forestry and Fisheries; Ministry of Economy, Trade and Industry; The World Trade Atlas

*Post's estimate based on available information.

**Post's estimates with the average recycle rate of 90.4%

Note: Numbers for 2014 onwards are forecast by Post.

Table – Wood Pellets (Unit: 1,000 MT)

Sources: Ministry of Agriculture, Forestry and Fisheries; Japan Wood Pellet Association; The World Trade Atlas

*Numbers for 2013 onwards are forecast by Post.

** Numbers for 2014 onwards are forecast by Post.