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Biofuels Annual

2017

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Report Highlights:

India in 2016 achieved its highest ever ethanol market penetration, a gasoline blend rate of 3.3 percent on average across the country. Nevertheless, tight ethanol supplies through 2018 will limit further gains or even shrink that percentage of penetration. As a result, the ethanol blending program (EBP) is likely to expand but at a slower pace as demand from industry is partly met by imports, which are projected to grow from 500 million liters in 2017 to 600 million liters in 2018. For biodiesel, though the market penetration rate remains minimal, it will continue to grow if supported by a commercially viable strategy for building a sustainable biodiesel industry.

Note: The year mentioned in this report is Calendar Year unless otherwise specified

Post:
New Delhi

Executive Summary:

By 2022, the Government of India (GOI) proposes to reduce its dependence on crude oil imports by ten percentage points in several ways: increasing domestic output; promoting energy efficiency and conservation; and encouraging greater use of alternative fuels. Growth in the biofuel market will partly reduce import dependence on crude oils and encourage optimal use of other renewable energy resources, particularly when strong economic growth prospects drive higher demand for gasoline and petroleum products.

India in 2016 achieved its highest ever ethanol market penetration, a gasoline blend rate of 3.3 percent on average across the country. Nevertheless, tight ethanol supplies through 2018 will limit further gains or even shrink that percentage of penetration. As a result, the ethanol blending program (EBP) is likely to expand but at a slower pace as demand from industry is partly met by imports. The small trade deficit that emerged in 2015 is expected to grow rapidly through 2018.

Assuming normal market conditions, ethanol imports will rise from 400 million liters in 2016 to 600 million liters through 2018. Almost 80 percent of imported ethanol (worth $173 million) in 2016 was sourced from the United States and was mostly classified as Undenatured, Fuel Use (at port of origin). Incidentally, 2016 import volume was the largest since 2009 (278 million liters) and almost double the import volume of 2015.

Through September 2016, strong retail gas prices, fixed prices for fuel ethanol, excise duty exemptions, and surplus ethanol availability, all pushed higher market penetration for ethanol. By some estimates, this higher penetration saved upwards of $350 million in foreign exchange. However, soft current retail gasoline prices have pushed ethanol prices down to INR 39 per liter (Prices are ex-factory and are valid from Dec 1, 2016 to Nov 30, 2017). Any additional charges in form of Value Added Tax (VAT)/Goods and Service Tax (GST) and transportation will be paid to the ethanol suppliers and administered ethanol price will be subject to revision per prevailing economic conditions.

Meanwhile, the National Biodiesel Mission (NBM) identified jatropha (*jatropha curcas*) as the most suitable inedible oilseed for biodiesel production to help achieve a proposed biodiesel blend of 20 percent with conventional diesel by 2017. That target was unmet due to a host of agronomical and economic constraints. To help fill the gap, several existing biodiesel units shifted operations to adopt multiple feedstock technology, which utilizes 'used cooking oils' (UCO), other unusable oil fractions, animal fats, and inedible oils; this achieved a minimal (0.001) blend rate. The market for biodiesel (B100) is nascent and will continue to grow if there is a strong commercially viable strategy for building a sustainable biodiesel industry. That growth is encouraged by deregulated diesel prices, bulk sale of biodiesel (B100) by authorized dealers, and authorization of joint ventures of parastatal oil marketing companies (OMCs) and private manufacturers to supply to bulk consumers only.

At this point, however, advanced biofuel development remains at the experimental stage with no viable plans for scaling it up. Notably, both the private and public sectors claim to be successful in developing

and customizing technology for converting ligno-cellulosic materials into advanced biofuels. Also, trials are still underway to process municipal solid waste, micro-algae and photosynthetic organisms into advanced biofuels. The suitability of these second-generation biofuels for respective needs has to be evaluated against a country's other bio-energy options to achieve the best possible social, environmental and economic benefits.

Author Defined:

I. POLICY AND PROGRAMS

INDIA'S BIOFUEL POLICY

Preface:

The Goal of the National Policy on Biofuels (approved on December 24, 2009) is to ensure that a minimum level of biofuels become readily available in the market to meet demand at any given time. An aspirational target of 20 percent blending of biofuels by 2017 was proposed, both for bio-diesel and bio-ethanol. The policy aims to push biofuels into the mainstream to supplement gasoline and diesel in transportation, as well as in stationary applications. Such a push helps to ensure energy security, address climate change mitigation, creates new employment opportunities, and eventually leads to environmentally sustainable development.

Taking cues from previous bioethanol and biodiesel blending programs, the GOI proposes to reduce its dependence on crude oil purchase by ten percentage points by 2022 through increased domestic production and greater use of alternative fuels (PIB Press Release, Nov 16, 2016). Growth in the biofuel market will partly reduce import dependence on crude oils and encourage optimal use of other renewable energy resources.

ETHANOL POLICY

India achieved its highest ever ethanol market penetration at 3.3 percent in 2016 but will eventually settle below last year's level given tight supply through 2017. The blend targets were partially successful in years of surplus sugar production but unfulfilled when sugar production declines. Since sugarcane production in India is cyclical, ethanol production also varies accordingly and therefore does not assure optimum supply levels needed to meet the demand at any given time. Ethanol is produced in India from sugarcane molasses and partly from grains.

In past, to renew its focus on implementing the EBP, GOI recommended 10 percent mandatory blending of ethanol with gasoline across all (cane-growing) states. The intent was that states producing a surplus of ethanol could supply it to states having a supply deficit, with the stated goal being to achieve a national-level blend rate of five percent.

Notably, certain policy decisions such as fixed pricing mechanism for fuel ethanol procurement for OMCs, excise duty exemptions (until last September), and surplus ethanol availability helped achieve the highest blend rate of 3.3 percent last year, which saved upwards of $350 million in foreign exchange. The Government also allowed procurement of ethanol produced from other non-food feed stocks, like

cellulosic and lingo-cellulosic materials, including petrochemical route (first-generation ethanol) (PIB Press). Last, a Steering Committee and a Working Group on biofuels both have been established in the Ministry of Petroleum and Natural Gas (MoPNG).

However, given 2017's lowest ethanol production in the last five years and modest recovery in ethanol production forecast for 2018, supplies are expected to be limited for potable use, industrial use, and for blending with gasoline. As a result, the EBP is likely to expand but at a slower pace; and, given current exchange rates, demand from industry will be met partly through increased imports.

Soft current crude oil prices and firm sugar prices have pushed ethanol prices down to INR 39 per liter. (Prices are ex-factory and are valid from Dec 1, 2016 to Nov 30, 2017). Any additional charges in the form of VAT/GST and transportation will be paid to the ethanol suppliers.

BIODIESEL POLICY

The NBM identified jatropha (*jatropha curcas*) as the most suitable inedible oilseed for biodiesel production to help achieve a proposed biodiesel blend of 20 percent with conventional diesel by 2017. That target was unmet due to a host of agronomical and economic constraints. To help fill the gap, several existing biodiesel units shifted operations to adopt multiple feedstock technology, which utilizes UCO, other unusable oil fractions, animal fats, and inedible oils; this achieved a minimal (0.001) blend rate.

The central government proposed that it and several state governments will promote planting of jatropha and other inedible oilseeds by providing fiscal incentives to various public, private, and cooperative sectors. The former Planning Commission of India (now National Institution for Transforming India (NITI) Commission) had even set an ambitious target of planting 11.2 to 13.4 million hectares of jatropha by the end of April 2012, but fell short due to reasons mentioned above.

The market for biodiesel (B 100) is nascent and will continue to grow if there is a strong commercially viable strategy for building a sustainable biodiesel industry. Growth is encouraged by deregulating diesel prices, bulk sale of biodiesel (B100) by authorized dealers, and authorization of joint ventures of OMCs and private manufacturers to supply to bulk consumers.

A nationwide five-percent biodiesel blending target would require a dedicated plantation of energy crops or a probable switch to developing a committed and efficient supply network of UCO, tree-borne oilseeds, or imported biodiesel (if viable or if there is import parity). It would also require deregulated diesel prices, and, assuming the product meets prescribed Bureau of Indian Standards (BIS) standards, permission for sale of biodiesel (B 100) by authorized dealers and joint ventures of OMCs and private manufacturers to bulk consumers.

Added notes: Due to various constraints such as very poor jatropha seed yield, limited availability of wasteland, and high plantation maintenance cost, the biodiesel project became unviable and on March 22, 2017. Jatropha plantation activities were discontinued. (The Cabinet Committee on Economic Affairs (CCEA) has since approved dissolution of CREDA HPCL Biofuel Ltd (CHBL) and Indian Oil - Chhattisgarh Renewable Energy Development Agency (CREDA) Biofuels Limited (ICBL). (PIB Press Release). More info in Appendix.

INDIA'S BIOFUEL POLICY: SALIENT FEATURES AND RECENT DEVELOPMENTS

- On October 13, 2016, CCEA announced that the new administered prices of ethanol for the EBP will be INR 39/liter (ex-factory) and will be applicable for the period Dec 2016 to Nov 2017. Additional charges will be paid to the ethanol suppliers as per actual in case of the excise duty and VAT/GST, and transportation charges as decided by OMCs. Ethanol prices may be reviewed and revised by the GOI at any time depending upon the prevailing economic situation and other relevant factors (PIB Press Release).

- On August 1, 2016, MoPNG, GOI, announced initiatives to advance the biodiesel program (PIB Press Release).

  (i) A newly formed Steering Committee in the Ministry led the national bio-fuel program.

  (ii) A separate Biofuel Cell has been constituted in MoPNG for dedicated focus on biofuels. The Cell, besides being a technical repository on biofuels, also monitors biodiesel procurement and blending by OMCs.

  (iii) BIS has revised the standalone Biodiesel (B100) specification and has developed specifications for biodiesel blends from B6- B20.

- On August 10, 2015, the MoPNG, GOI, notified Amended Order 2015, (Notification No G.S.R. 621 (E)), Motor Spirit and High Speed Diesel) which included a clause directing limited purpose sale of bio-diesel blending with High Speed Diesel, or HSD:

  a. The Federal government may permit the **bulk sale** of biodiesel (B-100) for blending with HSD per prescribed BIS standards to **bulk consumers** having a minimum requirement of biodiesel for their own consumption by a tank truck load supply which shall **not be less than twelve thousand liters.**

  b. Here oil companies includes the OMCs, any private bio-diesel manufacturer, the authorized dealer of such oil companies, and joint ventures of Public Sector OMCs authorized by the Federal government.

- On June 5, 2015, the GOI Union Cabinet approved the following decisions:

  - Sugarcane or sugarcane juice may not be used for production of ethanol and it be only produced only from molasses.

  - Ethanol produced from **non-food feedstock** besides molasses like cellulosic and ligno cellulosic materials and including petro-chemical route, may be allowed to be processed subject to meeting the relevant BIS standard.

  - Sugarcane juice may not be used for production of ethanol.

  - The MS and HSD Control Order may be **amended** to acknowledge private biodiesel manufacturers, their authorized dealers, and JVs of OMCs authorized by MoPNG as

dealers, each of which may have marketing and distribution functions for supply of biodiesel to consumers. Earlier, on January 16, 2015, the Union Cabinet amended Para 5.11 and 5.12 of the national biofuel policy to address direct sale of biodiesel.

- Relaxation of marketing resolution No. 23015/1/20001 dated March 8, 2002 and a new clause giving marketing rights for B-100 to the private bio-diesel manufacturers and authorized dealers.

- The price of bio-diesel will be market determined (Source: Cabinet-decisions-on-Biofuels).

- On December 10, 2014, the GOI announced a price control schedule for fuel ethanol procurement for multi-state OMCs. The program fixes landed ethanol prices at OMC depots from INR 48.50 to INR 49.50 per liter, a three to five percent increase over the previous price.

- Biofuel will be derived from non-feed stock that would be grown on degraded soils or wastelands not otherwise suited to agriculture, thus avoiding a possible conflict of fuel versus food security.

- Encourage use of renewable energy resources as supplement to motor transport fuels to improve India's energy security. An indicative 20 percent target for blending of biofuel for both biodiesel and bioethanol is proposed by end of 12th Five-Year Plan (fiscal 2012/13 through fiscal 2016/17).

- Minimum Support Price (MSP) mechanism for inedible oilseeds to provide fair price to oilseed growers, subject to periodic revision.

- GOI may consider creating a National Biofuel Fund to provide financial incentives, including subsidies and grants, for new and second-generation feedstocks, advanced technologies and conversion processes, and production facilities based on new and second-generation feedstocks.

- Support for research and development on biofuel feedstock production, including second generation biofuels.

- Meet the energy needs of India's vast rural population by stimulating rural development and creating employment opportunities and addressing global concerns about containment of carbon emissions through use of environment friendly biofuels.

- Bring biofuels under the ambit of "Declared Goods" by the GOI to ensure their unrestricted interstate and intrastate movement. Except for a concessional excise duty of 16 percent on bioethanol, no other central taxes and duties are proposed to be levied on biodiesel and bioethanol.

- India's energy security would remain vulnerable until alternative fuels to substitute or supplement petro-based fuels are developed based on indigenously produced renewable feed-stocks. Biofuels are environment friendly fuels and their utilization would address global

concerns about containment of carbon emissions.

- The transportation sector is a major polluting sector. Use of biofuels will help to meet tightening automotive vehicle emission standards. Carbon financing opportunities may offer a way to reduce CO2 emissions through plantations and use of biofuels for various applications.

- Biofuel technologies and projects would be allowed 100 percent foreign direct investment (FDI), provided the biofuel is for domestic use only. Plantations of inedible oil bearing plants would not be open for FDI participation.

- Establishment of the National Biofuel Steering Committee (NBSC) under policy guidelines provided by the Prime Minister.

- The biofuel program will support R&D and demonstration projects which lead to commercial development of second generation biofuels.

For more information, please follow the link to biofuel policy.

Added facts:

Impediments

Under the new GST regime (except potable alcohol), biodiesel, industrial alcohol, and bioethanol/fuel ethanol will all be taxed at 18 percent, starting July 1, 2017. For states in which the new GST rate is higher than the current VAT rate, the cost of production inputs to produce biofuel will increase. Note that for an unspecified time crude oil, natural gas, HSD, MS and Aviation turbine fuel have been exempted from GST.

Procedural formalities restrict movement of ethanol and its general availability for EBP. Examples include delays in issuance of import/export permits, renewable storage licenses, or no-objection certificates (NOC). When ethanol prices are right such delays also could encourage suppliers to divert ethanol to chemical and potable industries; and sugar mills and distilleries could export molasses as cattle feed if their prices are competitive.

Smaller land holdings and ownership issues with government- or community-owned wastelands have resulted in very little progress made by state governments to create large jatropha or pongamia plantations. Except for a few pilot projects, lack of raw materials has stymied efforts and investments by both private and public-sector companies to produce biodiesel commercially from jatropha seeds.

Institutional Mechanism

The National Biofuel Policy proposes to set up a National Biofuel Coordination Committee (NBCC) headed by the Prime Minister. Given the role of different agencies and ministries in the biofuel program, the role of NBCC is to provide high level coordination, policy guidance and review on different aspects of biofuel development, promotion and utilization. The policy also provides for

development of a Biofuel Steering Committee headed by Cabinet Secretary to oversee implementation of its policies.

Various state governments will work closely with respective research institutions, forestry departments, and universities for development and promotion of biofuel programs in respective states, but few states have drafted policies and set up institutions for promoting biofuel in their states. To deal with different aspects of biofuel development and promotion in the country, several ministries have been allocated specific roles and responsibilities, such as:

Ministry	Role
New and Renewable Energy (MNRE)	Policymaking and overall coordination concerning biofuels. Undertake Research and Development (R&D) on various applications of biofuels.
MoPNG	Responsible for marketing biofuels as well as development and implementation of pricing and procurement policy. A separate working group on biofuel was constituted to generate awareness and popularize and increase bio-fuel consumption in coordination with Petroleum Conservation Research Association (PCRA).
Agriculture (MoA) and Farmers Welfare	R&D of biofuel feedstock through Indian Council for Agricultural Research and Indian Agricultural Research Institute (sweet sorghum, jatropha, *Pongamia*, and inedible oilseeds). Undertake jatropha plantation in non-forest land.
Rural Development	Plantation of jatropha on wastelands. Integrate biodiesel program with rural development schemes (such as Mahatma Gandhi National Rural Employment Guarantee Scheme). Coordinate R&D with other departments/agencies.
Science and Technology (DST)	Support research on biofuel crops through bio-technology.
Road Transport and Highway (MoRTH)	Plantation along highway rights-of-way and use biofuel blended fuel. Work with automobile manufacturers association in India for engine modification, emission norms.
Railways (MoRail)	Undertake plantation of jatropha over wastelands along rail rights-of-way and trials of biodiesel blended fuel on railroad locomotives.
Environment and Forest (MoEF)	Ensure plantation of jatropha and tree borne oilseeds in forest wastelands; get Central Pollution Control Board to monitor health and environmental effects.

II. Gasoline and Diesel Pools

General Economy

India will be the fastest growing economy in the world in Indian Fiscal Year (IFY) 2017-18 (Apr-Mar). India's growth rate was estimated at 7.1 percent in 2016-17 and is likely to grow at 7.2 to 7.3 percent in IFY 2017/18 before springing further to 7.6 to 7.7 percent in IFY 2018/19 (Source: ADB, IMF and World Bank). Increases in public spending, private investment, liberalization of FDI regime, and expectation of the landmark GST rollout on July 1, 2017 will improve business confidence and promote

growth. Stronger consumption and fiscal reforms are also expected to improve business confidence and investment prospects in the country. However, large non-performing loans and high leverage of some companies are holding back investment.

Monetary policy is projected to remain tight as inflation expectations have still not fully adjusted down. Trade openness has increased, partly driven by a competitive service sector. Manufacturing has lagged behind, with limited contribution to exports and job creation, leaving many workers in low-paid jobs (OECD Economic Outlook). The world economy is expected to grow at 3.5 percent in 2017 and rise to 3.8 percent in 2018.

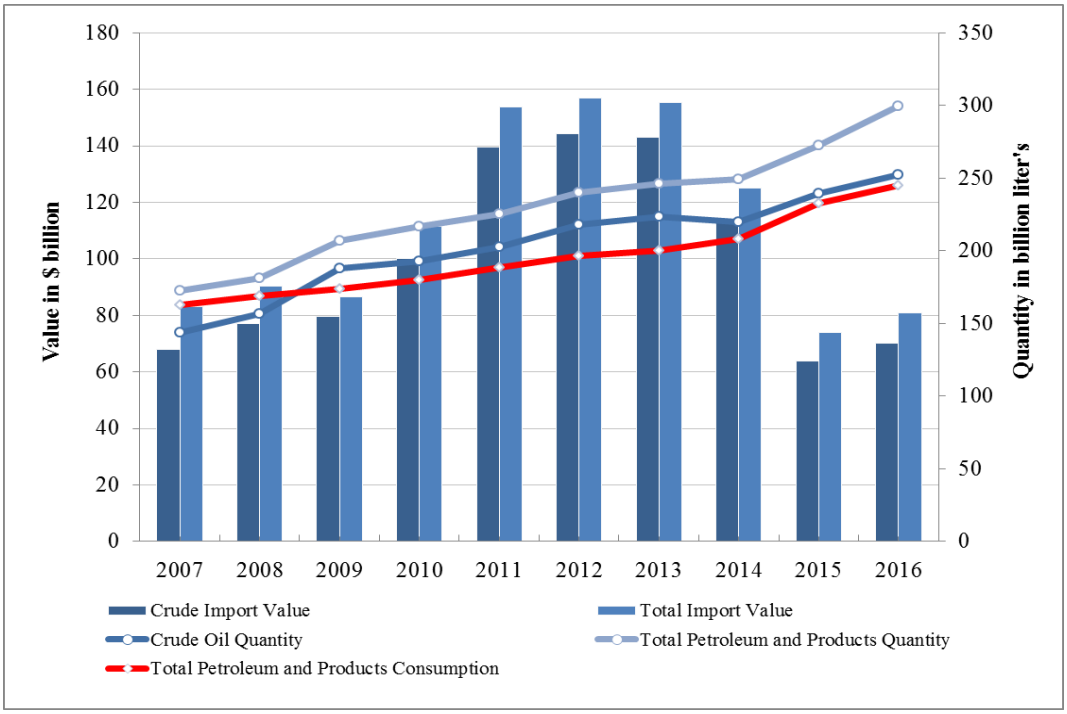
India is Increasingly Dependent on Energy Imports

Strong growth prospects for the Indian economy will drive demand for energy across different sectors although the energy consumption per capita (per industry estimates) is one-third of the global average. Hence, access to adequate and reliable sources of energy becomes vital, particularly when one-quarter of the population lacks access to electricity and dependence on fossil fuels (imported and local) continues to grow. The latter meets about three-quarters of India's energy demand.

India is the third-largest importer of crude oil after the United States and China and continues to rely largely on imports. In recent years lower crude oil prices have spurred increased demand for gasoline and petroleum products, which did not nearly offset foreign exchange savings resulting from lower import prices. Over the last four years, import volumes grew modestly from 240 billion liters to 278 billion liters while associated cost dropped more than 50 percent to $74 billion (see below, Figure 1).

Additionally, India is the fourth largest consumer of primary energy at 24.9 quadrillion British thermal unit (BTU)'s following China, United States and Russia. It is also the eighth largest energy producer at 14.18 quadrillion BTUs. As a result, despite notable fossil fuel resources, India is increasingly dependent on energy imports. Also, India's total installed power capacity is just under 327,000 megawatts, of which the largest energy source comes from coal (59%), followed by renewable such as traditional biomass and waste (18%), hydro-electricity (14%), gas (8%), nuclear (2%) and diesel (0.25%). Among renewable fuel sources, an estimated 56% is contributed by wind energy, 22 % by solar, 15% by bio-power and the remainder is from small hydropower. (Source: Central Electricity Authority, Ministry of Power, GOI).

Figure 1. India: Import of Crude Oil, Petroleum Products, and Consumption



Source: Petroleum Planning and Analysis Cell, government of India (GOI),
Time scale in Indian fiscal year

Industry and Transport Sectors are the Largest End-Users of Energy

The industry and transport sectors are the largest end-users of energy in India and account for half of the total energy consumed. The main fuels supplied to this demand are coal (in industry), petroleum (in transport), and electricity (in buildings, industry, and agriculture). Growth in the transport sector will continue to fuel petroleum consumption. Transportation consumes close to 70 percent of total diesel supply, 66 percent of which is used by passenger and commercial vehicles. Almost 99 percent of total gasoline consumption is used for transportation, 60 percent of which is for two-wheelers such as motorcycles and scooters. The share of road traffic as a percent of freight and passenger traffic is estimated at upwards of 60 percent and 90 percent. Currently, diesel alone meets an estimated 46 percent of transportation fuel demand, followed by gasoline at 24 percent (Figure 2). Further, it is estimated that in the next ten years, demand for transport fuels will rise from an estimated 134 billion liters in CY 2015 to 225 billion liters in CY 2026 (Table 1).

Why Road Transport: Convenience, flexibility, and cost saving are certainly some of the factors which favor automotive transport. Road transport also acts as a feeder service to railway, shipping and air traffic. Per the latest available statistics, the number of registered vehicles in India as of March 31, 2015 was 210 million, of which the two-wheeler share was 73.4 percent while car, jeep, and taxis constituted 13.62 percent. Buses and transport vehicles constitute just 13% (Annual Report 2016/17). In pace with economic growth, expanding urbanization (e.g., smart city initiative), increasing rise in consumer spending levels, and improving road infrastructure, new vehicle registration is expected to push the total number of registered motor vehicles past 230 million by the end of the current fiscal.

To effectively increase security of India's energy supply and to create more efficiency in energy

consumption, GOI plans to reduce import dependence on 'oil and natural gas' to two-thirds within the next five years and to half by 2030. India has already begun implementing oil and natural gas pricing reforms since 2013 to foster sustainable investment and help lower subsidy costs.

BS-IV emission norms in-force since April 1, 2017, BS-VI by 2020

Bharat Stage-IV (BS-IV) emission norms for two-wheeled, three-wheeled and four-wheeled vehicles have come into force since April 1, 2017. Hence, there will be no sale and registration of vehicles that don't comply with new norms. Earlier, BS-IV auto fuels were introduced in 13 identified major cities including Delhi and the National Capital Region since April 1, 2010. Fifty additional cities were included through March 15, 2015. Last year, GOI announced that it would skip BS-V norms and advance to BS-VI norms (reference EURO-VI) in 2020. The official notification for BS-VI emission norms which came from the MoRTH is available here → egazette**.**

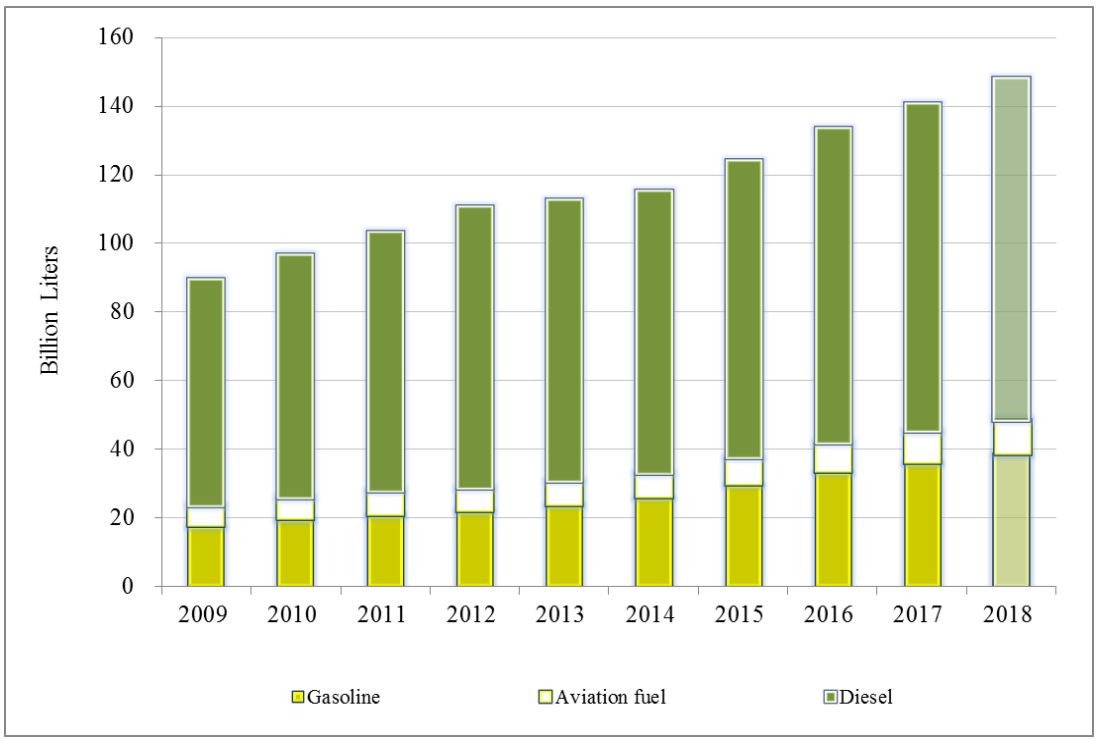
Media reports and industry sources highlight the need for an integrated holistic approach to control vehicular emissions. More importantly, the auto and oil industries need consensus to establish fuel quality standards and vehicular technology to meet the air quality targets (SIAM India). Experts believe that availability of vehicular technology is unlikely to be a constraint if BS-VI-compliant fuel is available nationwide. However, execution in the next three years will be a challenge. The focus will be on vehicles with cleaner and greener options, including electric vehicles.

Added Facts:

India ratifies the Paris Agreement on Climate Change

The "Paris Climate Agreement", took effect on November 4, 2016. On October 2, 2016, India ratified the Paris agreement on climate change to become the 62nd nation to join. As part of the initial commitments to the agreement, over the next 15 years India plans to reduce its carbon emission per unit of GDP by 33% from 2005 levels, and it aims to use non-fossil fuels to produce 40 percent of its installed electricity capacity by 2030. This would mean India will have to shift significantly from coal-based power generation to renewable energy sources. It will have to produce 100 gigawatts from solar, 60 gigawatts from wind, 10 gigawatts from biomass, and 5 gigawatts from small hydropower by 2022. Another commitment of the agreement requires India to increase its forest cover by five million hectares along with an improvement in the quality of green cover of an equal measure by 2030. (Source: Hindustantimes.com)

Figure 2. India: Consumption of Liquid Fuels, In Calendar Year



Source: Petroleum Planning and Analysis Cell, government of India (GOI)
*: Estimated for 2018

Table 1. India: Gasoline, Diesel and Jet Fuel Use

Fuel Use History (Million Liters)											
Calendar Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Gasoline Total	11,650	12,761	14,189	15,368	17,606	19,563	20,716	21,842	23,749	25,848	29,651
Diesel Total	47,810	51,084	55,597	61,491	66,390	71,041	75,866	82,238	82,256	82,674	87,064
On-road	28,686	30,651	33,358	36,894	39,834	42,625	45,520	49,343	49,354	49,605	52,239
Agriculture	5,737	6,130	6,672	7,379	7,967	8,525	9,104	9,869	9,871	9,921	10,448
Construction & Mining	1,912	2,043	2,224	2,460	2,656	2,842	3,035	3,290	3,290	3,307	3,483
Shipping & Rail	2,391	2,554	2,780	3,075	3,320	3,552	3,793	4,112	4,113	4,134	4,353
Industry	5,259	5,619	6,116	6,764	7,303	7,815	8,345	9,046	9,048	9,094	9,577
Heating	3,825	4,087	4,448	4,919	5,311	5,683	6,069	6,579	6,580	6,614	6,965
Jet Fuel Total	4,520	4,785	5,490	5,674	5,641	6,145	6,809	6,626	6,789	6,960	7,564
Total Fuel Markets	63,980	68,630	75,276	82,532	89,637	96,750	103,392	110,706	112,794	115,482	124,280
Fuel Use Projections (Million Liters)											

Calendar Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Gasoline Total	33,265	35,838	38,610	41,596	44,814	48,280	52,014	56,038	60,372	65,042	70,073
Diesel Total	91,965	95,754	99,699	103,807	108,083	112,536	117,173	122,000	127,027	132,260	137,709
On-road	55,179	57,452	59,819	62,284	64,850	67,522	70,304	73,200	76,216	79,356	82,626
Agriculture	11,036	11,490	11,964	12,457	12,970	13,504	14,061	14,640	15,243	15,871	16,525
Constructn & Mining	3,679	3,830	3,988	4,152	4,323	4,501	4,687	4,880	5,081	5,290	5,508
Shipping & Rail	4,598	4,788	4,985	5,190	5,404	5,627	5,859	6,100	6,351	6,613	6,885
Industry	10,116	10,533	10,967	11,419	11,889	12,379	12,889	13,420	13,973	14,549	15,148
Heating	7,357	7,660	7,976	8,305	8,647	9,003	9,374	9,760	10,162	10,581	11,017
Jet Fuel Total	7,935	8,561	9,237	9,965	10,752	11,600	12,515	13,503	14,568	15,718	16,958
Total Fuel Markets	133,165	140,153	147,545	155,368	163,649	172,416	181,702	191,541	201,967	213,020	224,740

Source: Industry and trade sources[1]

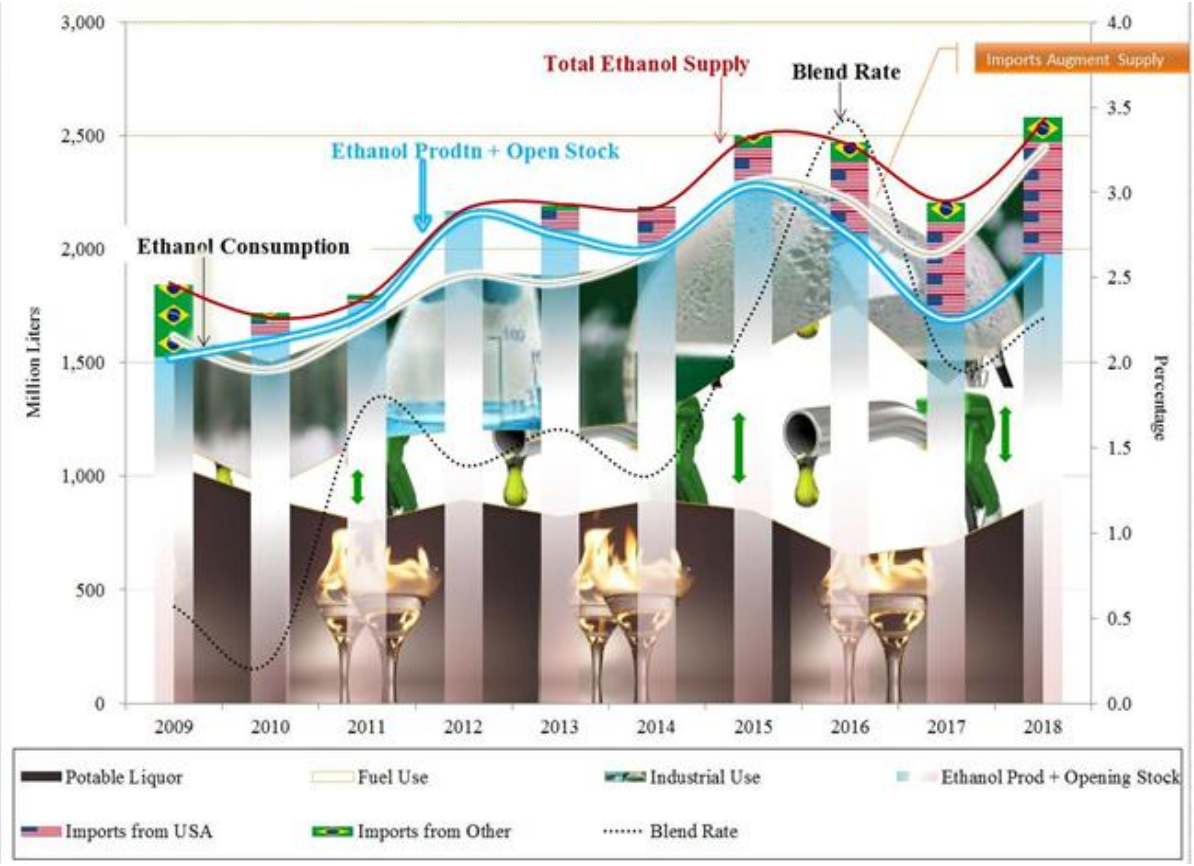
*: Heating / power generation

[1] The data is combined from various sources and is valid through 2015/16. No sources were found for forecasts of end use in heat and industry for 2016-2026. Long term average growth was used to forecast figures through 2026.

III: ETHANOL

India has around 330 distilleries which can produce over 4.5 billion liters of rectified spirit (alcohol) per year. Of this total, about 162 distilleries have the capacity to distill over 2.2 billion liters of conventional ethanol. India's ethanol program is based on sugar molasses, a by-product of the sugar industry, and not directly from sugarcane or corn.

Figure 3: India. Ethanol Production, Supply and Consumption



Source: FAS/USDA Data

Production

An estimated 1.65 billion liters of ethanol will be produced in 2017, almost 20 percent less than last year. Limited availability of molasses due to short sugarcane production, particularly in Southern and Western states, will keep the supply tight. Theoretically, the ethanol available is sufficient to meet the 5 percent blend target, but demand rationing, particularly from potable and industrial sectors, will limit ethanol market penetration close to 2 percent. Industry sources indicated that the OMCs may procure upwards of 700 million liters in 2017.

Assuming a normal 2017 monsoon, ethanol production in 2018 will improve to 1.9 billion liters on anticipated rise in sugarcane production, the result of farmers planting more canes to recover area lost to

adverse weather conditions. In turn, OMCs should be able to procure an estimated 850 million liters of ethanol for blending with gasoline in 2018, which will raise the national blend average slightly to 2.2 percent.

Table 2. India: Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)

Calendar Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Beginning Stocks	453	100	113	31	58	58	74	59	94	65
Production	1,073	1,522	1,681	2,154	2,057	2,002	2,292	2,061	1,651	1,894
Imports	278	144	61	5	108	194	203	400	500	600
Exports	14	53	119	177	233	180	165	136	100	120
Consumption	1,690	1,600	1,705	1,955	1,932	2,000	2,345	2,290	2,080	2,420
Fuel Consumption	100	50	365	305	382	350	685	1,110	700	850
Ending Stocks	100	113	31	58	58	74	59	94	65	19
Production Capacity										
Number of Refineries	115	115	115	115	115	115	160	161	161	162
Nameplate Capacity	1,500	1,500	1,500	2,000	2,000	2,000	2,100	2,210	2,215	2,300
Capacity Use (%)	0.72	1.01	1.12	1.08	1.03	1.00	1.09	0.93	0.75	0.82
Co-product Production (1,000 MT)										
Bagasse	85,509	87,690	102,714	108,309	102,360	105,642	108,699	104,535	86,400	97,500
Press Mud	11,401	11,692	13,695	14,441	13,648	14,086	14,493	13,938	11,520	13,000
Feedstock Use for Fuel (1,000 MT)										
Molasses	417	208	1,521	1,271	1,592	1,458	2,854	4,625	2,917	3,542
Market Penetration (Liters - specify unit)										
Fuel Ethanol	100	50	365	305	382	350	685	1,110	700	850
Gasoline	17,606	19,563	20,716	21,842	23,749	25,848	29,651	33,265	35,838	38,610
Blend Rate (%)	0.6	0.3	1.8	1.4	1.6	1.4	2.3	3.3	2.0	2.2

Source: FAS and Industry Source

In 2016, India achieved its highest ethanol market penetration at 3.3 percent (national-level blend). Contributing factors included a contracted ethanol supply at attractive prices, and relatively high prices for gasoline. In December 2014, the GOI announced price controls for OMCs to procure ethanol. The program fixed landed-ethanol prices at OMC depots from INR 48.50 to INR 49.50/liter. Additionally, on October 13, 2016, the CCEA revised ethanol prices for supply to OMCs to carry out the EBP in the following manner (Source: PIB Press release):

- Administered prices of ethanol for the EBP will be INR 39/liter from December 1, 2016 to November 30, 2017.
- Charges will be paid to the ethanol suppliers as per actuals in case of the excise duty and VAT/GST, and transportation charges as decided by OMCs. (Post comment: with the new 18 percent GST on ethanol, OMCs will now have to pay 3-4 percent more than prevailing prices. In many states, such as Punjab, Tamil Nadu, and Uttar Pradesh, where VAT is lower than the proposed GST, ethanol supplies will turn costlier unless individual states decide to make tax concessions or provide similar incentives to encourage ethanol blending.)
- If the need arises to increase or reduce the retail prices of gasoline by public sector OMCs, then such a change would affect the cost of holding constant the purchase price of ethanol during the supply year.
- Ethanol prices may be reviewed and revised by the GOI at any time depending upon the prevailing economic situation and other relevant factors.

For background information on the ethanol program, please see our biofuel annual 2016 GAIN report IN6088.

Consumption

India's ethanol consumption will outgrow production for the fourth consecutive year due to an uptick in fuel ethanol purchases and steady demand from the industrial and potable sectors (Figure 3). As a result, consumption will grow from 2 billion liters in 2017 to 2.4 billion liters in 2018. Since the GOI mandates the use of 'indigenous ethanol only' for EBP, fuel ethanol supply will rise to a modest 850 million liters, 20 percent over the current year's estimate. The chemical and industrial sector will have to rely more on imported ethanol (or import finished products) to augment the expected supply deficit. The consumption basket (excluding fuel ethanol) will include 1.6 billion liters for the industrial and potable alcohol sectors (which are exempted from GST). Since the quantity of ethanol demanded at higher prices may be less, the industrial uses and the potable sector will need to augment some of its supply from grain-based distilleries.

Trade

Given its widening supply deficit resulting from strong demand growth, India will continue to be a net importer of ethanol. The small trade deficit that emerged in 2015 is expected to grow rapidly through 2018, given the forecast of tight production this year and next. Assuming normal market conditions, ethanol imports are forecast to rise from 400 million liters in 2016 to 600 million liters through 2018.

Imports

Currently biofuel imports have no quantity restrictions, but traditionally India imports ethanol only to meet shortfalls in demand during years of lower sugar production. Low import duties on ethanol make imports attractive and economically viable, especially when crude oil prices strengthen. Demand is mostly for consumption across the potable liquor and chemical industries and not for fuel.

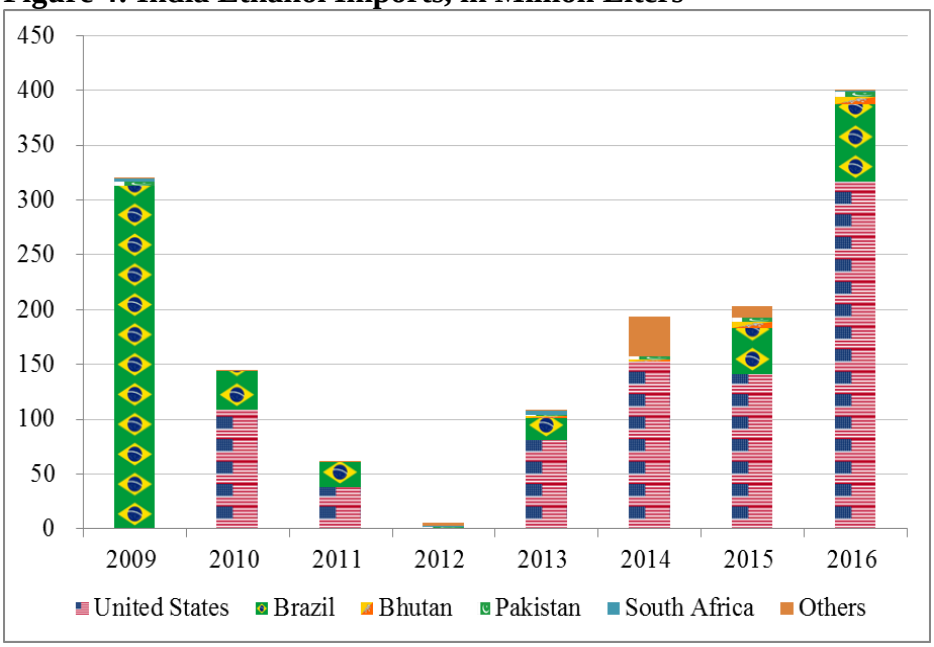
In 2016, India imported 400 million liters of ethanol (non-beverage), the largest quantity since 2009 (278 million liters) and almost double that of 2015. Almost 80 percent of imported ethanol (worth $173 million) was sourced from the United States and was mostly classified as Undenatured, Fuel Use. The remaining 18 percent was from Brazil and 2 percent from Bhutan and Pakistan. In general, imported ethanol is competitively priced against local supplies. Usually, when local ethanol prices are strong, industry users prefer to buy imported ethanol and sugar distilleries benefit from selling it to OMCs.

Exports

Assuming normal market conditions, India is likely to export 120 million liters of ethanol (mostly Undenatured) in 2018, 100 million liters in 2017, and already sold 136 million liters (worth $95 million) in 2016. Since peak export sales in 2013 (233 million liters), India exports of ethanol have declined by an average of 15 percent per year on tighter supply and strong local demand. Ghana, Nigeria, Cameroon, Nepal, Sierra Leone, Tanzania, Jordan, Uganda, Rwanda, and Jamaica were the main export destinations for Indian ethanol in the last 5 years, but market share was lost to competition from United States, South

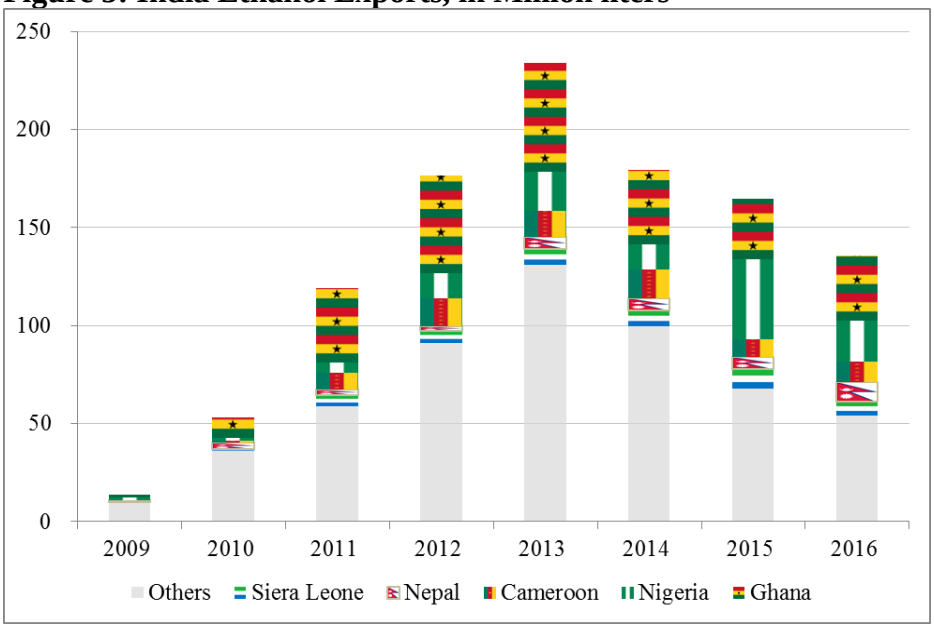
Africa, United Kingdom, and Canada. Biofuel exports are only permitted after domestic requirements are met and the final decision is taken by the NBCC. The GOI provides no financial assistance for exports of biofuels. However, current trade regulations allow duty-free import of feed stocks for re-export by certified export-oriented processors.

Figure 4: India Ethanol Imports, in Million Liters



Source: U.S. Census Bureau, GTA and Ministry of Commerce, GOI

Figure 5: India Ethanol Exports, in Million liters



Source: GTA and Ministry of Commerce, GOI

Others: include Tanzania, Uganda, Jordan, Kenya, Angola, Cote d lvoire and Congo

Duties

Currently, the basic Customs duty on denatured ethanol is 2.5 percent. It was reduced last (Indian) fiscal year from five to 2.5 percent for manufacture of excisable goods, subject to actual user conditions (Customs Notification No.12/2016). Before July 11, 2014, the duty was 7.5 percent (Customs Notification No.12/2014).

Table 3. India: Import duty on Ethanol (percent ad valorem on CIF value)

ITC HS Tariff Number	Total Import duty
Ethyl alcohol and other Spirits, denatured, of any strength; denatured ethanol; and denatured spirits [2207 2000]	In sequence: 53.54 percent (30 percent basic + 12.5 percent CVD + 4 percent Special CVD + 3 percent Education Cess). Basic Custom duty on denatured ethanol for manufacture of excisable goods reduced from 5 percent to 2.5 percent (CS12-2016.pdf). However, denatured spirits assessed 5 percent duty.
Undenatured Ethanol [2207 1000]	150

Source: www.cbec.gov.in

Ending Stocks

Steady rise in consumption demand will deplete stocks from an estimated 94 million liters in 2016 to 65 million liters in 2017. Stocks will decline further to 20 million liters in 2018 given tighter supplies; local ethanol prices likely will spike as a result.

Added Facts:

Expanding domestic ethanol supply could address supply issues

- Use of second-generation biofuels (for more info, see the section 'Advanced fuels')
- Promote use of alternate crops such as sweet sorghum, sugar beet, sweet potatoes, pearl millet and broken rice to supplement domestic ethanol production. At this stage the efforts to produce ethanol from these feed stocks are only experimental.
- The GOI offers subsidized loans through sugarcane development funds to sugar mills for establishing ethanol production plants.

Note: Developments in EBP are covered in the Appendix.

IV. Biodiesel/Renewable Diesel

The market for biodiesel is nascent and will continue to grow if there is a strong commercially viable strategy for building a sustainable biodiesel industry. Presently, India has five to six plants with capacity to produce 10,000 metric ton to 250,000 metric tons (MT) of biodiesel per year. Biodiesel is produced through multiple feedstock technology. Unfortunately, research trials have failed to build a

commercially viable biodiesel industry based on ‘jatropha’ (*Jatropha curcus*), and there is little indication that it can eventually succeed.

Production

India will produce upwards of 150 million liters of biodiesel in 2017 and will add another 10 million liters through 2018. Biodiesel producers utilize multiple feed-stocks such as ‘UCO, animal fats, tallow’s and ‘other oils’ (palm stearin, sludge, acidic oils, and tree oils etc.) to produce biodiesel, thereby utilizing close to 30 percent of the installed capacity. While the use of animal fats and tallow’s has remained constant, remaining feedstock use has shown steady growth, namely UCO and ‘other oils’.

Although there is no official regulation on supply of UCO or ‘other oils’ for biodiesel production, biodiesel sales have shown just incremental growth in recent years, with most of it coming from food processing industries and restaurants. Some firms claim to import smaller quantities of biodiesel and sell it locally after meeting prescribed BIS standards.

Consumption

Until recently, there was no excise duty on biodiesel, but with proposed GST of 18 percent, it may become costlier than conventional diesel; bulk buyers or end users may find it not to be competitive. Additionally, the excise duty concession on inputs such as palm stearin will also get replaced with a new 18 percent GST rate. Presently, no excise duty is levied on palm stearin supplied to bio-diesel producers, or for use in high speed diesel, which has 20 percent blends by volume of bio-diesel (Source: MNRE, GOI).

Industry experts claim that without suitable incentives, growth of the biodiesel sector will remain flat. Biodiesel is bought by small and medium enterprises, sold to individual consumers and progressive farmers to supply energy for brick kilns, irrigation pumps, cellular communication towers, and back-up power diesel generators. Biodiesel is also sold to bulk users such as Indian Railways, State transport corporations (e.g., Karnataka State Road Transport Corporation), automobiles and transport companies (state sponsored or private trial runs); it reportedly is also retailed at select government owned outlets.

Table 4. India: Biodiesel Production from Multiple Feedstock (Million Liters)

Calendar Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Beginning Stocks	0	45	36	29	30	23	14	11	11	12
Production	75	99	111	121	128	132	142	148	153	161
Imports	0	0	0	0	0	2	1	3	2	3
Exports	0	0	0	0	8	64	44	53	51	60
Consumption	30	108	118	120	128	79	101	98	104	104
Ending Stocks	45	36	29	30	23	14	11	11	12	12
Production Capacity (Million Liters)										
Biorefineries	5	5	5	5	6	6	6	6	6	6
Nameplate Capacity	450	450	450	460	465	480	480	500	500	500
Capacity Use (%)	16.7%	21.9%	24.7%	26.3%	27.5%	27.6%	29.5%	29.6%	30.7%	32.1%
Feedstock Use for Fuel (1,000 MT)										
Used Cooking Oil	35	38	42	48	50	55	60	65	70	75
Animal Fats & Tallow's	3	6	6	7	7	6	5	6	6	8
Other Oils	30	50	58	60	65	65	70	70	70	70
Market Penetration (Million Liters)										
Biodiesel, on-road use	15	36	28	44	44	26	42	40	44	48
Diesel, on-road use	39,834	42,625	45,520	49,343	49,354	49,605	52,239	55,179	57,452	59,819
Blend Rate (%)	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Diesel, total use	66,390	71,041	75,866	82,238	82,256	82,674	87,064	91,965	95,754	99,699

Source: Industry and Post estimates
*: CY 2018 is projected

Trade

Table 4. India: Import duty on Biodiesel (percent ad valorem on CIF value)

ITC HS Tariff Number	Total Import duty
Biodiesel and mixtures thereof, containing less than 70 percent of petroleum oils and oils obtained from Bituminous minerals (B30-B100) [3826 0000]	14.71 percent (10 percent basic + 4 percent Special CVD + 3 percent Education Cess)
Petroleum oil and oils obtained from Bituminous minerals (other than crude) and preparations not elsewhere specified or included, containing by weight more than 70 percent or more of petroleum oils, contain biodiesel, other than waste oils (B1-B30), [2710 2000]	26.16 (10 percent basic + 14 percent CVD + 3 percent Education Cess)

Source: www.cbec.gov.in

Four years ago, India had negligible trade in biodiesel. A year later, however, a small quantity of biodiesel (mostly 3826) was bought from Germany, UAE, France, China, Indonesia, Japan, and Netherlands. By 2016 the import value was $2.6 million, up from$350,000 in 2013. By contrast, India exported 53 million liters of B-100 in 2016 at an estimated value greater than $27 million. The main (re-)export destinations were Philippines, China, Malaysia, Spain, Netherlands, UAE, Nepal, and Kenya. Post anticipates the export sales to grow to 60 million liters in the forecast year.

Added facts:

Given the poor results from attempts to use jatropha as an input, researchers in private and public sectors have gradually shifted their focus and resources to study feasibility of producing biodiesel from tree-borne oilseeds (TBOs) such as pongamia (*Pongamia pinnata*), neem (*Azadirachta indica*), kusum (*Schleichera oleosa*), mahua (*Madhuca longifolia*), and waste or used edible and non-edible oils.

Stock

Stocks likely will remain tight as production gains are not commensurate with increases in consumption.

Developments in NBM are covered in the Appendix.

V. Advanced Biofuels

ADVANCED BIOFUELS

The Indian biofuel industry, both private and public sector, claim some success in developing the technology needed to convert biomass from wood and agricultural wastes (corn cob, bagasse, stalk of forage crops). Trials are still underway to process municipal solid waste, micro-algae, and photosynthetic organisms into advanced biofuels. However, given the technological challenges, commercial production and economic viability remain to be demonstrated. The suitability of second-generation biofuels for countries respective needs must be evaluated against other bio-energy options to achieve the best possible social and economic benefits. For some additional facts, kindly refer to notes at the Appendix.

VI. Appendix

Developments in EBP

Date	Action	Comments

January, 2003	The MoPNG made five percent ethanol blending (Gazette on EBP) in gasoline mandatory across 9 States and five Union Territories	Partially implemented due to unavailability of ethanol (due to low sugarcane production in 2003/04 and 2004/05)
September, 2006	Resurgence in sugarcane production in 2005/06 and 2006/07 led GOI to mandate five percent blending of ethanol in gasoline across 20 states and four Union Territories (excludes Northeast, Jammu & Kashmir and Andaman & Nicobar) subject to commercial viability	OMC contracted for 1.4 billion liters of ethanol for EBP at Rs 21.50/liter from Nov 2006 to Nov 2009. Only 540 million liter of ethanol supplied till April 2009 due to short supply of sugar molasses. GOI deferred implementation due to short supply of sugarcane in 2007/08
September, 2008	Union Cabinet approved the National Biofuel Policy. Five percent blending mandatory across all states in the country.	GOI deferred the plan again due to short supply of sugarcane and sugar molasses in 2008/09.
October, 2008	Third phase of implementing EBP envisaged blending ratio to be increased to 10 percent.	Since there was no official notification released, oil marketing companies have not started 10 percent ethanol blending.
November 2009	Government held meeting to decide blending target for EBP	Status-quo remains, targets five percent EBP
August 2010	Government fixed an ad-hoc provisional procurement price of INR 27 per liter of ethanol by OMC for EBP program. Decision was taken to constitute expert committee under Chairmanship of Dr. Choudhary, Member of Planning Commission, to recommend a formula for pricing ethanol.	Expert Committee in March 2011 had recommended that ethanol be priced 20 percent lower than gasoline price. No consensus yet on pricing policy of ethanol. In any event when ethanol supply runs short, government proposed to reduce import duty on alcohol and molasses. OMC stipulated that alcohol or molasses could not be imported for EBP, but must be exclusively sourced from domestic-produced molasses.
CY 2011	OMC unable to procure contracted ethanol supplies from sugar mills and ethanol manufacturers. The Ministry of Petroleum and Natural Gas, GOI has not been able to implement compulsory blending of five percent ethanol in gasoline.	Most of the domestic ethanol producers or suppliers were disqualified to supply ethanol. Non-finalization of ethanol pricing formula and procedural delays by various state governments delayed the procurement for EBP. Industry sources estimate that 365 million liters of ethanol was supplied against the contracted 570 million liters. During same period, a major share of molasses production was diverted as cattle feed to Europe.
CY 2012	OMC targets to procure one billion liters of ethanol for fiscal 2011/12.	After deducting the ethanol requirement for EBP in non-implementing states (such as Tamil Nadu, West Bengal, Odisha, Jharkhand, Chhattisgarh & Madhya Pradesh), the present requirement worked out to 720 million liters, of which suppliers had offered to supply 610 million liters. With weak supply in several states, the contracted supply was subsequently drawn down to 430 million liters and further down to 305 million liters during Calendar Year 2012. Surplus molasses was exported as cattle feed to Europe.
CY 2013	In a bid to renew its focus and strongly	The Union government under the Motor Spirits

	implement the EBP, the (CCEA on November 22, 2012, recommended five-percent mandatory blending of ethanol with gasoline (the blending target was already decided by the CCEA in the past). Henceforth, the procurement price of ethanol shall be decided by between the OMC and suppliers of ethanol (CCEA recommendation). OMC floated a joint e-tender in first week of January for procuring 1.4 billion liters of ethanol to be supplied during April 2013 through March 31, 2014. With the validity of the offer for the domestic tender expiring on May 27, 2013, the offer was further extended on request by two months through July 26, 2013. Per one of the CCEA recommendations, in case of any shortfall in domestic availability, the OMCs and chemical companies were free to import ethanol for EBP. Since OMCs were falling short by more than 820.3 million liters of ethanol, they floated a global tender in the third week of January to augment remaining supplies. The tender floated in January 2013 for 1.4 billion liters of ethanol supply through March 14 was extended to November 2014.	Act on January 2 notified that a few states such as Uttar Pradesh, Delhi, Haryana, Punjab, Karnataka and Goa can even achieve up to 10 percent ethanol blending target, but the overall average for the country as a whole should reach five percent by end of June 30, 2013. The interim (ad-hoc) price of INR 27 per liter would no longer hold as price would now be decided by market forces. Indian ethanol suppliers (sugar manufacturers) offered to supply 551 million liters. Price quoted by suppliers ranged from INR 38 to INR 54 per liter (*delivered at OMC depot*). The price quoted by bidders was perceived to be too high. OMCs received five offers from both Indian and international suppliers, of which one was rejected. (This was the first time the government had allowed foreign suppliers to offer ethanol for domestic EBP. Suppliers offered around 620 million liters of ethanol. However, the price quoted (INR 69 to 92 per liter of ethanol, C&F depot) was perceived to be high and therefore the global tender was rejected. Of the total ethanol offered by suppliers, the quantity accepted for lifting by OMCs was 382 million liters. Per industry sources, during CY 2013, all the contracts were valid for supplies until November 2014, but OMCs got validity extended through May 2015. The fuel ethanol blend rate that could be achieved then was 1.6 percent.
CY 2014	OMCs floated another tender in July 2013 for procuring 1.33 billion liters of ethanol for supply during December 2013 through November 2014. In January 2014, OMCs floated an EOI for procuring additional ethanol. GOI considered raising the EBP program target from five to 10 percent in near future.	The quantity offered by sugar mills/ethanol manufacturers was 618 million liters. The quantity accepted by OMCs for lifting was 247 million liters. Quantity offered by sugar mills was 53 million liters and the whole volume was accepted to be lifted by OMCs. Total quantity accepted by OMC was thus 247 + 53 million liters = 300 million liters. Assuming that OMC shall come out with another tender soon for ethanol procurement for CY 2015, Post anticipated that OMC shall procure another 50 million liters in December 2014. The cumulative volumes likely to be accepted by OMCs for blending with gasoline will be 350 million liters, which translates to market penetration at 1.4 percent.

	There was a proposal to revise the formula to fix the benchmark price for ethanol procurement. The proposed formula would be based on the average of the refinery transfer price (RTP) or cost of petrol to the oil marketing companies for the previous financial year instead of the lowest RTP, which stands at INR 44 a liter. The revised formula was expected to be a win-win opportunity for both the stakeholders. On December 10, 2014, GOI announced a price control schedule for fuel ethanol procurement for OMCs. The program fixes landed-ethanol prices at OMC depots from INR 48.50 to INR 49.50 per liter ($0.76 to $0.77/liter), a three to five percent increase over the previous price.	The EBP was being implemented in a total of 13 states with blending level of about 1.2 percent. Post expects some momentum when the new pricing formula was put in place and 'implemented'. Major distilleries were reported to have exported ethanol as well as molasses (as cattle feed) as way to infuse cash flows in season when sugar is at a surplus and sugar mills are finding it difficult to break-even. The OMCs were offering a ceiling price of INR 44 per liter ($0.74), delivered to various depots. The ex-mill prices of molasses based products (rectified spirit, extra neutral alcohol and fuel ethanol ($.67 per liter)) ranged from INR 33-46 per liter. The offered price by OMC then was still attractive for some suppliers or sugar mills although prevailing (average) retail price of gasoline was still high. This will likely accelerate India's EBP, infuse cash into the local sugar industry, help millers pay down debts, and curtail (by some estimates) upwards of $750 million in crude oil imports. In previous years, Post has observed that India has the capacity to fulfill its ethanol blending mandate, provided there are equal incentives for both the producers and blenders. Read GAIN IN4121 for further information.
CY 2015	In July 2014, OMCs floated a tender for procuring 1.56 billion liters of ethanol from supply from December 2014 to November 2015. Subsequent to above tender, OMC floated an EOI in December 2014 seeking to procure upwards of 1.6 billion liters (970 + 670 million liters) of ethanol. Further, OMCs floated an EOI in March 2015 seeking 367 million liters of ethanol. A third and fourth EOI was floated in May, seeking (213 + 9) million liters, respectively and bidding opened in the same month. In April 2015, GOI removed 12.36 central excise duty levied on ethanol supplied for blending with gasoline.	The actual supply started from January 2015. Around 584 million liters was offered by sugar mills of which 375 million liters was believed to be accepted by the OMCs (INR 44.5/liters). Quantity offered by sugar mills was 509 million liters of which 359 million liters was finalized by OMCs. The quantity offered by sugar mills was 125 million liters of which 94 million liters was accepted by OMC. Total quantity accepted by OMCs for blending is thus (375+359+94+21) = 849 million liters. The excise duty exemption will be applicable for ethanol produced from molasses generated during the next sugar season (October 2015-September 2016) and supplied for blending with gasoline (PIB Press Release). Industry sources claim that sugar mills are expected to benefit to an extent of INR five per liter on sale of ethanol for blending.

	Fifth and final EOI was floated I July 2015 for procuring 69 million liters against which the quantity offered was 39 million liters.	Total quantity thus offered until November 2015 was 1.56 billion liters of which sugar mills/ethanol manufacturers offered 849+39 =888 million liters. Industry sources estimate that around 675 million liters was lifted by OMCs until November 2015. By year-end total volume is expected to rise marginally to 685 million liters and therefore the expected blend rate will reach 2.3 percent.
CY 2016	In August 2015, OMC floated an EOI seeking 2.65 billion liters for supply in CY 2016. The intent is to make 10 percent blending compulsory. Subsequently, two more EOI were floated in December 2015 and February 2016 seeking 1.5 billion liters and 909 million liters, respectively.	The EOI was opened on September last year. Around 1.47 billion liters was the quantity offered by sugar mills. Actual quantity finalized was upwards of 1.03 billion liters. Sugar mills offered to supply 165 million liters and 183 million liters against EOIs. However, the quantity finalized by OMCs was 159.5 and 157.3 million liters. Total quantity finalized until May-end was 1.35 billion liters (1036 + 159.5 + 157.3). Against the contracted quantity of 1.3 billion liters, actual quantity lifted until December end was 1.11 billion liters which brings blend rate **to 3.3 percent**; highest since inception of EBP.
CY 2017	OMC floated tender (2 cycles until Feb 2017) seeking 2.8 billion liters of ethanol for blending with gasoline for supply during CY 2017. Further, it is estimated that by end of CY 2017, India would require more than seven billion liters (Table 1) of ethanol to meet its ambitious target of 20 percent EBP.	Against the requirement, quantity offered was 1.17 billion liters and of which volumes close to 807 million liters was finalized until April end. However, the actual quantity supplied until May 1, 2017 was 296 million liters. Industry estimates that 700 million should get blended by year-end. This will eventually bring down market penetration to 2 percent. The automotive industry seems to be gearing up for making vehicles compatible with the E-5 blends and will probably gear up for E-10 later. Industry sources believe that some models of two wheeler vehicles will have difficulty making their engines compatible initially. Given the current pace of development, a target to meet five percent blending of ethanol (1.7 billion liters) with gasoline looks plausible but 10 percent is not realistic.
Source: Information on procurement of ethanol for EBP was sourced from the Indian Sugar Mills Association (ISMA), New Delhi		

Developments in NBM:

Date	Action	Comments

April, 2003	Demonstration phase 2003 to 2007: Ministry of Rural Development appointed as nodal ministry to cover 400,000 hectares under jatropha cultivation. This phase also proposed nursery development, establishment of seed procurement and establishment centers, installation of trans-esterification plant, blending and marketing of biodiesel	Public and private sector, state government, research institutions (Indian and foreign) involved in the program achieved varying degrees of success.
October, 2005	The MoPNG announced biodiesel purchase policy in which OMC would purchase biodiesel across 20 procurement centers across the country to blend with high speed diesel w.e.f January 2006. Purchase price set at INR 26.5 per litre	Cost of biodiesel production higher (20 to 50 percent) than purchase price. No sale of biodiesel.
CY 2008	Self-Sustaining Execution phase 2008 to 2012: Targeted to produce sufficient biodiesel for 20 percent blending by end of XIth (2008-12) five year plan	Lack of large scale plantation, conventional low yielding jatropha cultivars, seed collection and extraction infrastructure, buy-back arrangement, capacity and confidence building measures among farmers impeded the progress of this phase.
CY 2010	An estimated 0.5 million hectares has been covered under jatropha cultivation of which two third plant populations is believed to be new plantation and would take two to three years to mature.	Assuming 80 percent biodiesel requirement is met though jatropha oilseeds, the biodiesel thus obtained will just meet 0.01 percent of total biodiesel required for five percent blending by 2010/11.
CY 2011	No additional wastelands have been brought under jatropha cultivation except for few captive plantations managed by OMCs.	The government may have to offer fiscal incentives (coupled with carbon credits) to growers to adopt better agronomic practices during first 2-3 years of plantation development besides marketing and price support mechanism to encourage jatropha plantation.
CY 2012	The production of biodiesel from jatropha seeds remained commercially insignificant.	According to the MoPNG, no biodiesel (from jatropha) has been procured by oil marketing companies for blending with diesel in last three to four years.
CY 2013	Biodiesel production from multiple feed-stocks (crude oil, used cooking oils, animal fats etc.) was an economically viable option left with the producers.	Most of the plants utilizing this technology made commercial sales in the past few years despite running at close to a third of their installed capacities (480 million liters estimated). Industry sources claim that small to medium scale industries are the major buyers of biodiesel (methyl ester) who blend it with conventional diesel. Industry sources claimed that the average purchase price of biodiesel in India then was around INR 45-48 per liter (including freight) and seemed viable for blending since regular diesel was selling at a price premium of 18-20 percent over biodiesel (methyl ester).
CY	Spotlight on industries engagement with tree-borne	Seed yield from jatropha plantation (on

2014	oilseeds as alternative to jatropha for biodiesel production. GOI in October 2014 deregulated diesel prices in line with gasoline.	pilot scale) were observed to be significantly lower than stipulated. Consequently, cost of production of biodiesel from jatropha seed is too high and producers have little incentive to produce at peak capacity Evidently, in last few years, few stakeholders (from private and government sector) were engaged in identifying tree-borne oilseeds (neem, pongamia, mahua and kusum) as alternative to jatropha for bio-diesel production, but on an experimental basis. However, availability, feasibility and sustainability of tree-borne oilseeds still need to be validated. Biodiesel producers claim to realize INR 38-40 from sale of a liter of biodiesel (excludes transportation cost). Hopes are high that if subsidy on diesel gets gradually phased out, then biodiesel producers may get a larger pie. The retail price will now be decided by the market forces and GOI will no longer have to compensate OMCs for selling diesel below market prices. This step will incentivize firms engaged in biodiesel production in India.
CY 2015	On January 16, the Union Cabinet chaired by the Prime Minister, Shri Narendra Modi, gave its approval for amending the MS) and HSD Control Order for Regulation of Supply, Distribution and Prevention of Malpractices dated 19.12.2005. The Cabinet has also decided to suitably amend Para 5.11 and 5.12 of the National biofuel policy for facilitating consumers of diesel in procuring bio-diesel directly from private bio-diesel manufacturers, their authorized dealers and JVs of OMCs authorized by the MoPNG. This decision will encourage the production and use of bio-diesel in the country. Early August, OMCs have launched the country´s first tender for biodiesel, seeking to procure 850 million liters from local producers between August 2015 and March 2016.	The amendment will allow private biodiesel manufacturers, their authorized dealers and JVs of OMCs authorized by the MoPNG as dealers and give marketing and distribution functions to them for the limited purpose of supply of bio-diesel to consumers. The investment and production conditions (as applicable) specified in the marketing resolution dated March 8, 2002, of MoPNG will also be relaxed and a new clause added to give marketing rights for biodiesel (B100) to the private biodiesel manufacturers, their authorized dealers and JVs of OMCs authorized by the MoPNG for direct sales to consumers. As the price of diesel is already deregulated, private biodiesel manufacturers are encouraged to sell biodiesel directly to consumers subject to their product meeting prescribed BIS standards (PIB Press release).

	On August 10, GOI had issued notification to allow the sale of Bio-diesel (B100) by private manufacturers to bulk (Gazette Notification No. GSR 621 (E)). The order is called the Motor Spirit and High Speed Diesel (Regulation of Supply, Distribution, and Prevention of Malpractices) Amendment Order, 2015. On August 11, 2015, Minister of State (I/c), Petroleum and Natural Gas, launched sale of B-5 Diesel on World Bio Fuel Day. (Source: News Release, IOC).	Bids were invited until August 19. The policy is meant to help with local price discovery ahead of a potential 20% blend for biodiesel in 2017. A 20% blend for ethanol has also been proposed but is unlikely since the current 5% blend has yet to be reached. Federal government may permit the sale of bio-diesel (B-100) for blending with HSD to bulk consumers such as Indian Railways, State Transport Undertakings and other bulk consumers having minimum requirement of bio-diesel for their own consumption by a tank truck load supply which shall not be less than twelve thousand liters. As part of the initial run, B-5 was expected to be sold to customers at some retail outlets in New Delhi, Vijayawada, Haldia, and Vishakhapatnam. The Bio-diesel Purchase Policy was announced in October 2005 and became effective January 2006.
CY 2016	January 21, 2016, tender was invited for procurement of 16 million liters of biodiesel from indigenous manufacturers meeting IS 15607:2005 specification Bio Diesel (B-100) for supply from February 2016 to March 2016. (Source: Bharat Petroleum) E-tender for 20.46 million liters for fuel supply in AP, Gujarat and Tamil Nadu between July and September	Few bulk users such as road transport companies, state transport corporations (plying public buses) and railways depots (diesel locomotives) claim to have utilized biodiesel for transporting goods and people. According to media reports, the Minister of State (Independent Charge) that some 13.2 million liters of B-100 has been procured by OMC until June 2016. Another 40 million liters was targeted to be procured during April 2016 through September 2016.

March 2017	The Cabinet Committee on Economic Affairs has approved closure/winding up of CREDA HPCL Biofuel Ltd (CHBL) and Indian Oil - Chhattisgarh Renewable Energy Development Agency (CREDA) Biofuels Limited (ICBL). Per media reports, on March 18, 2017, OMCs floated a tender for procurement of around 267.3 million liters of biodiesel (B-100) for the period from April 2017 to Oct 2017. (Tender No. 1000277414 (Tender ID-22454) closing on 07/04/2017 1400 hrs.) https://bharatpetroleum.com/pdf/BIO-diesel-April-17-to-Oct-2017final-18032017-2d8d36.pdf Biodiesel development is still in nascent stage. Commercial availability of bio-diesel and its availability across major retail centers will take its own time.	The offices of CHBL/ICBL have been closed. Joint Ventures (JV) between CREDA HPCL Biofuel Ltd (CHBL) and Indian Oil-CREDA Biofuels Limited (ICBL) were formed for carrying out energy crop (Jatropha) plantation and production of bio-diesel in 2008 and 2009 respectively. The CREDA, an arm of Chhattisgarh state government, had provided wasteland to CHBL and ICBL through Land Use Agreement for plantation of Jatropha. Due to various constraints such as very poor seed yield, limited availability of wasteland, high plantation maintenance cost etc. the project became unviable and Jatropha plantation activities were discontinued. Indian Oil Corporation Limited (IOC), Bharat Petroleum Corporation Limited (BPC), Hindustan Petroleum Corporation Limited (HPC), public sector enterprises, invite sealed tenders under the Two-Bid System, (Technical Bid and Price Bid) from indigenous manufacturer of Bio Diesel (B-100) meeting IS 15607:2016 specification Bio Diesel (B-100) (Latest revision during the period of tender) to various Depots. In India, oil marketing companies are getting hit hard with a new 6% excise duty on biodiesel along with a slew of other taxes that they say will make the mandated biodiesel blending unviable. Biodiesel was excise duty-free for 10 years. The mandate's implementation has been delayed to at least May 1 from the planned April 1 start date, however. Without excise duty, biodiesel is cheaper than fossil diesel but with the duty it may be more expensive. Biodiesel prices are set based on the Malaysian palm oil board's established price.

Additional facts/notes on advanced biofuels:

STRENGTH	WEAKNESS

1. Fast growing economy with investment capacity for large scale projects 2. Agricultural and forestry residues could be the feedstock of choice in the initial stage of the production, since they are readily available and do not require additional land cultivation. 3. Reduce expenditure on crude oil imports and GHG. More energy efficient than conventional fuels. 4. Ambitious biofuel mandates and access to public and private sector funding for R&D on the second-generation biofuels.	1. High capital investment, complexity in production process, 2. Lack of established market for primary agricultural residues. Also, its availability, variability and sustainability would be crucial. 3. Biomass supply cost could be a major bottleneck due to lack of infrastructure, poor logistics, and inefficient backward integration. Sometimes, lower bulk density biomass (agricultural and forestry) could increase biomass supply cost.
OPPORTUNITY	**THREAT**
1. Attract private and public investment 2. Improvement in rural income and employment generation could be social drivers for implementation of biofuel projects. Small-agricultural land holders could benefit more through cooperatives. 3. Provision for financial incentives, and grants based on merit for new and second-generation feed stocks; advanced technologies and conversion processes; and, production units 4. High biofuel production cost will eventually find market/s where there is a strong demand and effective policies, such as United States and EU.	1. Subsidies or incentive needed in short-term to encourage and promote second-generation biofuels will be high assuming that gestation time will be more than expected (However, revenue from fuel taxes could be utilized to cross-subsidize second-generation biofuels). 2. Technologies for biomass-to-biofuel conversion are also under various stages of development. Though biomass itself is cheap, the costs of its processing are relatively high. 3. Legal political framework for large investment is a major risk factor as well as financing, security of biomass supply, and availability of skilled human resource (for adoption of new technology). **4.** The opportunity costs for agricultural residues for competing uses will be decisive for utilization of the feedstock's and biomass supply security**.**
Adopted from **OECD Study**	

Additional notes on advanced biofuels:

According to a press release, India's first bio-refinery (100,000 liters per day) utilizing agricultural waste is likely to be set up in Bhatinda, Punjab. In addition to this, GOI is planning to set up 12 bio-refineries across 11 states to produce 350 to 400 million liters of ethanol per year (PIB Press Release).

According to PIB press release dated June 5, 2017, India will be participating in Mission Innovation and Clean Energy Ministerial in Beijing from June 6 to 8. During that period, the new collaborative public – private program on Smart Grids & Energy Storage will be announced under the Indo-US Joint Clean Energy Research (PACE-R) (**Link**).

_____Report Ends Here _____