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India

Biofuels Annual

Biofuels Annual 2019

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Report Highlights:
India's average blending rate for ethanol in gasoline is expected to reach a record 5.8%, up from a previous record 4.1% last year and considerably higher than historical levels. A surplus sugar season coupled with a stronger incentive to convert excess sugar to ethanol helps oil-marketing companies (OMCs) procure upwards of 2.4 billion liters this year. An upsurge in demand for the ethanol blending program (EBP) and consequent tight supply for industrial and potable use will encourage ethanol imports (mostly denatured) to grow 19 percent year-over-year to a record 750 million liters. The biodiesel market remains nearly nonexistent due to limited access to feedstock limited production capacity, a rudimentary supply chain, and import restrictions.

Section I. Executive Summary:

India's current aspirational blend goal for fuel ethanol is E10 by 2022, and there is no near-term blend target for biodiesel. Introduced last year, India's National Biofuel Policy 2018 seeks to achieve a national average of E20 for gasoline and B5 for diesel by 2030.

The new Ethanol Blending Program (EBP) stipulates procurement of ethanol produced directly from B-heavy molasses, sugarcane juice, and damaged food grains such as those of wheat and broken rice. A surplus sugar season coupled with a stronger financial incentive to convert excess sugar to ethanol should help the OMCs procure upwards of 2.4 billion liters in 2019. As a result, India will be able to achieve its highest fuel ethanol market penetration at 5.8%, compared to the previous record 4.1% last year. In theory, all ethanol available in 2019, if used completely for EBP, would meet a 6.6% blend rate.

Ethanol consumption for fuel and non-fuel use will outgrow production for the fifth consecutive year, more so in 2019 due to the upsurge in demand of fuel ethanol for blending with gasoline. In 2019, supply to industrial and potable sectors will be limited by higher prices, which will lead to more demand being met by imports as compared to the previous year. A recently introduced import license requirement for importing ethanol (for non-fuel use) is most likely to delay imports, if not stop them altogether. A few bulk importers will use current stocks and are likely to make fresh purchase agreements to cover for the lapse or procedural delay in the coming months since local demand is strong. Nevertheless, if all holds true as indicated, the United States will continue to be the largest ethanol supplier, and 2019 imports are likely to grow upwards of 750 million liters (mostly denatured), the highest in a decade. The U.S. import share may yield somewhat to competitive supplies from other origins.

In contrast, biodiesel market penetration will remain stuck at last year's level (0.14%) due to limited supply, insufficient feedstocks, supply chain constraints, and restrictions on imports. The majority of the biodiesel produced goes mostly to informal sectors, and the support received through OMCs procurement is not enough to pull demand significantly, a further constraint on market development. The recently notified requirement to apply for an import license also applies to biodiesel and will limit purchases to an estimated 12 million liters, which is half the amount from last year. Export sales will grow in response to steady demand from traditional buyers, but at a relatively slower pace.

Under the new 2018 biofuels policy, the raw materials identified for production of biodiesel include non-edible oilseeds, used/waste cooking oil (UCO), animal tallow, acid oils, and algal feedstock, to name a few. There is a renewed focus on developing a suitable collection mechanism to increase UCO supply for biodiesel production while imposing stringent rules to eliminate UCO entry into the food stream.

Advanced, commercial-scale biofuel production covering cellulosic and renewable fuels made using advanced technology platforms including intermediate syngas, such those under development in North America, Europe, China and Brazil, is still not viable despite a decade of support programs. This suggests that imported feedstock and conventional biofuels will likely remain critical to meet India's longer-term blending goals, especially given the projected growth of India's fuel pools.

Author Defined:

II. Policy and Programs

A) India's Biofuel Policy 2018

India's new biofuel policy seeks to achieve a national average of 20 percent blending of ethanol with gasoline and 5 percent blending of biodiesel with conventional diesel by 2030[1]. It is envisioned the targets will be met through: i) growth in domestic biofuel production (1-Generation (G), 2-G and 3-G[2]); ii) use of multiple feedstocks[3]; and iii) encouraging biofuel blending to supplement gasoline and diesel use in transportation, as well as in stationary and portable applications[4].

Fuel Ethanol

A National Blend Rate of 10 Percent by 2022

Progress made towards achieving objectives of biofuel policy "should ensure energy security, create new employment opportunities, promote a cleaner and healthier environment, reduce greenhouse gas emissions, and prevent diversion of UCO/WCO into the food chain." In both past and current biofuel policy, there are consumption, but no production mandates. The EBP was partially but never fully successful meeting blend mandates in years of surplus sugar production, while there was virtually no progress acting on the National Biodiesel Mission (NBM) mandate because the economic and agronomic conditions of a successful program based on jatropha were never achieved.

In the past, to renew its focus on implementing the EBP, the Government of India (GOI) recommended 10 percent mandatory blending of ethanol with gasoline across all cane-growing states, but could only achieve less than half of the set target given inadequate price incentives. 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 more than 5%. The present EBP mandate is to achieve a 10 percent national average blend by the year 2022.

Therefore, going beyond 2022, Post feels it is farfetched to imagine achieving E-20 by 2030 given 1) the general inability of the cane industry to supply India's ethanol demand (especially if fuel ethanol use is increased) even at current levels[5]. 2) Imports are managed in a way that minimizes the supply role they can play, and 3) it will be well beyond a decade before "advanced fuels" will be capable of large-scale commercial production even with huge subsidy outlays.

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[1] Assuming current consumption growth rate for fossil fuels, by 2030, an estimated 19 billion liters of ethanol and 8.3 billion liter of biodiesel will be required to meet E-20 and B-5 mandate.
[2] 1-G: first generation, 2-G: second generation and so on
[3] Creation of the National Biomass Repository is proposed
[4] For example, diesel generators or water pumps for irrigation
[5] Sugarcane production in India is cyclical and therefore ethanol production varies accordingly and does not assure targeted fuel ethanol supply levels needed to meet the OMC tenders at any given time.

i) Ethanol Policy

a) Expanded Eligible Feedstock and 2-G Purchasing Agreements

EBP under the 2018 Biofuels Policy allows procurement of ethanol produced directly from B-heavy molasses, sugarcane juice, and damaged food grains[6] such as wheat and broken rice. During the agriculture crop year (July-June), when the Ministry of Agriculture & Farmers Welfare projects over-supply of food grains, the policy will allow conversion of these surplus quantities of food grains to ethanol, based on the approval of the National Biofuel Coordination Committee. Use of alternative raw materials such as sugar beet or sweet sorghum, and starch-containing materials such as corn, cassava, or rotten potatoes will increase supply of ethanol for the blending program.

The policy document further states that OMCs have agreed to sign Ethanol Purchase Agreements (EPAs) with 2-G ethanol suppliers for a period of 15 years to provide a secure market to private stakeholders and support 2-G ethanol initiatives. Bio-compressed natural gas (CNG), being one of the major by-products in 2-G ethanol bio-refineries and transport fuel, will benefit from steady demand by the public sector gas marketing companies.

b) Import Licenses Now Compulsory for Biofuel (non-fuel use) Imports into India: Includes Denatured Ethyl Alcohol (all strengths), Undenatured Ethyl Alcohol (strength by volume of 80% or higher), Pure Biodiesel and Biodiesel Blends Over 30%, and Petroleum Oils Containing up to 30% Biodiesel (GAIN IN9048)

On May 24, 2019, the Directorate General of Foreign Trade (DGFT) under the Ministry of Commerce and Industry (MOCI) issued a notification that biofuel imports (non-fuel use) will now require an import license subject to GOI assessment of market conditions. The previous policy (see below) did not require an import license. Biofuel imports for fuel use remain 'restricted' and are not permitted. Note: the notification will come into effect on the day it is published in the Gazette of India.

On August 21, 2018, the DGFT of the MOCI amended import policy (notice) and restricted biofuel imports (HS Code 2207 2000, 2710 2000, 3826 0000) for all purposes, except for non-fuel use, but those imports were freely importable by actual users and did not require an import license. A week later, an MOCI Notification No: 29/2015-2020 amended the import policy of biofuels, revising "free" to be "restricted". Although exports to India are still permitted, an import license is now required for non-fuel purposes. Please note: since the trade restriction applies equally to bioethanol and biodiesel, it is therefore not covered separately under biodiesel policy.

Given a surplus in the 2019 sugar season and favorable pricing for purchase of ethanol (*see sub-heading 'ethanol administered price' below*), Post believes a strong incentive exists to divert more domestic ethanol for EBP, which will further encourage industrial users to seek imports to fill their consumption gap. *This assumes international ethanol prices remain competitive and crude oil prices remain firm*.

c) Ethanol Administered Price

[6] The challenges here will be 1) collection and transport costs to plants, 2) (how do) refineries adjust conversion process as mix of food grains delivered to the plants change on a daily basis and that too on a cost effective basis is yet to be seen.

In June 2018, the Cabinet Committee on Economic Affairs (CCEA) approved the following for the forthcoming sugar season 2018-19 during the ethanol supply period, which runs from 1st December 2018 to 30th November 2019:

Fixed the ex-mill price of ethanol derived out of C heavy molasses to INR 43.70 per liter (from the prevailing price of INR 40.85 per liter). Additionally, GST and transportation charges will be assessed.

Subsequently, in September last year, CCEA further approved the following **(**PIB Press Release)

- To fix the ex-mill price of ethanol derived out of B heavy molasses / partial sugarcane juice to INR 52.43 per liter (from the prevailing price of INR 47.13 per liter).
- To fix the ex-mill price of ethanol derived from 100 percent sugarcane juice at INR 59.13 per liter (from the prevailing price of INR 47.13 per liter) for those mills who will divert 100 percent sugarcane juice for production of ethanol (no sugar production)
- Additionally, GST and transportation charges will also be assessed. The OMCs were advised to fix realistic transportation charges so that long distance transportation of ethanol is not discouraged.
- OMCs were advised to prioritize ethanol from 1) 100 percent sugarcane juice, 2) B heavy molasses / partial sugarcane juice, 3) C heavy molasses and 4) damaged food grains/other sources, in that order.

ii) Biodiesel Policy

The National average blend rate for biodiesel in fossil diesel remains at last year's level (0.14%) due to multiple constraints, including limited feedstock availability, lack of an integrated and dedicated supply chain, and restrictions on imports. To date, biodiesel is manufactured from imported palm stearin, and small volumes of non-edible oils, UCO and domestically sourced animal fats. The permitted raw materials under the new policy retain the existing list while expanding the list of non-edible oilseeds.

Domestically sourced UCO was identified as a feedstock with large potential for biodiesel production. Starting July 1, 2018, all Food Business Operators (FBO) were required to monitor the quality of oil during frying. The maximum permissible limit of total polar compound in edible oils is 25 percent. The implementation of these regulations will require focus on consumer education and enforcement as well as the creation of an efficient system for collection (FSSAI Launches RUCO, Press Note and Gazette Notification).

The new biofuel policy also encourages the use of wastelands for feedstock generation. The local communities from Gram Panchayats (local assembly) and Talukas (an administrative district) will be encouraged to plant non-edible oilseed-bearing trees and crops such as **Pongamia pinnata** (Karanja), **Melia azadirachta** (Neem), castor, **Jatropha carcus**, **Callophylum innophylum**, **Simarouba glauca**, and **Hibiscus cannabbinus** for augmenting indigenous feedstock supply for biodiesel production.

Also, farmers will be encouraged to grow a variety of different biomass as well as oilseeds on their marginal lands as inter-crops, and as a second crop wherever only one crop is raised under rain-fed conditions. Suitable supply chain mechanisms, feedstock collection centers, and fair price mechanisms

for the engaged community will help development in coordination with local bodies, states, and concerned stakeholders[7] (excerpt from the new policy document).

In past, the National Biodiesel Mission (NBM) identified jatropha (*jatropha curcas*) as the most suitable inedible oilseed to help achieve a proposed biodiesel blend of 20 percent with conventional diesel by 2017. However, using jatropha proved untenable due to a host of agronomic and economic constraints (*please see link to our GAIN report IN7075 in Section IV for background information on NBM*).

iii) Other Biofuels: Drop-in-fuels, Bio-CNG, Bio-Hydrogen, Bio-methanol, Di-Methyl-Ether

A task force on waste to energy created by the National Institute for Transforming India (NITI Aayog) has estimated an annual generation of 62 MMT of Municipal Solid Waste (MSW) in India. This waste has large potential to support agriculture by producing compost and drop-in fuels and energy, including refuse-derived fuel, and biogas/electricity. Also, many technologies are available for converting waste into biofuels and other higher-value bio-chemicals, but are in the nascent stage and need to be proven on a commercial scale. Conversion of such waste into fuels will be promoted for meeting the energy demand in rural areas and also for addressing environmental issues.

Institutional Mechanism

The 2018 National Biofuel Policy proposes to set up a National Biofuel Coordination Committee (NBCC) headed by the Minister of Petroleum and Natural Gas and comprised of representatives of concerned ministries. The committee meets periodically to provide overall coordination and effective end-to-end implementation and monitoring of biofuel programs. To monitor the implementation of the biofuel program, the working group on biofuels will be setup under the Chairmanship of the Joint Secretary (Refinery), MPoNG, GOI, along with technical experts, representatives from relevant ministries, OMCs, the Petroleum Conservation Research Association (PCRA)[8], and other stakeholders. Additionally, various state governments will be encouraged to initiate biofuel developmental activities by setting up 'state level biofuel development boards' in line with existing boards in some states (such as Chhattisgarh, Karnataka, and Rajasthan). Such boards are financed by aid from the respective state governments.

Financial Support for Biofuel Producers and Consumers

Financing and Fiscal Incentives

The GOI claims it "will consider" the creation of financial incentives including subsidies, grants, tax credits, accelerated depreciation on plant expenditures, differential pricing vis-à-vis -1G Ethanol, Viability Gap Funding (VGF of INR 5000 crore, or $735 million), all within 6 years. This would be in addition to additional tax incentives, and higher purchase prices than for 1G biofuels. These incentives should encourage stakeholders to set up 2-G ethanol bio-refineries [4].

[7] Paragraph 1 to 4 are excerpts from the new biofuel policy

[8] PCRA is an organization established in India in 1978, under the umbrella of the Indian Ministry of Petroleum and Natural Gas that is engaged in promoting energy efficiency in various sectors of the economy.

Joint ventures and investments in the biofuel sector are encouraged. One hundred percent Foreign Direct Investment (FDI) in biofuel technologies is encouraged through an automatic approval route, provided biofuels produced are for domestic use only. Various other programs will support development of the "Advanced Biofuel" program. In addition to exploring opportunities for generating carbon credits, the National Bank for Agriculture and Rural Development (NABARD) and other Public Sector Banks will be encouraged to provide funding or financial assistance through soft loans. However, no detail has been provided regarding funding targets for producers.

Fiscal Stimulus to Augment Ethanol Supply for EBP

The EBP promotes blending of ethanol with gasoline to reduce pollution, encourage value addition along the value chain, and improve millers' cash flows to enable payment of arrears to cane growers. The CCEA approves additional funds under the "Scheme for extending financial assistance (interest subvention) to sugar mills for enhancement and augmentation of ethanol production capacity". Total proposed loans of $2.2 billion should help build more ethanol production capacity, which will enable the processing of excess sugar into ethanol (Source: PIB Press Release March 2019 and DFPD Notification on Augmenting Ethanol Supply).

Similarly, in addition to conventional EBP envisaged above, an alternate route such as 'second-generation (2G) ethanol', produced from biomass and other wastes, is being explored by the Ministry of Petroleum and Natural Gas (MoP&NG) to bridge the supply gap for the EBP program. In this direction, on February 28, 2019, "Pradhan Mantri (Prime Minister) JI-VAN Yojana (program)" was launched as a tool to create 2-G Ethanol capacity by attracting investments in this new sector. The JI-VAN Yojana (program) will be supported with total financial outlay of $277 million from 2018-19 to 2023-24. The Centre for High Technology (CHT), a technical body under the aegis of MoP&NG, will be the implementation Agency for the scheme (PIB Press Release, Feb 2019). The MoP&NG has a target of 10 percent ethanol blending in gasoline by 2022.

B) Renewable Energy, Greenhouse Gas (GHG) Emissions & Climate Change

Renewable Energy:
A total capacity of 78.4 GW of renewable energy has been installed in the country as of May 2019, of which an estimated 46 percent is contributed by wind energy, 37 percent by solar, 12.8 percent by bio-power, and the remainder by small hydropower. By 2022, the GOI plans to add 175 GW of energy from renewable resources, of which 100 GW is planned to come from solar, 60 GW from wind power, 10 GW from biomass power[1], and 5 GW from small hydro-power. Power from biomass combustion, biomass gasification and bagasse co-generation reached upwards of 9.3 GW (9131.5 MW from Biomass power/cogeneration + 138.3 MW from waste to energy) installed capacity as of April 30, 2019. Biomass power generation may surpass the target of 10 GW by 2022 given that 1 GW may be added per year.

With the MoP&NG taking stewardship of the new biofuel policy, the renewed focus of the Ministry of New and Renewable Energy is now on generating or producing energy from biogas, including enriched biogas, bio-CNG, and bio-power. Production will be from biomass/urban, industrial and agricultural wastes. The Ministry of Power, issued order no. 23/03/2016-R&R, dated June 14, 2018, which states

[1] Biofuel isn't included as part of the broader renewable energy outlook

the revised Renewable Purchase Obligation (RPO) targets for the national level. On February 1, 2019, Ministry of Power issued a clarification on RPO that excludes power consumption met from hydro sources. As per the order, the country has a target of 21 percent share of renewable energy in its total electricity consumption by March 2022.

Greenhouse Gas (GHG) Emissions:

The GOI has committed to reduce GHGs from 2005 levels by 20 to 25 percent by 2020 and 33 to 35 percent by 2030. Moving towards a low-carbon economy, the transport sector is key to achieving GHG reduction goals. To support the goal of increasing current fuel efficiency standards, the transport sector will upgrade vehicles using current Bharat Stage (BS)-IV standards to be compatible with BS -VI fuel [3] by 2020. The new fuel engine standards are likely to reduce harmful emissions and increase fuel efficiency. The issue of course has a certain urgency: the GOI originally was preparing to roll out BS-VI norms by 2023, but has since advanced the deadline to 2020.

National Greenhouse Gas Inventory:
India's emissions in 2014 were 2.6 million Gg (Giga gram) of CO2e of GHGs without Land Use, Land-Use Change and Forestry (LULUCF). The LULUCF sector remained a net sink. Considering emissions and removals from the LULUCF sector, net national emissions were 2.3 million Gg of CO2e. A summary of emissions and removals from these sectors is presented in Figure 1. The relative contribution of various GHGs by sector in the total inventory is also mentioned.

The energy sector accounted for 73 percent of the total GHG emissions for the year 2014. Fuel combustion activities emitted 1.87 million Gg CO2 e in 2014 including 1.14 million Gg CO2 e from energy industries. Within energy industries, 94.96 percent of emissions were from electricity production, 4.4% from refinery and 0.7% from manufacturing of solid fuels.

Road transport accounted for 90.1 percent of the total emissions from the transport sector, followed by civil aviation (5.6%), railways (3.1%) and domestic water-borne navigation (1.2%). In 2014, other sectors in the energy sector together emitted 128,643 Gg of CO2 e, of which approximately two-thirds were contributed by the residential sector, about one fifth by the commercial sector, and the rest by the combination of biomass burnt for energy (non-CO2 GHGs) and the Agriculture /Fisheries sectors. (Source: Excerpt from: India Submitted its 2nd Biennial Report to UNFCC in Dec 2018).

Climate Change: India's post-2020 Climate Goals:
For post-2020 period, in response to the decisions of the Conference to the Parties, India submitted its Nationally Determined Contribution (NDC) to the UNFCCC on October 2, 2015. That NDC outlined the climate actions intended to be taken under the Paris agreement. The eight goals put forth by India in its NDC are:

1. To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation.
2. To adopt a more climate-friendly and cleaner path than the one followed by other countries at corresponding levels of economic development.
3. To reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 levels.

4. To achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel resources by 2030. Transfer of technology and availability of low-cost international financing, such as the Green Climate Fund (GCF), will support achievement of these goals.
5. To create an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030.
6. To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, including agriculture, health and disaster management, and water resource management, as well as vulnerable geographic regions such as the Himalayan area and coastal regions.

7. To mobilize domestic and new & additional funds from developed countries to implement the above mitigation and adaptation actions in view of the resource required and the resource gap.
8. To build capacities, create domestic framework and international architecture for quick diffusion of innovative climate technology in India and for joint collaborative R&D for such future.

For more information please visit the following link MOEF Climate Change, GOI and refer to National Action Plan on Climate Change

Figure 1. India: Green House Emission by Sectors

	CO_2 emission	CO_2 removal	CH_4	N_2O	HFC 23	CF_4	C_2F_6	SF_6	CO_2 equivalent
TOTAL without LULUCF (Gg)	**1,997,891.85**	**-**	**20,005.35**	**475.29**	**1.59**	**2.61**	**0.71**	**0.004**	**2,607,488.12**
TOTAL with LULUCF (Gg)	**2,015,107.88**	**319,860.23**	**20,053.54**	**476.71**	**1.59**	**2.61**	**0.71**	**0.004**	**2,306,295.43**
1. ENERGY	1,844,705.03	-	2,133.37	65.35	-	-	-	-	1,909,765.74
2. IPPU	153,186.81	-	177.85	10.36	1.59	2.61	0.71	0.004	202,277.69
3. AGRICULTURE	-	-	14,709.78	349.39	-	-	-	-	417,217.54
4. LULUCF	17,216.04	319,860.23	48.19	1.42	-	-	-	-	-301,192.69
5. WASTE	-	-	2,984.35	50.18	-	-	-	-	78,227.15
Memo Item (not accounted in total Emissions)	**812,030.60**	**-**	**0.11**	**0.11**	**-**	**-**	**-**	**-**	**812,067.87**
International Bunkers	4,943.53	-	0.11	0.11	-	-	-	-	4,980.81
Aviation	3,681.65	-	0.03	0.10	-	-	-	-	3,714.12
Marine	1,261.88	-	0.08	0.01	-	-	-	-	1,266.69
CO_2 from Biomass	807,087.06	-	-	-	-	-	-	-	807,087.06

Source: Adopted From II[nd] Biennial Report Submitted to UNFCC by MoEFCC in Dec 2018

C) Import Duties/Export Taxes and Levies

Table 1. India: Import Duty on Biodiesel (percent ad valorem on CIF value)

ITC HS Tariff Number	Total Import duty
Biodiesel and mixtures thereof, not containing or containing less than 70 percent by weight of petroleum oils and oils obtained from Bituminous minerals (greater than B30 to B100) [3826 0000]	24.32 percent (10 percent basic + 10 percent Social Welfare Surcharge (SWS) on basic custom duty + 12 percent IGST***)
Petroleum oil and oils obtained from Bituminous minerals (other than crude), containing by weight more than 70 percent or more of petroleum oils, contain biodiesel, other than waste oils (B1-B30), [2710 2000]	30.98 (10 percent basic + 10 percent Social Welfare Surcharge (SWS) on basic custom duty + 18 percent IGST).

Source: www.cbic.gov.in, updated as of February 1, 2019

Table 2. 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]	Basic custom duty on denatured ethanol for manufacture of excisable goods* is 2.5%. However, denatured spirits assessed 5 percent duty for all goods except above**.
Undenatured Ethanol [2207 1000] of an alcoholic strength by volume of 80 percent or higher	150 percent (SWS of 10 percent on basic Customs duty exempted, State excise/VAT as applicable)

Source: www.cbic.gov.in, updated as of February 1, 2019
*: if the importer follows the procedure set out in the Customs (Import of goods at concessional rate of duty) Rules, 2017
**: Ethyl alcohol supplied to Oil Marketing Companies for blending with motor spirit (gasoline) will attract 5% Integrated Goods and Service Tax
***: Basis New Delhi, June 2019, a consumer pays INR 33.91 per liter (48%) and INR 23.3 per liter (36%) for buying a liter of gasoline and diesel. Figure in parentheses are tax component *w.r.t* actual retail price. Also note: the Central excise duty is a fixed amount and not a percentage on price. Additionally as indicated last year, the 5 percent road and infrastructure cess on ethanol-blended petrol up to 10 percent and bio-diesel up to 20 percent has been abolished (Excise on Biodiesel, Excise on 10% blend gasoline, Excise on 5% blend gasoline).

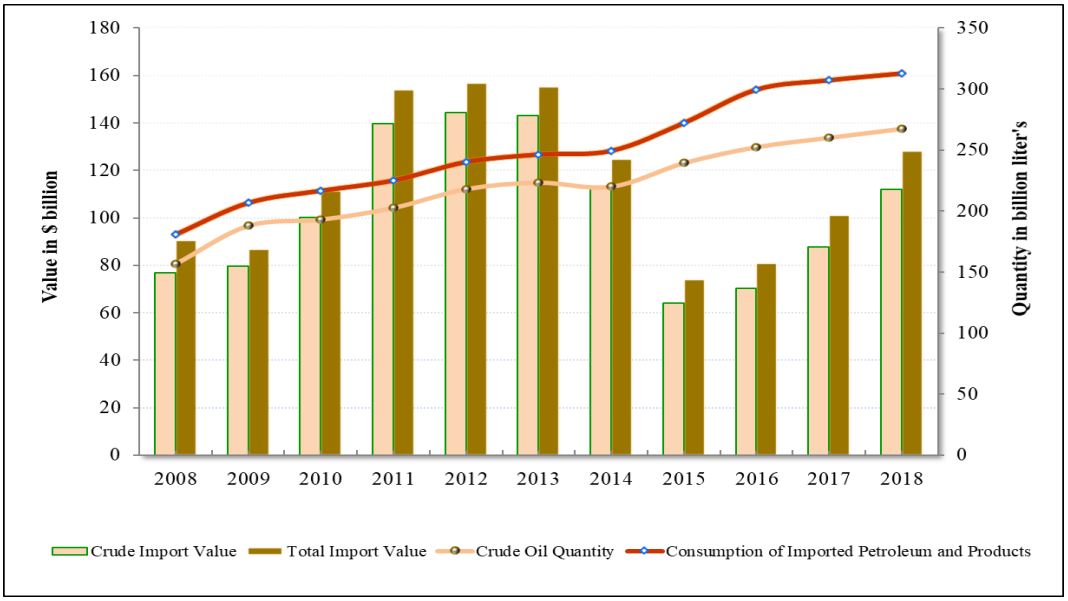
III. Gasoline and Diesel Pools

India's Primary Energy Requirement is Growing Larger
India's primary energy demand grew 4% (over 35 million tons of oil equivalent) year-over-year in 2018 compared to 2.3% growth seen worldwide. The growth in India was led by coal for power generation and oil for transport (IEA's Global Energy & CO_2 status report). Fossil fuels supply about three-quarters of India's primary energy demand. India is the fourth largest importer of crude oil after EU, China and the United States. India will continue to rely on imports mostly from Iraq, Saudi Arabia, Iran and the UAE. Presently, it is 74 percent costlier to import crude oils and petroleum products than it was four years ago following the oil price collapse of 2014. Crude oil imports still represent over 85 percent of total consumption of gasoline and petroleum products (see below, Figure 2). The supply gap may widen, given that consumption continues to grow faster than petroleum imports.

Secondly, India's total installed power capacity is 356,817 megawatts, of which the largest resource is coal (54.5%, down from 57% last year), followed by renewables (22%, up from 20%), hydro-electricity (13%), gas (7%), and the remainder from nuclear and diesel. (Source: Central Electricity Authority, Ministry of Power, GOI)

Transport Sector is One of the Largest End-Users of Energy
Currently, diesel alone meets an estimated 40 percent of transportation fuel demand, followed by gasoline at 27 percent (Figure 3.) Road traffic accounts for an estimated 60 percent of total freight traffic (vs. air and ship) and 90 percent of total passenger traffic.

Figure 2. 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

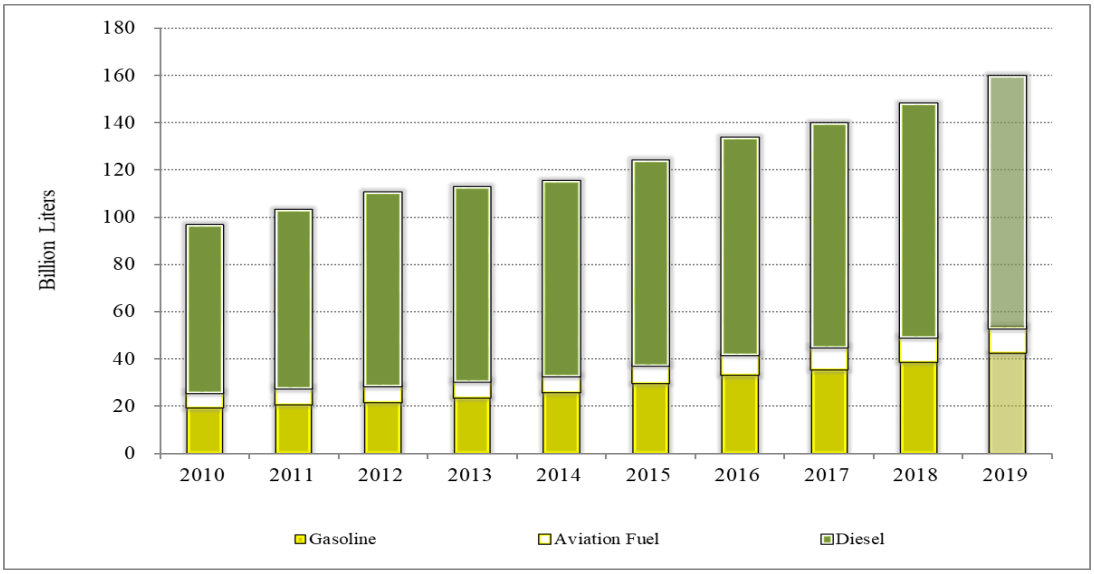
In terms of fuel type used, two-wheelers mostly use gasoline, while passenger and commercial vehicles mostly use diesel. If we look at the domestic vehicle sales trend for last year, which includes sales for passenger, commercial, 3-wheeler, 2-wheeler and 4-wheeled vehicles, some 81 percent came from the two-wheeler segment, which runs on conventional gasoline.

According to industry reports, consumer demand for all types of vehicles will accelerate this year and next as India strives to move forward with Faster Adoption and Manufacturing of (Hybrid) and Electric Vehicles' (FAME[9]) legislation developed under the Ministry of Heavy Industries & Public Enterprises. The total new registration volume for passenger cars in 2020 is estimated at upwards of four million units. Similarly, the light-vehicle fleet in 2020 is estimated at 43 million vehicles across multiple powertrain and fuel type combinations (primarily conventional gasoline and diesel vehicles).

In addition to changing sales and fleet volumes, the fleet profile will begin to change starting in 2020 as conventional fuels lose market share to alternative-fueled platforms to achieve the goals of the FAME legislation. Strong economic growth, declining interest rates, and a rapidly growing middle class with high disposable income and more purchasing power will spur demand for new vehicles. For 2018, the ownership ratio was estimated at 30.0 vehicles per 1,000 people. It is likely to grow to 33 vehicles by 2022 and reach 45 vehicles by 2030. Long term, there will be a marginal decline in the growth of vehicle demand as mass transportation and ride-sharing platforms in India become substantially more developed, and technology-driven mobile service providers start to emerge (Stratas Advisors).

Figure 3. India: Consumption of Liquid Fuels, In Calendar Year

[9] FAME, Ministry of Heavy Industry, GOI



Source: Petroleum Planning and Analysis Cell (PPAC), government of India (GOI)
* Estimated for 2019

Table 3. India: Fuel Use Projections, Million Liters

Calendar Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019f
Gasoline Total	19,563	20,716	21,842	23,749	25,848	29,651	33,265	35,956	39,015	42,033
Diesel Total	71,041	75,866	82,238	82,256	82,674	87,064	91,965	95,041	102,079	106,285
On-road	42,625	45,520	49,343	49,354	49,605	52,239	55,179	57,025	61,247	63,771
Agriculture	8,525	9,104	9,869	9,871	9,921	10,448	11,036	11,405	12,249	12,754
Construction & Mining	2,842	3,035	3,290	3,290	3,307	3,483	3,679	3,802	4,083	4,251
Shipping & Rail	3,552	3,793	4,112	4,113	4,134	4,353	4,598	4,752	5,104	5,314
Industry	7,815	8,345	9,046	9,048	9,094	9,577	10,116	10,455	11,229	11,691
Heating	5,683	6,069	6,579	6,580	6,614	6,965	7,357	7,603	8,166	8,503
Jet Fuel Total	6,145	6,809	6,626	6,789	6,960	7,564	8,458	9,288	9,743	10,512
Total Fuel Markets	96,750	103,392	110,706	112,794	115,482	124,280	133,688	140,285	150,837	158,830

Source: PPAC, GOI.
Note: f stands for forecast year. The breakdown of diesel consumption is based on industry and trade reports.

IV: ETHANOL

India has around 330 distilleries, which can produce over 4.8 billion liters of rectified spirits (alcohol) per year. Of this total, about 166 distilleries have the capacity to distill 2.6 billion liters of ethanol (denatured and undenatured) to be used in fuel, industrial chemicals, and beverages. Final C & B Heavy molasses, sugarcane juice, food grains unfit for human consumption, and any other potential domestic raw material sources available in the country may be used for making fuel-grade ethanol.

Consumption

India's total ethanol consumption in 2019 is forecast to rise 22 percent to a record 3.8 billion liters. Last year, a record 3.1 billion liters was consumed. The consumption will outgrow ethanol production for the fifth consecutive year, more so due to the burgeoning demand of fuel ethanol for blending with gasoline. As a result, supply to industrial and potable sectors will be limited by drop in demand on price sensitivities (illustrated in Figure 4). The ethanol consumption growth (14 percent annual, 5-year average, 2015-2019) is rather strong compared to production growth (8% annual, 5-year average). Both have risen, but in response to different drivers: the rise in fuel prices coupled with very attractive purchase price of ethanol is driving ethanol consumption; consecutive year bumper harvests is supporting production growth.

A 6.6% blend rate seems achievable if all the ethanol produced (from molasses) in 2019 is blended with gasoline. Potential blending would be higher yet if imports were permitting and duties lowered. However, given the demand from the potable and industrial sectors and limitations on imports, a national blend average of 5.8% in 2019 is expected. The Indian Sugar Mill Association indicate that the OMCs could procure upwards of 2.4 billion liters in 2019.

Of the total requirement of 3.3 billion liters established by OMCs for marketing year 2019, total ethanol offered by the suppliers (from 21 states) to the oil marketing companies for blending with gasoline was 3.13 billion liters. Of this, some 2.7 billion liters was finalized against which 1.08 billion liters has been supplied as of May 20, 2019. 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, partly from raw material imports or by directly importing the finished products.

Production

Production is forecast at 3 billion liters in 2019, which is eleven percent above last year and a record volume. Molasses supply for fuel use will increase in response to price incentive to divert B-heavy molasses, in addition to final C-heavy for producing fuel grade ethanol, but at the cost of diverting excess sugar. The Indian Sugar Mill Association supply estimate of 2.4 billion liters in 2019 is based on 1.8 billion liters produced from C-Heavy molasses, some 425-430 million liters from B-Heavy molasses, 165-170 million liters from damaged food grains, and 20 million liters from sugarcane juice.).

Last year (2018), an estimated 2.7 billion liter of ethanol was produced (from molasses). The total quantity offered for EBP was 1.8 billion liters of which 1.6 billion liters was blended with gasoline to mark a 4.1% blend rate for 2018. The differential and remunerative price to ethanol suppliers will substantially increase availability of ethanol for the EBP Program, reduce dependence on crude oil, and in turn help proliferate a more environmentally friendly fuel. For background information on the ethanol program, please see our Biofuel Annual 2017 GAIN report IN8085.

Trade

Imports

Although domestic production has risen, India remains a net importer of ethanol (for all end uses). For the sixth consecutive year the United States is still the single largest ethanol supplier to India. In calendar year (CY) 2018, Indian ethanol imports (mostly denatured) were down 14 percent to 633

million liters, valued at $269 million. Despite costlier imports, (INR depreciated 11 percent against the USD), strong local demand for industrial consumption drove Indian imports of U.S. ethanol. The U.S. ethanol share in the total import basket was down by 4%, but still held a dominant share (94 percent).

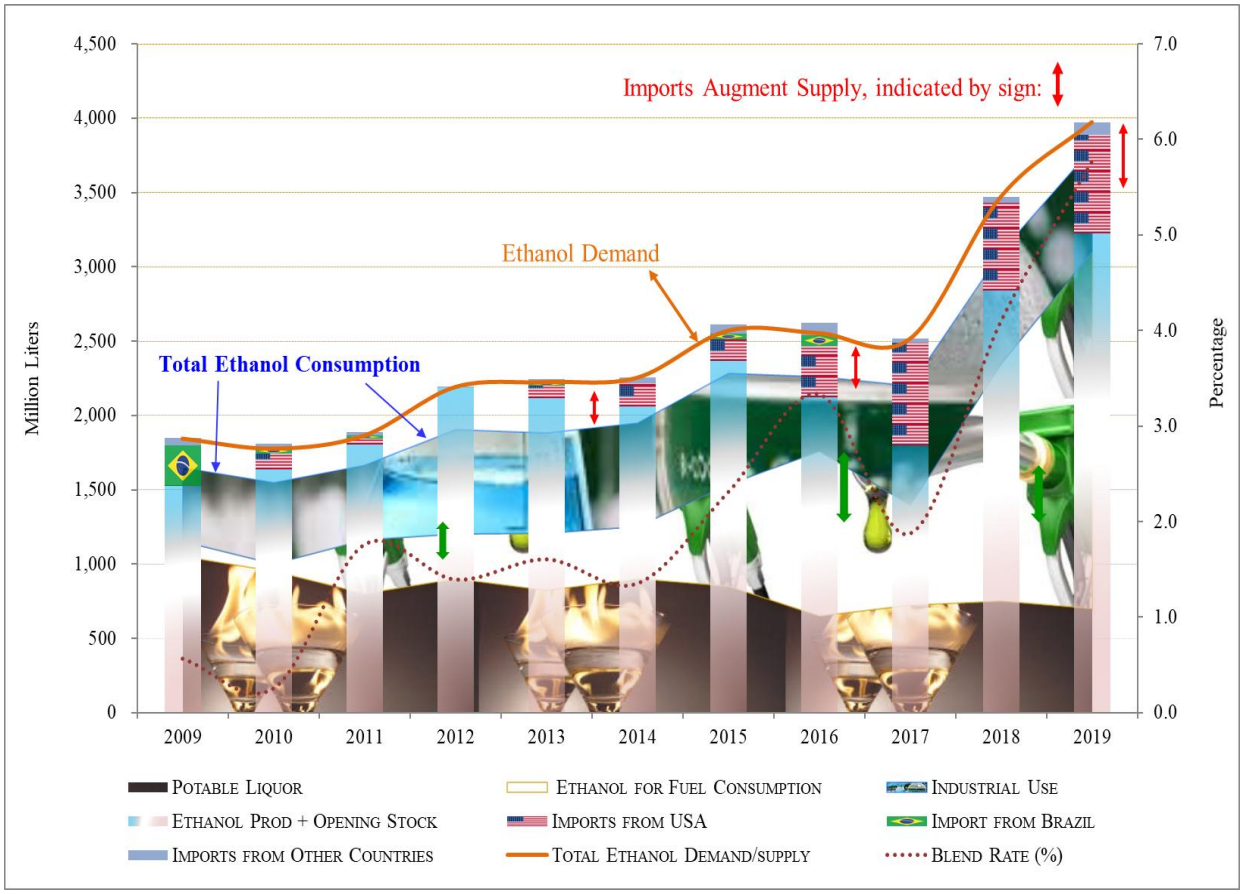
Generally, industrial and chemical users in India import ethanol to augment their cumulative demand, particularly when local supply is short. A recently introduced requirement to obtain an import license to import ethanol (for non-fuel use) may reduce imports temporarily. While importers scramble to comply with the new import requirements, a few major importers will use existing stocks to cover the shortfall in coming months. Overall import demand remains high: 2019 imports will grow to upwards of 750 million liters (mostly denatured), the highest in a decade, and the United States will continue to be the largest ethanol supplier to India. For the record, India imported 718 million liters of ethanol in 2017 worth $280 million, which was the highest volume sourced in the last ten years.

Other small but steady suppliers to India include Pakistan, South Africa, UAE, and UK. (Figure 5). China, South Korea, and Netherland are intermittent suppliers. Last year (2018), imports slumped 10 percent to 631 million liters after rising steadily for five years. Switzerland entered as a new player and supplied almost 4.6% of imports.

Exports

Ethanol exports in 2019 are expected to fall more than 20 percent to 100 million liters (mostly undenatured). Strong domestic consumption demand (for EBP and industrial use) will limit exportable supply. Biofuel or fuel grade exports are restricted when domestic supply is less than domestic demand. Some industry sources indicate that a steady demand from African nations and neighboring countries will keep export sales rolling, albeit in smaller volumes. In 2018, Nigeria, Ghana, Angola, Cameroon and Nepal were the top five export destinations (Figure 5). Ethanol suppliers from the United States, Netherland, France, Hungary, Belgium and Spain compete directly with Indian exporters' (Figure 6).

Figure 4: India. Ethanol Production, Supply and Consumption



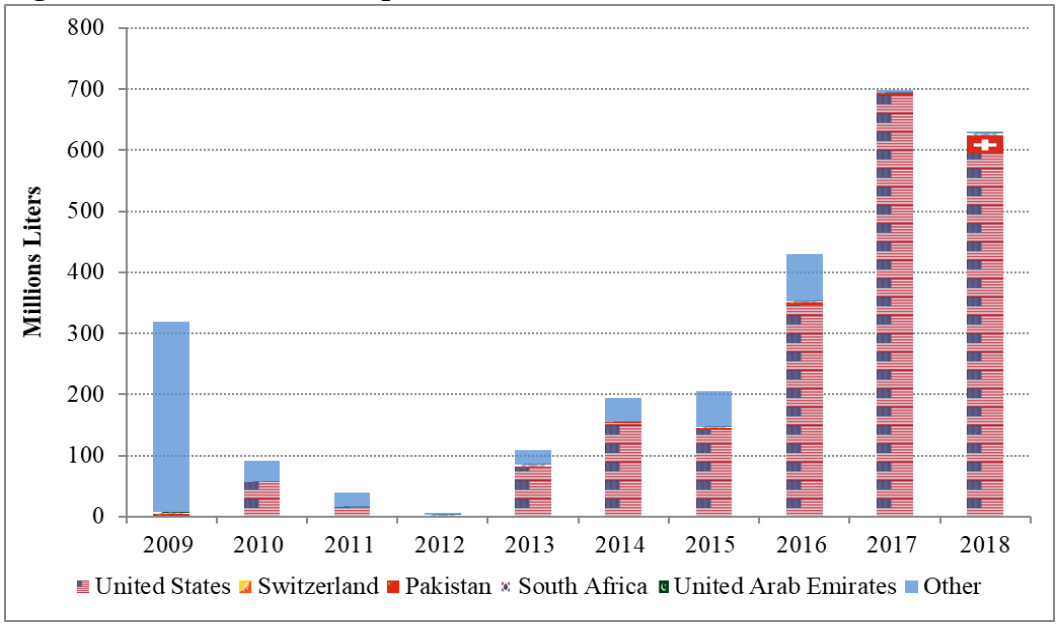
Source: Post and Industry estimate

Table 4. India: Ethanol Used as Beverage, Fuel, and Other Industrial Chemicals (Million Liters)

Calendar Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Beginning Stocks	112	125	33	60	60	75	61	128	146	222
Production	1,522	1,681	2,154	2,057	2,002	2,292	2,061	1,671	2,693	3,000
Imports	144	61	5	108	193	204	432	718	633	750
Exports	53	119	177	233	180	165	136	141	130	100
Consumption	1,600	1,715	1,955	1,932	2,000	2,345	2,290	2,230	3,120	3,820
Fuel Consumption	50	365	305	382	350	685	1,110	675	1,600	2,400
Ending Stocks	125	33	60	60	75	61	128	146	222	52
Production Capacity										
Number of Refineries	115	115	115	115	115	160	161	161	166	166+
Nameplate Capacity	1,500	1,500	2,000	2,000	2,000	2,100	2,210	2,215	2,300	2,600
Capacity Use (%)	101	112	108	103	100	109	93	75	117	115
Co-product Production (1,000 MT)										
Bagasse	87,690	102,714	108,309	102,360	105,642	108,699	97,485	79,176	120,422	112,640
Press Mud	11,692	13,695	14,441	13,648	14,086	14,493	12,852	10,438	15,876	14,850
Feedstock Use for Fuel (1,000 MT)										
Molasses	208	1,521	1,271	1,592	1,458	2,854	4,625	2,813	6,667	9,600
Market Penetration (Liters - specify unit)										
Fuel Ethanol	50	365	305	382	350	685	1,110	675	1,600	2,400
Gasoline	19,563	20,716	21,842	23,749	25,848	29,651	33,265	35,956	39,015	41,596
Blend Rate (%)	0.3	1.8	1.4	1.6	1.4	2.3	3.3	1.9	4.1	5.8

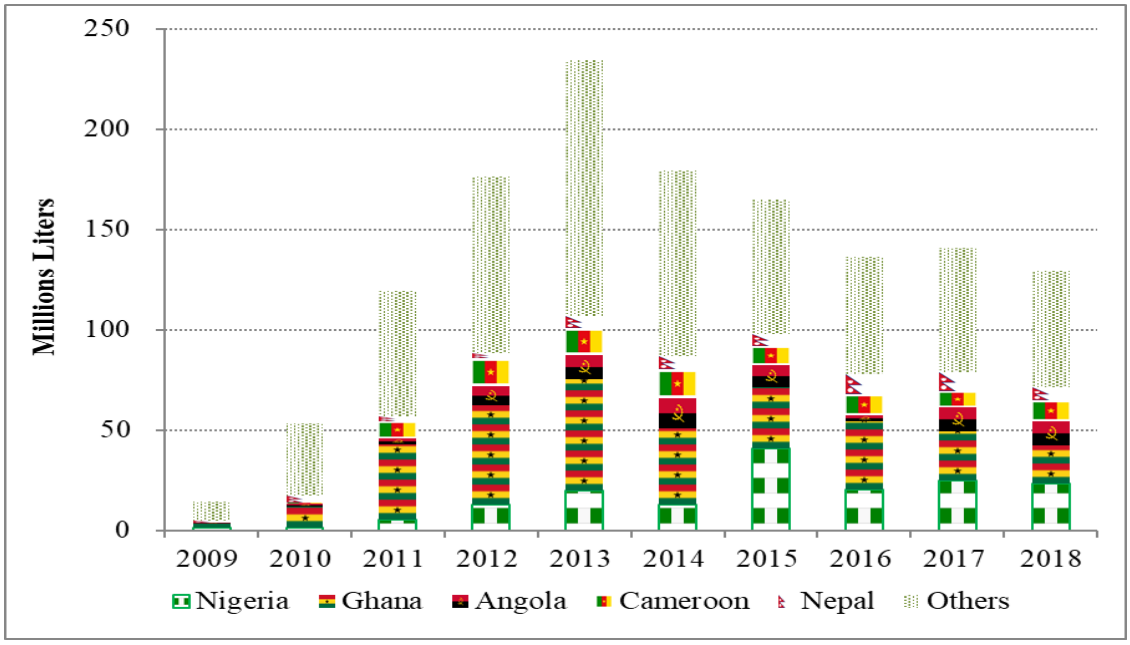
Source: FAS and Industry Source
Year 2019 is projected

Figure 5: India. Ethanol Imports



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

Figure 6: India. Ethanol Exports



Source: Global Trade Atlas (GTA) and Ministry of Commerce, GOI
Others: include Sierra Leone, Zambia, Uganda, Tanzania, Lebanon

V. Biodiesel/Renewable Diesel

The market for biodiesel is mostly informal, disbursed and very small. With many countries running at B5 or higher and a few non-OECD countries running at B10 or higher, this industry has tremendous growth potential in India provided there is a viable strategy for building a financially sustainable domestic industry coupled with some market opening for imports. Compared to the EBP, a limited number of suppliers produce biodiesel, and most of their production capacities are under-utilized since the availability of feedstock is not sufficient. The majority of the biodiesel produced is consumed by a disbursed and informal groups at the local level, much of this used in power generation. Support received through OMCs procurement is not enough to build commercial sales. The recent import license requirement also applies to biodiesel, and therefore imports will remain very limited. Past field trials, which use jatropha spp, some tree-borne oilseeds, and other non-edible oilseeds grown on non-arable, rainfed lands, have failed to progress even given insufficient government support. India does not produce drop-in renewable diesel.

Consumption

In the last ten years, biodiesel consumption grew four percent annually; in 2019 growth is expected at one percent. The quantity of biodiesel procured for blending with conventional diesel for on-road use will be marginally above last year's level and continued to account for less than has the estimated market for biodiesel. Buyers of such blended diesel are limited to some retail outlets of oil marketing companies, the Indian railways, State Road Transport Corporation of different states, fleet owners of road transport companies, and port authorities.

Smaller buyers will continue to procure for small and medium scale enterprises, progressive farmers (operating irrigation pumps and tractors), brick kilns, mobile communication towers, and back-up power diesel generators. Transport by road and rail account for roughly half of all biodiesel use, and the other half by off-road farm transport and various stationary applications.

The 2019 national average blend rate for on-road transport is expected to be close to last year (one-seventh of 1% (0.14%)). Post anticipates not more than 85 million liters to be blended with fossil diesel for on-road use in 2019. Last year, industry sources indicated that some 83 million liters of biodiesel were blended. Locally produced biodiesel is often quoted at ten percent discount to the prevailing retail price of diesel, which means its price is roughly equal to diesel after accounting for the slightly lower energy density of biodiesel. The current IGST rate on biodiesel is 12 percent.

Production

Presently, India has six plants with combined annual capacity of 650 million liters of biodiesel per year. The production capacity of existing plants ranges from 11 million liters to 280 million liters. India will produce upwards of 190 million liters of biodiesel in 2019, an additional 10 million liters above last year.

Biodiesel producers use non-edible industrial oil (palm stearin), UCO, animal fats, tallows and 'other oils' (sludge, acidic oils, and tree-borne oils etc.) to produce biodiesel, thereby utilizing 29 percent of the total installed capacity. While the use of animal fats and tallows has remained constant, the remaining feedstock use has shown steady growth, namely non-edible industrial oil and UCO. Except for later (UCO), currently there is no official regulation on supply of other available feedstocks for biodiesel production.

The 2018 Biofuel Policy encourages formation of supply chain (collection) mechanisms to increase biodiesel production. The development of a supply chain for UCO has received the most attention due to its immense potential to source feedstock from the food processing industry, restaurants, hotels, and all food business operators (FBOs). Currently, supply chain trials are underway. Additionally, some Indian firms claim to import smaller quantities of biodiesel and sell it locally after meeting requirements prescribed by Bureau of Indian Standards (BIS).

The GOI's Food Safety and Standards Authority of India (FSSAI), under Ministry of Health and Family Welfare, has proposed an EEE Strategy - **Education Enforcement Ecosystem --** to divert UCO from the food value chain, and help curb current illegal practices to reuse UCO in cooking. Repurposed Used Cooking Oil (RUCO) is an organization that will enable the collection and conversion of UCO to biodiesel. The FSSAI authority claims that an estimated 26 billion liters of UCO could be produced in country.

Table 5. India: Biodiesel Production from Multiple Feedstocks (Million Liters)

Biodiesel (Million Liters)										
Calendar Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Beginning Stocks	45	15	13	14	15	11	13	13	18	25
Production	100	111	126	132	138	152	158	170	185	190
Imports	0.0	0.0	0.0	0.3	1.7	0.8	2.7	7.1	25.2	11.5
Exports	0	0	0	3.9	41.5	33.1	41.7	7.6	23.1	19.7
Consumption	131	113	125	128	102	118	119	165	180	185
Ending Stocks	15	13	14	15	11	13	13	18	25	22
Production Capacity (Million Liters)										
Number of Biorefineries	5	5	5	6	6	6	6	6	6	6
Nameplate Capacity	450	450	460	465	480	500	550	600	650	660
Capacity Use (%)	22.2%	24.7%	27.4%	28.4%	28.8%	30.4%	28.7%	28.3%	28.5%	28.8%
Feedstock Use for Fuel (1,000 MT)										
Non-edible Industrial	50	58	65	70	75	85	90	100	110	105
Used Cooking Oil	38	42	48	49	50	55	55	55	60	65
Animal Fats & Tallow's	6	6	7	7	6	5	6	6	8	10
			120	126	131	145	151	161	178	180
Market Penetration (Million Liters)										
Biodiesel, on-road use	36	31	42	49	32	41	48	72	83	85
Diesel, on-road use	42,625	45,520	49,343	49,354	49,605	52,239	55,179	57,025	61,247	62,284
Blend Rate (%)	0.09	0.07	0.08	0.10	0.06	0.08	0.09	0.13	0.14	0.14
Diesel, total use	71,041	75,866	82,238	82,256	82,674	87,064	91,965	95,041	102,079	103,807

Source: Industry Sources and Post estimates
* CY 2019 is projected

Trade

There was no biodiesel trade until 2013, then exports became a significant part of the balance from 2014 to thru 2016, less so afterwards. Imports first became somewhat significant in 2017. Indonesia, UAE, Malaysia, France and China are the main suppliers of biodiesel to India, while India's major export destinations are Nepal, Nigeria, Oman, Philippines and Qatar.

VI. Advanced Biofuels

Advanced Biofuels

The Indian biofuel industry, both private and public sector, claim some success in developing the technology needed to convert wood and agricultural wastes (corn cob, bagasse, stalk of forage crops) to fuels. Trials, mostly in R&D stage, are still underway to process municipal solid waste and micro-algae into advanced biofuels. The new biofuel policy is intended to push advanced biofuel programs forward. Incentives include subsidies and grants, FDI in R&D, and subsidized pricing schemes more generous than those for first generation biofuels. Final action is subject to review by the National Biofuel Coordination Committee (please refer policy section). Note: advanced biofuels are defined in Appendix.

Industry experts believe that the suitability of second-generation biofuels must be evaluated against available bio-energy options to achieve the best possible socio-economic benefit. The only

breakthroughs observed in this domain are biofuel and other bio-chemicals made from municipal solid waste using everything that is thrown away except metal and glass; another breakthrough possible is use of methane gas and also a process which uses waste gasses from steel plants and heavy industry.

VII: Notes on Statistical Data

Unless otherwise noted, calendar year is used in this report.

From Section IV: Ethanol

Figure 4:
Total ethanol consumption includes fuel, potable and industrial use. Fuel use data has been sourced from the Indian Sugar Mill Association. The industrial and chemical use data was compiled basis inputs from Indian Chemical industry, All India Distillers Association and web resources. Total ethanol demand is estimated based on available supply and import requirement.

Table 3:
Molasses: 1 MT = 240 liters. Since both C-heavy (final) and B-heavy molasses will be used for ethanol production in 2019; the combined conversion rate comes out at 250 liters. Ethanol yield from B-Heavy molasses is considered at 300 liters/metric ton.

Bagasse conversion factor = 41 percent of cane crushed

Press Mud = 5.4 percent of actual cane crushed. Although it is reported to vary from 3.5 to 5.5 percent.

Figure 5 and 6:
HS Codes:
Commodity: 2207 as, Ethyl Alcohol, Undenatured, Of An Alcoholic Strength By Volume Of 80% Vol. Or Higher; Ethyl Alcohol And Other Spirits, Denatured, Of Any Strength

Commodity: 271020, Petroleum Oils And Preparations Containing Biodiesel, Containing By Weight Gt=70% Petroleum Oils Or Oils Of Bituminous Minerals, Other Than Waste Oils

Commodity: 382600, Biodiesel And Mixtures Thereof, Not Containing Or Containing Less Than 70% By Weight Of Petroleum Oils Or Oils Obtained From Bituminous Materials. Ethanol exports are commonly undenatured while imports are mostly denatured ethyl alcohol.

Data Source: the Global Trade Atlas, a service provided by IHS Markit, which reports trade data supplied by each country's official government source for trade data.

Please note: for ethanol imports originating from the United States, the data used is from the U.S. Census Bureau. The HS codes used are (a) denatured, fuel 2207.20.0010, (b) ethanol denatured, other 2207.20.0090, (c) ethanol undenatured, fuel 2207.10.6010 and (d) ethanol undenatured, other 2207.10.6090.

Just to clarify, a U.S. ethanol consignment marked 'fuel-grade' does not necessarily mean that its end-use will be for fuel use only. It is a classification. The U.S. ethanol codes were updated in 2012 to 10 digit HS Code. Since that time, for the U.S. system, 10 digit codes ending in ..10 were designated "fuel" (exports and imports) and those ending …90 were designated "other industrial chemicals, not fuel and not beverages". Beverage is always undenatured but fuel ethanol and ethanol for other industrial uses (non-fuel uses) can fall under **both** 2207.10 and 2207.20. India mostly imports **denatured** ethanol and a minor fraction of total imports is **undenatured.** Ethanol (ethyl alcohol (80% or higher by volume or strength) in India is fully harmonized at the 6-digit level code 2207.10 (undenatured) and 2207.20 (denatured).

For Section V. Biodiesel/Renewable Diesel

The statistics on production and consumption of biodiesel are approximate and ending stocks are estimated at 11% of domestic use since there are no data available.

Please note: under Table 4. India: Biodiesel production…..the biodiesel yield for biodiesel feedstock such as (1) non-edible oil that includes palm stearin, FFA of palm oil is 1,050 liters per metric ton of feedstock weight. Similarly, (2) 1MT of Animal Fats = 1,043 liters and (3) 1 MT of UCO = 1,043 liters

VIII. Appendix

The National Policy on Biofuels-2018 Defines D=Biofuels and Permits the Use of the Following Feedstock:

1) **Bioethanol**: ethanol produced from biomass such as sugar containing materials, like sugar cane, sugar beet, sweet sorghum etc.; starch containing materials such as corn, cassava, rotten potatoes, algae etc., and cellulosic materials such as bagasse, wood waste, agricultural and forestry residues or other renewable resources like industrial waste;

2) **Biodiesel:** a methyl or ethyl ester of fatty acids produced from non-edible vegetable oils, acid oil, used cooking oil or animal fat, and;

3) **Advanced Biofuels**: fuels which are (1) produced from lingo-cellulosic feedstock's (i.e. agricultural and forestry residues, e.g. rice & wheat straw/corn cobs & stover/bagasse, woody biomass), non-food crops (i.e. grasses, algae), or industrial waste and residue streams, (2) having low CO2 emission and do not compete with food crops for land use. Fuels such as Second Generation (2G) Ethanol, Drop-in fuels, algae based 3G biofuels, bio-CNG, bio-methanol, Di Methyl Ether (DME) derived from bio-methanol, bio-hydrogen, Drop-in fuels with MSW as the source / feedstock material will qualify as "Advanced Biofuels".

i) **Drop-in Fuels**: any liquid fuel produced from Biomass, agricultural-residues, wastes such as municipal solid wastes (MSW), plastic wastes, industrial wastes etc. which meets the Indian standards for motor spirit (MS), high speed diesel (HSD) and jet fuel, in pure or blended form, for its subsequent utilization in vehicles without any modifications in the engine systems and can utilize existing petroleum distribution system.

ii) **Bio-CNG:** purified form of bio-gas whose composition & energy potential is similar to that of fossil based natural gas and is produced from agricultural residues, animal dung, food waste, MSW and sewage water.

The major thrust of this policy is to ensure availability of biofuels from indigenous feedstock. As a step in this direction, the creation of a National Biomass Repository is proposed following an appraisal of biomass across the country. Potential domestic raw materials for production of biofuels are:

a) For Ethanol Production: B-Molasses, Sugarcane juice, biomass in the form of grasses, agriculture residues (rice straw, cotton stalk, corn cobs, saw dust, bagasse etc.), sugar containing materials like sugar beet, sweet sorghum, etc. and starch containing materials such as corn, cassava, rotten potatoes, damaged food grains such as wheat and broken rice, and surplus food grains as available. Algal feedstock and cultivation of seaweeds can also be a potential feedstock for ethanol production.

b) For Biodiesel Production: Non- edible oilseeds, Used Cooking Oil (UCO), animal tallow, acid oil, algal feedstock etc.

c) For Advanced Biofuels: biomass, and MSW.

Other Key Highlights of India's Biofuel Policy 2018:

> **Quality Standards:** Development of test methods, procedures and protocols will be priorities along with introduction of standards and certification for different biofuels and end use applications. The Bureau of Indian Standards (BIS) has already evolved standards for bioethanol, and biodiesel for standalone and blended form applications. Development of specifications for higher blending levels are underway. Opportunities will be explored to generate carbon credits for biofuels due to their GHG emissions savings of fossil fuels, in pure or blended form.

> **Push for Research and Development**: The policy would encourage innovation in the use of developed and emerging technologies. Identified areas of intensive R&D work include:
(1): Biofuel feedstock production
(2): Advanced conversion technologies from identified feedstock
(3): Technologies for end-use applications including modifications for biofuels
(4): Utilization of bi-products of biofuels

> **Distribution & Marketing of Biofuels**: Oil Marketing Companies will continue to store, distribute and market biofuels. They will be primarily responsible for maintaining and improving the storage, distribution and marketing infrastructure to meet the requirements of biofuels. The government may also allow other players to distribute and market biofuels depending upon factors such as ensuring quality standards, consumer awareness about blending percentages, warranty requirements, etc.

> **Pricing of Biofuels**: At present, the price of first generation molasses based ethanol for the EBP Program is being determined by the government based on the recommendation of a committee constituted for this purpose. For procurement of biodiesel for blending in diesel, the price is being determined by OMCs. The government will continue to incentivize first generation biofuels by administered prices or market determined prices depending upon various factors including market

conditions, availability of biofuels in the domestic market, import substitution requirements, etc. Advanced biofuels will be given differential pricing to further incentivize them. The mechanism for differential pricing for advanced biofuels will be decided by the National Biofuel Coordination Committee.

> **Import & Export of Biofuels**: Imports will adversely affect domestic biofuels and hence the import of biofuels will not be allowed, although under certain conditions biofuel feedstock imports may be permitted. The policy emphasizes the development of a domestic biofuel industry using domestic feedstock and wastelands. Feedstock import requirements will be decided by the National Biofuel Coordination Committee proposed under this policy. As the domestic biofuels availability is much lower than India's requirements, export of biofuels will not be allowed.

> **International Cooperation**:The policy seeks to establish scientific and technical cooperation (bilateral and multi-lateral) in the biofuel sector, but in accordance with national priorities to include joint research and technology development, field studies, pilot scale plants, and demonstration projects involving R&D institutes and industry.

Role of Stakeholders/Institutional Mechanism:

Ministry	**Role**
MoPNG	Overall coordinating ministry for development of biofuels: • National Biofuel Policy & its implementation • Research, Development & Demonstration on applications of biofuels • Marketing and distribution of biofuels • Blending levels of biofuels • Development & implementation of pricing & procurement policy • Dispute redressal • Foster international collaboration for advanced biofuel research and capacity building • Municipal Solid Waste (MSW) to transportation fuels
Ministry of Rural Development	Planting and supply chain activities along with rural livelihood
Department of Agriculture & Cooperation (Ministry of Agriculture & FW)	Production of plant materials through nurseries and planting for biofuels in coordination with other ministries
Ministry of Environment, Forest and Climate Change (MoEF&CC)	• Biofuel planting in forest lands and environmental issues concerning biofuels • Involvement of communities in maintenance of growing areas and supply chain
Ministry of Science and Technology (Department of Biotechnology and Department of Science & Technology)	• R&D & Demonstration on various feedstocks and improvement of technologies for biofuel development. • Promote innovation and newer research in the biofuel area. • Development of technologies for bio-refinery and value added products.

Ministry of Road Transport and Highway (MoRTH)	• Encourage consumption/usage of biofuels in the transport sector
Ministry of Railways	• Encourage consumption/usage of biofuels
Department of Consumer Affairs (Ministry of CA, F&PD)	• Developing specifications, standards and codes for ensuring quality control of biofuels for end uses
Ministry of Heavy Industries and Public Enterprises	• To advise equipment manufacturers to make equipment compatible with biofuels available in the market
Ministry of New & Renewable Energy	• To produce energy through biogas including enriched biogas, bio-CNG and bio-power etc. from biomass/urban, industrial and agricultural waste
Ministry of Housing & Urban Poverty Alleviation	• To coordinate with states and ULBs for the availability of MSW as an important feedstock for biofuels, including municipal solid waste in urban areas
Ministry of Consumer Affairs, Food & Public Distribution, Department of Food & Public Distribution	• Provide suitable financial incentives to the sugar sector for setting up of ethanol distilleries