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## India

## Biofuels Annual

## 2013

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**Report Highlights:**

Domestic ethanol production for CY 2014 will decline to 1.9 billion liters due to a downswing in India's sugar production cycle (October-September) for second consecutive year. The contracted ethanol supply for calendar 2013 is sufficient to meet the 2.9% blending target. Steady demand for ethanol coupled with an expected rise in blending for Ethanol Blending Program (EBP) will push total ethanol consumption in CY 2013 to 2.4 billion liters.

**Post:**

New Delhi

**Executive Summary:**

Domestic ethanol production for CY 2014 will decline to 1.9 billion liters due to a downswing in India's sugar production cycle (October-September) for the second consecutive year. Despite tight domestic supplies, the local ethanol suppliers have already committed to supply 550 million liters of ethanol for the 5-percent mandatory EBP. The target to blend 2.9 percent of ethanol with gasoline for CY 2013 looks achievable.

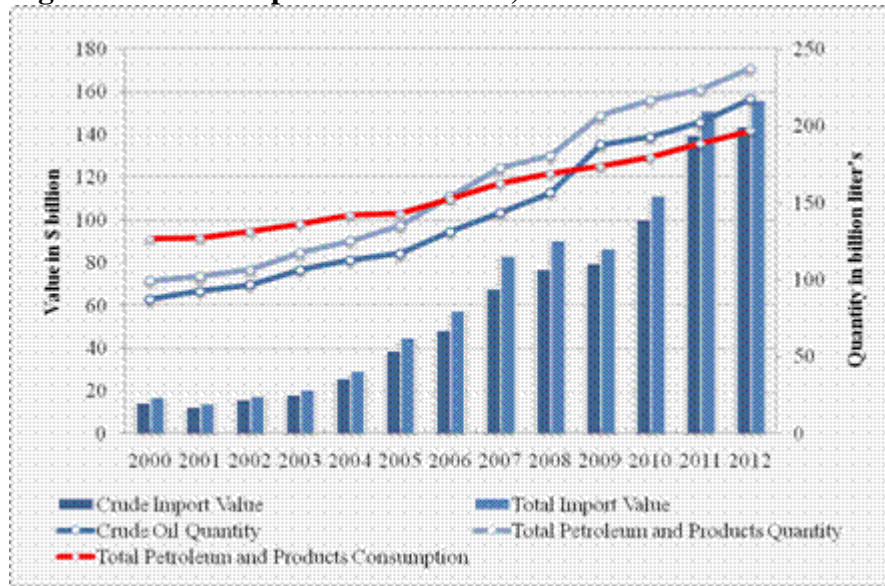
The GOI's ambitious plan of producing sufficient biodiesel by 2011/12 (marketing year October/September) to meet its mandate of 20 percent blending with diesel was unachievable due to unavailability of sufficient feedstock (jatropha seeds) and lack of high yielding drought tolerant jatropha cultivars.

**Author Defined:****Policy and Programs:****OVERVIEW:**

The Indian economy [1] is expected to grow modestly at about 5 percent over the coming year. India's economic growth is driving its energy consumption across all major sectors, inevitably making it the fourth largest primary energy and petroleum consumers besides being the sixth largest liquefied natural gas importer in the world. With gradual strengthening of the world economy, developing and emerging economies are expected to grow modestly due to expectation of robust domestic demand, growth in international trade, and easier macro-economic policies.

Import of gasoline and petroleum products were 40 percent short of total consumption, as early as Indian Fiscal Year (IFY) 2000. However, with growing reliance on imports, the gap reduced to 5 percent by fiscal 2005 [2] and outgrew consumption in the following year (fiscal 2006). Since then, imports have been growing at more than 7 percent and are expected to reach 238 billion liters in fiscal 2012, up 40 billion liters over estimated consumption for the same period. While India's domestic energy base is substantial, India continues to rely on imports for a considerable amount of its energy use [3], consequently accelerating India's oil import expenditure to over \$144 billion in fiscal 2012, up 3 percent over previous year (Figure 1).

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



Source: Petroleum Planning and Analysis Cell, Government of India (GOI)

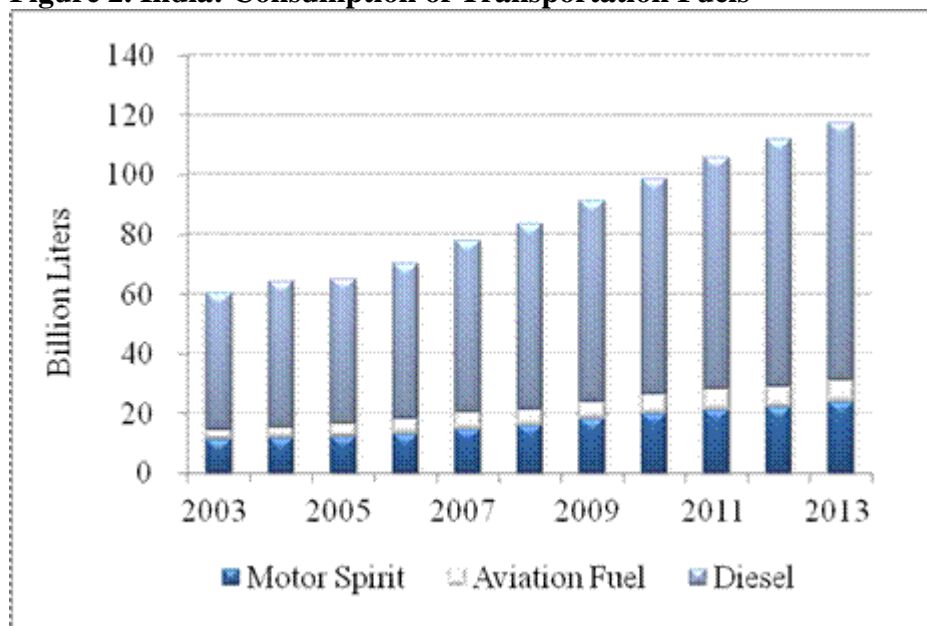
Note: Time scale is Indian fiscal year

Thus, in terms of end usage, energy demand across the transport sector is highest. In India, road infrastructure is used to transport over 60 percent of total goods and 85 to 88 percent of total passenger traffic. Easy availability, adaptability to individual needs and cost saving are some of the factors which go in favor of road transport. Road transport also acts as a feeder service to railway, shipping and air traffic. With the vehicle population growing at 8-10 percent annually, the share of road traffic as percent of freight and passenger traffic was 60 percent and 90 percent respectively, by end of IFY 2009/10.

The total number of registered motor vehicles in India in fiscal 2010-11 was 142 million [4] (two-wheelers constituted 72 percent of total share). Continued economic growth, increasing urbanization, rise in consumer spending levels and with improving road infrastructure, new vehicle registration is expected to push total registered motor vehicle population to 165 million by end of current fiscal year.

As vehicle ownership expands, so will the demand for gasoline and petroleum products rise in tandem. Currently, diesel alone meets an estimated 73 percent of transportation fuel demand followed by gasoline at 20 percent (Figure 2) and their combined demand is expected to grow by more than 5 percent over coming years. Further, it's estimated that by end of this decade, the average demand for transport fuels will rise from an estimated 117 billion liters in CY 2013 to 167 billion liters and would grow further to reach 195 million liters by CY 2023 (Table 1).

**Figure 2. India: Consumption of Transportation Fuels**



Source: Petroleum Planning and Analysis Cell, Government of India (GOI)

\*: Estimated for IFY 2014

**Table 1. India: Fuel Use Projections (Billion Liters)**

Calendar Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Gasoline Total</b>	28	30	32	35	37	40	43	47	50
<b>Diesel Total</b>	94	97	101	106	110	115	119	124	129
On-road	56	58	61	63	66	69	72	74	78
Agriculture	11	12	12	13	13	14	14	15	16
Construction /mining	4	4	4	4	4	5	5	5	5
Shipping/rail	5	5	5	5	5	6	6	6	6
Industry	10	11	11	12	12	13	13	14	14
*Heating	7	8	8	8	9	9	10	10	10
<b>Jet Fuel Total</b>	8	9	10	10	11	12	13	14	15
<b>Total Fuel Markets</b>	130	136	143	151	159	167	176	185	195

Source: Industry and trade sources

\*: Heating / power generation

Proportion of diesel consumption through 2023 are indicative only.

The current growth in transport activity and consequent increase in expenditure and consumption of petroleum products comes at a cost to the environment and is raising serious concerns. Since India is the fourth ([energy data](#)) largest global contributor to carbon emissions, GOI transport policy has targeted EURO-III and IV vehicle emission norms [5] for vehicles, which in turn require adoption of clean and green fuel. To meet that objective, the Union Cabinet approved the National Policy on biofuels on December 24, 2009 ([PIB press release](#)).

## **SCOPE**

Biofuels seek to supplement conventional energy resources for meeting rapidly increasing requirement of transportation fuels and meeting energy needs of India's vast rural population by use of non-food feed stocks and as a result to reduce dependence on import of fossil fuels. The intent is to provide a higher degree of national energy security in an environmentally friendly, cost-effective and sustainable manner.

Believing India to be endowed with significant potential for generating energy through renewable resources, the GOI is promoting and encouraging production and use of a) ethanol derived from sugar molasses/juice for blending with gasoline and b) biodiesel derived from inedible oils and oil waste for blending with diesel.

Presently, production of biodiesel from jatropha seeds is commercially negligible. Slow progress made towards jatropha planting has resulted in lower availability of jatropha seeds to be used as feed-stock for biodiesel production and hence most of the biodiesel units operating in India have shifted to alternative feed-stocks such as edible oil waste (unusable oil fractions), animal fat and inedible oils, utilizing almost 40 percent of their existing capacity to continue year round operations.

Additionally, biomass has been playing important role as fuel for sugar mills, textiles, paper mills, small and medium enterprises (SME) and has significant potential in breweries, textile mills, fertilizer plants, paper and pulp industry, solvent extraction units, rice mills, and petrochemical plants. The total estimated biomass power potential in India is estimated at 31,000 MW of which the surplus power generation through bagasse cogeneration is estimated at 10,000 MW.

## **‘INDIA’S BIOFUEL POLICY’**

The Government of India (GOI) approved the National Policy on Biofuels on December 24, 2009. The policy encourages use of renewable energy resources as alternate fuel to supplement transport fuels and had proposed an indicative target to replace 20 percent of petroleum fuel consumption with biofuels (bioethanol and biodiesel) by end of 12<sup>th</sup> Five-Year Plan (2017).

In a bid to renew its focus and strongly implement the Ethanol Blending Program (EBP), the Cabinet Committee of Economic Affairs (CCEA) on November 22, 2012, recommended 5 percent mandatory blending of ethanol with gasoline [6]. It also recommended that the procurement price of ethanol shall now be decided by between the Oil Marketing Companies (mostly PSU) and suppliers of ethanol. The government's current target of 5 percent blending of ethanol in gasoline has been partially successful in years of surplus sugar production and unfilled when sugar production declines. Presently, the contracted ethanol supply for calendar year 2013 is sufficient to meet 2.9 percent blending target.

## **SALIENT FEATURES OF INDIA’S BIOFUEL POLICY**

- Derive biofuel 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.
- Strengthen India's energy security by encouraging use of renewable energy resources to supplement motor transport fuels. An indicative 20-percent target for blending of biofuel for both biodiesel and bioethanol is proposed by end of 12<sup>th</sup> Five-Year Plan.
- Minimum Support Price (MSP) mechanism for inedible oilseeds to provide fair price to oilseed growers but subject to periodic revision.
- Oil Marketing Companies propose to purchase bioethanol at Minimum Purchase Price (MPP) based on the actual cost of production and import price of bioethanol. In the case of biodiesel, the MPP should be linked to the prevailing retail diesel price.
- If necessary, GOI proposes to consider creating a National Biofuel Fund for providing financial incentives, including subsidies and grants, for new and second generation feed stocks, advanced technologies and conversion processes, and production units based on new and second generation feedstock.
- Thrust for innovation, (multi-institutional, indigenous and time bound) research and development on biofuel feedstock (*utilization of indigenous biomass feedstock included*) 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 so as 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.
- Biofuel technologies and projects would be allowed 100 percent foreign equity through automatic approval to attract foreign direct investment (FDI), provided the biofuel is for domestic use only, and not for export. Plantations of inedible oil bearing plants would not be open for FDI participation.
- Setting up of National Biofuel Steering Committee (NBSC) under Prime Minister to provide policy guidelines.

For more information, please follow the link to [biofuel policy](#).

## **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 biofuel program, the role of NBCC to provide high level coordination, policy guidance and review on different aspects of biofuel development, promotion and utilization becomes more imperative. The committee would meet periodically to review the progress and monitor the biofuel program. The policy also supports development of Biofuel Steering Committee headed by Cabinet Secretary to oversee implementation of its policies on regular basis.

Various state governments will work closely with respective research institutions, forestry department, universities etc for development and promotion of biofuel program in respective states. Few states (<http://www.pcra-biofuels.org/whois.htm>) have drafted policies and set up institutions for promoting biofuel in their states. In order 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 of...	Role
New and Renewable Energy	Policymaking and overall coordination concerning biofuels. Undertake Research and Development (R&D) on various applications of biofuels
Petroleum and Natural Gas	Responsible for marketing biofuels as well as development and implementation of pricing and procurement policy
Agriculture	R&D of biofuel feedstock through Indian Council for Agricultural Research and Indian Agricultural Research Institute (sweet sorghum, jatropha, <i>Pongamia</i> , 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	Support research on biofuel crops through bio-technology
Road Transport and Highway	Plantation along highway rights-of-way and use biofuel blended fuel. Work with automobile manufacturers association in India for engine modification, emission norms
Railways	Undertake plantation of jatropha over wastelands along rail rights-of-way and trials of biodiesel blended fuel on railroad locomotives.
Environment and Forest	Ensure plantation of jatropha and tree borne oilseeds in forest wastelands; get Central Pollution Control Board to monitor health and environmental effects.

## ETHANOL POLICY

Ethanol is produced in India from sugarcane molasses for blending with gasoline. Beginning January 2003, GOI mandated the use of 5-percent ethanol blend in gasoline through its ambitious Ethanol Blending Program (EBP). Ethanol and alcohol production in India depends largely on availability of sugar molasses (a byproduct of sugar production). 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. At times, lower availability of sugar molasses and resultant higher molasses prices affect the cost of production of ethanol, thereby disrupting supply of ethanol for the blending program at pre-negotiated fixed ethanol prices.

## Developments in EBP

Date	Action	Comments
January, 2003	Ministry of Petroleum and Natural Gas (MoPNG) made 5 percent ethanol	Partially implemented due to unavailability of ethanol (due to low

	blending ( <a href="#">Gazette on EBP</a> ) in gasoline mandatory across 9 States and 5 Union Territories	sugarcane production in 2003/04 and 2004/05)
September, 2006	Resurgence in sugarcane production in 2005/06 and 2006/07 led GOI mandate 5 percent blending of ethanol in gasoline across 20 states and 4 Union Territories (excludes Northeast, Jammu & Kashmir and Andaman & Nicobar) subject to commercial viability	OMC contracted for 1.4 billion litres of ethanol for EBP at Rs 21.50/litre from Nov 2006 to Nov 2009. Only 540 million litres 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 5 percent EBP
August 2010	Government fixed an <a href="#">ad-hoc provisional procurement</a> price of Rs 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 caveated the proposal that alcohol or molasses could not be imported for EBP; it has to be exclusively sourced from domestic produced molasses.
Fiscal 2010/11	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 5 percent ethanol in gasoline.	<p>Most of the domestic ethanol producers or suppliers were disqualified to supply ethanol.</p> <p>Non-finalization of ethanol pricing formula and procedural delays by various state governments delayed the procurement for EBP.</p> <p>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</p>



		cattle feed to Europe.
Fiscal 2011/12	OMC targets to procure 1 billion liters of ethanol for fiscal 2011/12.	<p>After deducting the ethanol requirement for EBP in non-implementing states (such as Tamil Nadu, West Bengal, Odisha, Jharkhand, Chhattisgarh &amp; Madhya Pradesh), the present requirement worked out to 720 million liters, of which suppliers had offered to supply 610 million liters.</p> <p>With lesser supply in few 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.</p>
Fiscal 2012/13	<p>In a bid to renew its focus and strongly implement the EBP, the Cabinet Committee of Economic Affairs (CCEA) on November 22, 2012, recommended 5-percent mandatory blending of ethanol with gasoline [7] .</p> <p>Henceforth, the procurement price of ethanol shall be decided by between the OMC and suppliers of ethanol (CCEA recommendation).</p> <p>OMC floated a joint e-tender in first week of January for procuring 1.05 billion liters of ethanol to be supplied during April 2013 through March 31, 2014.</p> <p>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 third week of January to augment remaining supplies.</p>	<p>Few states can even achieve up to 10 percent ethanol blending target, but the overall average for the country as whole should reach 5 percent by end of June 30, 2013. This was notified by the union government under the Motor Spirits Act on January 2.</p> <p>The interim (ad-hoc) price of Rs 27 per liter would no longer hold as price would now be decided by market forces.</p> <p>Indian ethanol suppliers offered to supply 550 million liters [8] . Price quoted by suppliers ranged from Rs 38 to Rs 62 per liter (<i>delivered at OMC Depot</i>). The price quoted was perceived to be on the high side.</p> <p>OMCs received 5 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 (Rs 69 to 92 per liter of ethanol, C&amp;F depot) was perceived to be high and therefore the global tender</p>

		was rejected.
Current status	<p>The validity offer for the domestic tender expired on May 27, 2012.</p> <p>A fresh tender likely for procurement of balance quantity of ethanol likely in near-term.</p>	<p>The offer was extended on request by two months through July 26, 2013.</p> <p>According to CCEA, the EBP is presently being implemented in a total of 13 states with blending level of about 2 percent.</p> <p>Post comments: After accounting for domestic consumption, the net ethanol availability seems adequate to meet 2.9 percent and 2.1 percent of ethanol blending target for CY 2013 and CY 2014, respectively. Theoretically, the quantity of ethanol available blending with gasoline during the current and forecast year should decline from 9 percent to 8 percent, respectively. [9]</p>

### Means to expand domestic ethanol supply

- If mills are given the freedom to flexibly deploy the juice extracted from cane, whether to crystallize most of it into sugar or ferment it into alcohol, they will produce more of whichever fetches higher revenues [10] . Coupled with a robust EBP, the cyclical swings in sugar production could also be addressed. Given the projected lower sugar production in marketing years 2012/13 and 2013/14, experimental use of sugarcane juice for ethanol production seems unviable.
- The GOI is offering subsidized loans through sugarcane development funds to sugar mills for setting up of ethanol production units. The loan would cover a maximum of 40 percent of the project cost.
- Public and private institutions can promote use of alternate crops such as sweet sorghum, sugar beet, sweet potatoes, to supplement domestic ethanol production, though the efforts to produce ethanol from these feed stocks are only experimental.
- Research and development efforts to develop a low-cost technology to utilize ligno-cellulosic material such as agricultural and forest residues to produce bioethanol.

### Impediments

Procedural hurdles such as non-issuance of export permits for interstate transport of ethanol, delay in issuing no-objection certificates (NOC), plus higher taxes and levies across different states have impeded the EBP. Rules and regulations, including the high excise duty (central excise duty of INR 772.50 per ton on molasses versus 12.36% ad valorem on industrial alcohol), interstate charges, and so

on applicable to control alcohol for potable industry use are equally applicable for ethanol blending with gasoline, thereby severely constraining its availability and utilization for EBP.

## BIODIESEL POLICY

The GOI had launched the National Biodiesel Mission (NBM) identifying jatropha (*Jatropha curcas*) as the most suitable inedible oilseed for biodiesel production. The Planning Commission of India had set an ambitious target of planting 11.2 to 13.4 million hectares to jatropha by the end of 11<sup>th</sup> Five Year Plan (2011/12). The central government and several state governments provide fiscal incentives for supporting planting of jatropha and other inedible oilseeds. Several public institutions, [government departments](#), state biofuel boards, state agricultural universities and cooperative sectors are also supporting the biofuel mission in various capacities.

### Developments in NBM:

Date	Action	Comments
April, 2003	<b>Demonstration phase 2003 to 2007:</b> 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 centres, 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	MoPNG announced biodiesel purchase policy in which Oil Marketing Companies (OMC) would purchase biodiesel across 20 procurement centres 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.
2008	<b>Self Sustaining Execution phase 2008 to 2012:</b> Targeted to produce sufficient biodiesel for 20 percent blending by end of XI <sup>th</sup> (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.
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 5 percent blending by 2010/11.
Fiscal	No additional wastelands have been	The government may have to offer fiscal

2011/12	brought under jatropha cultivation except for few captive plantations managed by OMCs.	incentives [11] 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.
Fiscal 2011/12	The production of biodiesel from jatropha seeds remained commercially insignificant.	According to the Ministry of Petroleum and Natural Gas, GOI, no biodiesel has been procured by oil marketing companies for blending with diesel in last three to four years.
Current status	Biodiesel production from multiple feed-stocks (crude oil, used cooking oils, animal fats etc.) seems viable	Most of the plants utilizing this technology were able to make commercial sales in last few years despite running at quarter of their installed capacities (450 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 claim that the average purchase price of biodiesel in India [12] is around INR 45-48 per liter and seems viable for blending as regular diesel is selling at a price premium of 18-20 percent over biodiesel (methyl ester).

The GOI's ambitious plan of producing sufficient biodiesel by 2011/12 (marketing year October/September) to meet its mandate of 20-percent blending with diesel was unachievable due to unavailability of sufficient feedstock (jatropha seeds) and lack of high-yielding drought-tolerant jatropha cultivars.

Around 3.21 million metric tons of biodiesel would be required from 3.42 million hectares to meet the 5-percent blending target by IFY 2011/12. [13] Considering jatropha to be a major feedstock for biodiesel (80 percent biodiesel requirement to be met through jatropha) with an average seed yield of 2.5 tons/hectare and 30 percent biodiesel recovery rate, Post estimates that 18.6 million hectares need be brought under jatropha cultivation to meet an ambitious 20-percent blending target by 2017. The above assessment assumes a steady rise in demand for diesel (at 6.4 to 7 percent/year) consumption in India. The diesel demand during 12<sup>th</sup> Five-Year Plan period (fiscal 2012 through 2016) is likely to grow 35 percent to 87.4 million tons. [14] Meeting a 5-percent blending target will require an additional 4.1 million hectares under jatropha.

## Impediments

The combination of smaller land holdings and ownership issues with government- or community-owned wastelands has resulted in very little progress made by state governments to create large jatropha

plantations. Negligible commercial production of biodiesel from jatropha seeds has stymied efforts and investments by both private and public-sector companies. Additionally, the proposal to raise the purchase price of biodiesel to make it attractive for biodiesel producers hasn't received much attention and is in limbo (please see GAIN report IN2081 for more information).

## Ethanol:

India has 330 distilleries which can produce over 4 billion litres of rectified spirit (alcohol) per year in addition to 1.5 billion liters of fuel ethanol. Of this total, about 143 distilleries have the capacity to distill around 2 billion liters [15] of conventional ethanol per year and could meet the demand for 5-percent blending with gasoline. India produces conventional bioethanol from sugar molasses. Production of advanced bioethanol is in its research and development.

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

Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Beginning Stocks	483	747	1,396	1,672	1,241	1,061	757	908	582
Production	1,898	2,398	2,150	1,073	1,522	1,681	2,154	2,064	1,906
Imports	30	15	70	280	92	39	34	35	40
Exports	24	14	4	4	14	29	22	20	30
Consumption	1,640	1,750	1,940	1,780	1,780	1,995	2,015	2,405	2,110
Fuel Consumption	200	200	280	100	50	365	305	650	500
Ending Stocks	747	1,396	1,672	1,241	1,061	757	908	582	388
<b>Production Capacity</b>									
No of Refineries	115	115	115	115	115	115	115	115	115
Nameplate Capacity	1,500	1,500	1,500	1,500	1,500	1,500	2,000	2,000	2,000
Capacity Use (%)	127	160	143	72	101	112	108	103	95
<b>Feedstock Use (1,000 MT)</b>									
Molasses	7,910	9,992	8,958	4,469	6,342	7,004	8,975	8,602	7,940
<b>Market Penetration</b>									
Fuel Ethanol	200	200	280	100	50	365	305	650	500
Gasoline	13,056	14,527	15,829	18,022	19,954	21,080	22,132	22,510	23,703
Blend Rate (%)	1.5	1.4	1.8	0.6	0.3	1.7	1.4	2.9	2.1

Source: FAS/New Delhi Estimates based on information from trade sources

\*: Forecast

## Production

Domestic ethanol production for CY 2014 will decline to 1.9 billion liters due to a downswing in India's sugar production cycle (October-September) for the second consecutive year. Despite tight domestic supplies, local ethanol suppliers have already committed to supply 550 million liters of ethanol for 5-percent mandatory EBP. This along with the fact that more than three-fifths of total bio-refineries intend to supply ethanol, a target to blend 2.9 percent of ethanol with gasoline for CY 2013 looks achievable.

Additionally, the prices quoted by suppliers (INR36-61 per liter, C&F OMC depots) for the domestic e-tender appears to be on high side, but are still attractive for blending given the current retail prices of gasoline across major depots in the country. A benchmark price somewhere in the middle of the quoted price range could still be negotiated between buyer and seller and looks feasible as well.

In the past, short supplies of sugar molasses during downswings in sugar production have not only raised ethanol's cost of production but made unviable supply of ethanol to petroleum companies at the pre-negotiated (ad-hoc) price. Any procedural delay in EBP, particularly when profit margins of sugar mills are thin, may encourage sugar mills to divert molasses to cattle feed while diverting excess ethanol to other potential end users (e.g., potable alcohol production units).

## Consumption

Despite short supplies of molasses, steady demand for ethanol from the chemical and potable liquor industries amid an expected rise in blending for EBP will push total ethanol consumption in CY 2013 to 2.4 billion liters [16]. The following year, a forecast short ethanol supply will trim consumption, but should still be higher than average consumption of the last 5 years, and is pegged at 2 billion liters.

## Trade

India has become a net importer of ethanol. Since 2003, when the Government of India (GOI) started its ambitious EBP, the trade balance for ethanol has been generally negative. However, lately the balance has tapered down from its peak of \$140 million in CY 2005 to \$11 million in CY 2012, indicating a gradual rise in export of ethanol and other spirits. [17]

Lower import duty helps make imports attractive and economically viable. Per [Customs Notification No. 12/2012](#), the GOI on March 17, 2012, lowered the import tariff on ethanol from all countries to 7.55 percent (Table 2); except for imports from Brazil, which enjoy a preferential rate of 6 percent due to a 20-percent rebate per [Customs vide notification No. 57/2009](#). Traditionally, India imports ethanol only to meet shortfalls in demand during years of lower sugar production. Demand is mostly for consumption across the potable liquor and chemical industries and not for fuel. There are no quantitative restrictions on import of biofuels as well.

Ghana, Saudi Arabia, and Tanzania are among the major importers of Indian ethanol while the United States, South Africa and Thailand have been the major exporters of ethanol to India. The GOI provides no financial assistance for exports of biofuels. However, current trade regulations allow duty-free imports of feed stocks for re-export by certified export oriented units.

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

ITC HS Tariff Number	Total Import duty (percent)
2207.20 Denatured Ethyl Alcohol and Spirits (including ethanol)	7.55
3824.90 Chemical products not elsewhere specified (including biodiesel)	25.85

Source: Central Board of Excise and Customs, GOI

## Ending Stocks

The ending stocks for the forecast year (CY 2014) will decline to less than half a million liters, down 194,000 liters from the previous year. A forecast of lower ethanol production coupled with growing consumption demand will keep ending stocks relatively tight.

### **Biodiesel:**

Establishment and promotion of jatropha plantation is a state rather than union government subject. Public-sector petroleum companies and private sector companies have entered into memoranda of understanding with state governments to establish and promote jatropha plantation on government wastelands or via contract farming with small and medium farmers. However, only a few states have been able actively to promote jatropha plantation despite government incentives and encouraging policies.

Production of biodiesel from jatropha seeds is negligible; hence there have been no commercial sales of biodiesel across the biodiesel purchase centers set up by the GOI. Concurrently, slow progress made in jatropha planting has resulted in lower availability of jatropha seeds to be used as feed-stock for biodiesel production and hence there has been a shift to alternative feed stocks. [18]

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

<b>Calendar Year</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
Beginning Stocks	0	45	38	42	45	45
Production	75	90	102	115	120	130
Imports	0	0	0	0	0	0
Exports	0	0	0	0	0	0
Consumption	30	52	60	70	75	80
Ending Stocks	45	38	42	45	45	50
<b>Production Capacity</b>						
Number of Biorefineries	5	5	5	5	6	6
Nameplate Capacity	450	450	450	460	465	480
Capacity Use (%)	17	20	23	25	26	27
<b>Feedstock Use (1,000 MT)*</b>						
Used Cooking Oil	23	36	48	53	56	58
Animal Fats and Tallows	3	4	5	5	6	6
Other Oils	19	33	42	47	50	52
<b>Market Penetration</b>						
Biodiesel, on-road use	30	52	60	70	75	80
Diesel, on-road use	63,388	65,999	68,718	71,550	74,497	77,567
Blend Rate (%)	0.0	0.1	0.1	0.1	0.1	0.1
Diesel, total use	105,646	109,999	114,531	119,249	124,162	129,278

Source: Industry and Post estimates  
CY 2014 is projected

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\* Used cooking oil includes vegetable oils such as rice bran oil, palm stearine, cotton seed oil and fatty acid oils while 'Other Oils' include tree oils, palm sludge etc.

There are about 5-6 large capacity biodiesel plants (10,000 to 250,000 metric tons per year) in India with capacity to produce biodiesel from alternative feed stocks such as edible oil waste (unusable oil fractions), animal fats and inedible vegetable oils. Currently, an estimated 110 to 115 million liters of biodiesel is produced in India from multiple feed stocks; however, the installed capacity to produce biodiesel is estimated to exceed 350 to 400 million liters. [19] The biodiesel produced is sold to small and medium enterprises, to experimental projects carried out by automobiles and transport companies (trial runs) [20], apart from minor sales to unorganized consumers such as cellular communication towers, brick kilns, farmers, and owners of diesel generators.

### **Advanced Biofuels:**

Research and development are conducted to develop suitable technologies for production of advanced biofuels from wood biomass, agricultural and forest waste, municipal solid waste conversion, microalgae and photosynthetic organisms. Given the technological challenges, commercial production of advanced biofuels remains to be demonstrated as economically viable.

### **Biomass for Heat and Power:**

#### **Scope**

The Ministry of New and Renewable Energy, GOI, is implementing the biomass power program with the objective of harnessing grid-quality power from biomass resources through various conversion technologies along with optimizing power generation from sugar bagasse. The benefits include its renewability, wide adaptability, carbon neutrality and the potential to generate employment in rural areas. Biomass<sup>[21]</sup> has been playing an important role as fuel for sugar mills, textiles, paper mills, rice mills, solvent extraction units, small and medium enterprises.

#### **Biomass material**

Normally, biomass materials used for power generation include bagasse, rice husk, straw, cotton stalk, coconut shells, soy husk, de-oiled cakes, coffee waste, jute wastes, peanut shells, and sawdust. [22] However, the use of biomass as cattle feed and part utilization by power industries may lead to a rise in cost of fuel for biomass power plant as it may not be available unless exclusively grown for power generation. The crop residues from non-fodder crops, e.g., cotton, oilseeds, chilies and bamboo residues may be good alternatives for biomass power production.<sup>[23]</sup>

#### **Availability**

The availability of biomass in India is estimated at about 500 million tons per year covering residues from agriculture, processing industries, and forestry. Between 120 and 150 million tons of surplus agro industrial and agricultural residues per year could be made available for power generation. This estimate is based on a survey by the Indian Ministry of New and Renewable Energy, which indicated



that 15 to 20 percent of total crop residues could be used for power generation, without altering the primary crops' present uses.

### Bagasse power cogeneration

With modernization of new and existing sugar mills surplus power generation through bagasse cogeneration in India's 550 sugar mills is estimated at 10,000 MW (target for 12<sup>th</sup> Five-year plan is to achieve 32 percent of total potential) if these mills were to adopt technically and economically optimal levels of cogeneration for extracting power from the bagasse they produce. The optimum cogeneration capacity installed in Indian sugar mills is one of the highest among major sugar producing countries. The total estimated biomass power potential ([biomass power](#)) is about 31,000 MW.

The GOI has initiated several programs and schemes for promoting renewable energy sources.

Seventeen Indian states have policies for development of biomass power. Biomass power projects attract fiscal incentives such as accelerated depreciation, concessional customs duties, and income tax exemptions. Emphasis will be put on development of fuel value-chain business models while encouraging the operating period of bagasse cogeneration projects from 180-220 to 300-plus days.

Further details may be accessed from [www.mnre.gov.in](http://www.mnre.gov.in).

**Table 3. India's Biomass-Based Commercial Energy Achievement**

Sector	Total Deployment in 2012/13	Cumulative Achievements as of 01/31/13	Total target by end of 12 <sup>th</sup> five year plan	Estimated Potential
<b>A. Grid Interactive Power (Capacities in MW)</b>				
<i>Biomass power and gasification</i>	113.50	1263.60	1525	18,000
<i>Bagasse cogeneration</i>	315.70	2300.93	3216	10,000
<i>Waste to power</i>	6.40	96.08	324	2,700
<b>B. Off-Grid /Captive Power (Capacities in MW<sub>EQ</sub>)</b>				
<i>Waste to energy</i>	13.82	115.56	NA	NA
<i>Biomass (non-bagasse) Cogeneration</i>	60.59	443.10	NA	NA
<i>Biomass Gasifiers</i>				
<i>i)Rural</i>	0.672	16.792	NA	NA
<i>ii)Industrial</i>	6.02	140.10	NA	NA
<i>Biogas based energy system</i>	0.65	0.65	NA	NA
<b>C. Other Renewable Energy System</b>				
<i>Family Biogas Plants (in 000')</i>	77	4623	5600	12,000

Source: Ministry of New and Renewable Energy, GOI

Notes:

NA: Not Available

MW: Megawatts

MW<sub>EQ</sub>: Megawatts equivalent

\*: Includes 1932 MW from private sector sugar mills while additional capacity from cooperative sector likely to be commissioned by August 2012

<sup>[1]</sup> Economic Survey of India pegs growth at 6.1 to 6.7 percent for fiscal 2013/14, while other private institutions and rating agencies expect Indian economic growth to moderate down to 5.5 percent and 6 percent in current fiscal.

<sup>[2]</sup> Fiscal 2000 means Indian fiscal 2000/01, unless otherwise stated in the report

<sup>[3]</sup> According to the International Energy Agency (IEA) coal and oil combined represent about two-thirds of total energy use. Natural gas has seven percent share. Combustible renewable and waste constitute about one forth of Indian energy being used by more than 800 million Indian households for cooking. Other renewable such as wind, geothermal, solar, and hydroelectricity represent a 2 percent share of the Indian fuel mix. Nuclear holds a one percent share.

<sup>[4]</sup> Ministry of Road Transport and Highways, GOI

<sup>[5]</sup> <http://morth.nic.in/index2.asp?slid=58&sublinkid=29&lang=1>

<sup>[6]</sup> CCEA had previously set the blending target

<sup>[7]</sup> The blending target was already decided by the CCEA in the past

<sup>1</sup> Per industry sources, ethanol suppliers could have offered more but prior commitments to potential buyers restricted the volume to 550 million liters.

<sup>[9]</sup> It is estimated that by end of CY 2017, India would require more than 6.3 billion liters (Table 1) of ethanol to meet its ambitious target of 20 percent EBP. Given the current pace of development, a target to meet 5% blending of ethanol (1.6 billion liters) with gasoline looks plausible.

<sup>[10]</sup> Excerpts from *Hindu Business Line* column “Dithering on ethanol”, March 14, 2014.

<sup>[11]</sup> Coupled with carbon credits

<sup>[12]</sup> Particularly in Andhra Pradesh that produces bulk of biodiesel through multiple feed stock utilization

<sup>[13]</sup> A policy brief paper from the National Centre for Agricultural Economics and Policy Research (NCAP)

<sup>[14]</sup> The diesel demand in 2011-12 was estimated at 65.2 million tons (77.7 billion liters).

<sup>1</sup> Which includes an additional annual ethanol production capacity of over 400 million litres that was built up in last five years after government provided funds to sugar mills

<sup>[16]</sup> Historic high figure achieved in last decade

<sup>[17]</sup> Export of biofuel is only permitted after it meets the domestic requirement and the final decision would be taken by the National Biofuel Coordination Committee.

<sup>[18]</sup> Additionally, rising wage rates and inefficient marketing channels have made its production unviable.

<sup>[19]</sup> Per industry sources, existing biodiesel units (using multiple feed-stocks) went commercially viable since 2009.

<sup>[20]</sup> Though few state road transport corporations claim to run their buses on blended fuels

<sup>[21]</sup> Non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms

<sup>[22]</sup> Annual report 2011/12, MNRE, GOI

<sup>[23]</sup> Department of Science and Technology, GOI