India’s Biofuels – Looking Up To The Future

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Agenda

Introduction to Stratas Advisors

Overview

Drivers to Use Biofuels

Global Biofuels

India’s Biofuels Policy and Market

Challenges and Outlook
Who We Are

• Stratas Advisors is a global consulting and advisory firm that covers the full spectrum of the energy sector and closely linked industries

• The world’s leading businesses, governments and institutions turn to us for data, analysis and insight (IOCs, NOCs, independents, energy consumers and financial entities)

• We help our clients achieve tangible results through informed strategic decision-making and implementation planning

• Key differentiators include
  – Global coverage with deep local knowledge
  – Integrated analysis across the entire energy value chain, including macro-level analysis (geopolitics, macro-economics, policies and regulations)

• Our research and consulting staff comprises professionals located on the ground in key global energy market centers

• Combined, our team brings over 500 years of combined energy industry expertise, including
  – Technical (Petroleum Engineers, Geologists, Process Engineers)
  – Economists
  – Political Scientists
  – Financial Analysts
## Service Matrix

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Our Clients Rely on Us

A sampling of our global clients

### Automotive
- BMW
- Chrysler LLC
- Daimler
- Fiat
- Ford
- GM
- Honda
- Hyundai
- Nissan
- PSA Peugeot
- Renault
- Scania
- Subaru
- Toyota
- Volkswagen
- Volvo

### Heavy Industries
- ABB
- AMEC
- Baker Hughes
- Bechtel
- Black & Veatch
- CH2M Engineering
- Foster Wheeler
- Halliburton
- Honeywell
- Jacobs Engineering
- Mitsubishi
- KBR
- Schlumberger
- Tetra Tech
- URS
- Worley Parsons

### Logistics
- Access Midstream
- Buckeye Partners
- Burlington Northern Santa Fe
- Cascade Tanks
- ChemTrade Logistics
- CRU Logistics
- CSX
- DCP Midstream
- Delta Air Lines
- Kinder Morgan
- Plains All American
- Spectra Energy
- TransCanada
- Union Pacific

### Oil & Gas
- BP
- Chevron
- CVR Energy
- Essar Oil
- ExxonMobil
- Marathon Oil
- Noble Energy
- Occidental
- OGX Resources
- Petrobras
- PetroChina
- Phillips66
- Reliance
- Repsol
- Saudi Aramco
- Shell

### Petrochemicals
- Afton Chemical
- BASF
- Braskem
- Dow
- DuPont
- Huntsman
- Infineum
- Johnson Matthey
- Lubrizol
- LyondellBasell
- Nova Chemicals
- Shintech
- TOTAL
- UOP
Overview

Increasing biofuels utilization
Biofuels Uptake

Increase domestic resources and reduce imports

• Petroleum importing countries with abundant agriculture resources will continue blending biofuels:
  • Supporting domestic economy
  • Saving foreign currencies
  • Increase tax revenues

• Adopting biofuels is seen as more economic compared to other alternative fuels:
  • Less infrastructure change needed i.e. existing refueling network can be used
  • Existing fleet can be used with minimal changes, except for high biofuels blend which need special vehicles e.g. flex-fuel vehicles
Biofuels Drivers

Economy is the most common driver in Asia
Economic vs. Environment

Economic is the most common driver

- Economic
- Environment
  - LCFS
  - RED
- Energy Security
  - All

Source: Stratas Advisors, March 2016
Global Biofuels

More countries adding biofuels into fuel pool
Global Biofuels Mandate in 2017

More countries opt to add biofuels into their transportation fuel pools

Legend:
- Ethanol and biodiesel
- Ethanol only
- Biodiesel only
- Partial or no known biofuels program

Source: Stratas Advisors, January 2018
Current Biofuels Policy and Market in India

India’s focus is on reducing petroleum imports
Ethanol - Current Situation

• In a notification dated Jan. 21, 2013, the Ministry of Petroleum and Natural Gas (MoPNG) required oil marketing companies (OMCs) to achieve E5 blending across the nation by June 30, 2013

• Furthermore, to ease the burden of the OMCs, the government amended the mandate from E5 to "an average of 5 vol% of ethanol in total gasoline sold in the country"

• Under this notification, ethanol blends level may vary subject to a maximum of 10 vol% ethanol (E10) as per the Bureau of Indian Standards gasoline specifications.

• Further in 2015, the government decided to increase ethanol blending level from 5 vol% to an average of 10 vol% of ethanol in total gasoline consumption in India

• The achieved blending remains significantly below the 5% target because the government restricts ethanol use for fuel to domestic supply combined with demand from other sectors and a fixed pricing mechanism

• Draft of New National Policy on Biofuels, dated Nov. 22, 2017 amended ethanol content to 20 vol% in total gasoline sold in the country by 2030.
• The demand for fuel ethanol has been increasing significantly and moved toward 20 Mbbl/d in 2016…
• … but still has only reached a market penetration of 3.5%
• In contrast, domestic supply of ethanol has remained essentially flat
India’s Sugarcane Production

- Sugarcane production has been increasing because of improved yields in the state of Maharashtra and Uttar Pradesh, the two largest sugar producers in India
- Production is expected to continue trending upwards, but at a relatively low rate of increase

Source: Stratas Advisors, Indian Sugar Mills Association
Evolution of Ethanol Prices in India

• August 2010: INR 27 / liter ex-factory price
• November 2012: the central government decided to have market determined price for fuel ethanol, on the basis of tenders between buyers and sellers of fuel ethanol.
• December 2012 – November 2013: INR 32 / liter ex-factory price
• December 2013 – November 2014: Average basic price of INR 38 / liter
• December 2014 – November 2016: INR 48.50 – INR 49.50 / liter depending on transportation charges
• December 2016 – November 2017: INR 38.97 / liter exclusive of tax and transportation charges
• December 2017 – November 2018: INR 40.85 (US$0.6327) / liter exclusive of tax and transportation charges
• In the past India has imported some ethanol, but the amounts have been relatively small

• Furthermore, the imports have been related to industrial ethanol because the Indian government did not allow imported ethanol to be used in fuel blending
Biomass-based Diesel - Current Situation

- In August 2015, the government ordered the OMCs to start blending 5 vol% biomass-based diesel in high speed diesel
- On Nov. 22, 2017, the draft of New National Policy on Biofuels which include 5 vol% of biomass-based diesel in diesel by 2030 was announced

- Biomass-based diesel blending has only been mandated after about 10 years since biofuel
- The tender of 20 million liters of biomass-based diesel to be blended in fiscal year 2017-2018 has yet to close.
- Feedstock becomes a problem, traditional feedstocks i.e. vegetable oils attracts high import tax, and used cooking oils has yet to be effectively utilized
- Tax on biomass-based diesel includes 18% GST and 6% excise duty.
Negligible volume of biomass-based diesel blended with high speed diesel

....Supply met demand, no imports of biomass-based diesel noted, small volume of exports
Future Outlook and Challenges

Feedstock availability is the largest obstacle
Production Outlook for Ethanol

The production of ethanol is expected to increase in the short-term…

…but to plateau after 2021 because of the constraints associated with availability of feedstocks

It will be difficult to increase ethanol production without significant growth in synthetic and cellulosic ethanol production plants

Source: Stratas Advisors
Constraints of Ethanol

• The supply of fuel ethanol supply has been the major constraint in meeting the ethanol mandate of E5 across the country

• Ethanol blending levels have always been dependent on supply availability and have yet to reach overall 5 vol% since 2007

• The difficulties of sourcing fuel ethanol lies in several challenges
  • Limited molasses availability for ethanol production
  • Limited ethanol production capacities with the sugar industry/distilleries
  • Production of ethanol is currently limited only in few sugar producing states
  • Difficulties in inter and intra state movement of ethanol due to state specific issues such as delay in excise permissions, imposition of import/export duties and taxes
  • Limited ethanol storage capacity with distilleries and oil marketing companies
Production Outlook for Biomass-based Diesel

- Production is expected to increase following the new biofuels mandate
- … but will not meet the mandated demand due to limited feedstock
Constraints of Biomass-based Diesel

- Limited feedstock available:
  - Vegetable oils attract high import taxes, but domestic veg. oil production is not sufficient
  - Used cooking oil are difficult to collect → logistics issue
  - Non-traditional feedstock i.e. algae is still in research stage
  - High potentials of waste resources, but high capex to build bio-refinery/advanced biomass-based diesel plant

- The National Green Tribunal has mandated all public transportation run on diesel to switch to natural gas/biogas
- Biogas production from waste is encouraged
- Kerala State Transport Corporation (pioneer of biomass-based diesel usage) plans to switch all buses to run on natural gas by 2021
- Shift to natural gas and/or electric will likely damp the demand of biomass-based diesel in the long term
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