Summary and Policy Recommendations

Emerging from the

Symposium on Biofuels & Bioenergy

and

Roundtable Meeting on How to Enhance Biofuels Availability

Organized by

PETROFED

Petroleum Federation of India

May 11, 2016


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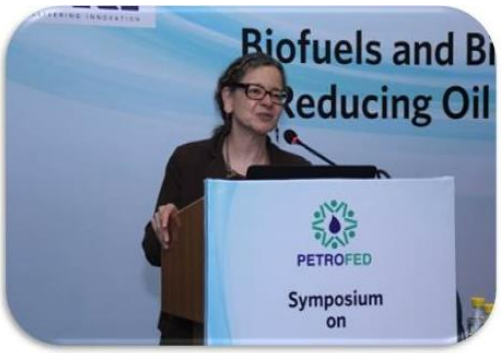
SECRETARY
MoP&NG


Biofuels and Bi
Reducing Oil
PETROFED
Symposium
on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on


Symposium
on
Biofuels and Bioenergy: Enablers for
Reducing Oil Import Dependence
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Summary of the Symposium on Biofuels & Bioenergy

Biofuels are being looked upon as an attractive alternative transport fuel amidst India's growing oil demand and energy security concerns. Though Indian government has announced various policy initiatives in the past to promote biofuels, yet the biofuels program has not attained its full potential attributed to various factors including feedstock availability, accessibility and affordability.

To deliberate on these critical issues, PetroFed organized one day Symposium on 'Biofuels and Bioenergy: Enablers for Reducing Oil Import Dependence' on May 11, 2016 at the India Habitat Centre, New Delhi. To further suggest the suitable policies and to design strategies for maximization of biofuels availability in the country, PetroFed also organized a focused roundtable meeting **'Way-forward for Enhancing Biofuels Availability'** on the same evening.

In this symposium during the day, the Hon'ble Minister for Petroleum and Natural Gas Shri Dharmendra Pradhan shared that India will achieve 5% ethanol blending target this year. Shri Pradhan said that minimum support price has been provided by the OMCs which can be extended to bioenergy. Hon'ble Minister emphasized that while India is a market for bioenergy related technologies, however the affordability is the key. Dr. V.K. Saraswat, Member NITI Aayog also stressed on the need for imbibing the new technologies for enhancing biofuels production while keeping the affordability and sustainability issues in mind.

In his valedictory address, the Secretary P&NG, Shri K.D. Tripathi said that the Government of India has taken various initiatives in coordination with academic institutions, on development & promotion of biofuels (ethanol & biodiesel). He further added that the long-term aspiration should be to

commercialize technologies for enhancing biofuels share in the energy mix through technological breakthroughs in advanced biofuels production. At the same time businesses should also step forward and be prepared proactively to evolve and adapt to the emerging change.

Dr. Jennifer Holmgren, CEO LanzaTech informed that sugar based molasses may not be sufficient for ethanol production in the long term for India. She suggested adoption of innovative technologies for recycling the waste to ethanol and for carbon smart future.

Some of the important suggestions made during the seminar are as follows;

- India's INDC commitments call for raising the bar on the status quo for greenhouse gas emissions amidst energy security and environment challenges.
- Investments, technologies (indigeneous) & policy are important pillars to make biofuels a reality in India.
- Integration of drop-in biofuels into existing refineries minimizes capex and offers many other benefits with reasonable payback periods.
- Renewable fuels definition should be extended to renewable hydrocarbons; energy content considerations should be deliberated.
- Challenges associated with biomass aggregation and supply chain need to be addressed.
- Many technologies are being proposed for India and it is high time that we bring in Life cycle Assessment (LCA) at technology selection stage.

The summary of the presentations made during the symposium is attached as **Annexure I**.

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Annexure I

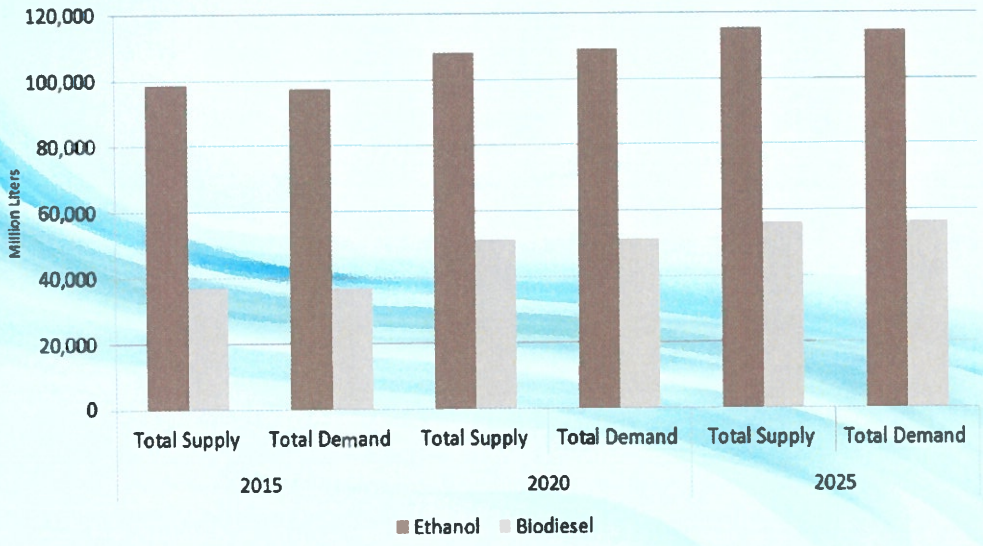
Summary

Symposium on
"Biofuels and Bioenergy: Enablers for Reducing Oil Import Dependence"

May 11, 2016
New Delhi, India

Global Supply and Demand 2015-2025

- Biofuels to account for 5.5 vol% of total fuel pool



Source: Stratas Advisors, March 2016

Inaugural Session

Sh. Dharmendra Pradhan, Hon'ble Union Minister of State (IC)
Ministry of Petroleum and Natural Gas, Govt. of India

- To meet growing energy needs; manage import bill and energy security, create new economy as a thinking society
- India has challenges to cope up with global developments & mitigate emissions
- Amidst growing fossil fuel based transportation and electricity need, there is need for a new economy model through new technology
- Synergize bioenergy to conventional energy market and develop India specific model

Sh. Dharmendra Pradhan, Hon'ble Union Minister of State (IC)
Ministry of Petroleum and Natural Gas, Govt. of India

- Technology should play an important role so that biofuels can play an important role in India's inclusive growth story
- India will achieve 5% ethanol blending this year, MSP have been given by OMCs, which can be extended to bioenergy
- Affordability & win-win for all should be the key
- India is a market for bioenergy & technologies
- Suggested PetroFed to come up with Specific recommendations for biofuels scale up policy interventions.

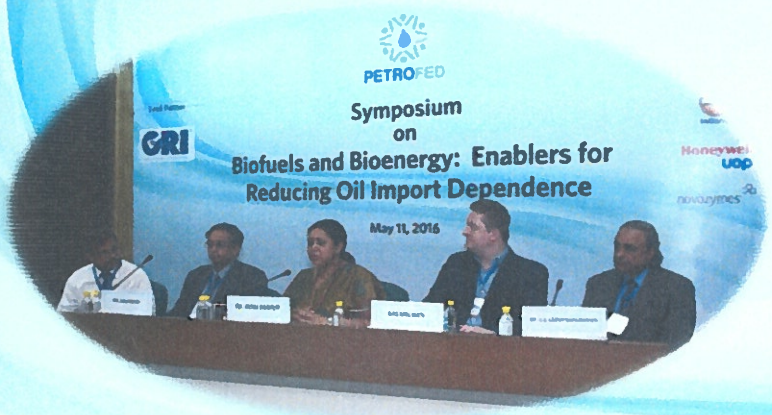
Dr. V. K. Saraswat,
Member, NITI Aayog

- Alternate fuel economy is the need for hour considering our growing energy needs & environmental constrains
- Need to imbibe new Technologies to enhance biofuel production
- Biomass need to utilised to full potential through both thermochemical/biological routes
- For Biofuels economy; price affordability and sustainability should be kept in mind
- Ensure a coordination and understanding between supplier and buyer for smooth implementation of biofuels program

Dr. Jennifer Holmgren,
CEO, LanzaTech, US

- Emphasised on the Circular economy
- Sugar based molasses may not be sufficient for ethanol production in long term for India
- Innovative technology for recycling for waste to ethanol & C smart future
- Change the way we think about carbon

Session I: Advanced Biofuels & Technologies



Session I

***Session Chair: Dr. Renu Swarup**, Sr. Adviser, DBT*

- Expressed need to expedite and expand the R&D efforts
- Challenges in infrastructure and technology
- Mission Innovation
- Challenges in promotion of technology and affordability
- Focused efforts need for demonstration to deployment of biofuels technologies to enhance the biofuels share in the energy mix

Dr. Anjan Ray, UOP

- India's INDC commitments calls for raising the bar on the status quo for greenhouse gas emissions amidst energy security and environment challenges
- Aviation biofuels are gaining momentum, EU & US are already moving in this direction.
- Significant investments would be needed for fuel storage, handling systems and vehicle design for adoption of first generation biofuels
- Drop-in hydrocarbon renewable fuels can address all of these challenges comprehensively; go beyond lipid and sugards
- Integration of drop-in biofuels into existing refineries minimizes capex and offers many other benefits with reasonable payback periods.

Mr. Bas Melssen, Novozyme

- Overview of Global Cellulosic Biofuels status
- Advanced Enzymatic hydrolysis as a key enabler of 2G biofuels, howeverAsia has glaring absence of commercial 2G facilities
- Highlighted on the Importance of policy support forbiofuels to be a reality through incentives to make it economically viably
- Advanced biofuels has potential to boost econoic activity & employment generation
- Investments, technologies (indigeneous) & policy are important pillar to make biofuels a reality in India

Dr. C. S. Laxmi Narasimhan, Shell Technology Centre

- Game changing technology for Hydrocarbon production from waste biomass *(100+feedstocks have been used)*
- Shared insights of innovative technology IH2 which can be integrated with refineries
- Renewable fuels definition should be extended to renewable hydrocarbons; energy content considerations should be deliberated

Mr. Mahesh Kulkarni, Manager, Praj Industries Ltd.

- Innovative Technology for bioethanol products production
- Well established Basket of Technologies emphasize on ethanol maximization
- Successful commercial use of technologies has been in place

Session II: Biofuels Experience, Challenges & Learnings

Session Chair: Ms. Varsha Joshi, JS (MNRE)

- Policies should ensure that biofuels initiatives are sustainable
- Synergy between suppliers and buyers
- Government is reviewing Biofuels policies to make it more robust.

Session II

Mr. Subodh Kumar,
IndianOil Corp. Ltd.

- Share Oil industry experience of biofuels implementation
- Success and Failures of biodiesel production from non-edible oil seeds
- Shared success story of Ethanol Blending Program in India
- Indian Oil is also working on Next Generation Biofuels - Ligno-cellulosic Ethanol and exploring Waste to Energy options.

Mr. P.K. Banerjee, SIAM

- Brought Auto Industry perspective and positive impact of ethanol
- Challenges in standardization and ethanol availability
- Brought into discussion commercial aspects of ethanol

Mr. R. K. Misra,
Indian Railways Organization
for Alternate Fuels

- Shared biofuels program and biodiesel trials in railways
- Due to limited availability, railways is also looking for own production plants
- Mandated 5% biodiesel in 16 divisions
- Biodiesel can play an important role for railways
- Plants for Waste to Energy have also been set up by Railways for Electricity generation

Session III: Advanced Biofuels & Technologies

Session Chair: Dr. Y. B. Ramakrishna,
Chairman, Working Group on Bio Fuels

Session III

Session Chair: Dr. Y. B. Ramakrishna,
Chairman, Working Group on Bio Fuels

- Tapping of renewable energy sources could help reduce the dependence on the import of crude oil.
- Ethanol could further help in substitution of transport gasoline, however we need innovative technologies and supportive policies suited for Indian needs.
- Challenges associated with biomass aggregation and supply chain need to be over comed.

Mr. Chris de Lavigne, KPMG Services Pte Limited

- Why there is still continued interest in biofuels?
- Shared project funding aspect, key criteria, risk assessment and pitfalls for a biofuel project to be funded.
- A successful project need to be technically, economically & Financially feasible.

Dr. Vibha Dhawan, TERI

- Micro-alge as a biofuel source
- Challenges in technology development and shared experience of photo-bioreactors and raceway ponds

Lt. Col. Monish Ahuja (Retd.), Punjab Renewable Energy Systems Pvt. Ltd.

- Experience for Development & maintenance of Energy Plantation, biomass aggregation and Supply Chain Management.
- This biomass model PRESPL enters into long term fuel supply agreement with clients with pre-decided price, schedule of supply, guarantying quantity and quality of fuel supply.
- Model has allowed the Engagement of local farmer community

Mainak Chakraborty, CEO, GPS Renewables

- AD (Anaerobic Digestion) technology using waste to generate 24x7 RE (Renewable Energy)
- **BioUrja** as name of initiative; A feedstock agnostic is an efficient option for conversion of waste to energy in urban/ rural setting.

Session-IV: How do we Maximize Ethanol Availability?

Dr. D. K. Tuli, DBT-IOC Centre for Advanced Bio-Energy Research

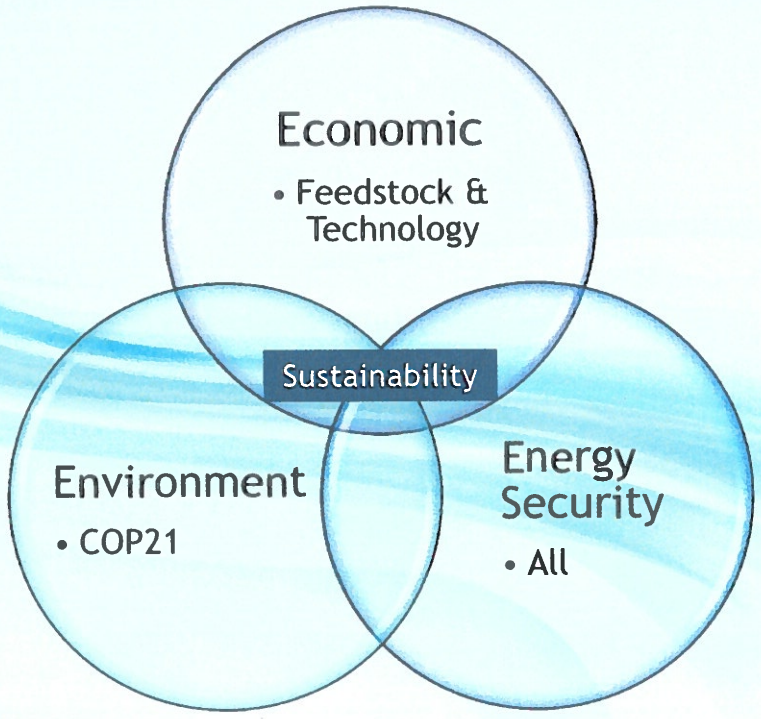
- Biofuels are promoted as an alternate to fossil fuels but more importantly for GHG reductions.
- All biofuels are not equivalent on reduction of GHG.
- US EPA has defined advanced biofuels in terms of their capacity to reduce GHG and all incentives are decided based upon this rating. India will also follow similar practices.
- Many technologies are being proposed for India and it is high time that we bring in Life cycle Assessment (LCA) at technology selection stage.
- LCA of some biofuel utilization practices will be discussed.

Mr. Vasudeo Joshi, Praj Industries Limited

- Shared Praj R&D capability and strengthen in ethanol leadership
- Smart distillery for 1st generation ethanol
- Infinity technology for ethanol production from variety of feedstocks
- Value maximization through SMART Biorefinery

Mr. S. R. Soni, India Glycols Limited

- 2G technology for ethanol production based of DBT-ICT lignocellulosic ethanol technology
- The technology will enable to maximize ethanol production from waste



Roundtable Meeting on How to Enhance Biofuels Availability

May 11, 2016

Recommendations Emerging from

Roundtable Meeting on

Way-forward for Enhancing Biofuels Availability

Roundtable Meeting Recommendations

The focused group roundtable meeting was chaired by Dr. Y. B. Ramakrishna, Chairman, Working Group on Biofuels, Ministry of Petroleum & Natural Gas, Government of India. Select national and international experts participated in the deliberations. The discussions were focused on the technology and policy enablers required to enhance the availability of biofuels in India.

The highlights of deliberations and key recommendations are as follows;

i) Incentivize Biomass Producers

Biofuels is a nascent industry and at threshold of moving to commercial scale in a big way. The consistent and sustained supply of biomass is essential for enhancing the bankability of biomass-based bio-energy and biofuel projects. The experts also deliberated on the associated challenges for biomass supply chain.

It was suggested to incentivize biomass owners and farmers (in the case of agricultural residues) through a direct benefit transfer model linked to utilization of such biomass for second generation biofuels production. Besides the potential pollution-related benefit by fostering second-generation biofuels, there will also be an increase in farmer income through sale of crop residues and likely improvement in arable land use through energy crops on marginal lands and short rotation crops on fallow lands.

The promotion of biomass related activities will lead to rural employment generation for the biomass aggregation, storage, handling and transportation value chain. The proficient supply chain will result in the

consistency of feedstock for biofuels projects as farmers are less likely to switch crop patterns, if they are consistently profitable.

ii) Impart Skills for Efficient Supply-Chain Management

An efficient biomass supply chain management is essential for biofuels program and maximizing their production. The experts reflected that since a well-organized biomass supply chain model is the key enabler for the development and sustainability of biomass based fuels. Thus, it is essential to share and impart the expertise inputs for the biomass supply chain Management.

iii) Promoting Waste-based biofuel's Feedstock

It was also proposed to extend this logic further to waste-based feedstock for biofuels. This can be applied to used cooking oil collection programs (through incentivizing households and small enterprises not to dump cooking oil residues into drains), landfill wastes (encouraging segregation, pay door-to-door garbage collection) and dung and poultry litter for biogas generation etc.

iv) Create Level Playing Field

One of the key points emerged during the discussions was related to the need for creating a level playing field across different types of bio-energy and developing a model (e.g. like the California low-carbon fuel standard) that gives weightage to greenhouse gas emission reduction, extent of fossil fuel replacement and its energy content.

At the same time, it was discussed that the model needs to be relatively simple and not distort markets. If a fixed price model is adopted, for example as has been done for sugarcane-based ethanol, it should be

reviewed at an agreed frequency based on agreed transparent parameters and criteria. Similar price setting can then be done using the same criteria for other fuels like biodiesel, Bio-CNG, biomass pyrolysis oil, renewable hydrocarbons etc.

v) 2nd Generation Bioethanol Projects

Second generation or advanced biofuels are being mooted as appropriate alternatives to address the challenges posed by the promotion of first generation biofuels. However, as biofuel industry is yet to mature, it may be challenging for the 2nd generation biofuel to emerge as a cost-effective alternative to fossil fuels without adequate subsidies and other policy incentives.

vi) Policy Support

The experts called for the requirement of policy certainty to boost the investor's confidence in addition to the inclusion of 2nd Generation Bio-ethanol projects under the 'Priority Sector'. It was also proposed that 2nd Generation Bio-Ethanol projects could be included under harmonized list of infrastructure sectors. (i.e. granted Infrastructure status).

vii) Promote Public-Private Partnerships

The experts opined that an active involvement of the private sector and public-private partnerships could help accelerate the penetration of second-generation biofuels, which may be essential to tackle the challenges of India's transport fuel security. Among various approaches to lend financial and technology support, mechanism like viability gap funding / technology partners for setting up projects or financial assistance from IREDA etc. were proposed by the experts.

viii) Expedite Environmental Clearance

2nd Gen Bio ethanol projects with zero liquid effluent discharge could be included under the "Orange Category" and the environmental clearance process could be expedited for faster implementation of the projects.

ix) Fiscal Incentives

The experts also suggested the extension of fiscal incentives availed by renewable energy projects as the same may also apply to 2nd generation bio-ethanol production projects. Some key recommendations included exemption from customs duty and excise duty for machinery and components during the setting up of the project or providing tax holiday.

X) Funding of the 1st Commercial Project

One of the key challenges associated with biofuels industry is financing of the first commercial project based on any new innovative technology. A sovereign guarantee on the first commercial project will help banks to fund the same. Such mechanism is already in practice in more than 20 countries. Hence, a suitable system needs to be evolved by the government of India.

xi) Taxation

On the taxation structure the experts suggested the removal of state levies on the inter-state movement of the bio-fuel. Additionally the administrative reforms at the state level, including digitizing the excise permit processes will ease the transportation and logistical requirements. It was also suggested that tax breaks should be proposed for the emission reduction technologies.

2. Key Recommendations

i) The 2nd generation biofuel production being capital-intensive and risk prone has long gestation periods, thus policy support in terms of time bound initiatives and framework will enhance the investor confidence.

ii) Biomass availability and sustainable supply is a requisite for a successful biofuels program. The experts suggested introduction of incentives and infrastructure for the collection of biomass feedstock will help to garner the feedstock owners interest and the same could be through the existing programs (eg. MGNREGA) developed by several federal and state ministries.

iii) To promote efficient utilization of biomass and capture social value of carbon by promoting second generation biofuels and devising a mechanism for the direct benefit transfer model linked to utilization of agri biomass for biofuels production as it will help creating interests of famers and biomass owners.

iv) Multiple technologies should be pursued. Legislation should be technology neutral and be based on desired outcome. The specific approach or technology should not be named; allow technologies to compete commercially after helping with first commercial.
