Development of Biofuels for the Indian Transport Sector: A Precursor to the Global Biofuel Alliance Launched During the G20 New Delhi Summit

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Abstract

The Indian government (GoI) during the G20 New Delhi Summit launched the Global Biofuel Alliance (GBA). The stated aim of this global alliance is to mainstream the utilisation of biofuels as alternatives to petroleum products for the global transport sector demand for final energy. To put the announcement of the GBA in a proper perspective, it is imperative to contextualise the GoI's initiatives from time-to-time to develop biofuels as alternative transport fuels. This study provides a comprehensive coverage of the various interventions in India by the central and state governments over the last two decades. Finally, it concludes that the recent achievements in biofuel development in the Indian context have resulted from concerted efforts for nearly two decades and represents a classic case of adopting the public policy stance of learning by doing.

Keywords: Global Biofuel Alliance, biodiesel, bioethanol, renewable energy, transport, India

1. Introduction

Biofuels in general refer to liquid or gaseous fuels derived from biomass. Among the bio-liquids, bioethanol and biodiesel are produced from various alternative edible or non-edible oilseeds and other biotic sources like sugar cane or cellulosic component of biomass. The Indian government (GoI), during the G20 presidency, launched the Global Biofuel Alliance. The stated aim of the alliance is to mainstream the utilisation of biofuels as alternatives to the petroleum products such

as petrol and high speed diesel. It also aims to encourage "technology advancements, intensifying utilization of sustainable biofuels, shaping robust standard setting and certification through the participation of a wide spectrum of stakeholders". In order to put the announcement of the GBA in a proper perspective, it is imperative to reflect on various initiatives of the GoI from time to time to develop biofuels as alternative transport fuels. In this context, this study provides a comprehensive coverage of the various interventions on behalf of the central and state governments over the last two decades.

It is noteworthy here that the road transport remains the dominant mode of transport compared to other modes such as railways, water and air transport and therefore accounts for the highest share in the total final energy consumed in the transport sector worldwide. Moreover, it is the petroleum products such as motor gasoline and high speed diesel (HSD) that remain the principal source of final energy for the world's road transport. The transition from the conventional to alternative fuels in the world's road transport requires – a) increasing the availability of alternative fuels, b) modifications in the present-day dominant spark-ignition and compression-ignition based vehicle technologies and c) the research and development of renewable alternatives and the compatible new vehicle technologies.

Road transport vehicles essentially use Internal Combustion (IC) engines such as spark-ignition (SI) engines and compression-ignition (CI) engines. Broadly speaking, these internal combustion engines drive the vehicle by first converting the chemical energy contained in the fuel into thermal energy and then utilising this thermal energy to perform mechanical work, which ultimately produces kinetic energy. However, these SI and CI engines differ significantly in how fuel combustion takes place initially. In SI engines, fuel is mixed with air before combustion takes place and the spark (i.e. high energy electrical discharge) finally initiates the combustion process. In CI engines, the air gets compressed during the compression stroke, and the fuel is injected into the cylinder. The fuel auto ignites as it gets mixed with the compressed air at a high temperature in the cylinder. Since the method of initiation and combustion in the case of SI and CI engines is different, the nature of fuels compatible for these vehicles technologies also differs in terms of their properties (Naber and Johnson, 2014).

Motor gasoline is used exclusively in SI engine-based vehicles. A wide range of alternative liquid/gaseous fuels are compatible with SI engines – liquid fuels include alcohols such as methanol, ethanol and butanol and gaseous fuels such as natural gas, biogas and hydrogen. Among the several properties, a fuel's octane rating is one of the important criteria for selecting fuel for these engines. The higher the fuel's octane rating, the greater its resistance to the pre-ignition (knock). Diesel, on the hand, is most commonly used in CI engines as it has higher cetane numbers which indicates the propensity of a fuel for auto-ignition. The alternative fuels for CI engines are liquid fuels such as biodiesel, Fischer-Tropsch (FT) diesel and Di-methyl ether (DME) and gaseous fuels such as compressed natural gas and hydrogen (Naber and Johnson, 2014).

An important attribute of biofuels – biodiesel and bioethanol is that since these can be processed to have suitable physical and chemical properties, they are suitable as blends in high speed diesel (HSD) and motor gasoline (MG) respectively with appropriate modifications in the internal combustion engines or as the principal fuel in flex-fuel vehicles. Research and development (R&D) efforts to encourage the production and use of biofuels in the transport sector have received global attention, especially in countries that import oil. The major driving force behind the acceptance of biofuels as an alternative transport fuel in such economies across the world has been that the feedstock can be produced domestically, thus reducing the dependence on imported crude oil and has the potential of increasing the resilience of the process of economic growth to oil shocks. Biotic resource use further assumes significance given their carbon neutrality as the carbon cycle of the earth's ecosystem recycles carbon dioxide back into the plant body, provided the biomass stock is maintained. One expects that such a development of biofuels would thus contribute to controlling global warming and abatement of climate change while supporting the economic development process. Besides economic considerations and environmental benefits, the value chain of organizing the production of biofuels promises social benefits in terms of developing an agro-based energy industry, thus creating employment opportunities and bringing rural development. Moreover, the oil marketing companies carrying out downstream operations in the oil industry find it easy to integrate these biofuels into their existing petroleum products supply chain across the country.

2. Indian Biofuels Initiatives: An Overview

In the backdrop of the growing global importance of biofuels as a renewable source of final energy in the transport sector and the potential benefits of promoting an agro-based energy industry for developing economies, the Indian government has encouraged biofuels domestically as part of its energy policy agenda since the early 2000s.

2.1 Committee for Development of Biofuels in India

On 18th July, 2002, the government constituted the 'Committee on Development of Biofuels' under Dr. D. N. Tewari as its chairman. Its report is called 'Report of the Committee on Development of Biofuels', finalised in April 2003. The committee recommended that in the case of bioethanol production, molasses - the by-product of manufacturing sugar from cane juice should serve as feedstock. The committee envisaged that 7 per cent bioethanol blending could be achieved and recommended scaling up to 10 per cent bioethanol blend in the fuel mix for the 10th Five Year Plan (2002-2007).

To increase the availability of domestically produced bioethanol, the committee also recommended producing ethanol directly from sugar cane juice, especially in the case of states where sugar cane production exceeds what is required to meet the demand for sugar. Given the skewed sugar mills capacity concentrated in the areas with acreage under sugar cane cultivation, the committee recommended that the feedstock for bioethanol production i.e. molasses, be allowed to move freely across states to meet the mandatory bioethanol blending targets. The committee also recommended the provision of incentives for encouraging investment in new distilleries and for the modernization of the existing sugar mills by integrating distilleries with them, permitting flexibility in the choice of feedstock i.e. molasses- or cane juice-based bioethanol given the prevailing market conditions (GOI, 2003).

So far as biodiesel is concerned, the committee proposed to set up a "National Mission on Biodiesel" to achieve a target of 20 per cent biodiesel blending in the high speed diesel by 2011-2012. The committee also suggested that the implementation of this mission be carried out in two phases:

Phase-I: The 1st Phase under this mission should be known as the 'Demonstration Phase' and should cover 5 years starting from 2003.

The committee believed that the government must be active during this phase so that biodiesel production becomes economically viable with all its essential forward and backward linkages. In this backdrop, the committee laid down the following four objectives for this phase:

(i) 'To lay down the foundation of a fast-growing and self-sustaining people and enterprise-driven biodiesel production program in the country'.

(ii) 'To produce enough feedstock for biodiesel production'.

(iii) 'To test, develop and demonstrate the viability of programme constituting components, and their cost-benefit including their forward and backward linkages'.

(iv) "To inform and educate the potential partici-pants of the programme".

With the aim of realising the above objectives, the committee suggested setting up 6 Micro-missions covering the various aspects of the different stages involved in biodiesel production. The aim of the first three among the proposed six micro-missions, namely "Micro-mission on Plantation on Forests Lands", "Micro-mission on Plantation on Non-forest Lands" and "Micro-mission on Plantation on other lands" was to encourage the plantation of shrub or tree-borne non-edible oilseeds such as jatropha/Pongamia pinnata across the country. The committee further recommended a separate nodal agency - Ministry of Environment & Forests, National Oilseeds and Vegetable Oil Development Board (NOVOD) and Ministry of Rural Development for the effective and smooth implementation of the three micro-missions respectively. The committee proposed a target of planting jatropha curcas on 4 lakh hectares comprising forest and non-forest land across the eight Indian states (namely Andhra Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Tamil Nadu, Tripura and Uttar Pradesh). In this context, the committee recommended that the under-stocked forest land area of about 2 lakh hectares in the size of 50,000 to 60,000 hectares be under jatropha cover in each state (namely, Chhattisgarh, Jharkhand, Tamil Nadu and Tripura). The Joint Forest Management Committees in these states should manage these plantations. The remaining 2 lakh hectares (comprising of non-forest land in the 50,000 to 60,000 hectares

range) should be from states such as Andhra Pradesh, Madhya Pradesh, Maharashtra and Uttar Pradesh (GOI, 2003).

The focus of the other three micro-missions, namely "Micro-mission on Procurement of Seed and Oil Extraction", "Micro-mission on Trans-esterification" and "Micro-mission on Research and Development" was to encourage participation in the activities such as procurement of jatropha oilseeds and extraction of raw oil, its processing for manufacturing biodiesel and the R&D efforts for improving oilseeds yield and recovery of biodiesel etc. The committee recommended Khadi and Village Industries Commission (KVIC), Ministry of Petroleum and Natural Gas (MoPNG) and the State Agricultural Universities, along with the public- and privately-funded research institutions, as the agencies for governing the implementation of these three micro-missions respectively.

Phase-II: During the 2nd phase of the mission, the committee envisaged that feedstock plantation and biodiesel production would become 'self-sustaining' and the government would be a facilitator instead of being a 'prime mover' as suggested under the proposed 1st phase of the mission. The committee proposed to launch the 2nd phase from the year 2007. The committee further sets a target of introducing 5 per cent blending of biodiesel in the high speed diesel consumed in the transport sector for the year 2005 and envisaged that the total quantity of biodiesel required for achieving 20 per cent would be available domestically by 2011-12 (GOI, 2003).

2.2 Measures prior to the announcement of the National Policy on Biofuels

Despite the committee's forward-looking recommendations confirming the prospects of biofuels – bioethanol and biodiesel for India, the biofuels sector development was marked by uncertainty, particularly for want of a national policy laying down the guidelines governing this sector and the objectives and targets of biofuels production and use are concerned. The committee's final report, placed before the Prime Minister's Office for approval in July, 2003, remained a 'draft report' for over five years, elevating the uncertainty regarding the prospects of biofuels in India before it was finally approved in September 2008 (Altenburg et al., 2009).

It must be noted here that the Ministry of Petroleum and Natural Gas (hereafter MoPNG), through a notification on 1st January 2004 published in "The Gazette of India" dated 9th January 2004, permitted the sale of motor gasoline blended with only 5 per cent bioethanol in the 14 districts of Andhra Pradesh (namely Chittoor, Cuddapah, Kurnool, Anantapur, Nellore, Nalgonda, Mahaboobnagar, Hyderabad, Adilabad, Nizamabad, Warangal, Karimnagar, Ranga Reddy and Medak), along with Tamil Nadu and the Union Territory (UT) – Pondicherry. Bioethanol-blended motor gasoline was to be introduced in these two states and the UT in January 2004. However, the MoPNG, in its notification dated 30th January 2004 published in The Gazette of India on 27th February 2004, put on hold the sale of blended petrol in Tamil Nadu and Pondicherry and even its spread was limited to 12 of the 14 districts of Andhra Pradesh as notified earlier (i.e. excluding Chittoor and Nellore). Subsequently, in the case of Tamil Nadu, the MoPNG did allow the sale of blended petrol, but it was limited only to the nine districts of the state (namely Coimbatore, Dundigul, Erode, Nilgiri, Tirunelveli, Ramnathpuram, Virudhunagar, Tuticorin and Kanyakumari). Further, the MoPNG permitted approximately three months i.e. from 14th April 2004 to 14th July 2004, for the successful implementation of the sale of 5 per cent ethanol-blended petrol in these selected districts.

On 27th October 2004, the ambit of the ethanol blending programme got extended by the MoPNG from the few selected districts of Andhra Pradesh and Tamil Nadu to other Indian states and UTs (namely, Goa, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Uttar Pradesh and Uttaranchal and the three Union Territories i.e. Daman & Diu, Dadra & Nagar and Chandigarh). The blended motor gasoline was to be sold subject to the conditions that (i) its price is comparable to the potential alternative uses and (ii) its price remains comparable to the import parity price for the location. Finally, it took another two years for the MoPNG to make the ethanol blending program national coverage. On 20th September 2006, the MoPNG directed the Oil Marketing Companies (OMCs) to market 5 per cent ethanol-blended petrol across the 20 states (i.e. excluding Arunachal Pradesh, Assam, Jammu and Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura) and 4 UTs (i.e. excluding Andaman and Nicobar Islands, Lakshadweep) from 1st November 2006.

To introduce 5 per cent biodiesel blending from 2005 in the county as recommended by the Committee on Development of Biofuels, the MoPNG announced its 'Biodiesel Purchase Policy' on 9th October 2005. As per the announced policy, the MoPNG initially fixed the price of biodiesel at Rs 25 per litre for six months, taking effect on 1st January 2006. Based on the consultations with the OMCs such as Indian Oil Corporation Limited (IOCL), Hindustan Petroleum Corporation Limited (HPCL) and Bharat Petroleum Corporation Limited (BPCL), the MoPNG identified 20 purchase centres across the 12 Indian states belonging to either of these three public OMCs where biodiesel manufacturers could sell their final product i.e. biodiesel for blending purposes (GOI, 2005).

According to the MoPNG, the biodiesel manufacturers in these states were required to register themselves with the designated purchase centres of the OMCs. It was mandatory that the manufacturer's plant capacity, its credibility and quality of biodiesel be certified before they could sell biodiesel to any of the designated centres. The MoPNG also directed that the biodiesel purchase price should be uniform at all biodiesel purchase centres (including any taxes, duties and transportation cost involved). However, the responsibility of testing the biodiesel brought to these centres was entrusted with the OMCs which were to make the necessary arrangements and bear the cost of the testing as well. Once fixed by OMCs, the uniform price of biodiesel would remain effective for six months, after which it was to be reviewed given the market conditions. The MoPNG also appointed the Petroleum Policy and Analysis Cell (PPAC) to monitor the OMCs' implementation of the Biodiesel Purchase Policy (GOI, 2005).

2.2.1 State-level Initiatives for Biofuels

Since agriculture is a 'State' subject in India, states such as Andhra Pradesh, Chhattisgarh, Karnataka, Tamil Nadu and Uttarakhand undertook several policy initiatives to encourage energy plantations for biodiesel production. In Andhra Pradesh, the government has been promoting the plantation of Pongamia pinnata since 2006. The Department of Panchayati Raj and Rural Development implemented the program, while the Rain Shadows Areas Development Department was responsible for policy formulation. The plantations are encouraged in the forest land managed by the Joint Forest Management Committees and since November 2006, the small and marginal farmers with agricultural landholdings of less than 5 acres have been allowed to participate in

the programme. The government provides subsidised seedlings and also reduced the value-added tax on biodiesel to 4 per cent (Altenburg et al., 2009; Raju et al., 2012).

In Chhattisgarh, the state government established the Chhattisgarh Biodiesel Development Authority (CBDA) in 2005 under the aegis of Chhattisgarh Renewable Energy Development Authority (CREDA). The biodiesel programme in the state encourages jatropha plantations on all types of land, such as forest land, revenue and common land, and private agricultural land holdings. The state government provided 500 seedlings free of cost; farmers must pay a subsidised rate of Rs 1 per seedling for the additional purchases. The state government encouraged private enterprises to set up biodiesel manufacturing units through subsidies and tax exemptions. In addition, the state government had plans to use the Straight Vegetable Oil (SVO) extracted from jatropha oilseeds to electrify as many as 500 villages unconnected to the grid. The CREDA took this initiative, which used the funding available under the Village Energy Security Programme of the Ministry of New and Renewable Energy. The CREDA developed plans to set up an SVO extraction unit for a group of five to six villages to supply the oil to the generators installed in each village for producing power (Altenburg et al., 2009).

On 9th March 2009, the Karnataka government announced its 'State Biofuel Policy' and besides jatropha, it also emphasised tree-borne oilseeds such as Pongamia, Neem, Simarouba and Mahua for biodiesel production. The biofuel policy encouraged plantations on dry and marginal land and wastelands across the state. In this regard, the State Revenue and the Forest Department were to identify the wasteland under the government or private ownership suitable for energy plantations. The collection of seeds is to be carried out by the 'self-help women's groups and local user groups' and private entrepreneurs will be encouraged to set up biodiesel-producing units in the state. The state government also established a Karnataka State Biofuel Development Board (KSBDB) under the chairmanship of the Hon'ble Chief Minister of the state for the implementation of the biofuel policy. The State Task Force on Biofuel, established on 12th October 2009, was to perform an advisory role for the state government and the KSBDB (GoK, 2009; Raju et al., 2012).

In 2004, the Tamil Nadu government launched its biodiesel programme under which it decided to finance nurseries for raising and distributing about 30 million jatropha seedlings to farmers and panchayats free of cost. The state government developed an input-based monitoring mechanism that could ensure the distribution of seedlings, but the actual plantations of these seedlings could not be ensured owing to a lack of monitoring. Moreover, on account of the low survival rate of jatropha seedlings and the requirement of intensive use of agricultural inputs such as manure, fertilisers and water for irrigation, thus involving higher expenses in the maintenance of jatropha seedlings farmers began to give up jatropha plantation. Finally, the state government discontinued the practice of distributing subsidised jatropha seedlings by the year 2006. However, the newly elected state government in the year 2006 reintroduced the biodiesel programme under which instead of supplying jatropha seedlings for free of cost, it decided to offer a subsidy of Rs 1.5 per seedling to all the nurseries managed by self-help groups (SHG), non-governmental organisations (NGOs) and the Tamil Nadu Agricultural University (TNAU). It is found that farmers depending on their size of agricultural land holdings had a different incentive for undertaking jatropha plantation. Small and marginal farmers carried out boundary plantations (or plantations on fences or hedges) as an additional source of income, whereas rich farmers with large landholdings opted for block plantations. The absentee landlords were willing to undertake jatropha plantations on their land to avail themselves of the benefit from tax rebates only. Further, the state government to encourage the uptake of jatropha seedlings and extraction of straight vegetable oil (SVO) exempted jatropha oilseeds from any purchase tax and no value-added tax was levied on SVO (Altenburg et al., 2009).

In 2004, the Uttarakhand biodiesel programme was mainly driven by creating employment opportunities and rehabilitating the degraded forest land as the state experienced high unemployment rates and thus out-migration of people in the search for livelihoods. The state planned to carry out jatropha plantations on approximately 2 lakh hectares of forest land until 2012. The state government also established the Uttarakhand Biodiesel Board (UBB) which oversees the state's biodiesel programme and provides necessary training while monitoring the jatropha plantation activities. Besides utilising the funds from the National Oilseeds and Vegetable Oil Development (NOVOD) Board and the Department of Land Resources under the aegis of the Ministry of Rural Development

and various central government-sponsored schemes (such as Swaran Jayanti Gram Swarozgar Yojana and the Village Energy Security Programme, the UBB also receives financial assistance from the state along with the private biodiesel manufacturers for fulfilling its responsibilities (Altenburg et al., 2009).

In 2007, the Odisha government formulated the policy guidelines for 'Raising Energy Plantations and Biodiesel Production' covering ten years. The Science and Technology Department of the Odisha government estimated the total biodiesel production potential in the state at 14,000 kilo litres (KL) per annum. The biodiesel programme had plans to cover 30 per cent of the state's total wasteland for jatropha plantations (RCDC, 2011). The main objectives of the biodiesel policy of the state are as follows:

(i) "To put barren, uncultivated and fallow land of the state into effective use through raising energy plantations".

(ii) "To enable the poor and disadvantaged people of the society to take up cultivation of oilseed bearing trees".

(iii) "To enable interested and eligible entrepreneurs to set up biodiesel production plants".

(iv) "To provide suitable market linkage to biodiesel producers to sell their product and endeavour for a minimum support price".

(v) "To set up the quality control facilities to guide entrepreneurs to produce biodiesel conforming to the standards set by the Bureau of Indian Standards".

Orissa Renewable Energy Development Agency (OREDA) became the nodal agency for the biodiesel programme. The Orissa Forest Development Corporation (OFDC) was responsible for encouraging the cultivation of tree-borne oilseeds for biodiesel production in the state. The Orissa University of Agricultural Technology (OUAT) and Biju Patnaik University of Technology (BPUT) were to provide technological and scientific inputs for successfully implementing biodiesel production activities in the state. The Odisha government has also constituted a monitoring committee under the chairmanship of the Chief Secretary for the appraisal of biodiesel-related activities as per the

policy guidelines and for providing the necessary information to the state government every quarter (RCDC, 2011).

2.3 National Policy on Biofuels, 2009

The Ministry of New and Renewable Energy (MNRE) announced the National Policy on Biofuels in December 2009, after the Cabinet Committee approved it on 23rd July, 2009. This reaffirms the commitment of the Indian government towards developing biofuels, putting at rest the uncertainties around this emerging sector. This policy attempts "to facilitate and bring about optimal development and utilisation of indigenous biomass feedstocks for producing biofuels" (GOI, 2009). The policy announcement and its provisions would play a crucial role in addressing the concerns of the different stakeholders, which is essential for their participation and attracting the required flow of investment for the various stages involved in the biofuel value chain.

The MNRE in its resolution vide dated 7th May, 2010 published in the Gazette of India dated 16th August, 2011 and its office memorandum vide dated 7th May, 2010 set up a National Biofuel Coordination Committee (NBCC) under the chairmanship of the Hon'ble Prime Minister with the purpose of providing "overall coordination, effective end-to-end implementation and monitoring of biofuel programmes" in the country. It also sets up a Biofuel Steering Committee (BSC) under the chairmanship of the Cabinet Secretary "to provide effective guidance and to oversee implementation of the policy on a regular and continuing basis".

The Indian biofuel policy has set the target of achieving 20 per cent blending of biofuels, both for bioethanol and biodiesel for 2017. In the case of biodiesel, the proposed target is "recommendatory" in nature, whereas since October 2008, the intermediate target of 10 per cent bioethanol blending remains mandatory. It is important to note here that the biofuel policy focuses on using indigenous non-food biomass sources as feedstocks for producing biofuels. It thus forbids any import of free fatty acid (FFA) oils for biodiesel production in the country and even the import of biofuels – bioethanol and biodiesel are subject to the approval of the "National Biofuel Coordination Committee (NBCC)" and that too for meeting the required blending targets only. The imported biofuels are also subject to duties and taxes, so they don't compete with domestically produced biofuels. Further, the export

of such fuels is allowed only after the domestic blending requirements has been met and the approval of the NBCC is also mandatory in such cases (GOI, 2009).

India is a world's leading producer of sugar cane and sugar cane cultivation is being practiced by Indian farmers across several states. Consequently, India has a large industrial base of sugar mills that manufacture sugar from cane juice. Molasses is the by-product of sugar from cane juice and serves as an intermediate input for distilleries producing potable alcohol and hydrous ethanol for industrial use in the chemical industry, pharmaceuticals, etc. The biofuel policy encourages molasses as feedstock for bioethanol production and to further augment the domestic availability of bioethanol for blending purposes, has allowed its production directly from the cane juice subject to the condition that "it does not in any way create supply constraints in production of sugar or availability of ethanol for industrial use".

Unlike sugar cane, the plantation of shrub and tree-borne non-edible oilseeds are not currently practiced by the Indian farmers. Though several edible oilseeds such as groundnut, nigerseed, rapeseed and mustard, safflower, sesamum, soybean and sunflower are being produced by Indian farmers, but the Indian government can't afford to divert these for biodiesel production since their domestic demand exceeds their domestic production making India a net importer of edible oil. The Indian biofuel policy promotes using non-edible shrub/tree-borne oilseeds cultivated in the "government/ community wasteland, degraded or fallow land in forest and non-forest areas" for biodiesel production.

One of the fundamental challenges in ensuring domestic production and availability of biodiesel for blending purpose is establishing the biodiesel value chain in the states with the potential availability of wastelands for such energy plantations. The national biofuel policy aims to address the problem of the availability of feedstocks by announcing minimum support prices (MSP) for such non-edible oilseeds, with the provision that they will be revised periodically to ensure fair returns to farmers. Since the energy plantations and the harvest of oilseeds is expected to be labour intensive in nature, the biofuel policy extends the coverage of the "National Rural Employment Guarantee Scheme (NREGS)" to include such activities. Further, the government plans to encourage private participation in oil extraction and biodiesel

processing units which can procure the oilseeds produced in the surrounding areas. The government also plans to promote the Gram/ Intermediate Panchayats to set up oil extraction units, which can then sell the raw extracted oil or Straight Vegetable Oil (SVO) to the nearby biodiesel processing units (GOI, 2009).

To provide financial support to the stakeholders across the different stages of biofuel value chain, the government plans to declare the biodiesel sector "as a priority sector for the purpose of lending by financial institutions and banks". The energy plantations by farmers will be supported by the "National Bank of Agriculture and Rural Development (NABARD)" and institutions such as "Indian Renewable Energy Development Authority (IREDA)", "Small Industries Development Bank of India (SIDBI)", other financing agencies and commercial banks will also be encouraged to extend funding to this sector. It is noteworthy here that excluding energy plantations, the government also plans to approve foreign equity to the extent of 100 per cent through an automatic approval route to attract foreign capital in the biofuel-related technologies and projects, subject to the condition that the total quantity of biofuels produced is meant for the domestic market only. The domestic biodiesel production is not subject to any excise duty and the government has allowed a concessional excise duty of 16 per cent for bioethanol. There are plans to provide custom and excise duty concessions "on plant and machinery for biofuel production, including for engines that are run on biofuels for transport, stationary and other applications, if these are not manufactured indigenously" (GOI, 2009).

To encourage investment in suitable biofuel production units across the country, the government will announce the "Minimum Purchase Price (MPP)" for both – bioethanol and biodiesel. The Biofuel Steering Committee (BSC) has been assigned the responsibility of setting MPP for these fuels, which will be announced after they have been duly approved by the NBCC. The MPP for biodiesel is to be calculated after considering various stagesof biodiesel value chain i.e. from oilseeds production till the marketing stage and relative to the prevailing high diesel price in retail. For bioethanol, the MPP is to be determined considering the cost of production and imported price of bioethanol. The OMCs have been assigned the responsibility of storage, distribution and marketing of biofuels with the provision that if the petroleum

products (i.e. petrol and high speed diesel) price fall below the MPP fixed for bioethanol and biodiesel respectively, the government would duly compensate them for the difference (GOI, 2009).

2.4 National Policy on Biofuels, 2018 and 2022

On 4th June 2018, the GoI replaced the "National Policy on Biofuels, 2009" with a new policy referred to as National Policy on Biofuels 2018. As per this policy, despite the mere 2.0 per cent blending of bioethanol and even less than 0.1 per cent of biodiesel blending being achieved till date, the GoI proposed an "indicative target" of achieving 20 per cent bioethanol blending and 5 percent biodiesel blending by the year 2030 (GOI, 2018). Besides the blending targets, the GoI also "established guaranteed pricing, long-term ethanol contracts, technical standards and codes and financial support for building new facilities and upgrading existing ones" (IEA, 2023). One of key initiatives of the National Biofuels Policy 2018 further amended on 18th May 2022 has been to even "advance the bioethanol blending target of 20 per cent in petrol forward by 5 years from the initial timeline of 2030".

3. Concluding Remarks

Against the above backdrop, it must be noted that the recent achievements in biofuel development in the Indian context have resulted from concerted efforts for close to two decades. It's a classic case of adopting a public policy stance of learning by doing, wherein an instrumental role is of the "coordinated policies, high political support" along with the potential availability of feedstocks to make it a reality.

References

Altenburg, T., Dietz, H., Hahl, M., Nikolidakis, N., Rosendahl, C., & Seelige, K. (2009). Biodiesel in India: Value chain organisation and policy options for rural development Bonn, Germany: German Development Institute (DIE).

GOI. (2003). Report of the Committee on Development of Biofuel. Planning Commission, Government of India.

GOI. (2005). Biodiesel Purchase Policy. Ministry of Petroleum and Natural Gas (MoPNG), Government of India.

GOI. (2009). National Policy on Biofuels. Ministry of New and Renewable Energy, Government of India.

GOI. (2018). National Policy on Biofuels. Ministry of New and Renewable Energy, Government of India.

GoK. (2009). Karnataka State Bio-fuel Policy. Bengaluru, Karnataka: Government of Karnataka

IEA (2023). Biofuel Policy in Brazil, India and the United States: Insights for the Global Biofuel Alliance, International Energy Agency

Naber, J. D. & Jonhson, J. E. (2014). Internal combustion engine cycles and concepts In R. Folkson (Eds.) Alternative Fuels and Advanced Vehicle Technologies for Improved Environmental Performance: Towards Zero Carbon Transportation, Woodhead Publishing, Elsevier.

Raju, S. S., Shinoj, P., Chand, R., Joshi, P. K., Kumar, P., & Msangi, S. (2012). Biofuels in India: Potential, Policy and Emerging Paradigms. Policy Paper. National Centre for Agricultural Economics and Policy Research (NCAP). New Delhi.

RCDC. (2011). The Biofuel Policy: Global Trends with Impact in Odisha. Bhubaneswar, Odisha: Regional Centre for Development Cooperation.