

3rd Edition

# CHEMICAL INDUSTRY OUTLOOK 2023

## India@75

### Looking Back, Looking Ahead

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# BIOENERGY SCENARIO IN INDIA @2047

**Bioenergy triggers carbon neutral cycles, as carbon absorbed by the plants from the atmosphere during photosynthesis is released during combustion of biofuels**



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Year 2047 will mark the centenary of India's independence from British colonial rule. This momentous occasion provides us an opportunity to reflect upon some daunting challenges and glorious achievements over the past 100 years. As a nation, we are striving hard to realize the Prime Minister's vision of becoming the 3rd largest economy in the world and a developed nation by 2047.

Energy is the growth engine for the economy and India has set a target to be energy self-sufficient by 2047. India's energy demand is expected to increase on the back of growth in infrastructure, industry, and transportation. With a population of over 1.4 billion and growing, India is the world's third-largest energy consumer as well as greenhouse gases (GHG) emitter, after China and the United States.

During the COP26 climate change summit in Glasgow, India announced a net zero target of 2070. India is perhaps the only nation in the G20 group on course with its nationally determined contributions (NDCs), as committed in COP21 Paris climate change summit. Energy transition has emerged as the most promising pathway in the race to zero campaign. India's energy mix, dominated by imported

fossil fuels, is undergoing change with renewable energy sources making strong inroads. Bioenergy with its positive social, environmental, and economic impact on a nation's growth, is playing an important role in the energy transition.

Bioeconomy is knowledge-based production and use of biological resources to provide products, processes, services & energy in all economic sectors within the frame of a sustainable economic system. As reported by BIRAC's (Biotechnology Industry Research Assistance Council) Bioeconomy Report 2022, bioeconomy in India has grown to the size of more than US \$100 billion with bioenergy as one of the budding areas. Bioenergy is the mainstay of bioeconomy.

Bioenergy is a sustainable source of energy that can be produced using natural resources such as agri-based biomass. Bioenergy utilizes biological resources, available in abundance to generate wealth in the form of biofuels and bio-chemicals from what otherwise would have been agricultural waste. Bioenergy triggers carbon neutral cycles, as carbon absorbed by the plants from the atmosphere during photosynthesis is released during combustion of biofuels. Besides helping conserve the environment, Bioenergy positively impacts society and economy. While helping curb GHG emissions, it helps create jobs in rural areas.

Any nation's growth strategy is built on the strength of the resources they possess. India is blessed with ample sunshine, huge agricultural land and abundant bio-based feedstock that it must leverage. India has a distinct advantage of plentiful sugary, starchy, and lignocellulosic feedstock. Deploying these biobased feedstocks



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for production of biofuels is helping mainstream Bioenergy in India's energy portfolio. The unique aspect of bioenergy is it offers farmers an additional revenue stream by selling agricultural waste as feedstock for the bioenergy plants. These include among others rice straw, wheat straw, cotton straw, bagasse, etc.

Flourishing biofuels industry has developed a resilient ecosystem across the value chain; from backward integration of the feedstock supply chain to forward integration of biofuel take-off and dispensing to end users. Robust industry ecosystem comprises developers, technology providers, financiers, government bodies, industry associations, and academic Institutions.

One of the unique aspects of India's growth story in biofuels is its strong capability in developing and deploying home-grown innovative technology. India has a network of state of the art R&D facilities in industrial biotechnology and a pool of highly qualified technologists. Scientists work on cross functional technology advancements to develop innovative solutions that are capable of processing a diverse variety of feedstock efficiently. Technology plays a critical role as a game changer by facilitating commercial viability of biofuel plants on a continuous basis. The captive technology solutions comprise of well-proven traditional biofuels using 1G technology, rapid commercialization of advanced biofuels such as 2G ethanol, CBG, etc. and development of future fuels like Sustainable Aviation fuel (SAF), Marine biofuels and Bio-hydrogen, etc. Technology is helping optimize energy, utility, and carbon footprint of biofuel plants thus making them competitive.

Undoubtedly, the government's progressive strategic interventions from time to time have played a key role in helping grow the biofuels industry. India's spectacular achievements in the Ethanol Blending Programme (EBP) are attributable to a number of strategic policy interventions, starting with the inception of 5% Ethanol blending in 2003. Major breakthrough came in the form of introduction of the National Biofuels Policy in 2018. Expanded



range of feedstock, upward revision of pricing of biofuels, financial support for setting up production capacities have helped leapfrog industry. Inclusion of starchy feedstock for Ethanol production in 2020 has helped ethanol production across the country giving a fillip to EBP. Further induction of progressive policy namely, Sustainable Alternative Towards Affordable Transportation (SATAT), for propagating use of Compressed Bio Gas (CBG) in transportation sector, has fortified the future of biofuels in India.

Transportation sector is the second largest consumer of energy and emitter of GHGs after industry. Decarbonization of the sector as climate action, is not a matter of choice but an imperative and EBP has emerged as a very promising pathway. India achieved E10 blending mandate five months ahead of its target last year. India is progressing well as per NITI Aayog's five-year roadmap for E20 and in fact the target has been advanced by 5 years to 2025 from 2030. In yet another significant move, the Government of India has launched E20 blended petrol in major cities starting February 2023. This is a clear indication of growing propagation of ethanol blending programs. Automakers are also ready with their E20 material compliant cars which are to be delivered from April 2023.

Success of EBP has made a

multifaceted socio-economic impact for India. India is heavily dependent on imported crude oil and has a huge forex outgo that contributes to current account deficit. According to the statements issued by the finance ministry, ethanol blending of 10% has resulted in reduction of crude oil import and corresponding foreign exchange savings of Rs. 41,000 crore. It has also facilitated India's energy security besides helping increase the farmers' income.

The Union Budget 2023 has laid a strong emphasis on green growth during the Amrutkaal. Green growth encompasses energy transition, environmentally friendly agriculture, and sustainable energy in the country. GOBARdhan scheme envisaged for promoting circular economy has provision for setting up 200 'waste to wealth' compressed biogas plants and 300 community biogas plants at the outlay of Rs. 10,000 crore. One of the main highlights of the budget was the 'Green Hydrogen Mission'. Rs. 19,744 crore of total outlay was approved for National Green Hydrogen mission over the period which will be beneficial for development of bio-hydrogen technologies.

As per Biotechnology Industry Research Assistance Council (BIRAC)'s Bioeconomy report 2022, bioeconomy in India is projected to grow upto US



\$300 billion by 2030. On the back of a progressive policy framework, innovative home-grown technology, robust industry ecosystem and abundant bio-based feedstock, India's bioenergy sector is poised for a very promising future. During COP27 climate change summit in Egypt, while reiterating commitment to honouring GHG reduction as per Panchamrit agenda, India has reaffirmed the important role of biofuels.

Bio-Mobility platform denotes technology solutions for production of low carbon renewable transportation fuel from biobased feedstock for all modes of transportation namely surface, air and marine.

Bio-Mobility works in tandem with electric mobility in the form of hybrid vehicles that can run on Internal Combustion Engine (ICE) as well as electricity. During India Auto Expo held at Delhi in January 2023, leading auto OEMs i.e. Toyota, Maruti Suzuki, etc. launched flex fuel hybrid vehicles. Flex fuel hybrid vehicles can run on the ethanol blend varying from 20% up to 85%. Flex fuel policy

is in offing and major OEMs are working to introduce new models. This is expected to augment demand for ethanol beyond E20. Diesel consumption in India is over three times that of gasoline. Technology is being developed for blending ethanol in diesel, which would increase demand further with huge savings in crude oil import.

While mitigating GHG emissions from road transport, there is also a need to decarbonize the aviation sector. Globally the civil aviation industry generates around 2 to 3% of total global emissions. To limit global warming to 2 degree centigrade, it is imperative to decarbonize this 'hard to abate' aviation sector. The International Civil Aviation Organization (ICAO) adopted the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) to address CO2 emissions from international aviation. Under CORSIA guidelines, airlines and other aircraft operators will offset any growth in CO2 emissions above 2020 levels. CORSIA mandatory stage begins in 2027, where SAF is considered a priority solution to decarbonize aviation. Similar guidelines are expected to regulate the

emissions in marine transportation, where marine biofuels will play a major role.

Circular economy has emerged as a very promising pathway for energy transition. A circular economy is a model of production and consumption, which involves reusing, repairing, refurbishing and recycling existing materials and products for as long as possible. This calls for the use of sustainable materials and chemicals that operate on a shorter carbon cycle. Renewable chemicals and materials derived from biological resources provide a very promising solution in this regard. For instance, the world is struggling with plastic menace as it is non-biodegradable and adversely impacts biodiversity. Bioplastics that are made from agricultural resources are low carbon in nature and therefore seen as alternatives for single use plastic.

Bioenergy is an important element in addressing climate change, securing energy supply, and providing inclusive growth. Bio-economy encompasses 11 of 17 SDGs defined by UNFCCC in 2016 and bioenergy as the mainstay of bio-economy has a pivotal role to play. With growing adoption of biofuels like ethanol, CBG and inclusion of SAF and marine biofuels, India can certainly achieve energy independence by 2047. By focusing on technology innovation, policy support, infrastructure development and public awareness, India can become a leader in the bioenergy sector and contribute significantly to the global transition towards a low-carbon economy by 2047. ■

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