



WORLD BIOGAS ASSOCIATION

Market Report



In association with



INVEST INDIA
NATIONAL INVESTMENT PROMOTION
& FACILITATION AGENCY

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Introduction

India this year will become the world's most populous country and is set to become one of the world's leading economies by 2050. As such, India will play a decisive leadership role in the fight against climate change. India has recognised and embraced this, developing the blueprint for a net zero economy for itself and other emerging economies to follow.

This blueprint is set to deliver a number of key targets and commitments. India seeks to be energy independent by 2047 and a net zero economy by 2070. The country also made a commitment at COP26 to achieve by 2030 a renewable energy capacity of 500GW

and reduction of carbon emissions of ~1bn tons (all tons are metric). At COP27 it made a further commitment to focus on rationalising the natural resources at its disposal to achieve this.

Bioenergy is the key to enabling India to deliver on its Nationally Determined Contributions. Bioenergy includes a suite of biomass-based energy sources, including biofuels (ethanol), biogas, bioCNG, bioLNG, biodiesel, biohydrogen and briquettes/pellets. All have a critical role to play.

Under the leadership of PM Modi India is backing bioenergy in its programme to build a secure, sustainable and resilient economy. As the world's most populous nation and an agricultural powerhouse,

India has abundant supplies of biomass to deliver across the bioenergy value chain. Available biomass is estimated at over ~1,000 MMT (million metric tons) a year¹.

The modern biogas industry in India has been growing since the 1980s, primarily driven by decentralised model using cattle manure in rural areas, and subsequently programmes for Energy Recovery from Municipal/Urban, Industrial and Agricultural Wastes. In recent years, however, there has been a further push for anaerobic digestion technology to be deployed across the economy, in support of India's climate and energy security goals.

Biomethane consumption, according to the International Energy Agency (IEA), in its energy outlook 2021, reaches 18 billion cubic metres a year (BCM/yr – equivalent to 15 million tons of oil equivalent (MTOE)) by 2040 under the country's current policy scenario (Stated Policies Scenario; IEA)².

As president of G20 this year, India set out to be "Inclusive, ambitious, action orientated". A key manifestation of this outlook was the launch of the Global Biofuels Alliance (GBA), to facilitate global cooperation, identify opportunities to collaborate, address the underlying challenges and intensify the use of sustainable biofuels.

Current Scenario

India's total annual energy demand is ~10,000 TWh³. Per capita use is ~7,000kWh- five to 10 times less than in Europe and the US, respectively⁴.

Energy use in India has doubled since the turn of the millennium, with demand being met primarily from coal (55.58%), oil (27.80%), gas (5.79%), hydro (4.54%), solar (2.47%), wind (1.81%), biofuels (0.31%), other (1.69%)⁵.

India's installed non-fossil fuel capacity has increased 150% over the last decade and stands at more than 179.322 GWh (including large hydro and nuclear), ~43% of the country's total capacity (as of July 2023).

At 9.93% India saw the highest year-on-year growth in renewable energy expansion in 2022. Installed solar energy capacity has increased by around 25 times over the same period and stands at 71.14GWh⁶.

There are over 5.1 million biogas plants installed in India⁷. The majority of these plants are household/community type plants of 1-25m³ biogas per day for meeting cooking fuel requirements. The total biogas generation capacity of these plants is ~4.43 million cubic metres per day (MCD) – equivalent to ~47 gigawatts or 3.2 BCM/yr.

Meanwhile, large urban waste to energy projects are producing biogas ~7,71,008 MCD; bio-CNG/CBG ~2,64,467kg/per day; and power (grid and off-grid) ~401.79MWeq⁸.

Biogas Potential

India has enormous biogas potential, arising from its status as the world's most populous country and as an agricultural powerhouse. Readily available feedstock volumes indicate the country could produce ~62MMT bioCNG (~86BCM/yr) enough to meet >9% of India's current energy demand. Compared to current bioCNG output of 3.2 BCM/yr, for the bioCNG sector to achieve its full potential by 2047 in support of India's drive to become energy independent would indicate a 14.70% CAGR.

Glossary of common terms

Throughout this report we refer to upgraded biogas as **bioCNG – bio-compressed natural gas**. This can be described as **RNG, renewable natural gas (US); biomethane (EU/UK); and in some instances, in India CBG, compressed biogas**.

All tons are metric tons.

The term **biofertiliser** is used in relation to the mineral-rich byproduct of biogas generation, often referred to as **digestate**.

Conversions

Rs. = rupees

1 Crore Rupees = US\$ 120,237

1 Lakh Rupees = US\$ 1,202

Fortune Business forecast market value to be \$2.25 billion in 2029, with a compound annual growth rate of 6.3% from today's \$1.47 billion⁹. However, that was made before the Government of India announced a raft of initiatives and incentives in support of biogas, with the target of achieving a 15% natural gas contribution to the energy mix by 2030.

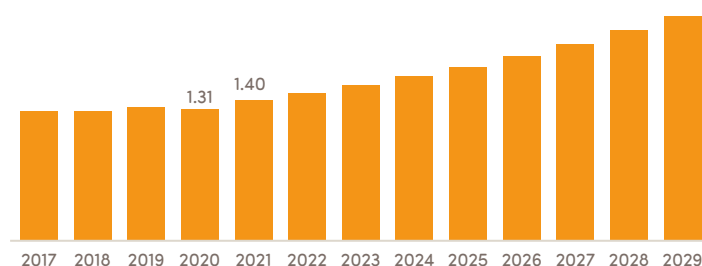
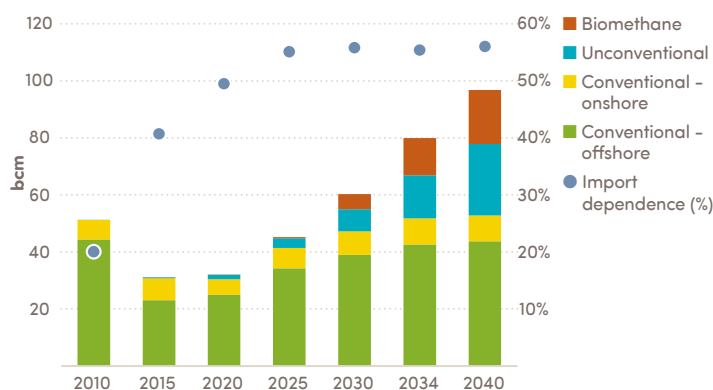


Figure 1: Prediction of Biogas Market growth as per Fortune Business

While projections show that other sources of gas will outweigh the use of biomethane over the next 20 years, biomethane is predicted to grow at the fastest rate. The IEA in its Energy Outlook for India underlines that India's long-term vision for gas needs to incorporate a growing role for biogas and low-carbon hydrogen, for which India has large potential.



A revival in offshore gas fields over the next decade helps bring production back to its historic 2010 peak; unconventional gas and biomethane lead growth in the 2030s.

Figure 2: Domestic gas production in India in the STEPS (Stated Policies Scenario), 2010-2040 (IEA's India Energy Outlook 2021)

Feedstock Potential

Agricultural and livestock waste, organic municipal solid waste generated in urban centres and sewage, are major potential feedstocks for producing biogas, as are pressmud (sugar industry waste), spent wash, waste from abattoirs, pulp and paper waste.

Crop and process residues

India is an agrarian economy leading to high agricultural waste in the form of a crop and process residues.

A 2018 study undertaken by the Indian Agricultural Research Institute and TIFAC (Technology Information Forecasting and Assessment Council) found agricultural activities produced 693 MMT of dry biomass from 195 million hectares of gross cultivated area, with an estimated surplus of 179 MMT not already being used domestically.

The common practice in some states is to burn the surplus crop residue which has led to serious issues with air quality, especially in Delhi, where pollutants, such as black soot and carbon, can be ten times greater than the World Health Organisation recommended permissible level – at 98 micrograms per m³ as opposed to 10 µg/m³¹⁰. These practices contribute to India's poor air quality, causing serious health problems, estimated to cost ~\$36.8bn annually in terms of health problems and economic disruption¹¹.

Manure

The national herd in India stands at 300 million head of cattle and buffalo, with the theoretical potential of generating 10 BCM/yr (374 PJ)¹². The country's national flock, numbering 851.81 million poultry¹³ offers the potential to generate a further ~1 BCM/yr¹⁴.

Pressmud

India is the world's largest producer of sugar with over 500 refineries, and more than 350 distilleries producing ethanol from sugar surpluses. CBG production from pressmud and spent wash is estimated at around 5.68 – 9.09 BCM (5–8 MMT) annually¹⁵. Pressmud contains volatile solids, lignin, cellulose, hemicelluloses and a good proportion of nitrogen, making it a very good feedstock for the generation of bioenergy (methane) by anaerobic bimethanation¹⁶.

A study of biogas potential reported a range of 82–105 m³ of biogas per ton of pressmud¹⁷.

Municipal Solid Waste (MSW)

India generates ~62 MMT million tons of municipal solid waste per year, of which more than 70% is discarded untreated in open dumping yards and landfills, with no sorting or processing¹⁸. Out of the municipal solid waste generated, 50% is comprised of organic waste¹⁹.

31% of the Indian population lives in urban areas. Home to ~377 million people (Census of India, 2011), the urban population produced around 0.143 million tons of municipal solid waste (MSW) daily in 2015, according to the Central Pollution Control Board (CPCB). In 2016–17, total of ~97 million tons food and ~184 million tons of vegetables were produced, of which 40% was estimated to have gone to waste (USDA 2018).

Waste generation in the country is likely to more than double by 2030, increasing up to 165 million tons (MT) per year (World Bank, 2018)²⁰.

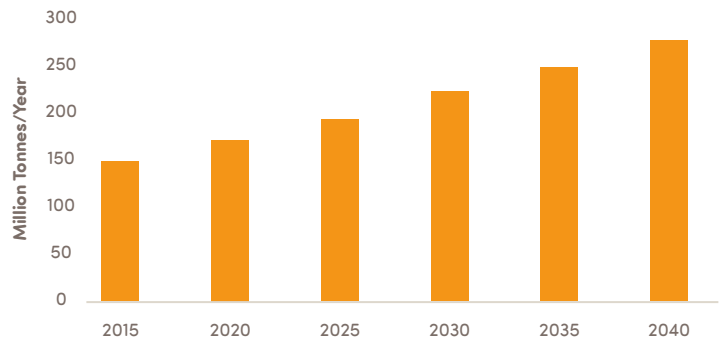


Figure 3: Projected growth in the volume of food waste
(Source: Mittal, Ahlgren and Shukla, 2019²¹)

Sewage

Sewage offers another plentiful supply of feedstock. In March 2021, sewage generation from urban areas was estimated at 72,368 million litres per day (MLD), against available sewage treatment capacity of 31,841 MLD²², meaning over 50% currently goes untreated.

Policies / Initiatives

India has made significant progress in renewable energy capacity installation, ranking fourth in the world in 2022²³. A raft of policy and initiatives has been developed to support biogas development, small, medium and large. The Ministry for Renewable Energy (MNRE) has developed the biogas expansion framework under the wide-ranging National Bioenergy Programme. Delivery of separate strands falls on relevant ministries.

Sustainable Alternative Towards Affordable Transportation (SATAT) initiative

Launched in 2018, under SATAT, the Ministry of Petroleum and Natural Gas (MoPNG) aims to stimulate investment in the development of 5,000 large-scale biogas plants, to produce and supply bioCNG to Oil Marketing Companies (OMCs) for sale as automotive and industrial fuels, and latterly as City Gas. The plants are expected to produce 15 MMT a year of bioCNG²⁴.

To stimulate the market a raft of incentives was established under SATAT, including:

- assuring a long-term price which will not be lower than INR 54 /kg + applicable taxes,
- inclusion of bioCNG sector in priority sector lending for credit availability through banks,
- ensuring offtake of bioCNG via long-term agreements with oil and gas marketing companies,
- synchronisation of bioCNG with domestic natural gas for supplies to city gas distribution networks,
- providing financial assistance of up to a maximum INR 10 crores per project (see Waste to Energy, Central Financial Assistance, below),
- providing Market Development Assistance at the rate of Rs. 1,500/ton to the fermented organic manure (digestate) produced as a co-product of biogas production and designating a lead fertiliser supplier (LFS) in each state for its offtake.

Aside from the incentives listed above, the Government of India earlier this year announced a 5% bioCNG blending mandate would in due course be introduced for all gas markets, i.e., across India's network of 5,899 natural gas refuelling stations and city grid distributors.

Furthermore, in order to promote green fuel, a central excise duty exemption is being provided to blended Compressed Natural Gas from so much of the amount of excise as is equal to the GST paid on biogas/bioCNG contained in the blended natural gas.

CNG (Transport) and PNG (Domestic)

The Government of India in April 2021 gave the go-ahead for bioCNG generated under the SATAT scheme to be co-mingled with domestic gas in the CNG(T)/PNG(D) segment of city gas distribution network, subject to meeting the technical standards with the natural gas in the City Gas Distribution (CGD) network.

The scheme envisages the share of co-mingled bioCNG in the total domestic gas supplied to the bioCNG(T) and PNG(D) segments of CGD sector to reach up to 10%. The procurement price of bioCNG was also revised and indexed to the prevailing compressed natural gas prices from June 2022, with a minimum procurement price of Rs. 54/kg plus taxes under SATAT²⁵.

One Nation, One Gas Grid

Upscaling is underway for the "One Nation, One Gas Grid", with approximately 33,753km Natural Gas Pipeline network across the country has been authorised for construction. Of this, 23,478km, including spur lines, tie-in connectivity, Sub-Transmission Pipelines (STPL) and dedicated pipelines, are operational, and a further 12,037km is under various stages of construction²⁶.

Expansion of the grid will support city gas distribution and LNG regasification terminals²⁷. The potential to involve Foreign Direct Investment, economies of scale and oil marketing companies will improve the overall attractiveness of the biogas sector.

Waste to Energy (Central Financial Assistance)

The Government of India continues the Waste to Energy Programme, a nationwide program aimed at recovery of energy from urban, industrial and agricultural wastes. The potential from urban and industrial waste is projected at 5,690 MW²⁸.

Under the programme, Central Financial Assistance (CFA) is available to waste to energy plants for biogas, bioCNG and power generation. The Waste to Energy Programme has an outlay of Rs. 600 Crores (Cr). The standard CFA rate in relation with the installed capacity is as below:

Type of project	Standard CFA rate @ installed capacity of the plant
Biogas	Rs 0.25 Cr per 12,000 m ³ /day (maximum CFA of Rs. 5.0 Cr/project)
BioCNG	Rs 4.0 Cr per 4,800 kg/day (for bioCNG generation from new biogas plant) Rs 3.0 Cr per 4,800 kg/day (for bioCNG generation from existing biogas plant*) Maximum CFA of Rs. 10.0 Cr/project for both cases.

For the Waste to Energy plants that are set up in Special Category States (NE Region, Sikkim, Himachal Pradesh, and Uttarakhand, Jammu & Kashmir, Ladakh, Lakshadweep and Andaman & Nicobar Islands) the eligible CFA would be 20% higher than Standard CFA pattern.

Under the programme 90 projects were underway at the start of 2023;

- 7 Biogas Generation plants with a cumulative production capacity of about 83400 m³/day;
- 34 BioCNG Generation plants with a cumulative production capacity of about 248000 kgs/day; and
- 49 Power generation plants with a cumulative production capacity of about 330 MW.

Pricing of bioCNG as a Transportation Fuel

- The minimum procurement price of bioCNG will not be lower than Rs. 54/Kg + applicable taxes for the period up to 31.03.2029
- The Retail selling price of bioCNG in a market shall be indexed with the Retail Selling Price of Compressed Natural Gas.
- The procurement price of bioCNG is Rs 56.70/Kg when the retail selling price of bioCNG is up to Rs 70/kg delivered at the Retail Outlet situated at any distance (up to 75 Km on way). Additional transportation costs of bioCNG beyond 75 Km from the bioCNG plant shall be considered separately, at mutually agreed rates.
- BioCNG procurement price will vary with CNG price as follows²⁹:

Lower Retail Selling Price of bioCNG in Slab (including tax, Rs./Kg)	Higher Retail Selling Price of bioCNG in Slab (including tax, Rs./Kg)	Procurement price of bioCNG (with GST, Rs./Kg)
Retail Selling Price up to 70		56.7
70.01	75	58.01
75.01	80	62.01
80.01	85	66.01
85.01	90	70.01
90.01	95	74.01
95.01	100	78.01

National Biogas Programme (NBP)

The Ministry of New & Renewable Energy (MNRE) has been implementing Biogas Schemes in support of AD and biogas development in remote, rural and semi-urban areas of the country, such as the New National Biogas and Organic Manure Programme (NNBOMP) and Biogas Power Generation (Off-grid) and Thermal energy application Programme (BPGTP).

As of 2021 these were amalgamated into the Biogas Programme and were approved for continuation under the umbrella National Bioenergy Programme (NBP) out to March 2026.

The objectives of the Biogas Programme are to support the development of biogas plants for clean cooking fuel, lighting, meeting thermal and decentralised power generation needs of users, which ultimately results in Green House Gas (GHG) emissions reductions, improved sanitation, facilitate management and utilisation of biogas plant produced slurry as an organic enriched Solid Biogas Fertiliser, Women Empowerment and creation of Rural Employment etc³⁰.

The programme will support the development of plants from 1m³ to 1,000m³ unit size depending on feedstock availability and need – family/ household, small farmers, dairy farmers and for community, institutional and industrial/ commercial applications.

Galvanising Organic Bio-Agro Resources Dhan (GOBARdhan)

Galvanising Organic Bio-Resources Dhan (GOBARdhan), launched in 2018 under Swachh Bharat Mission (Grameen) (SBM(G)) of the Department of Drinking Water and Sanitation (DDWS), is an integral component of bio-degradable waste management under SBM(G) Phase II for ensuring cleanliness in villages by converting organic/ biodegradable waste, including cattle dung, crop residue, market waste etc, into biogas and bio-slurry. Financial assistance of up to Rs 50 lakh per district is available for the entire programme period (2020-21 to 2024-25). At least one model community-level biogas plant per district is envisaged under the programme.

Further, the “GOBARdhan-Waste to Wealth” initiative aims to convert waste to wealth and promote the circular economy. Various Ministries/ Departments are closely working together for the implementation of the GOBARdhan initiative based on a whole Government approach. GOBARdhan covers any project that utilises organic waste like cattle dung, agri residue, organic fraction of municipal solid waste (MSW) etc. to produce biogas/bioCNG and organic manure.

DDWS is coordinating the implementation of GOBARdhan and has developed a Unified Registration Portal (URP) to streamline registration of biogas/bioCNG projects across the country.

To date, 1,194 biogas plants and 444 bioCNG plants have been registered on the URP, under various categories along the pipeline; Functional, Completed, Under Construction and Yet to Start³¹.

Various other enablers and policy initiatives have been put in place by stakeholder Ministries/Departments to ensure implementation of the initiative at speed and scale.

As per the Budget Announcement 2023-24, 500 new ‘waste to wealth’ plants under GOBARdhan initiative will be established for promoting the circular economy. These will include 200 bioCNG plants, including 75 plants in urban areas, and 300 community or cluster-based plants, at a total investment of Rs.10,000 crores.

The GOBARdhan initiative will benefit from the imminent introduction of the 5% bioCNG mandate and planned exemptions to the GST (goods and services tax) paid for bioCNG contained in the blended natural gas³².

Carbon Credits and Taxation

The Government of India passed an amendment to the Energy Conservation Bill at the end of 2022 to enable the setting up of a domestic carbon credit trading scheme. The amendment aims to establish a carbon market in the nation by the means of a Carbon Credit Certificate and Carbon Credit trading scheme³³.

BioCNG is one of 13 activities to be considered for the trading of carbon credits under bilateral/cooperative approaches under Article 6.2 of the Paris Agreement Rule Book³⁴.

Market Development Assistance (MDA) for Promoting Organic Fertilisers from Biogas Plants

In June 2023, a Market Development Assistance (MDA) scheme in the form of Rs 1,500 per tonne has been established to support the marketing of biofertilisers produced as by-product from biogas plants/bioCNG plants.

Promotion of Natural Farming as sustainable agriculture practice in restoring soil health and reducing input costs for farmers. 425 KVKS (Krishi Vigyan Kendras) have laid down demonstrations of natural farming practices and organised 6,777 awareness programs involving 6.80 lakh (million) farmers. Course curricula for Natural Farming have also been developed for BSc as well as MSc programmes, to be implemented from the academic session July–August 2023³⁵.

Crop Residue Management Guidelines

Crop Residue Management Guidelines have been developed to address the practice of in-situ disposal in the States of Punjab, Haryana, Uttar Pradesh, Madhya Pradesh and NCT of Delhi. The guidelines include:

- support for the procurement of machinery and equipment for ex-situ management of crop residue. The guidelines provide for 65% government subsidy for procurement of machinery required for collection of residues and setting up of storage depots of capacity 4,500 tonne each. A 25% contribution shall be made by the industry and 10% by the beneficiary, which shall enter into an agreement with the industry for supply of feedstock at a lower price.
- establishment of Custom Hiring Centres (CHCs) of crop residue management machines. Financial assistance @ 80% of the project cost for the development of CHCs costing up to Rs. 15 lakhs will be available to Rural Entrepreneurs (Rural youth and farmer as an entrepreneur), Cooperative Societies of Farmers, Self Help Groups (SHGs), Registered Farmers Societies, Farmer Producer Organisations (FPOs) and Panchayats.
- financial assistance for the establishment of crop residue/paddy straw supply chain.
- Information, Education and Communication (IEC) for awareness on crop residue management.

Import Duty Concession

Concessional Custom Duty Certificates (CCDC) can be applied on the import of machinery and components required for the initial setting up of projects for the generation of bioCNG, to generate electricity from non-conventional materials such as agricultural, forestry, agro-industrial, industrial, municipal and urban waste, bio waste, or poultry litter³⁶.

Driving forces

India’s transition to a renewable energy future is driven by several factors associated with climate, energy and food security.

GHG Abatement Targets

India is among the world’s largest emitters of greenhouse gases (GHGs), alongside China and the US, with annual GHG emissions of 3,200,821 kilotons of CO₂ equivalent a year³⁷, although India’s per capita emissions are significantly lower than other major economies.

Under its Nationally Determined Contribution to the Paris Agreement, by 2030 India aims to reduce the emissions intensity of its GDP by 45% from 2005 levels, and to achieve ~50% cumulative electric power installed capacity from non-fossil fuel-based energy resources.

Exponential Growing Energy Demand

India is the 3rd largest energy and oil consumer in the world. Furthermore, the IEA forecasts India will be responsible for a quarter (25%) of all growth in global energy consumption in the coming two decades. The BP Statistics Review estimates that India’s energy demand will double, while natural gas demand is expected to grow five-fold by 2050³⁸.

Energy Security

India imported 232.7 MMT of crude oil at a cost of \$157.6bn, reflecting an import dependency of 87%, during the Financial Year 2022–23. The country also imported 26.3 BCM of LNG at a cost of \$17.1bn, reflecting an import dependency of 44%.

The Government of India has set a goal to expand the contribution of natural gas in the country's overall energy consumption basket to 15% by the year 2030 with the aim to expand as a gas-based economy. Moreover, speedy expansion of bioCNG will help India in meeting additional requirement from domestic resources³⁹.

Soil Health

The overuse of chemical fertilisers has resulted in severe imbalance of organic carbon, micronutrients, nitrogen, phosphorus and potassium in the country's soil. The government further faces a rising bill for chemical fertiliser subsidies that stood at Rupees 1.64 trillion⁴⁰.

Biofertiliser is a ready-made alternative to chemical (mineral) fertiliser and organic/natural farming is being promoted under government programmes such as Paramparagat Krishi Vikas Yojana, Mission Organic Value Chain Development for Northeastern Region, and National Food Security Mission. Meanwhile, the Ministry of Chemicals and Fertilisers will be promoting the use of biofertiliser, which is produced as a byproduct of biogas/bioCNG, under the GOBHARDhan initiative⁴¹. As of now, 11 biofertilisers are approved under the Fertiliser Control Order (FCO)⁴².

Circular Economy for Rural Development and Employment

The decentralised potential of anaerobic digestion (AD) makes it highly relevant to rural areas as a source of clean cooking fuel, in place of labour intensive and environmentally damaging firewood and cow dung.

It also presents livelihood opportunities throughout the supply chain for farmers and entrepreneurs, supporting India's rural development and employment objectives.

The circular economy associated with the biogas industry will be generating 75,000 direct jobs and lakhs of indirect jobs through Sustainable Alternative Towards Affordable Transportation (SATAT) alone⁴³.

Progressive R&D and Technology Development

The first rule of economics is to invest in R&D for the development of any sector. India has developed a network of dedicated channels for research and development in biogas processes and technology, such as the Agri-Business Incubation Centre, Biogas Development and Training Centre and Indian Agricultural Research Institute.

These organisations help in localised innovations such as compact farm biogas systems, advanced municipal waste digesters and biomethane upgrading technologies, and are serving to broaden the range of biogas applications.

Barriers to Growth

Country level

Infrastructure: The infrastructure concerning compressed biogas – pipelines, distribution network, storage capacity, national gas vehicle infrastructure, and waste supply – need to be strengthened further to optimise AD technology. The availability of refuelling stations is increasing in tandem with the commissioning of bioCNG plant but may not be sufficient to offtake all gas produced when all the plants start optimising production.

Bankability of Biogas Plants: Reluctance by lenders to finance bioCNG projects on non-resource basis due to non-availability of performance metrics and therefore understanding of ROI.

Biofertiliser: Limited development of the biofertiliser market affects the economics of biogas projects. The market for biofertiliser needs to be further strengthened.

Underdeveloped Supply Chain for Feedstock: The supply chain needs to be further strengthened for consistent availability of high-quality raw materials. Currently in India, municipalities expect to be paid by the project developer for organic feedstocks, while it is commonly to the contrary in almost all other countries.

Urban level

Capital for Large Scale Plants: The high initial capital outlay for biogas plant when added to costs of feedstock acquisition and patchy gas distribution infrastructure deter new entrants, rendering the market fragmented.

Variation in Feedstock Quality: Lack of mandatory source segregation affects availability of feedstock, such as food waste for large biogas plants. This leads to a varied feedstock quality that has implications for productivity.

Rural level

Feedstock: A sufficient supply of water and substrate is essential for the functioning of AD at all scales. On rural family plants, even with ownership of 2–3 cattle, maintaining a dependable substrate supply is challenging. Additionally, water stress remains high in some States in India. Feeding insufficient inputs or incorrect ratios can lead to subpar biogas plant performance or the formation of scum, rendering the installed plant non-functional.

Handling of Biogas Plant Effluent: Instance of improper handling of digested effluents, especially from plants with low retention times can lead to emission of methane in the environment.

Social Barriers: A certain amount of drudgery is associated with the operation of family type biogas plants as everyday a required quantity of manure is mixed with water for feeding the biogas plant and then to manage the effluent. The preference for traditional cooking methods means there is limited awareness of the benefits of biogas. Combined with the perception of biogas as “gobar gas” leads to hesitation in adaptation.

Potential solutions

Country level

Regulatory Framework: Strengthening of coordination between multiple Central and State government policies for municipal solid waste management, bioenergy, transport and agriculture waste.

Infrastructure: Collaborative approach can be taken with private investors to create an environment for facilitating optimal supply chain for inputs and outputs (feedstock and end products). The transmission and distribution system need to be up-scaled and modernised to include intra-regional and interregional connections, creating a Green Energy Corridors. Additionally, smart metering system can be incorporated in system⁴⁴.

Biofertilisers: Mandatory use of biofertilisers – like the bioCNG mandate – could be explored alongside the tapering-off of subsidies for the use of mineral fertilisers.

Technology and Operation and Maintenance: It is hoped that with the launch of Global Biofuels Alliance, it will be possible to bridge the gaps in technological know-how and create a high-performing industry, maximising returns on investment.

Urban specific

Financing: Establish a data base of the performance metrics and standards of existing biogas plants to provide investors/financial institutions with proof of anticipated Return on Investment. Explore the use of credit guarantees from organisations such as IREDA (India Renewable Energy Development Agency) and the World Bank as a way to relax collateral conditions.

Waste Management: Continue on the process of creating municipal bylaws to mandate and ensure strict application for segregation of organic waste at source, including households, markets and commercial establishments.

Rural specific

Feedstock Stability: To overcome substrate deficiency, community-based biogas should be given preference to pool more cattle dung resources. It should be accompanied by withdrawal of subsidies on LPG in a phased manner to increase the attractiveness of biogas.

Awareness: Outreach activities such as pamphlet distribution, hands-on training, after installation services and exposure visits to change the perception biogas from “Gobar gas” are necessary for increased and high uptake.

Summary

India has huge potential for biogas and the political will to capitalise on the opportunity, as evidenced by the raft of government policies and initiatives to provide financial, technical and infrastructural support to tap into the estimated potential of 85 BCM/yr.

Biogas can play an important role in India’s energy transition, ensuring energy security and affordability, enhancing entrepreneurship and boosting local economies. Transitioning to biogas will contribute to job creation and rural resilience.

The development of the biogas industry is essential for strengthening India’s energy security and attaining its ambitious climate goals.

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