Compressed Biogas Integration in India's Gas Economy: Progress and Prospects

पी एन जी आर बी
PNGRB

August 2025

Contents

1 Introduction

The government of India has put in place an elaborate action plan to create a complete biogas infrastructure with its production from biowaste, distribution to the user and ensure efficient consumption of the same through integration with other forms of clean energy. 5000 biogas plants were targeted to be established all over India by 2030 to achieve the desired milestone in this direction.

While the Ministry of New and Renewable Energy (MNRE) is coordinating this broader mission, Ministry of Petroleum and Natural Gas (MOPNG), Ministry of Housing and Urban Affairs, Ministry of Jal Shakti, Sanitation, Niti Aayog, Federation of India Petroleum Industries (FIPI) and several other institutions from Government as well as private enterprises are actively participating in the action plan, besides Petroleum and Natural Gas Regulatory Board (PNGRB) who is also coordinating for this broader mission.

In line with the national priority to promote clean and sustainable energy, the CBG (Compressed Bio-Gas) Division has been constituted within PNGRB to facilitate the development and integration of CBG into the existing Natural Gas ecosystem. The Division acts as a focal point for regulatory facilitation, technical coordination, and stakeholder engagement in the CBG sector.

2 Overview about CBG

Compressed Biogas (CBG) is a clean, renewable, and environment-friendly fuel produced through the anaerobic digestion of organic waste such as agricultural residue, municipal waste, cattle dung, sewage sludge, and food waste. It is purified to produce methane-rich gas (90-95% CH_4), almost similar in composition and energy content to Compressed Natural Gas (CNG). CBG plays a vital role in reducing

dependency on fossil fuels, managing organic waste efficiently, and supporting India's vision of a cleaner and greener energy future.

CBG has calorific value and other properties like CNG and hence can be utilized as green renewable automotive fuel. Thus, it can replace CNG in automotive, industrial and commercial areas. Ministry of Road Transport and Highways, Government of India had permitted usage of bio-compressed natural gas (bio- CNG) for motor vehicles as an alternate composition of the compressed natural gas (CNG).

Building on this momentum, India's policy landscape is evolving to provide the much-needed institutional push. Recent developments by way of mandatory blending mandate, beginning with 1% CBG in CNG/PNG from FY 2025-2026, and scaling up to 5% by FY 2028-2029. This signals a clear shift from a voluntary approach under SATAT to a compliance driven framework, aligning energy security goals with climate action.

This convergence of institutional effort and private sector participation now places Compressed Bio-Gas (CBG) at the heart of India's clean energy transition. With rising awareness, expanding CGD infrastructure, and growing rural entrepreneurship, CBG is no longer a peripheral experiment, it is a core green gas strategy for India's net-zero ambitions.

3 Quality of CBG (Specification)

In India, Compressed Biogas (CBG) is required to meet the Bureau of Indian Standards (BIS) Specification IS 16087:2016, which ensures the quality and safety of the gas for end-use applications. As per this standard, CBG must contain a minimum of 90% methane (CH_4) by volume, with stringent limits on moisture, hydrogen sulphide (H_2S), carbon dioxide (CO_2), and other impurities. The calorific value of CBG

typically ranges from 52,000 to 57,000 kJ/kg, making it suitable for injection into the City Gas Distribution (CGD) network and use as a transportation or industrial fuel. Compliance with this standard is essential for commercial sale and distribution of CBG in India.

In view of evolving industry needs, technology advancements, and the growing demand for quality assurance in the production and utilization of Compressed Biogas (CBG), the Bureau of Indian Standards (BIS) is under the process of amending the existing CBG specification - IS 16087:2016. The proposed amendments aim to revise permissible impurity levels and align CBG quality parameters more closely as usage of fuel in automotive and industrial sectors. This revision is expected to facilitate wider adoption of CBG across the City Gas Distribution (CGD)/NGPL networks, improve ease of doing business for CBG producers, and ensure safe, efficient, and environment-friendly energy delivery.

4 Feed Stock for CBG Production

Country possesses a rich and diverse base of organic feedstock that makes it highly suitable for large-scale production of CBG. These feedstocks are not only abundantly available across urban and rural areas. Using them for CBG production not only creates clean energy but also helps keep the environment clean and reduces pollution.

Emerging feedstocks for compressed biogas (CBG) in India indicate the evolving landscape of renewable energy sources within the country. Several factors contribute to the emergence of these feedstocks, ranging from technological advancements to environmental imperatives. An overview of some noteworthy emerging feedstocks, are as under

i. Agriculture waste
ii. Cow Dung
iii. Poultry Waste
iv. Animal Waste
v. Napier Grass
vi. Vegetables waste
vii. Food Waste
viii. Coffee waste
ix. Press mud
x. Rice Straw
xi. Municipal Solid Waste
xii. Municipal Sewerage
xiii. Spend Wash
xiv. Chicken waste
xv. Dairy Waste, etc.

5 Production & operative/upcoming CBG plants

Across the country, a growing number of Compressed Biogas (CBG) plants have become operational, and several others are under various stages of construction. These plants are utilizing a wide range of organic feedstocks. To facilitate efficient evacuation and supply, many of these plants are now being connected to the City Gas Distribution (CGD) network or are taking initiatives for connectivity to NGPL for direct injection of CBG. In parallel, mobile cascades continue to play a key role in reaching areas without pipeline infrastructure, ensuring last-mile delivery. PNGRB, in coordination with stakeholders, is actively supporting pipeline connectivity to operational and upcoming plants to enhance offtake reliability and enable seamless integration with the national gas grid.

Status of operative/upcoming CBG plants across country:

i. Operative ~ 160 nos of rated production capacity of 1.36 MMSCMD
ii. Under construction: ~244 nos of rated production capacity of 2.78 MMSCMD
iii. Yet to start Construction: ~ 744 nos of rated production capacity of 3.58 MMSCMD

Total of 1150 CBG plants have been registered for their interest in the production of CBG, which are having overall total rated production capacity of about 7.72 MMSCMD.

CBG deployment is supported by a multi-ministerial approach involving:

- MoPNG – Policy & SATAT framework
- MoEFCC – Waste management policy
- MNRE – Biogas technology promotion
- MoHUA – Urban municipal waste support
- MoFPI & ICAR – Agri-residue and food waste valorisation and
- PNGRB – Connectivity and regulations

6 Challenges in achieving production

Several operational CBG plants across the country are currently producing below their rated capacities, despite having adequate infrastructure in place. It appears that the average utilization in many such plants ranges from 20% to 60% of the installed capacity. This underperformance can be attributed to various factors, including inconsistent feedstock availability, seasonal variation in biomass supply, technical challenges in plant operations and logistical issues in offtake arrangements.

Efforts are being made by all associated agencies and stakeholders to strengthen feedstock supply chains, provide technical handholding to operators, and promote timely

offtake through both modes i.e. Thru pipelines connectivity and mobile cascades. Supportive policies and financial assistance schemes such as the DPI Scheme are expected to improve operational efficiencies and help CBG plants progressively scale up to their full rated capacities. PNGRB is making concentric approach for bringing synergy between CBG producer and CGD network ends, for establishing pipeline connectivity for CBG plants up to maximum extent for whole production without any flaring and avoiding any logistical issues in offtake arrangements.

7 Advantages from CBG pipeline connectivity:

Connecting CBG plants to pipelines ensures a reliable and more safe operation. It reduces dependence on road transport (mobile cascades), lowers logistics costs, and minimizes gas loss. The key advantages are as under.

a) Once installed, it ensures an uninterrupted supply of biogas to the NG Networks.

b) The requirement for additional infrastructure /instrumentation is very minimal.

c) Large volumes can be transferred based on continuous supply.

d) The long operational life of pipeline with marginal maintenance operational/maintenance requirements.

8 Quality Requirements for Injection of CBG into CGD and NGPL networks

The quality parameters of Biogas (Biomethane) to be injected into CGD or NGPL shall be in line with requirement specified in:

I. PNGRB (Access Code for Common Carrier or Contract Carrier Natural Gas Pipelines) Regulations, 2009 for NGPL and latest amendments.

II. PNGRB (Access Code for City or Local Natural Gas Distribution Networks) Regulations, 2020 for CGD network and latest amendments.

III. IS 16087: 2016: Biogas (Biomethane) - Specification (latest amendments)

- For injection of Biogas (Biomethane) into Natural Gas Pipeline – above sub-para I & III are applicable for quality parameters
- For injection of Biogas (Biomethane) into City Gas Distribution Networks – above sub- para II & III are applicable for quality parameters

Specifications, whichever are more stringent in above referred Regulations/code shall be considered.

9 Taxation and Cost Implications on CBG sales

The tax structure applicable to Compressed Biogas (CBG) and its blending with natural gas significantly impacts the pricing and cost economics. Prevailing such tax structure is elaborated as under :

Biogas Sales as CBG at Retail Outlets, the GST @ 5% paid on CBG purchased is offset as input credit with the GST @ 5% charged on the sale of CBG. Also, there is no excise duty applicable on such compression of CBG and hence no repercussions on the cost structure towards the same on CGD entities.

Blended Biogas as CNG/CBG at Retail Outlets, the GST @ 5% is paid on such purchase, but when the same biogas is blended with natural gas, the product coming out is treated as natural gas and state VAT becomes applicable on the sale of such blended gas. Excise duty @14% is paid if such blended gas as it is compressed and setoff to the extent of 5% GST is available and remaining 9% remains as the cost. Additionally, the VAT paid on the sale of blended gas does not have any setoff and hence, the entire VAT becomes cost. Additional cost is coming to 9 % + applicable VAT of particular State (range 3 % to 14.5 % etc. as applicable)

Biogas sales as PNG to Domestic PNG/Industries/ Commercial customers, the GST @ 5% is paid on such purchase, but when the same biogas is blended with natural

gas, the product coming out is treated as natural gas and state VAT becomes applicable on the sale of such blended gas. Excise duty in such case is not applicable. Setoff to the extent of 5% GST is not available. Additional cost is coming to 5 % GST + VAT of particular State (range 3 % to 14.5% etc. as applicable).

This leads to additional cost burdens of excise duty while sales of CBG as CBG/CNG at retail outlets being as it is compressed. Recognising this challenge, the matter regarding exemption from excise duty on CBG blended with CNG is currently being pursued with the Ministry of Finance (MoF) to promote greater adoption of renewable gas in the sector.

10 Initiatives in CBG Sector

PNGRB is actively engaged in fostering the integration of Compressed Biogas (CBG) into the existing City Gas Distribution (CGD) and natural gas pipeline infrastructure. This involves a multifaceted approach including technical facilitation, digital monitoring, stakeholder coordination, and policy support. Key responsibilities include supporting CBG plants in achieving physical connectivity with CGD networks and trunk pipelines, developing a dedicated web-based portal with GIS mapping for planning and monitoring purposes, conducting consultations and workshops to address connectivity and offtake challenges, and promoting waste-to-energy integration through CBG as a cleaner, domestically produced substitute to imported LNG.

11 Way Forward

11.1 **Streamlined Connectivity Facilitation**: Establish a dedicated coordination mechanism to fast-track connectivity of CBG plants to CGD networks and trunk pipelines, with periodic monitoring and grievance redressal.

11.2 **Operationalisation of Web Portal**: Launch and institutionalise the web-based portal for real-time tracking, GIS mapping, and data integration of CBG plants for infrastructure and network planning.

11.3 **Policy Convergence with States**: Encourage alignment of state bio-energy policies with national-level initiatives, ensuring unified support mechanisms and incentives for CBG developers.

11.4 . **Tax Rationalisation for Blended Gas**: Pursue with the Ministry of Finance the exemption of excise duty and rationalisation of VAT treatment on CBG blended with natural gas to reduce end-user cost burden

11.5 **Stakeholder Engagement**: Conduct regular stakeholder consultations, capacity-building workshops, and investor outreach to address sectoral challenges and promote private sector participation.

11.6 **Finalisation and Implementation of RGC Mechanism** Expedite the regulatory framework for Renewable Gas Certificates (RGCs) to enable transparent and efficient market-based trading of CBG.

11.7. **Integration with LNG Substitution Strategy**: Position CBG as a domestic renewable alternative to imported LNG, with clear tracking of substitution achieved in energy planning.

The above actions will help streamline CBG infrastructure integration, enhance market confidence, and position CBG as a key component in India's clean energy transition. PNGRB will continue to act as a facilitative regulator in enabling this transition through proactive policy support and institutional coordination.

- XXX -