COMPRESSED BIOGAS (CBG)

India's Circular Bioeconomy & Clean Fuel Opportunity

Prepared for Corporate Leaders & Climate-Tech Stakeholders

Bio Energy

Opportunity 4 : Compressed Biogas (CBG)

This section provides key inputs on the Indian Compressed Biogas (CBG) Opportunities for corporate leaders.

Highlights

- Strong policy-backed growth opportunity under India's SATAT program and gas blending ambitions, positioning CBG as a strategic domestic fuel source
- Multi-feedstock flexibility (agri residues, municipal waste, press mud, manure) enabling circular waste-to-energy ecosystems
- Growing demand from transport and industry as a low-carbon substitute for CNG/LNG and fossil gas
- Co-product economics (organic fertilizer, digestate, carbon credits) improving overall plant viability

Key recommendations for corporate leaders include:

- Secure long-term feedstock ecosystems through options such as contract farming, farmer partnerships, and municipality contracts for waste aggregation
- Develop integrated offtake partnerships with OMCs, transport fleets, and industrial users for revenue certainty
- Design projects as circular economy platforms to monetize fertilizer, carbon credits, and waste management services

Opportunity Snapshot: Compressed Biogas (CBG)

Converts organic waste such a MSW/ agricultural waste into natural gas substitute

Market Signal

- Strong policy push via **SATAT, blending mandates** and CGD demand
- Demand led by **OMC's, transport fleets,** and industry fuel substitution.
- **Annual Market Size by 2030:** 7000-10000 ₹ Cr

What Makes or Breaks It?

- Feedstock Aggregation within **50-100 km** radius ensuring plant utilization
- Offtake Partnerships with **OMCs/CGD/ industrial buyers**
- Operational Efficiency in digestion, purification and uptime **(>85-90%)**

Why It Matters NOW?

- Circular economy focus and push for **W2E (waste-to-energy)**
- Rising LNG/CNG prices, improving CBG competitiveness
- Govt. incentives + OMC demand accelerating adoption

Well Aligned Opportunity for

- **Agri Supply chain players** with feedstock access (FPOs, aggregators, mills)
- **Fuel distribution players** (CGD companies, OMC linked distributors)
- **Industrial fuel consumers** (cement,ceramic, chemicals), seeking fuel substitution

Key Challenges

- **High Customer Acquisition Costs,** due to fragmented demand across MSMEs
- **ROI visibility issues** due to measurement and verification complexity

Business Model

- Cluster-based projects (near feedstock/biomass zones)
- Long-term supply & offtake (FPO's +OMCs/CGD)
- Integrated model (gas + bio-fertilizer + carbon monetization)

Introduction and Business Case

Compressed Biogas (CBG) is produced by purifying biogas derived from agricultural residues, animal waste, press mud, MSW and sewage sludge, such that the resulting gas matches natural gas quality standards.

CBG offers a clean, renewable substitute for fossil-based natural gas, directly usable in vehicles, city gas networks and industries. For India, CBG addresses stubble burning, waste disposal and fossil imports, while providing farmers with income streams. To this end, the central government had come up with the ambitious SATAT initiative some years back.

With strong policy tailwinds, and combined with its potential to improve energy security and rural economies, CBG can be expected to comprise a critical component of India's bio-economy.

Market Potential for Compressed Biogas in India

Year	Market Size (₹ Cr)	Capacity Outlook	Drivers
2025	1300-1500	~200-250 kT	Initial SATAT plants operational; OMC offtake contracts.
2030	7,000-10,000	~1000-1500 kT	Scale-up with 5,000+ SATAT plants; CGD blending.
2040	45,000-60,000	~5000 - 7000 kT	Mass adoption in transport, CGD grids and industry.

Market Segments and Applications

Segment	Applications	Business Model	Key Drivers
Utility-scale biomethane production	Grid injection, Bio-CNG for mobility, industrial gas substitution	Own–operate–integrate	Decarbonization of gas portfolios
Landfill & waste-based RNG	Bio-CNG for transport fleets, pipeline RNG	Asset-heavy ownership + offtake contracts	Low-carbon fuel credits
Biomethane production platforms	Industrial fuel switching, grid gas, mobility fuels	Platform acquisition + long-term PPAs/offtake	EU Fit-for-55, energy security, Scope-1 & 3 reductions

Renewable gas utilities	Grid-injected biomethane, municipal gas supply	Utility-style ownership + regulated sales	Gas decarbonization commitments by cities & utilities
Residue-based BioCNG & BioLNG	Transport fuels (Bio-CNG/Bio-LNG), industrial users	Integrated producer + fuel marketer	Agricultural waste utilization; transport fuel decarbonization
Biogas & biomethane infrastructure	Bio-CNG plants, upgrading systems, bio-LNG	EPC + O&M + selective asset ownership	Global demand for turnkey biomethane projects
Transport fuel retail	Fleet Bio-CNG (trucks, buses), refuse vehicles	Fuel offtake + station infrastructure	Fleet ESG targets; LCFS & carbon credit monetization
Dairy & organic waste RNG	Bio-CNG, pipeline RNG, transport fuels	JV-led project development + integration	Methane abatement + ultra-low CI fuels
Biomethane project pipeline	Grid biomethane, future Bio-CNG mobility	Equity stakes + project pipeline build-out	Iberian biomethane policy push; gas decarbonization

Typical Project Capacities & Investments Required in India

Project Type	Feedstock	Typical Size	Output	Indicative CapEx (₹ Cr)
Cluster CBG (entry)	Cattle dung + agri residues	2-5 TPD CBG	700-1,800 kg/day	12-25
Mandi/Agri-hub CBG (standard)	Press-mud/bagasse, straw, F&V waste	10-15 TPD CBG	3,500-5,000 kg/day	35-60
Large CBG (industrial)	Mixed residues + segregated OFMSW	30-50 TPD CBG	10,000-17,000 kg/day	80-140
MSW-to-CBG (urban)	OFMSW (source-segregated)	10-20 TPD CBG	3,500-7,000 kg/day	40-80
Integrated bio-fert line	Digestate processing	50-150 TPD wet digestate	30-60 TPD bio-fert	6-15

Underlying Technologies & Processes

Element	Options	Key Traits
Feedstock	Agri residues, dung, press-mud, MSW, sewage sludge	Abundant, region-specific; moisture & collection critical.
Conversion process	Anaerobic digestion → raw biogas	Proven, scalable; yields biogas + digestate (bio-fertilizer).
Purification & upgrading	PSA, water scrubbing, membrane separation	Removes CO_2, H_2S, moisture; produces >95% pure methane.
Compression & storage	CBG compressed to 200-250 bar	Matches CNG specs; allows transport and retail.
By-products	Digestate → biofertilizer; CO_2 → industrial use	Adds revenue streams and circularity.
Distribution	CGD pipeline injection, cascades, bottling plants	Ensures end-user access in transport & industry.

Key Challenges

Challenge Area	Key Issues	Business Impact	India Specific	Strategic Implications
Feedstock Supply Chain & Aggregation	Collection of agri-waste, municipal waste, or organic feedstock; seasonal variability; logistics complexity	Inconsistent feedstock reduces plant load factor and impacts revenue stability	Fragmented waste streams; dependence on local ecosystem (farms, mandis, municipalities)	Long-term feedstock agreements, decentralized collection hubs, and strong local partnerships needed
Capital Intensity & Financing Risk	High upfront capex for digestion, upgrading systems, compression units, and infrastructure	Long payback periods; investor risk perception due to operational complexity	SATAT scheme supports projects but financing challenges remain	Structured financing, subsidies, and JV models improve bankability
Offtaker Agreements & Pricing Structure	Dependence on Oil Marketing Companies (OMCs) or local	Revenue predictability tied to policy-driven procurement	SATAT provides offtake assurance but contract	Diversify customers (transport, industrial fuel,

	gas demand; pricing uncertainty		execution varies	CGD networks)
Operational Complexity & Technology Reliability	Feedstock quality variability, biological process sensitivity, gas upgrading efficiency	Operational downtime increases costs; affects project economics	Limited skilled manpower and technical expertise in some regions	Invest in robust technology, automation, and experienced operators
Policy, Infrastructure & Regional Constraints	Pipeline access, gas bottling logistics, local regulatory approvals, land availability	Slower project timelines; increased logistics costs	CGD network expansion uneven across states; regional viability differs	Select locations near gas grids, urban waste sources, or transport corridors

Prominent Players in the Indian Market

Company / Entity	Project Details
Verbio India	Punjab straw-based biorefinery producing ~33 TPD CBG; largest operational project.
EverEnviro Resource Mgmt.	Developing 20+ CBG plants; JV with ONGC for national rollout.
GPS Renewables	Partnering with BPCL & Oil India to build multi-plant CBG portfolios.
Indian Oil / BPCL / HPCL (OMCs)	Anchor offtakers under SATAT with long-term purchase agreements.
Adani Gas / Torrent Gas	Integrating CBG into city gas distribution (CGD) networks.
PRESPL	Biomass aggregation and pelletisation; collaborating with developers for CBG feedstock supply.
Carbonlites	Unique circular economy solution that converts wet waste into CBG and organic fertilisers.
Torrent Gas	City Gas Distribution (CGD) business with nationwide presence.

Innovation Perspectives

Innovation	Business Opportunity	For Senior Management
Biomethane as a global traded molecule	Global **biomethane trading desk**,	Book-and-claim markets, corporate green gas contracts
Waste-to-value at massive scale	Roll-up of **stranded methane assets**	AI-driven landfill optimization, carbon-negative fuels
Ultra-low CI fuels	Premium **negative-CI fuel markets**	Carbon removal-linked fuel products
Residue-first feedstock innovation	Large-scale **straw-to-BioCNG/BioLNG**	Replicable **crop-residue platforms** across Asia, Africa, Eastern Europe
CBG at population scale	Ability to deploy hundreds of plants with captive demand	**CBG-as-a-network**, rural energy + fertilizer loops, gas-to-chemicals integration
City-scale circular gas	**Urban circular-economy platforms**, long-term city decarbonization contracts	Links municipal waste, heat, power & gas grids
CBG as a fleet decarbonization service	Fuel-plus-carbon-credits bundles	Zero-capex fleet conversion models
Biogas plant as a product	Platformization of plants	Licensing + O&M-as-a-service globally
Early-stage biomethane pipeline capture	Locking up prime sites before market maturity	**First-mover advantage** in Iberian green gas certificates & contracts

Concentric & Satellite Opportunities

- Feedstock aggregation & logistics networks: FPO- and startup-led systems for collecting, preprocessing and supplying dung, press-mud and crop residues.
- CBG plant EPC & technology providers: Concentric firms offering turnkey biogas-to-CBG systems with local digester and upgrader manufacturing.
- Bio-fertiliser processing & marketing units: Enterprises converting digestate into branded organic fertilisers for regional agri-markets.
- Rural clean-fuel entrepreneurship clusters: Village-scale franchise models for community CBG stations and local transport refuelling.

- Agro-industrial integration models: Satellite ecosystems linking sugar mills, dairies and food processors into circular bioenergy hubs.
- CBG-PNG Blending Infrastructure: Injection kits for city gas networks (10-20% blend).
- CBG Compressors & Bottling Stations: High-pressure cascades for CNG-equivalent filling (200-250 bar).

Key Takeaway for Senior Management

Takeaway	Details
Feedstock ecosystems determine long-term defensibility	• CBG economics are driven by reliable organic waste aggregation, not just plant technology • ***Examples**:* cattle manure networks, agri-residue contracts, municipal waste tie-ups, press mud sourcing • **Competitive advantage:** proprietary waste aggregation platforms create supply moats competitors cannot replicate
CBG is a circular economy infrastructure business, not a fuel plant	• Profits come from integrated monetization of gas + fertilizer + carbon benefits • *Sub-components:* digestate processing, bio-fertilizer branding, carbon credit stacking • **Competitive advantage:** diversified revenue stabilizes returns beyond gas pricing cycles
Offtake partnerships shape bankability more than production capacity	• Revenue certainty depends on long-term OMC contracts, fleet agreements, and industrial buyers • ***Examples**:* transport fuel supply contracts, city gas distribution tie-ins
Operational uptime is the hidden IRR driver	• Digester stability, gas purification efficiency, and maintenance discipline define output • ***Examples**:* biological process optimization, predictive maintenance, gas analytics • **Innovation focus:** AI-driven digester control and performance monitoring, and digital plant intelligence can significantly increase yield and reliability
Cluster deployment beats isolated projects	• Feedstock density and logistics economics favor regional platforms especially around feedstock availability clusters • ***Examples**:* dairy clusters, sugar belts, agro-processing zones • **Competitive advantage:** lower logistics cost and scalable platform growth

Next Steps for Corporate Leaders

Compressed Biogas is advancing as a low-carbon substitute for CNG/LPG in transport, industrial heat, and city gas networks, supported by feedstock availability, waste-to-energy policy, SATAT programs, and interest from OMCs and CGD operators. CBG's value proposition is strengthened by circular bioeconomy applications, digestate utilization for soil health, and carbon market opportunities — though project viability hinges on feedstock aggregation, gas purity, pipeline integration, and long-term offtake.

This could be an attractive climate tech opportunity for industries and firms in specific sectors and industries keen on catering to this fast growing market.

Connect with Team EAI to know more about this opportunity and take your corporate's initial steps. Send a note to consult@eai.in or talk to Muthukrishnan - 9952910083