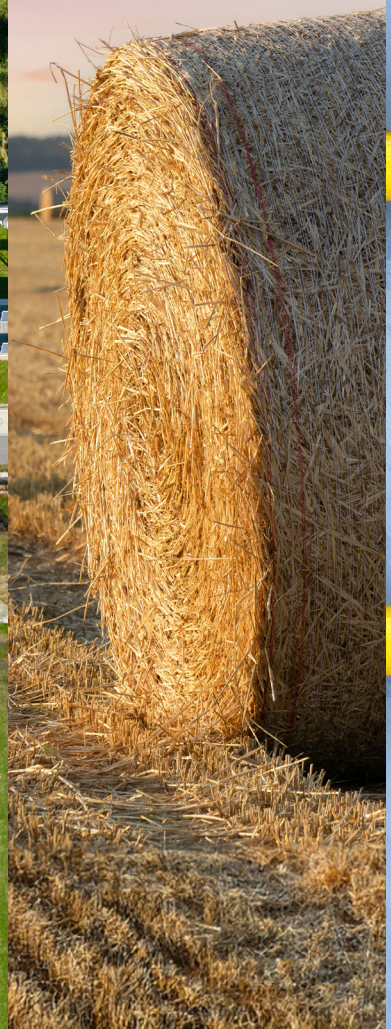
DEVELOPING AN EFFECTIVE STATE-LEVEL COMPRESSED BIOGAS POLICY IN INDIA

CURRENT STATUS AND KEY STRATEGIES

POLICY BRIEF



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1. INTRODUCTION

In recent months, the Indian government has implemented several policy changes to boost growth and investment in the compressed biogas sector. Policies such as the Ministry of Petroleum and Natural Gas's Sustainable Alternative Towards Affordable Transportation (SATAT) scheme and the Ministry of New and Renewable Energy's National Bioenergy Programme aim to produce 15 million metric tonnes of compressed biogas (CBG) from 5,000 plants nationwide by 2030. The integration of various types of financial assistance has encouraged private sector participation to increase the adoption of compressed biogas, a cleaner alternative to natural gas. Internationally, the Global Biofuel Alliance was launched in September 2023 under India's G20 leadership, involving 24 countries and 12 international organizations. This initiative seeks to advance the development and deployment of biofuels, positioning them as crucial for energy transition and contributing to job creation and economic growth.

Compressed biogas is produced from waste biomass sources like agricultural residue, cattle dung, sugarcane press mud, municipal solid waste, and sewage sludge through the process of anaerobic decomposition. CBG stands as a promising technology for clean energy production within a circular economy framework, offering the opportunity to decrease imports, manage waste, and mitigate greenhouse gas emissions.

Despite its many advantages, the adoption of CBG projects has been sluggish, with only 97 operational CBG projects by July 2024, far short of the target of 5,000 plants. A significant challenge hindering the growth of CBG in the country is the ineffective implementation of policies at the state level.

Currently, despite having good CBG potential, many states lack supportive policies and are uncertain about the necessary incentives. Rather than tailoring policies to their unique strengths, they often replicate existing ones. Consequently, several states have sought policy advocacy from the Centre for

Science and Environment (CSE) in this area. To bridge this gap, CSE has developed a policy brief that highlights essential factors for designing state-specific policies supportive of compressed biogas. The brief also examines current bioenergy policies and incorporates international best practices to aid in informed policy-making for different state governments and state renewable energy nodal agencies.

2. PRESENT SCENARIO OF CBG PROJECTS IN THE COUNTRY

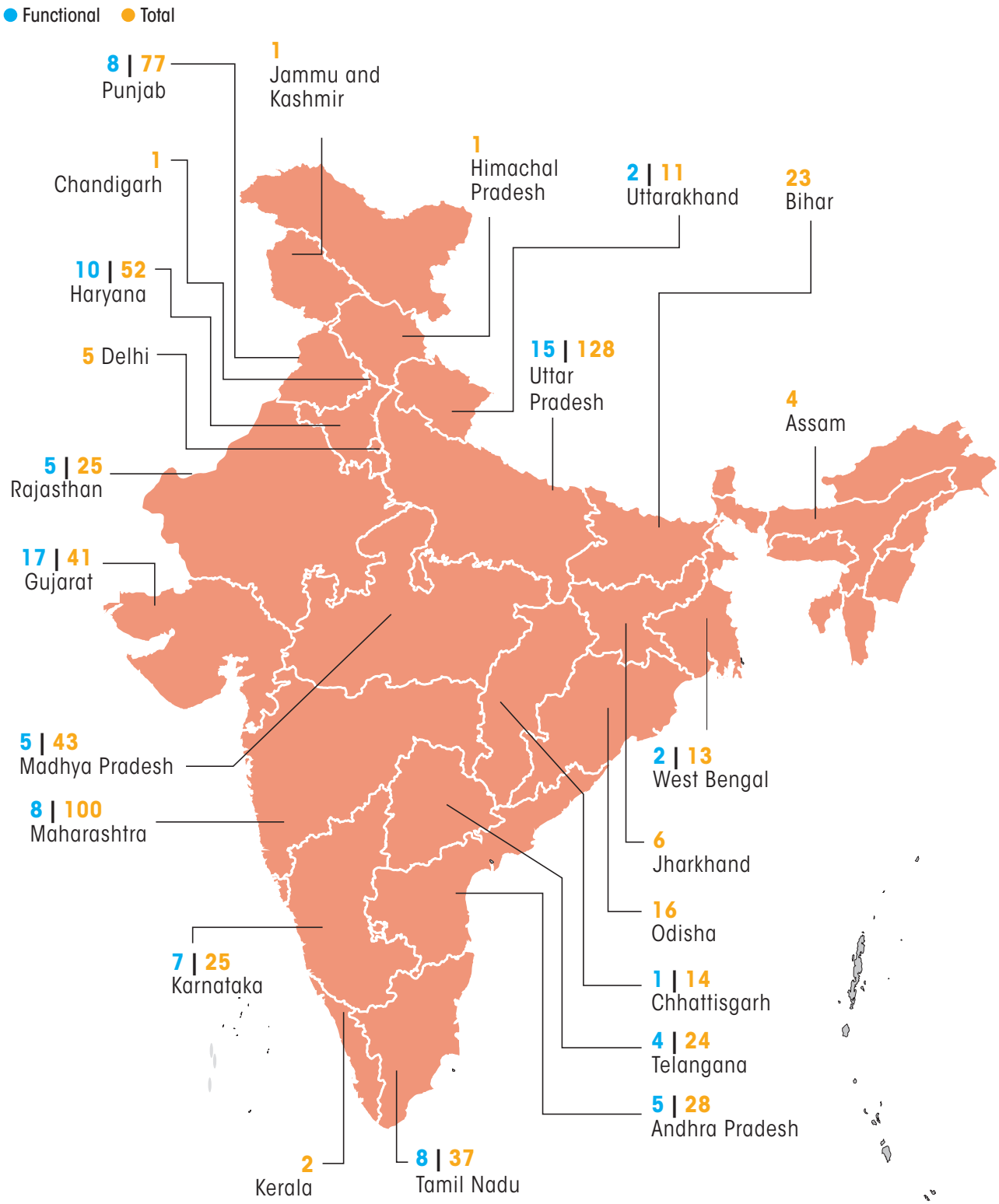
Table 1 presents the current status of CBG projects across various states and Union territories in India. Out of the 677 projects registered nationwide, 408 have yet to begin construction, 172 are currently under construction, and 97 are operational. Approximately 60 per cent of the registered projects have not commenced, likely due to factors such as lack of funding, slow regulatory approvals, difficulties in sourcing feedstock, or technological challenges. The states with the highest number of projects in the pipeline are Uttar Pradesh, Maharashtra, Punjab, Madhya Pradesh, and Haryana. Gujarat leads with the highest number of operational plants (17), followed by Uttar Pradesh (15) and Haryana (10). Interestingly, all these three states have a state-level bioenergy policy in place (see *Table 1: Status of compressed biogas [CBG] plants across different states of India*).

Table 1: Status of compressed biogas (CBG) plants across different states of India

State/Union territory	CBG plants registered				
	Yet to start construction	Construction in progress	Completed	Functional	Total
Andaman and Nicobar Islands	0	0	0	0	0
Andhra Pradesh	15	8	0	5	28
Arunachal Pradesh	0	0	0	0	0
Assam	3	1	0	0	4
Bihar	14	9	0	0	23
Chandigarh	1	0	0	0	1
Chhattisgarh	11	2	0	1	14
Dadra and Nagar Haveli and Daman and Diu	0	0	0	0	0
Delhi	0	5	0	0	5
Goa	0	0	0	0	0
Gujarat	14	10	0	17	41
Haryana	27	14	1	10	52
Himachal Pradesh	1	0	0	0	1
Jammu and Kashmir	1	0	0	0	1
Jharkhand	2	4	0	0	6
Karnataka	11	6	1	7	25
Kerala	2	0	0	0	2
Ladakh	0	0	0	0	0
Lakshadweep	0	0	0	0	0
Madhya Pradesh	28	10	0	5	43
Maharashtra	70	20	2	8	100
Manipur	0	0	0	0	0
Meghalaya	0	0	0	0	0
Mizoram	0	0	0	0	0
Nagaland	0	0	0	0	0
Odisha	10	6	0	0	16
Puducherry	0	0	0	0	0
Punjab	56	13	0	8	77
Rajasthan	12	8	0	5	25
Sikkim	0	0	0	0	0
Tamil Nadu	23	6	0	8	37
Telangana	14	6	0	4	24
Tripura	0	0	0	0	0
Uttar Pradesh	78	33	2	15	128
Uttarakhand	7	2	0	2	11
West Bengal	8	3	0	2	13
Total	408	166	6	97	677

Source: https://gobardhan.co.in/

Map 1: Total upcoming and functional CBG plants in different states of India



3. STATUS OF BIOENERGY POLICY IN INDIAN STATES

India's renewable energy policy framework at the state level is quite fragmented. Some states have a comprehensive renewable energy policy, others have distinct policies for solar, hydro, and bioenergy, and a few have no policies at all (see *Table 2: Status of renewable energy and bioenergy policies in Indian states*). Notably, Bihar, Uttar Pradesh, Gujarat, and Haryana have separate bioenergy policies that include CBG. In contrast, Karnataka, Madhya Pradesh, and Maharashtra have integrated some aspects of biogas into their renewable energy policies, but they focus on producing electricity from biogas rather than biomethane.

Despite having significant CBG potential, states like Maharashtra, Punjab, Madhya Pradesh, and Tamil Nadu lack a dedicated bioenergy policy, which could hinder the development of CBG plants due to the absence of a structured framework. The table also indicates that only a few states have a comprehensive renewable energy policy; most states, such as Chhattisgarh, Tamil Nadu, and Uttarakhand, have individual policies for solar, wind, or hydropower.

Table 2: Status of renewable energy and bioenergy policies in Indian states

State	State's RE policy	Key highlights if biogas is part of RE Policy	Bioenergy policy name and year	Nodal agency for implementation of bioenergy policy
Andhra Pradesh	AP Renewable Energy Export Policy, 2020; Solar Power Policy 2018; Wind Power Policy 2018; Wind Solar Hybrid Power Policy 2018		-	-
Arunachal Pradesh	-		-	-
Assam	Assam RE Policy, 2022		-	-
Bihar	Bihar Policy for Promotion of Bihar New & Renewable Energy Sources 2017		Bihar Biofuels Production Promotion Policy, 2023	Department of Industries, Government of Bihar

State	State's RE policy	Key highlights if biogas is part of RE Policy	Bioenergy policy name and year	Nodal agency for implementation of bioenergy policy
Chhattisgarh	Wind Energy Policy 2006; State Solar Energy Policy 2017; Small Hydro Policy 2006		-	-
Goa	Sate Solar Policy 2017		-	-
Gujarat	Gujarat RE Policy 2023; Small Hydel Policy 2016;	1. Gujarat Waste-to-Energy-Policy-2022 2. Waste-to-energy-related projects are incentivized to tackle municipal solid waste to generate electricity	Gujarat State Biotechnology Policy, 2022	Gujarat State Biotechnology Mission
Haryana	Solar Power Policy 2016		Haryana Bio-energy Policy, 2018	Haryana Renewable Energy Development Agency (HAREDA)
Himachal Pradesh	Himachal Energy Policy 2021; Solar Power Policy 2016		-	-
Jharkhand	State Solar Policy 2022		-	-
Karnataka	Karnataka RE Policy 2022; Solar Policy 2014	1. Under the policy, incentives are available for co-generation and waste-to-energy plants that aim to convert biogas into electricity	-	-
Kerala	RE Policy 2002; Solar Energy Policy 2013		-	-
Madhya Pradesh	Madhya Pradesh RE Policy 2022; sHydro (2011), Wind (2012), Solar (2012)	1. Incentives for community based biogas manufacturing 2. Exemption in Electricity Duty and Energy Development Cess 3. 50 per cent reimbursement on stamp duty 4. Government land, if available, shall be provided on concessional rate (rebate of 50 per cent on circle rate) to developers	-	-

State	State's RE policy	Key highlights if biogas is part of RE Policy	Bioenergy policy name and year	Nodal agency for implementation of bioenergy policy
Maharashtra	RE Policy 2020; Green Hydrogen Policy 2023	1. State-level support for biogas to electricity 2. The financial assistance of Rs 40,000 per kW is available for biogas-based power in the range of 3-250 kW capacity	-	-
Manipur	RE policy 2006		-	-
Meghalaya	-		-	-
Mizoram	Solar Power Policy 2017		-	-
Nagaland	-		-	-
Odisha	Odisha RE Policy 2022		-	-
Punjab	Punjab New and Renewable Sources of Energy Policy (2012), Net Metering Policy for Rooftop SPV Power Plants	1. Land stamp duty and registration charges exempted 2. Panchayat land available for projects on long-term lease basis 3. Electricity duty exempted during the construction and testing period	-	-
Rajasthan	Rajasthan RE Policy 2023; Green Hydrogen Policy 2023		-	-
Sikkim	Grid Connected Rooftop Solar Photovoltaic System Policy (2019)		-	-
Tamil Nadu	Solar Energy Policy 2019		-	-
Telangana	Telangana Solar Power Policy 2015		-	-
Tripura	-		-	-
Uttarakhand	UK State Solar Policy 2023; Development of Micro & Mini Hydro Power Projects upto 2 MW 2015		-	-
Uttar Pradesh	UP Solar Energy Policy 2022; Solar Rooftop Programme, Green Hydrogen Policy 2024		Uttar Pradesh Bioenergy Policy, 2022	Uttar Pradesh New & Renewable Energy Development Agency (UPNEDA)
West Bengal	Policy on Co-generation and Generation of Electricity from Renewable Sources of Energy 2012		-	-

4. KEY HIGHLIGHTS OF THE STATES' BIOENERGY POLICIES

4.1 UTTAR PRADESH BIOENERGY POLICY 2022

The Uttar Pradesh Bioenergy Policy released in October 2022 provides for various enablers to promote bioenergy production, particularly focusing on CBG. The policy offers a subsidy of Rs 75 lakh per tonne of CBG production capacity, capped at Rs 20 crore per project. Government-owned land can be leased at a nominal rate of Rs 1 per acre per year to set up CBG plants and store feedstock. Development fees, stamp duty, and electricity duty are fully waived to reduce initial costs. Additionally, economic assistance is provided through an infrastructure subsidy for constructing up to 5 km of approach roads, with a maximum investment limit of Rs 50 crore.

To support the acquisition of balers, rakers and trolley equipment, a state subsidy of 30 per cent of the cost, up to Rs 20 lakh, is available. The policy also includes provisions for land-use alterations and exemptions from the Land Ceiling Act. A Bioenergy online portal has been created to streamline the application process, offering a unified platform for investors with a single-window clearance system. The policy mandates the installation of one bio-plant in each tehsil, with the tehsil designated as the catchment area for the bioenergy plant. The Agriculture Department will facilitate the formation, training and capacity building of farmer producer organizations (FPOs) within these catchment areas to ensure a steady supply of agricultural waste to CBG plants and to secure long-term supply contracts with a letter of intent holders. A project officer will be deployed in each district to assist investors and serve as the primary contact for obtaining necessary approvals from the district magistrate's office. Additionally, a district-level committee will be constituted to make agricultural waste readily available to investors at market prices. The Agriculture Department and State Agricultural Universities will promote the research, marketing and distribution of organic manure produced by CBG units, further integrating bioenergy into the state's agricultural economy.

4.2 BIHAR BIOFUELS PRODUCTION PROMOTION POLICY, 2023

The Bihar Biofuels Production Promotion Policy, 2023, was designed to enhance the state's investment landscape for CBG manufacturing. The policy provides a capital subsidy of 15 per cent of the cost of plant and machinery, capped at Rs 5 crores. The policy also offers a 100 per cent exemption on stamp duty, registration fees and land conversion fees to reduce costs further. An interest subvention incentive is provided at 10 per cent of the term loan for five years, with an upper limit of 50 per cent of the project cost or Rs 20 crore. Additionally, tax-related incentives include a 100 per cent SGST reimbursement and a 100 per cent electricity duty reimbursement for five years, with a maximum limit equivalent to the total project cost. A skill development subsidy of Rs 20,000 per employee is available to train candidates domiciled in Bihar to promote local employment. The policy also simplifies the application process through a single-window clearance portal. Moreover, the policy emphasizes human resource development by encouraging the government and other institutions to run awareness programmes, training and capacity-building initiatives to ensure the availability of trained manpower at all levels within the bioenergy sector.

4.3 GUJARAT STATE BIOTECHNOLOGY POLICY

The policy aims to support 500 biotechnology units and create over 1.2 lakh jobs in the biotechnology sector, including areas such as biofuels and biofertilizers. The policy offers capital assistance of 25 per cent of capital investments, with a ceiling of Rs 40 crore, disbursed in 20 quarterly instalments over five years. Additionally, operational assistance is provided at 15 per cent of expenses, capped at Rs 5 crores per annum. To streamline the establishment of new units, a 'Single Window Clearance Mechanism' has been established to grant necessary approvals and clearances. The policy also includes a 100 per cent reimbursement of electricity duty on power purchased from state electricity distribution companies or power distribution licensees for a period of five years. Interest subsidies on term loans are available at 7 per cent for borrowings

up to Rs 100 crore, with a ceiling of Rs 7 crore per annum, and an additional 3 per cent for borrowings above Rs 100 crore, with an overall ceiling of Rs 20 crore per annum or the actual interest paid, whichever is lower. The policy introduces an Employment Generation Incentive titled AatmaNirbhar Gujarat Rojgar Sahay, offering benefits of up to 50 per cent of CTC, with a maximum of Rs 50,000 per male employee and Rs 60,000 per female employee. This incentive is available to applicants for local employees who have completed at least one year of employment with the unit. The Gujarat State Biotechnology Mission has been designated as the nodal agency responsible for the implementation, support and coordination between various government departments to ensure the policy's effective execution.

4.4 HARYANA BIOENERGY POLICY

The Haryana Bioenergy Policy designates the Haryana Renewable Energy Development Agency (HAREDA) as the nodal agency responsible for facilitating bioenergy projects and implementing the policy. The policy allows the government of Haryana to facilitate the lease of panchayat land at reasonable rates for a minimum period of 35 years to set up biomass projects. Agricultural land is also permitted for use in establishing biomass-based projects within the state. To support the efficient collection of biomass for approved projects, the policy provides reapers, balers and trawlers either on rent or through an upfront subsidy. To ensure a consistent and continuous supply of biomass, the Department of Agriculture and Farmer Welfare has been designated to carry out area demarcation, ensuring that proposed projects do not conflict with other agricultural initiatives. The capacity of these projects is capped at 80 per cent of the feedstock availability in the district, as determined by the biomass assessment report. The policy offers exemptions from land use approval, external development charges, scrutiny fees, and infrastructure development charges. Additionally, there is a 100 per cent exemption from entry tax on all supplies, including capital goods, structures, and raw materials, necessary for setting up and trial operations of the projects. The Agriculture and Farmer Welfare Department, along with state

agriculture universities, will promote organic fertilizers produced by these projects, provided they meet specified standards. State Agriculture Universities will conduct trials to document results without charging any fees. The State Transport Department will also encourage the use of biofuels in public transport vehicles. The policy includes an offline application system with an associated application fee, a non-refundable scrutiny fee, and a performance security fee.

1.5 COMPARATIVE ANALYSIS OF STATES' BIOENERGY POLICIES

State governments in Bihar, Gujarat, Uttar Pradesh and Haryana provide various subsidies and benefits to promote CBG. However, there are notable gaps and inconsistencies in these policies. For instance, Haryana does not offer any capital assistance to CBG producers, while Gujarat stands out by providing operational assistance, which is not available in Uttar Pradesh, Bihar and Haryana.

Interest subvention is another area where policies are lacking; neither Uttar Pradesh nor Haryana mention any relief or subsidies for interest. Tax benefits such as 100 per cent GST reimbursement are available in Bihar, Uttar Pradesh and Haryana, but not in Gujarat. However, all four states offer exemptions from stamp duty and registration fees.

Regarding electricity duty, Bihar and Gujarat reimburse it for five years, and Uttar Pradesh does so for ten years, whereas Haryana does not provide any reimbursement. Land assistance varies significantly: Uttar Pradesh offers land at Rs 1 per acre per year, and Haryana facilitates leasing panchayat land at reasonable rates for biomass projects for a minimum of 35 years. In contrast, Bihar and Gujarat do not offer land assistance.

Employment incentives are available only in Bihar and Gujarat, with Bihar also providing a skill development subsidy of Rs

20,000 per employee. Infrastructure support, such as approach road facilities and catchment area provisions, is present in Uttar Pradesh and Haryana's policies but absent in Bihar and Gujarat.

This table examines the CBG policy scenario in four Indian states: Bihar, Gujarat, Uttar Pradesh, and Haryana. Among the following states, Uttar Pradesh emerges as the one with the most ambitious policy, as it not only offers a high subsidy of 75 lakh/ton of CBG capacity but also offers land assistance, approach road facility, an online portal for application and ensures a continuous supply of feedstock by permitting only one bioenergy plant per tehsil. Bihar, Gujarat, and Uttar Pradesh all offer significant subsidies for bioenergy production, while the state of Haryana is lagging behind. Haryana neither offers financial incentives to producers nor provides an online portal for application or employment support.

In summary, while there is various support for CBG across states, the extent and nature of these benefits vary widely. Uttar Pradesh offers the most comprehensive support, including land, electricity duty reimbursement, and infrastructure. Most states lack capital and operational assistance, interest subvention, and skill development subsidies. Tax benefits and exemptions are universally provided, but their specifics and durations differ significantly.

Table 3: Comparative analysis of states' bioenergy policies

Parameter	Name of state			
	Bihar	Gujarat	Uttar Pradesh	Haryana
Capital assistance	Up to 15 per cent of the cost of plant and machinery (max. Rs 5 crore), higher for priority groups (max. Rs 5.25 crore)	25 per cent of Eligible Gross Fixed Capital Investment (eGFCI)	Subsidy of 75 lakh/ tonne of CBG production; capped at a max of Rs 20 crore	N/A
Operational assistance	N/A	15 per cent of the cost incurred; capped at Rs 25 crore	N/A	N/A
Interest subvention	10 per cent of term loan for 5 years (max Rs. 20 crores)	Interest subsidy at 7 per cent for borrowings up to 100 cr (capped at Rs 7 crore/annum)	N/A	N/A

Parameter	Name of state			
	Bihar	Gujarat	Uttar Pradesh	Haryana
Tax benefits	100 per cent state goods and service tax reimbursement for 5 years (capped at 100 per cent of project cost, 80 per cent SGST reimbursement for priority sectors)	N/A	100 per cent reimbursement of state goods and service tax for 10 years	100 per cent exemption from entry tax with respect to all supplies (including capital goods, structure, and raw materials) made for setting up and trial operations of the projects
Registration/ stamp duty and land conversion fee	100 per cent exemption of stamp duty and registration fees; 100 per cent exemption of Land conversion fees	Stamp duty and registration fee paid towards purchase/ lease/transfer of land and/ or office space and fee paid towards conversion of land is exempted	100 per cent exemption on stamp duty payable on rent deed/lease/sale deed/registration	100 per cent exemption from payment of fees and stamp duty charges
Electricity duty	100 per cent reimbursement for five years	100 per cent reimbursement for five years	100 per cent exemption in electricity duty for 10 years	N/A
Land assistance	N/A	Facilitation for land identification	Land on lease at a minimal rate (Rs 1/acre/ year)	Assistance in lease of panchayat lands
Employment incentives	50 per cent reimbursement (in the case of male workers) and 100 per cent reimbursement (in the case of female workers) on account of EPF and ESI Scheme for five years; skill development subsidy of Rs 20,000 per employee	100 per cent reimbursement of EPF scheme in the case of females and 75 per cent in the case of males for five years; up to 50 per cent of CTC with caps of Rs 50,000 per male and Rs 60,000 per female employee, for local employees after one year of employment	N/A	N/A
Approach road	N/A	N/A	If an entrepreneur invests Rs 50 crore or more in a bioenergy plant, he/she will be given the facility of an approach road up to a maximum of 5 km from the unit to the main road	N/A
Catchment area	N/A	N/A	One bioenergy plant per tehsil	Department of Agriculture and Farmer Welfare to carry out area demarcation
Online portal for application	Yes (https://swc2.bihar.gov.in)	Yes (https://btm.gujarat.gov.in/bt-policy-new.htm)	Yes (https://www.upneda.in/bio/)	No
Duration of policy	July 10, 2023–June 30, 2025	February 15, 2022–March 31, 2027	October 2022–October 2027	March 2018–not defined

6. INTERNATIONAL BEST PRACTICES

The development of biogas varies globally, influenced not just by the availability of feedstocks but also by supportive policies. Europe, China and the United States collectively contribute to 90 per cent of global biogas production (IEA). Europe leads in biogas production, with Germany holding the largest share, accounting for two-thirds of Europe's biogas plant capacity. Other European nations like Denmark, France, Sweden, Italy, Finland and the Netherlands have also actively promoted biogas production. Approximately half of the remaining global production is from developing countries in Asia, particularly Thailand and India.

Broadly, effective implementation is associated with setting ambitious production targets, providing economic subsidies, putting blending mandates, facilitating international trade, developing gas quality standards, designing the framework for the use of byproduct digestate in terms of regulations, standards and certifications, introducing financial de-risking measures such as public–private partnerships and providing monetary awards in terms of green attributes or certificates.

The classic example of ambitious target setting is Denmark, which aims to replace 100 per cent of its natural gas consumption with biomethane by 2030. To encourage market growth, France has implemented cost-sharing between the biomethane gas grid-operators and the biomethane plant owners. Additionally, France's 'zoning' approach allows multiple biomethane producers in the same area to share a common gas network injection facility, resulting in economies of scale and reduced connection costs. To maintain healthy economic margins for CBG producers, gas feed-in tariffs are adjusted for inflation. France also plans to transition the entire Paris bus fleet to biomethane or electric by 2025 to reduce emissions and enhance public transportation sustainability. In Germany, renewable energy producers receive guaranteed remuneration, usually through long-term contracts of 20 years. Like France, Germany divides the costs of injecting biomethane

into the gas grid, with the plant operator covering 25 per cent and the gas grid operator covering 75 per cent of construction costs. Berlin's Municipal Waste Authority uses biomethane from organic waste to power 150 waste-collection vehicles, promoting a circular economy with minimal fuel transportation charges. Furthermore, to avoid the food-vs-fuel debate, Germany limits the use of corn and grains for biomethane installations to 40 per cent.

Italy supports the biomethane sector with economic subsidies, including capital grants covering up to 40 per cent of construction costs for new biomethane plants and an incentive tariff for net biomethane production over 15 years. The UK government aims for 10 per cent biomethane in the gas grid by 2025 and has introduced renewable gas guarantees of origin for green certification of each unit of biomethane injected into the grid. The Netherlands targets a 20 per cent biomethane blending rate by 2030 and has a subsidy programme for low-carbon technologies. Sweden offers investment support of up to 45 per cent for greenhouse gas reduction measures, including biomethane plants and bio-LNG filling stations. Finland provides subsidies for biomethane plants and incentives for CNG and LNG vehicles and fuel stations (see *Table 4: Compressed biogas supportive policies and best practices in diffreent countries*).

Table 4: Compressed biogas supportive policies and best practices in different countries

Country	Policies and best practices
France	• The French biomethane industry is witnessing significant growth and has upgraded its goal to 20 per cent renewable gas—it was previously 10 per cent—by 2030. • Clarifying the responsibility for gas grid connection costs can aid market expansion. In numerous markets, this responsibility is unclear, often leaving producers to cover the full capital costs. However, in France, these costs are distributed between the biomethane plant owner and the gas network operator. • Network planning plays a crucial role in identifying future needs by comparing biomethane feedstock availability to current gas networks. This process helps pinpoint optimal locations for plant development and highlights regional grid-development requirements. Additionally, the potential for multiple producers in the same area to share a common gas network injection facility can yield economies of scale and lower connection costs. In France, this has been facilitated through a 'zoning' approach. • Distribution System Operators (DSOs) and Transmission System Operators (TSOs) cover up to 60 per cent of the costs of connecting to the distribution and transmission grids. • Feed-in tariffs (FiTs), designated for smaller projects, are adjusted for inflation to ensure that CBG producers maintain healthy economic margins. • Starting in 2026, the French government plans to introduce a biomethane production certificate programme. This initiative aims to support and incentivize the production of biomethane by issuing certificates to producers, thereby incentivizing them for the green attributes. • The European Commission aims to achieve a complete shift of Paris's bus fleet to compressed biogas or electric buses by 2025. This target is part of efforts to decrease emissions and enhance the sustainability of public transportation in the city.
Germany	• Germany has the largest biogas production capacity in Europe. Growing efforts to reduce carbon dioxide emissions from fuels are forcing producers to switch to biofuels. • The Federal Immission Control Act (BImSchG) sets greenhouse gas (GHG) reduction quotas for fuel suppliers, requiring an 8 per cent reduction in 2023, increasing to 25 per cent by 2030. Fuel providers exceeding a certain GHG intensity will face a penalty of Euro 600 per metric tonne of CO2. This regulation also incentivizes fuel providers to sell bio-CNG and LNG to meet these targets. • Carbon intensity-based policies can encourage the adoption of biomethane. Germany's Climate Protection Quota allows low-carbon fuels to compete based on their cost-effectiveness in contributing to annual road transport emissions reduction targets. • Germany provides guaranteed remuneration for each unit of renewable energy produced, typically through long-term contracts. New qualifying plants receive a fixed feed-in tariff for 20 years from the start of their operations. • Tax exemptions are granted to incentivize purchases of compressed biogas (CBG) for Combined Heat and Power (CHP), heating, and vehicle fuel purposes. • In Germany, the costs for injecting biomethane into the gas grid are divided; the plant operator covers 25 per cent of the construction costs, while the gas grid operator covers 75 per cent. • Biomethane installations are restricted to using a maximum of 40 per cent corn and grains as feedstock
Italy	• Italy has allocated almost Euro 2 billion to promote the development of biomethane as part of the National Post-Covid Recovery and Sustainability Plan. In September 2022, new biomethane regulations introduced two financial mechanisms aimed at boosting production: a support system for capital investments and a new incentive tariff mechanism. • In 2022, fuel suppliers must incorporate 10 per cent biofuels into their products, with 2 per cent specifically designated as biomethane. To achieve these goals, suppliers can purchase Certificates of Supply for Consumption (CICs). • A capital grant of up to 40 per cent of construction costs for new biomethane plants. • An incentive tariff applied to the net production of biomethane for a period of 15 years.

Country	Policies and best practices
Denmark	• Since the introduction of feed-in tariffs in 2012, Denmark's biomethane sector has expanded rapidly. By 2022, biomethane constituted 19 per cent of the country's gas consumption. By September 2023, this figure had risen to 39 per cent. Denmark aims to replace natural gas consumption with biomethane by 2030 entirely. • The sharing of gas grid costs between biomethane plant owners and gas network operators includes the network operators covering expenses for compression and quality conditioning. • In Denmark, biogas plants are categorized into four types: agricultural, sewage, industrial and landfill plants. Agricultural plants constitute about 85 per cent of biogas production, with future production expansions expected primarily at these facilities.
United Kingdom	• Feed-in tariff policies have been instrumental in promoting growth in key biomethane markets. Implementing mechanisms for budgetary control and flexibility to adjust tariffs in response to production cost changes are crucial aspects of these policies. These principles are exemplified in the UK's Green Gas Support Scheme (GGSS), initiated in 2021. The GGSS provides tariff-based support for biomethane generated via anaerobic digestion and injected into the grid from November 2021 to November 2025. • Renewable Gas Guarantees of Origin (RGGOs) are distinctive markers assigned to each unit of biomethane injected into the grid, recorded within the Green Gas Certification Scheme. • A quota system that supports biomethane use in transportation is called the Renewable Transport Fuel Obligation (RTFO), which is an obligation on suppliers of fossil petrol and diesel to supply a certain percentage of renewable fuel to the UK market. • The UK government aims to achieve a target of 10 per cent biomethane in the gas grid by 2025.
Netherlands	• The country aims to achieve a production target of 2 billion cubic metres (21 TWh) by 2030 and attain a 20 per cent blending rate of biomethane by the same year • The Sustainable Energy Production and Climate Transition Incentive Scheme (SDE++ scheme) is a subsidy programme aimed at supporting low-carbon power technologies and CO2 sequestration. Funding is distributed over 12–15 years, depending on the technology involved. The amount granted is calculated based on the energy produced by the facility or the emissions avoided through the technology, and biomethane projects are included under this scheme.
Sweden	• Sweden has a robust biomethane sector, with the transport industry being the primary consumer. The Swedish government is supposed to roll out a new strategy encompassing long-term support measures and a goal of producing 10 TWh of biomethane by 2030. • The local Climate Investment Programme (2015–26) provides investment support of up to 45 per cent for all types of GHG reduction measures, including support for bio-CNG plants and bio-LNG filling stations.
Finland	• Biogas and biomethane development are pivotal in Finland's climate and energy strategy. The national goal set in 2021 aims to achieve 4 TWh of domestic biogas and biomethane production by 2030. New mechanisms like the national Guarantee of Origin system and investment subsidies have been introduced to support this target. • Upon becoming operational, biomethane plants can receive investment subsidies covering up to 25 per cent of the total project cost, with potential increases to 40 per cent for projects involving new technologies. • Subsidies are made available for CNG and LNG vehicles as well as refuelling stations

7. KEY POINTS TO CONSIDER WHILE DRAFTING A STATE'S CBG POLICY

7.1. MAINTAINING A CONTINUOUS SUPPLY OF FEEDSTOCK TO THE CBG PLANT

A1: Agricultural residue

Challenge:

The primary issues with agricultural residue include the absence of efficient machinery for timely harvesting, lack of biomass storage facilities, outdated data on biomass availability at the district level, and failure to recognize farmers as critical shareholders in biomass aggregation and bioenergy projects. This oversight leads to flawed financial models and project failures. Additionally, companies struggle to determine biomass pricing until the tender process is completed, often finding that the lowest bids are still too high. This issue arises because bidders previously did not adequately address supply chain risk mitigation. When risks were considered, prices increased. Private entities have either managed biomass aggregation themselves with limited success or hired aggregation companies at higher costs and risks.

The lack of state-level implementation of central policies further slows sector growth, increasing risks and deterring investors and developers. Various ministries roll out schemes without adequate inter-ministerial coordination, leading to biomass shortages in certain regions. This lack of zoning for large-scale projects hampers structured growth in the bioenergy sector, raising risks in the upstream value chain for compressed biogas (CBG).

Recommendations:

- Farmer Producer Organizations (FPOs) and self-help groups (SHGs) are vital to the feedstock supply chain. They should be made shareholders in bioenergy plants and receive necessary

training for feedstock collection. Prioritizing them as biomass aggregators and offering incentives for residue management machinery is essential.

- Support is needed for biomass depots where farmers can deliver biomass, thereby aiding industrial development in rural India. Government entities like the National Bank for Agriculture and Rural Development and the National Agricultural Cooperative Marketing Federation of India Limited should establish advanced warehousing infrastructure. These storage facilities could also serve as exchange points for biomass and organic fertilizers, boosting supply chains and creating village-level employment. They can be leased to farmers and biomass aggregators at affordable rates, with the option to develop these warehouses through public-private partnerships (PPP).
- A combined effort is required to promote the manufacture of post-harvest machinery and tools in India to drive large-scale growth in the bioenergy sector. Tax waivers on agri-residue management machines should be provided to support this manufacturing process. Setting up Custom Hiring Centres in districts with abundant agricultural residue could further improve the efficiency of crop residue management.
- With many industries seeking biomass, certain regions may face biomass scarcity, especially agricultural residue, which could spread to other areas. To prevent this, policies should mandate one bioenergy plant per tehsil/block/district. A second plant should only be permitted if it uses a different type of feedstock than the existing plant.
- Using the latest technologies, such as satellite imagery, identify crop residue sites within the state. Maintain a state waste atlas with decentralized, district-wise data, updating it every five years to pinpoint hotspot districts. Make this information publicly available online.
- District-biofuel committees, led by the district magistrate, should be established to enhance coordination among stakeholders and prioritize dispute resolution. These committees will ensure a continuous feedstock supply to bioenergy plants, implement the one-tehsil-one-plant strategy, train Farmer Producer Organizations (FPOs), and integrate FPOs with bioenergy plants.

A2: Municipal solid waste

Challenge:

Segregation at source is the biggest challenge in India, as people are not ready to segregate waste according to the biodegradable/ non-biodegradable category of waste. According to the Solid Waste Management Rule, 2016, a national mandate was formed to segregate waste at its source. This mandate failed miserably, as the segregation of waste is still one of the biggest challenges while dealing with MSW. The main reason behind this failure is a lack of enforcement and no behavioural changes in locals. One of the major challenges with the collection and transportation of waste is the lack of proper infrastructure to transport the waste in a segregated manner. Even if the waste is segregated at the source, collecting and transporting dry and organic waste in the same vehicle reduces the efforts to zero. Waste quantification and characterization—which includes the quantity of waste generated, sources that generate waste, the composition of waste, and impurities in waste—is currently lacking.

Recommendations:

- In the long run, the CBG projects could run on MSW if the strict regulations and better enforcement of the Solid Waste Management 2016 regulations are mandated by the states
- There is a need to upgrade the waste collection infrastructure. To facilitate this, the collection could also be done using the public–private-partnership model.
- Urban local bodies shall conduct regular analysis and surveys to get data for efficient estimation of waste availability fit to use for CBG generation.
- Even after segregation, there are some food components, like onion peels, lemons, etc., that need to be separated before feeding the organics in the digestor. This is important as these will disturb the biology of the reactor. To ensure this, advanced machinery needs to be in place to segregate these components using modern technology. This needs investment in research and development, as well as incentive support from the state governments.

- It has also been seen that a lot of sand comes at the CBG projects with organic waste, which ultimately settles in the digestors and lowers its efficiency. The state policy should incentivize machinery that filters sand from the organic waste.

A3: Pressmud

Challenges:

Sugar mills, once viewing pressmud as a waste problem, now acknowledge its capacity to generate income, resulting in a significant surge in pressmud prices over the past couple of years, escalating from Rs 100 per tonne to Rs 600–800 per tonne. Pressmud also faces competition for its use as a feedstock for pellet formation and as fuel in brick kilns. The absence of agreements with sugar mills intensifies the obstacles. Furthermore, the storage of pressmud poses difficulties as it goes through gradual decomposition, complicating extended storage and elevating production expenses.

Recommendations:

- CBG producers should be assisted in tying up with nearby sugar mills and ensuring that the pressmud is procured at fixed prices with reasonable increments in procurement prices every year. Like cane prices, the Central/state government shall cap the price of the pressmud that could lead to uniform pricing across the state. Long-term agreements >10 years with the CBG producers shall be the priority.
- Alternative uses of pressmud, such as pellet formation and direct usage as fuel for brick kilns in the CBG plant vicinity, should be discouraged by strictly maintaining the penalty guidelines.
- The state governments should only sanction a limited number of plants around sugar mills, depending on the pressmud quantity production.
- Barren lands under the state purview should be made available for pressmud storage, and capex incentives for storage infrastructure should be provided under the state's policy.

- Research and development on pressmud storage methods should be executed. The standard operation procedure (SOP) for pressmud storage should be made part of the policy with clear guidelines.

A4: Animal waste

Challenge:
The issue with animal waste is that it is dispersed across rural areas, making collection difficult. Additionally, it has a low total-solids content, resulting in lower biogas production compared to other feedstocks with the same input quantity. Furthermore, inconsistent pricing across different districts and states, along with the absence of standardized pricing criteria for the feedstock, leads to economic imbalances for CBG producers.

Recommendations:

- Large cattle farms, cow shelters, and goshalas with a combined quantity of atleast 100 tons of cattle dung per day should be encouraged to set up CBG projects either on their premises or in nearby areas. It should also be ensured that the feedstock is available at no cost. Decentralized biogas models are preferred for smaller quantities.
- Milk cooperatives should be informed about the potential of cattle dung as an energy source, and mechanisms should be established to collect it through a cooperative model. A model cooperative facility, similar to Amul, should be developed to promote the establishment of CBG plants within a 25 km radius. This initiative will ensure the effective utilization of organic feedstock and provide farmers and stakeholders with economic benefits from the CBG plant in terms of power and manure. Additionally, stakeholders in the cooperative society should participate in awareness and training programs to stay informed and updated.
- The price of cattle dung should be determined based on its total solid content to ensure farmers receive fair compensation. For instance, the National Dairy Development Board has created a price chart based on two quality parameters of bio-slurry,

similar to the system used for milk procurement. This approach benefits both farmers and CBG producers.

- Besides solid feedstocks, industries with liquid effluents, such as spent wash from distilleries, discharges from paper and pulp manufacturing, and other types of liquid industrial waste, should be encouraged to establish CBG projects.

7.2 ENSURING COMPLETE GAS OFFTAKE FROM THE CBG PLANT

- There has been partial offtake of CBG from the plants due to low consumption on CNG stations. Also, transporting the gas through cascades leads to increased transport cost and gas leakages. To overcome this challenge, it shall be ensured that CNG and PNG pipeline is connected to the CBG plant by providing incentives on pipeline expansion capital cost and providing faster regulatory approvals. The Central government approved the scheme on June 26, 2024 for development of pipeline infrastructure (DPI) for injection of CBG in city gas distribution network, and provides standard financial assistance for laying of pipeline (Steel/MDPE) up to 50 km @ 50 per cent of the project cost or Rs 0.5 crore per km, whichever is less. In case of connectivity where only MDPE pipeline is used, the financial assistance shall be restricted to 50 per cent of project cost or 0.075 crore per km, whichever is lower. In addition to this incentive, the state governments shall also provide additional subsidies on pipeline installation as it is a crucial aspect to ensure complete CBG offtake.
- Most of the CBG projects are located in rural areas, but the demand for CNG in rural areas is hampered by the scarcity of CNG vehicles in these regions. To address this issue and stimulate demand, providing incentives for retrofitting existing petrol/diesel vehicles into CNG to create demand could be beneficial. Conversion of agricultural equipment, including tractors, to CNG, shall be promoted by providing indirect benefits. Recently, Bajaj launched India's first two-wheeler on CNG that will help to stimulate CNG demand in the country.
- Facilitating and incentivizing industries and hotels to use CBG could lead to secondary market creation in the states.

7.3 ENSURING BIO-SLURRY/FERMENTED ORGANIC MANURE (FOM) OFFTAKE FROM THE CBG PLANT

- Biomethane production generates a byproduct called bio-slurry or fermented organic manure (FOM), which can be utilized as a fertilizer or soil improver, substituting inorganic fertilizers and aiding in soil restoration and carbon retention. However, despite its potential value, digestate is difficult to monetize and is often seen as a disposal problem rather than a revenue source. Plant owners frequently give it away to nearby farmers or dispose of it on vacant land due to the lack of awareness about FOM's benefits, application methods and optimal usage periods. This lack of knowledge also hampers the practice of enriching FOM.

- To address this, states should ensure that fertilizer companies like IFFCO and KRIFCO purchase FOM at fixed prices. Alternatively, state governments could provide a one-time subsidy to install FOM enrichment machinery at plants. Raising awareness about FOM characteristics, application procedures, and benefits through organizations like Krishi Vigyan Kendra and State Agricultural Universities is essential. Additionally, encouraging other FOM consumers, such as the National Highway Authority of India (NHAI) for mid-path plantations and organic farms, especially if a CBG project is within a 20 km radius, could help facilitate FOM offtake from CBG plants.

- Creating a national or state-level single brand for FOM/LFOM produced by CBG projects could help farmers better understand its quality and uses. The government could introduce suffix designations like A, B, C and D to identify FOM based on its source, such as press mud, agricultural residue, animal manure or municipal solid waste, as each type has different characteristics and benefits for soil. This clarity is essential for the end users, who are farmers.

7.4 SUPPORT DURING INSTALLATION OF THE CBG PLANT

The following measures would be beneficial during installation of CBG plants:

- Given the high initial costs of installing CBG projects, offering state subsidies in addition to the Ministry of New and Renewable Energy capital cost subsidy could be advantageous. A subsidy of Rs 50–75 lakh per tonne of the plant's CBG capacity could be provided.
- CBG plants must meet various regulatory requirements and obtain permits for emissions to air and water, waste handling, digestate management, health and safety, gas handling and storage, construction, feedstocks, and connection to the gas grid. Ensuring best practices through regulation is essential. However, the approval process can be lengthy, taking around two years in the best-case scenario but extending to five years or more in other cases. This is particularly challenging in India, where the government aims to rapidly install 5000 CBG projects. Accelerating the permitting process, ideally within standard approval timeframes, is crucial for the swift growth of the biomethane industry. This can be achieved by increasing staff resources to process applications, providing specialized training in biogas and biomethane, leveraging digitalization, and simplifying requirements where possible, such as through one-stop shops. It is important to recognize that while speeding up the process is desirable, maintaining regulatory compliance and best practices remains necessary. An online portal with a time-tracking system for regulatory approvals across different state departments could facilitate this process.
- Land should be offered at reasonable prices per acre, rather than free, near the feedstock hub or CBG plant, rather than in random locations. This involves prioritizing appropriate land parcels and speeding up approval processes, including obtaining NOCs from District Magistrates and various regulatory authorities. Additionally, land registration charges should be waived. Since most of these plants are installed in rural areas near agricultural

land, the conversion of land use from agricultural to industrial for CBG projects should be facilitated within a specified time frame.

- The states should map the infrastructure of CNG pipelines and publish detailed maps online through their respective renewable energy agency portals. This will help CBG producers find suitable locations for their projects efficiently.
- Establish frameworks for cooperative infrastructure deployment aimed at biomethane upgrading and integrating into gas networks. This approach aims to reduce investment and operational costs for multiple biogas producers located in the same geographical area, such as multiple CBG units.
- Assistance should be providded in facilitating independent electricity feeder-line connections, crucial for CBG projects requiring continuous 24-hour electricity. Alternatively, the integration of solar projects with CBG plants should be promoted to ensure fixed-price off-take for surplus electricity generated by these projects..

7.5 TECHNICAL ASSISTANCE OR OPERATIONAL SUPPORT

Provision of the following technical assistance and/or operational support is recommended:

- Operational challenges frequently confront functioning plants, resulting in issues like gas leakage, inefficiency and operating below optimal capacity. This arises from a lack of skilled personnel with inadequate understanding of biogas production systems involved in plant operations. Capacity-building programmes on operational aspects of the CBG project at regular intervals by the state renewable energy nodal agency is a key requirement. A trained pool of manpower is missing, even after the gas-based economy and the six-year-old initiative Sustainable Alternative Towards Affordable Transportation (SATAT) are six years old. Like the programme Suryamitra, state renewable energy nodal agencies shall train jaivmitras to operate bioenergy projects.

- Performing scientific analysis presents difficulties, including a lack of awareness regarding laboratories for sample characterization and the absence of easily accessible monitoring instruments for operations. Additionally, there is an absence of a Biogas Development and Training Centre (BDTC) in various states, which was created by the Ministry of New and Renewable Energy to handhold the small scale biogas plants. It is important to specify the sample testing labs for the CBG projects in the state, which could be either government universities labs or BDTCs, and clearly define the characterization prices and application procedure.
- Given that CBG plants are environmentally friendly projects that help reduce carbon emissions, they qualify for carbon credits. Nevertheless, the application procedure is complex and the associated fees are high. To streamline this, it is recommended that a collective pool be formed for all CBG projects within the state, with the state nodal agency acting as the unified applicant for all operational plants in the region. Uttar Pradesh serves as a prime example of this approach.

The adoption of compressed biogas (CBG) projects in India has been slow—with just 100 projects in operation as of August 2024—falling well below the goal of 5,000 plants by 2030.

A key obstacle to CBG development is the ineffective execution of policies at the state level. While several states have significant CBG potential, they still lack clear policies and incentives. Only four states—Uttar Pradesh, Haryana, Bihar, and Gujarat—currently have bioenergy policies that support CBG.

To address this issue, this policy brief identifies critical elements for crafting state-specific CBG policies. It also reviews existing state bioenergy policies and draws on international best practices to guide effective policy-making for state governments and renewable energy agencies.

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