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Can biogas aid India's energy security?

India, which imports nearly 85% of its crude oil needs, remains vulnerable to global energy shocks. Over the years, it has pushed several initiatives to promote compressed biogas. Despite these efforts, progress has been limited; government support and incentives could provide a boost to the sector

EXPLAINER

By Nivedita

Tensions in West Asia continue to keep global energy markets on edge. India imports nearly 85% of its crude oil needs, much of it from West Asia, and supplies faced disruptions due to the Israel-U.S.-Iran war. While the government has diversified its crude oil suppliers, around 90% of India's LPG imports still transit through the Strait of Hormuz, making any instability in the region a potential risk to India's energy security.

Over the years, India has pushed several initiatives to promote alternate fuels like compressed biogas to reduce dependence on imported fuel, tackle agricultural waste and support rural incomes. But despite ambitious targets and policy support, progress has remained limited.

The search for an alternative fuel

Biogas is a mixture of methane, CO₂ and small quantities of other gases produced by anaerobic digestion of organic matter. It can be processed and compressed to get Compressed Biogas (CBG). It is chemically identical to CNG; renewable, carbon-neutral and can be produced from waste. It can be used directly to produce electricity, heating or as an energy source for cooking.

India has also been trying to blend biogas into its gas supply for at least a decade. The push gathered pace in 2018, when the Sustainable Alternative Towards Affordable Transportation (SATAT) initiative was launched with a target of establishing 5,000 plants by 2023. Only 132 are completed as of June 3, 2026.

The Centre launched the GobarDhan (Galvanising Organic Bio-Agro Resources Dhan) scheme to increase CBG production. Under this 'waste to wealth' programme, the government offered grants of up to ₹50 lakh per district for



A biogas plant at the Waste-to-Energy unit in Koramangala in Bengaluru. J. ALLEN EGENUSE

community biogas plants. ₹564 crore was earmarked for the purchase of biomass collection machinery, while ₹994 crore was allocated to build pipelines connecting biogas plants directly to the gas grid.

However, progress on the ground has remained limited. The lack of infrastructure, poor private investment, difficulties in accessing formal credit and high upfront cost of technologies have stalled progress. Financial support from the government can make biogas projects economically viable. Other incentives, like accelerated depreciation and tax holidays, would also help attract private players.

Impact on cultivation patterns

The development of biogas has been uneven across the world, with Europe, China and the United States accounting for 90% of global production.

Germany is one of the largest producers in Europe, along with France, Denmark and the U.K. The fillip for the sector came in 2000, when Germany introduced the Renewable Energy Sources Act to incentivise production.

Over the years, it introduced schemes to guarantee income to producers, gave bonuses to help operators increase their income and encouraged small-scale biogas plants. However, the country's push for biogas triggered a "corn mania", with maize cultivation rising sharply because it was highly profitable for farmers. Maize slowly started to replace other food crops. Over a decade later, the government was forced to step in and control this by introducing a cap on the use of maize in biogas plants.

This danger hits close to home. The Economic Survey 2026 noted that maize cultivation in India has increased sharply, potentially affecting crop diversity and food security. It noted that while the national maize yield increased from approximately 2.56 tonnes per hectare in FY16 to roughly 3.78 tonnes per hectare by FY25, the yields for soybeans, sunflower, rapeseed, peanuts and millets, among other crops, have either stagnated or declined.

While this trend could be attributed to technological advancements, ethanol pricing can be an important factor.

The government fixes administered

per-litre ethanol prices based on the feedstock used. The price for maize-based ethanol is higher, while the price for rice-based ethanol is lower. The price for molasses-based ethanol is fixed between the two. Between FY22 and FY25, the administered price of maize-based ethanol grew at a compound annual growth rate (CAGR) of 11.7%, making maize more lucrative for farmers.

While maize's area under cultivation and production jumped between FY22 and FY25, pulses output declined, while oilseeds and other cereals registered only modest growth.

India imports large quantities of pulses and edible oils to meet demand. Yet, instead of focusing on increasing production, the government's policy might inadvertently disincentivise farmers from cultivating them. Over time, this could increase India's dependence on imports and expose domestic food prices to greater volatility during supply shocks.

Denmark, which is targeting to use only biomethane in its gas system by 2030, offers a solution. The government discouraged the use of crops as feedstock, and the primary source is livestock manure and agricultural waste.

Government's action plan

In 2023, the National Biofuels Coordination Committee approved a mandatory blending obligation. Gas distributors have been mandated to blend CBG into their supply from FY26. It would start at 1% and rise to 5% by FY29. In her Budget speech in February 2024, Finance Minister Nirmala Sitharaman said the phased blending of CBG in CNG for transport and Piped Natural Gas for domestic purposes "will be mandated."

To meet these targets, the government is ramping up the establishment of plants.

The question is whether the government can replicate India's ethanol blending programme with CBG. In 2014, just 1.5% of petrol was blended with ethanol. By December 2025, it had hit 20%, five years ahead of the original 2030 target.

THE GIST

Biogas is a mixture of methane, CO₂ and small quantities of other gases produced by anaerobic digestion of organic matter. It can be processed and compressed to get Compressed Biogas (CBG)

In 2023, the National Biofuels Coordination Committee approved a mandatory blending obligation. Gas distributors have been mandated to blend CBG into their supply from FY26. It would start at 1% and rise to 5% by FY29.

1. **Context:** India imports nearly 85% of its crude oil requirement; Compressed Biogas (CBG) is being promoted to enhance energy security, reduce fossil-fuel imports and utilise organic waste.

2. Compressed Biogas (CBG)

I. **Biogas:** Produced through anaerobic digestion of biodegradable waste; primarily contains Methane (CH_4) and Carbon Dioxide (CO_2).

II. **Compressed Biogas (CBG):** Purified and compressed biogas with properties comparable to Compressed Natural Gas (CNG).

3. Government Initiatives

I. **Sustainable Alternative Towards Affordable Transportation (SATAT), 2018:** Promotes CBG production and marketing.

II. **Galvanising Organic Bio-Agro Resources Dhan (GOBARdhan):** Supports waste-to-wealth and rural bioenergy.

III. **Mandatory CBG blending in City Gas Distribution (CGD) network:** 1% (FY26) → 5% (FY29).

4. Challenges

I. High capital cost and inadequate infrastructure.

II. Weak biomass supply chain and limited private investment.

III. Excessive use of maize as feedstock may affect crop diversification and food security.

5. Significance

I. Improves energy security by reducing crude oil and natural gas imports.

II. Supports circular economy, lowers methane emissions and stubble burning.

III. Generates rural employment and additional income for farmers.

User data exposed due to flaws in UMAN portal: researchers

UAN of PF subscribers, LPG booking details, and Aadhaar numbers among the exposed data; IT Ministry acknowledges vulnerabilities, says necessary measures are being implemented; initial fixes do nothing to fix the system, says researcher

Aroon Deep
NEW DELHI

Multiple vulnerabilities in the UMAN, or Unified Mobile Application for New-age Governance, portal that aggregates hundreds of public services offered by the Union and State governments are leaving data of potentially millions of Indians exposed across a variety of databases, including those from the Employees' Provident Fund Organisation (EPFO), according to two security researchers who shared their findings with *The Hindu*.

The vulnerabilities, which have likely existed for years, affect several services tested on the UMAN portal, which has onboarded over 2,400 services. It stems from the architecture of the portal itself, said the researchers, Akshay C.S. and Viral Vaghela. "Almost everything is broken by design," Mr. Vaghela said.

The data exposed included Unique Account Numbers (UAN) with the EPFO, LPG cylinder booking details with at least one major oil marketing com-

Data at risk

Vulnerabilities in the UMAN portal are exposing user data across hundreds of services, including UAN cards, according to researchers

- Apart from UAN, details of LPG cylinder bookings and Aadhaar numbers have been exposed
- The EPFO module alone has been used over 40 crore times in the last three months; shortly after the vulnerabilities were reported, the main EPFO portal was taken down for "migration"
- The IT Ministry's initial fix has not completely shut off the flaws, over a month after vulnerabilities were reported to the government, the researchers say



pany, and Aadhaar numbers across several services where a user's ID details are saved. The Aadhaar numbers were found across many services in plain text, though such storage is disallowed by the Aadhaar Act, 2016. The Aadhaar module itself within UMAN was not vulnerable.

The EPFO module is UMAN's most-used service, recording over 40 crore transactions over the past three months.

The Ministry of Electronics and Information Technology acknowledged the vulnerabilities in a

statement to *The Hindu*. "Our development and security teams have carefully examined the observations and are implementing the necessary corrective and preventive measures," the Ministry said. "The plain-text information in the concerned APIs has been appropriately encrypted."

API review

The Ministry added that it has "reviewed the API transaction logs for the past three months" and found that "transaction volumes" were consistent and that it continued to keep a watch on activities on the

UMAN portal.

The Hindu is withholding the precise technical details of the vulnerabilities, as they remain active despite the above interventions. The encryption the IT Ministry referred to is "flawed and inadequate", Mr. Akshay said, adding that a simple workaround allowed it to be cracked anyway. At *The Hindu*'s request, the researchers shared their findings with Karan Saini, another independent security researcher, who termed the vulnerabilities "significant".

"Considering that rate limiting was implemented and the large number-space of EPFO UANs, it is unlikely that the vulnerability could have been exploited to mirror the entire EPFO database," Mr. Saini said, referring to the steps taken by the site to limit the number of requests a user can make. Still, he added, it "could potentially have been abused by cybercriminals in possession of UANs to siphon funds at scale by allowing for both changing of bank account details and initiating payouts, which is very concerning".

"The fixes initially im-

plemented following the disclosure appear to do nothing to secure the system and instead confuse obscurity with security, while also introducing another vulnerability in the process," Mr. Saini said.

Mr. Akshay and Mr. Vaghela reported both vulnerabilities to the IT Ministry and the Computer Emergency Response Team, India (CERT-In), which issues alerts and helps organisations across the country with fixes for vulnerabilities like these. Shortly after the pair reported the vulnerabilities, the EPFO took down its online portal for a "migration", and some services remained unavailable this week.

The researchers said they suspected this was in response to their alerts, which were also sent to the organisation. The Ministry of Labour and Employment did not respond to a request for comment.

"It is worth examining whether the fixes deployed on the UMAN portal were simultaneously deployed across the services for which UMAN acts as a proxy," Mr. Saini said.

1. **Context (GS II: E-Governance | Digital India | Cyber Security)**

I. Researchers reported security vulnerabilities in the Unified Mobile Application for New-age Governance (UMANG) portal that allegedly exposed users' personal data. The Ministry of Electronics and Information Technology (MeitY) has initiated corrective measures.

2. **UMANG (Unified Mobile Application for New-age Governance)**

I. **Launched:** 2017 under the Digital India Programme by MeitY; developed by the National e-Governance Division (NeGD).

II. **Objective:** Provide a single-window platform for Central, State and local government services.

III. **Coverage:** 2,400+ services, including Employees' Provident Fund Organisation (EPFO), Aadhaar, DigiLocker, Passport, Permanent Account Number (PAN), utilities and pension services.

3. **Significance**

I. Promotes citizen-centric digital governance.

II. Enhances accessibility, transparency and Ease of Living.

III. Strengthens the Digital India ecosystem.

4. **Issues Highlighted**

I. Personal data exposure due to Application Programming Interface (API) vulnerabilities.

II. Concerns over data privacy and cybersecurity.

III. Need for stronger security audits, encryption and timely vulnerability patching.

What is the India-Australia uranium supplies agreement?

What do the administrative arrangements mean for India's nuclear energy sector?

Kallol Bhattacharjee

The story so far:

During Prime Minister Narendra Modi's visit to Australia last week, India and Australia "finalised the administrative arrangements" required to enable export of uranium from Australia to India. These exports will be "exclusively for peaceful purposes and under International Atomic Energy Agency (IAEA) watch" under the Australia-India Nuclear Cooperation Agreement, 2015.

What does the latest development mean?

The finalisation of the "administrative arrangements" means that private Australian mining entities involved in uranium extraction will be able to conclude commercial contracts with Indian private sector companies and joint ventures. The participation of private

Indian entities in uranium exports from Australia adds a new chapter to India's energy journey, which was recently boosted by the SHANTI Act passed in December 2025, opening the nuclear sector to private players.

The timing of the announcement is significant, as it has come at a time when India's energy sector is under severe stress due to the U.S.-Israel attack on Iran. India is being forced to diversify and explore options to cope with short-term requirements by buying hydrocarbons from Russia, the United States, and Venezuela, while also planning for the future. The arrangements with Australia for uranium export are expected to help India meet its energy requirements in the future.

Why is this significant?

Australia holds more than a quarter of the global uranium reserves and has traditionally maintained a strict policy

regarding the supply or export of uranium to non-NPT member countries. According to the World Nuclear Association the countries that have received Australia's uranium include the United States, Japan, South Korea, France, Sweden, Belgium, Finland, the United Kingdom, and Germany. India is among the non-signatories, which are countries that chose not to sign the Nuclear Non-Proliferation Treaty.

Australia has been exporting uranium to countries with which it has "bilateral safeguards agreements", as it maintains that support for nuclear non-proliferation is among its "paramount" considerations. The "administrative arrangements" can be interpreted as further firming up of "bilateral safeguards" that were part of the Australia-India Nuclear Cooperation Agreement 2015.

India has an unblemished nuclear supply chain record and an ambitious nuclear energy programme. Though it is

not a signatory to the NPT, it signed a safeguards agreement with the IAEA in 2008 after India and the U.S. signed the nuclear deal, which was presided over by Prime Minister Manmohan Singh and President George W. Bush. Subsequently, the 48-member Nuclear Suppliers Group made a major move by exempting India from the list of countries with which they are prohibited from engaging in nuclear-energy-related business, thereby opening the gates for nuclear-energy-related supplies to India. This exemption has been the basis of several civil nuclear agreements that India has signed with partner countries.

What negotiations made this arrangement possible in 2026?

While Canberra and New Delhi have finalised the "administrative arrangements" now, negotiations between the two sides have been ongoing for nearly two decades. On November 12, 2009, during Prime Minister Kevin Rudd's visit to India, the two issues were addressed."

A joint statement issued during this visit said, "Mr. Rudd noted India's plans to meet its future energy requirements by exploring and developing all sources of energy, including nuclear, renewable and non-conventional resources. Both sides recognised the benefits of enhancing bilateral commercial exchanges of renewable and non-renewable energy

resources. The two Prime Ministers also agreed that energy security concerns are best met by reconciling the long-term interests of both energy-producing and energy-consuming countries through a truly open and competitive energy market. Both sides also expressed their willingness to join efforts which promote a cooperative response to any global energy crisis." The same joint statement also mentioned mutual commitment to oppose nuclear weapons. These negotiations led to the Australia-India Nuclear Cooperation Agreement, which was signed in 2014 and came into force in 2015.

According to World Nuclear Association, the "administrative arrangement" between India and Australia was 'finalised and became operational' after the signing of the Australia-India Nuclear Cooperation Agreement of 2015 and at least 300 tonnes of uranium were exported to India since 2018.

But it is understood, that uranium export was part of a 'test drive' as there were lingering concerns about Indian entities receiving Australian uranium. The latest announcement on the "administrative arrangements" and the emphasis on "exclusively peaceful purposes and under International Atomic Energy Agency (IAEA) safeguards" indicates that the 'test run' has paved the way for bigger commercial deliveries.

1. **Context (GS II: India–Australia Relations | GS III: Energy Security | Nuclear Energy):** India and Australia have finalised the administrative arrangements under the Australia–India Nuclear Cooperation Agreement (2015), paving the way for commercial uranium exports from Australia to India for peaceful civilian nuclear use.

2. **Australia–India Nuclear Cooperation Agreement, 2015**

I. **Signed:** 2014 | **Came into force:** 2015.

II. Enables Australia to export uranium to India exclusively for peaceful purposes under International Atomic Energy Agency (IAEA) safeguards.

III. Built on the Nuclear Suppliers Group (NSG) waiver (2008), which allowed civil nuclear commerce with India despite it not being a signatory to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

IV. Strengthens bilateral cooperation in civil nuclear energy and long-term energy security.

3. **Administrative Arrangements (2026)**

I. Operationalise the 2015 agreement by laying down procedures for commercial uranium exports.

II. Permit Australian private mining companies to sign export contracts with Indian public and private entities.

III. Establish mechanisms for tracking, accounting and end-use verification of uranium in accordance with IAEA safeguards.

4. **Significance**

I. Supports India's expanding nuclear power programme and long-term energy security.

II. Coincides with the SHAKTI (Streamlining Harnessing of Atomic Knowledge for Transformative Innovation) Act, 2025, which opens India's civilian nuclear sector to greater private participation, enabling private firms to benefit from assured uranium supplies.

III. Deepens the India–Australia Comprehensive Strategic Partnership and cooperation in critical minerals and clean energy.

5. **International Atomic Energy Agency (IAEA)**

I. Established: 1957 | Headquarters: Vienna, Austria.

II. Autonomous international organisation within the UN system promoting the safe, secure and peaceful use of nuclear energy.

III. Conducts nuclear safeguards and inspections to ensure civilian nuclear materials are not diverted for military purposes.

1

INS MAHENDRAGIRI COMMISSIONED

Strengthening India's Maritime Might



INS Mahendragiri, the 6th Project-17A Nilgiri-class stealth frigate, was commissioned at Visakhapatnam on 11 July 2026.

KEY CAPABILITIES



Stealth guided missile frigate



Advanced sensors & combat management systems



Anti-air, anti-surface & anti-submarine warfare capability



Long-range maritime & helicopter operations



High indigenous content

EVOLUTION OF INDIGENOUS FRIGATES

Talwar Class
(Russian Built)

Shivalik Class
(Project 17)

Nilgiri Class
(Project 17A)

WHY IT MATTERS

- Enhances India's maritime deterrence
- Ensures capability for multi-domain operations
- Strengthens Blue Economy
- Aatmanirbhar Bharat in defence

2

GUARDIANS OF INDIA'S MARITIME FRONTIERS

Three Indigenous Naval Classes

NILGIRI CLASS
(Project 17A)

Stealth Frigates



- 7 Ships
- Length: 149 m
- Displacement: 6,670 tonnes
- Speed: 28 knots
- BrahMos Missiles
- Advanced sensors & low radar signature

SANDHAYAK CLASS

(Survey Vessels – Large)



- 4 Ships
- Length: 110 m
- Displacement: 3,400 tonnes
- Hydrographic surveys
- Ocean mapping & charting
- Supports Blue Economy

ARNALA CLASS

(ASW Shallow Water Craft)



- 8 Ships
- Length: 77.6 m
- Displacement: 900 tonnes
- Anti-submarine warfare
- Coastal security operations
- Shallow water operations

MARITIME SECURITY BOOST



Secure Sea Lines of Communication (SLOCs)



Protect Exclusive Economic Zone (EEZ)



Counter threats above, on and under the sea



Strengthen coastal & island territories

3

INDIA-JAPAN 8TH DEFENCE POLICY DIALOGUE



Tokyo, 13 July 2026

India and Japan reaffirmed their commitment to deepen defence ties through the India-Japan Special Strategic and Global Partnership for a Free, Open and Inclusive Indo-Pacific.

KEY OUTCOMES

- Strengthened military-to-military exchanges
- Enhanced maritime security cooperation
- Joint exercises and capacity building
- Defence technology & equipment cooperation
- Institutional mechanisms for dialogue
- Shared vision for a stable Indo-Pacific

AREAS OF COOPERATION

- Maritime Security
- Defence Technology
- Cyber & Space
- Capacity Building
- Industrial Collaboration

INDO-PACIFIC VISION (SHARED)

- Free
- Open
- Inclusive
- Rules-based
- Respect for International Law

4

KEY DEFENCE ARCHITECTURE

MECHANISM	FOCUS
2+2 Ministerial Dialogue	Strategic & defence cooperation
Annual Defence Dialogue	Policy-level discussions
Military Exercises	Training, courses, staff talks
Joint Exercises (Dharma Guardian, JIMEX, Veer Guardian)	Interoperability & coordination
Defence Industry Partnerships	Co-development & co-production

FUTURE ENGAGEMENT



Regular high-level exchanges



2+2 Ministerial Dialogue



Co-development in defence technology



Enhanced maritime domain awareness



Collaborative capacity building

5

STRATEGIC IMPORTANCE FOR INDIA



- Strengthens Indo-Pacific stability
- Counters coercive maritime activities
- Promotes rule-based order
- Safeguards economic and energy interests
- Supports peace, prosperity and sustainable growth

AT A GLANCE



~11,098 km
India's coastline



2.5 lakh+
Indian Navy personnel



>600
Warships, Submarines & MSMEs engaged



₹2.23 lakh crore
Defence Production (FY 2024-25)



Growing indigenous content in naval platforms

UPSC RELEVANCE

GS-II

- India-Japan Relations
- International Institutions
- Maritime Diplomacy

GS-III

- Defence Technology
- Maritime Security
- Blue Economy
- Indigenous Defence Production

KEY TAKEAWAY



Indigenous capabilities, strategic partnerships and maritime cooperation are building a strong, secure and self-reliant India in the Indo-Pacific.

SECURE SEAS • STRONG PARTNERSHIPS • SELF-RELIANT INDIA



UnderStand UPSC

What we UnderStand, We Conquer

