

India's First Small Scale Liquefaction Bio Methane Plant for Sustainable Crop Residue Management and Bio-LNG Production

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India, as the world's most populous country and a major agricultural producer, faces a significant environmental challenge: the widespread burning of crop residues. Annually, vast amounts of straw, particularly from rice (43%) and wheat (21%), are incinerated by farmers to prepare fields for subsequent crops. This practice not only contributes heavily to air pollution but also represents a tremendous waste of valuable biomass. This abstract proposes a sustainable and economically viable solution: the environmental friendly utilization of straw (parali) for biomethane production, creating a complete ecological cycle with virtually no waste.

Biomethane production from agricultural waste offers a clean and circular solution. It allows the conversion of Parali into renewable fuel, while the by-products—organic fertilizers and animal feed—can be returned to farmers, completing a sustainable ecological loop. This "smart sustainability" approach replaces fossil fuels, driving decarbonization in industry and transportation. This strategy aligns with India's goal to increase natural gas usage from 6% to 15% of its energy mix by 2030 and supports energy access, economic growth, and environmental sustainability in both urban and rural areas

A key hurdle to widespread biomethane adoption is the lack of extensive pipeline infrastructure, especially in remote areas. This is where Small-Scale Liquefied Natural Gas (SSLNG) solutions become critical. SSLNG plants are portable, scalable, and can be set up in decentralized locations, liquefying biomethane for transport to demand centers not connected by pipelines, such as Shimla, Manali, and Leh. GAIL's pioneering SSLNG initiative in India demonstrates the immense potential of this technology to expand natural gas access, reduce emissions, and offer flexible energy solutions. SSLNG can precede pipeline construction, helping to build demand for natural gas in new regions and spurring industries to switch from more expensive and polluting fuels like diesel and LPG.

GAIL's SSLNG initiative demonstrates a transformative approach to increase natural gas penetration across India. Liquefied biomethane can be transported to satellite demand nodes and later support the development of pipeline infrastructure by creating initial market demand. LNG, including biomethane-derived LNG, offers notable environmental advantages: 30% lower CO₂ emissions, 90% lower NO_x and particulate matter emissions, and zero SO_x emissions compared to diesel.

By integrating SSLNG technology with biomethane production from agricultural waste, India can promote clean energy access, reduce reliance on fossil fuels, improve rural economies, and support its energy transition towards a low-carbon, sustainable future.

Beyond energy security and cost economics, the environmental benefits are compelling. LNG vehicles exhibit significantly lower emissions compared to diesel engines: 30% less CO₂, 90% less NO_x and PM, and 100% less SO_x. By transforming agricultural waste into a valuable energy resource and utilizing innovative distribution methods, India can achieve a cleaner energy economy, enhance energy access, and mitigate the adverse effects of crop residue burning.

To view the **full technical programme**, visit <https://lng2026.com/technical-programme>

This abstract will be presented during LNG2026 conference on 2-5 February in Doha, Qatar