Overview of China's Biogas Market

Shizhong Li
Hydrogen Research Center, Yangtze Delta Region Institute, Tsinghua University, China

Contents

1. An Overview of the Chinese Biogas Market

- ✓ China's biogas market is one of the largest and most dynamic in the world, driven by a powerful combination of national energy security needs, severe environmental challenges.
- ✓ Since 2014, the market has evolved significantly from small-scale, rural household digesters to large-scale, centralized industrial and agricultural projects, with a growing emphasis on upgrading biogas to biomethane（Bio-natural gas）.
- ✓ The potential of biomethane production is around 150 billion Nm^3 annually.

中华人民共和国国家发展和改革委员会
National Development and Reform Commission

热门搜索：油价 产业结构调整指导

请输入关键字

公开事项名称：	关于促进生物天然气产业化发展的指导意见(发改能源规〔2019〕1895号)		
索引号：	000013039-2019-00566	主办单位：	国家发展改革委
制发日期：	2019-12-04		

关于促进生物天然气产业化发展的指导意见

Guidance on Promoting the Industrialization Development of Bio-Natural Gas

发改能源规〔2019〕1895号

各省、自治区、直辖市及新疆生产建设兵团有关部门，有关中央企业：

为落实中央财经委员会第一次会议精神以及《中共中央 国务院关于全面加强生态环境保护坚决打好污染防治攻坚战的意见》《中共中央 国务院关于印发<乡村振兴战略规划（2018-2022年）>的通知》《国务院关于印发打赢蓝天保卫战三年行动计划的通知》等文件要求，加快生物天然气产业化发展，现提出以下意见。

一、促进生物天然气产业化发展的重要意义

生物天然气是以农作物秸秆、畜禽粪污、餐厨垃圾、农副产品加工废水等各类城乡有机废弃物为原料，经厌氧发酵和净化提纯产生的绿色低碳清洁可再生的天然气，同时厌氧发酵过程中产生的沼渣沼液可生产有机肥。我国发展生物天然气意义重大。

构建分布式可再生清洁燃气生产消费体系，有效替代农村散煤。发展生物天然气，构建就地收集原料、就地加工转化、就近消费利用的分布式清洁燃气生产消费体系，增加县域天然气气源保障，加快替代燃煤、特别是农村散煤，治理大气污染，助力打赢蓝天保卫战。

规模化处理有机废弃物，保护城乡生态环境。发展生物天然气，以工业化规模化专业化方式处理城乡有机废弃物，构建企业化商业化可持续发展机制，加快推进畜禽粪污资源化利用，解决粪污、秸秆露天焚烧等引起的环境污染问题，实现城乡有机废弃物能源化产业化可持续利用，变废为宝、一举多得。

优化天然气供给结构，发展现代新能源产业。发展生物天然气，立足国内，内生发展，作为常规天然气的重要补充，有利于补齐天然气供需短板，降低进口依存度，助力解决农村煤改气气源问题，提高能源安全保障程度。推进生物质能转型升级，加快可再生能源在燃气领域应用，培育发展可再生能源新兴产业。

当前，生物天然气处于发展初期，面临着技术不成熟、产业体系不健全、政策支持力度不够等问题和困难，亟需加大支持，完善政策，加快生物天然气产业化发展步伐。

Significance

- ✓ Alternative to fossil fuel, to build a clean and renewable gas production and consumption system.
- ✓ Waste biomass reuse for emission reduction and a sustainable homeland.
- ✓ Optimize the supply structure of natural gas and develop a new energy industry.

Developing goal

- ✓ By 2025, a certain scale of bio-nature gas with annual output of more than **10 billion** Nm^3 of biomethane.
- ✓ By 2030, steady development with a world forefront scale. Annual output of **20 billion** Nm^3 of biomethane, accounting a certain proportion of domestic natural gas production.

However, the biomethane industry is still in its early stage with an annual production of only **500 million Nm^3**.

Financial support and tax concession (MOF)

Guidelines on tax concession to support rural revitalization

- ✓ Promote tax incentives for the comprehensive utilization of agricultural resources.
- ✓ Enterprise that develop biogas is corporate income tax exemption in the first three years and half exemption in the second three years.

Support of central budget investment plan

- ✓ Large-scale biogas project has a chance to apply for the support of central budget investment plan, in the special project of pollution control and energy conservation and carbon reduction.
- ✓ The subsidy standard is RMB 1,500 yuan per cubic meter of anaerobic digester's volume.
- ✓ Individual project can receive funding support ranging from RMB 10 million to 30 million yuan for construction.
- ✓ The subsidy ratio shall not exceed 35% of its investment.

2. Regulatory conditions and permit processes

Navigating China's regulatory landscape is complex and multi-layered, involving national, provincial, and local authorities.

Key National Policies:

- ✓ Dual Carbon Goals: The overarching framework making renewable energy projects like biogas a national priority.
- ✓ 14th Five-Year Plan (2021-2025): Explicitly supports the development of biomass energy, including biogas, for waste treatment and energy production.
- ✓ Renewable Energy Law: Provides the foundation for feed-in tariffs and grid connection support.
- ✓ Waste Management Policies: Stricter laws on agricultural waste (e.g., livestock manure), industrial organic wastewater, and municipal food waste compel industries to seek treatment solutions, making biogas an attractive option.

Key Regulatory Bodies:

- ✓ National Development and Reform Commission (NDRC): Sets overall industrial policy and approves major projects.
- ✓ Ministry of Ecology and Environment (MEE): Responsible for environmental impact assessments (EIA) and pollution discharge permits.
- ✓ National Energy Administration (NEA): Oversees energy development, grid connection, and renewable energy quotas.
- ✓ Ministry of Agriculture and Rural Affairs (MARA): Crucial for projects involving agricultural waste and rural development.

Permit Process

- ✓ Project Approval/Filing: Submit project proposal to local NDRC for approval (large projects) or filing (smaller projects).
- ✓ Environmental Impact Assessment (EIA): Conduct and submit an EIA report to the local MEE bureau for approval. This is a critical and often lengthy step.
- ✓ Land Use Permit: Secure land use rights, which can be challenging and expensive.
- ✓ Grid Connection Approval: For projects injecting gas into the grid, approval from the local gas grid company is required.
- ✓ Construction Permits: Standard building permits from local construction authorities.
- ✓ Operation Permits: Obtain a pollution discharge permit and other operational licenses before commencing operation.

However, the process is notoriously bureaucratic, and requirements can vary significantly between provinces.

3. The Importance of Having a Local Partner When Entering the Chinese Market

This is not just an advantage, it is a necessity for success. A local partner is indispensable for the following reasons:

- ✓ Navigating "Guanxi" (Relationships): The permit process and business negotiations in China run on relationships. A well-connected local partner can open doors to key government officials and grid companies, dramatically speeding up approvals.
- ✓ Regulatory and Legal Expertise: A local partner understands the intricacies of Chinese law, tax structures, and frequently changing local policies. They can help structure the joint venture (JV) correctly and ensure compliance.
- ✓ Market Knowledge and Access: They have on-the-ground knowledge of regional potential, waste supply chains, and potential offtakers for heat, power, or gas.
- ✓ Cultural and Linguistic Bridge: They manage language barriers and cultural nuances in business etiquette, which are critical for building trust.
- ✓ Risk Mitigation: A partner shares the investment burden and helps mitigate political, operational, and financial risks. They are often better equipped to manage relationships with local communities and labor.
- ✓ Common partnership models include forming a Joint Venture (JV) with a Chinese waste management company, a large farm operator, or an engineering firm.

4. Regional potential for biogas production

Biogas potential in China is highly regionalized, closely tied to agricultural and industrial activity. High-Potential Regions:

- ✓ Central and Eastern China (e.g., Shandong, Henan, Hebei, Hunan): These are major agricultural and livestock (especially hog) production bases. They generate enormous quantities of manure and agricultural residue, offering the highest density of feedstock. However, competition for feedstock is increasing.
- ✓ Northeast China (e.g., Heilongjiang, Jilin): Major grain production region, leading to abundant straw and crop residues.
- ✓ South China (e.g., Guangdong, Guangxi): Strong industrial and agricultural base, with significant food processing and livestock farming. High energy demand makes the economics attractive.
- ✓ Metropolitan Areas (e.g., Beijing, Shanghai, Shenzhen): These megacities generate vast amounts of municipal food waste. Government mandates for waste sorting and treatment create a strong driver for building large-scale biogas plants.

5. Opportunities for upgrading biogas and injecting it into the gas grid

This represents the most significant growth segment and value-creation opportunity in the Chinese biogas market.

- ✓ Government Support: The NDRC and NEA have issued policies encouraging the development of biomethane and its injection into the natural gas grid. Pilot projects are being actively promoted.
- ✓ Economic Incentives: Upgraded biomethane (RNG) can be sold at a significant premium to raw biogas, as it can replace imported LNG or pipeline natural gas. It can be used for CNG vehicles, industrial heating, or residential cooking.

Grid Injection Challenges & Process:

- ✓ Technical Standards: The biomethane must be purified to meet strict Chinese natural gas grid standards (e.g., for CO_2, H_2S, and siloxanes).
- ✓ Commercial Negotiation: Gaining grid access requires negotiation with regional gas grid monopolies, which can be difficult without strong local backing. The purchase price is a key commercial hurdle.
- ✓ Pilot Programs: The government has initiated several pilot programs for agricultural waste-to-biomethane projects in key provinces to establish viable business models and technical standards.
- ✓ Despite the challenges, successful grid-injection projects can secure long-term, stable revenue streams, making them highly attractive for investors.

Liquified biomethane for the decarbonization of maritime transport

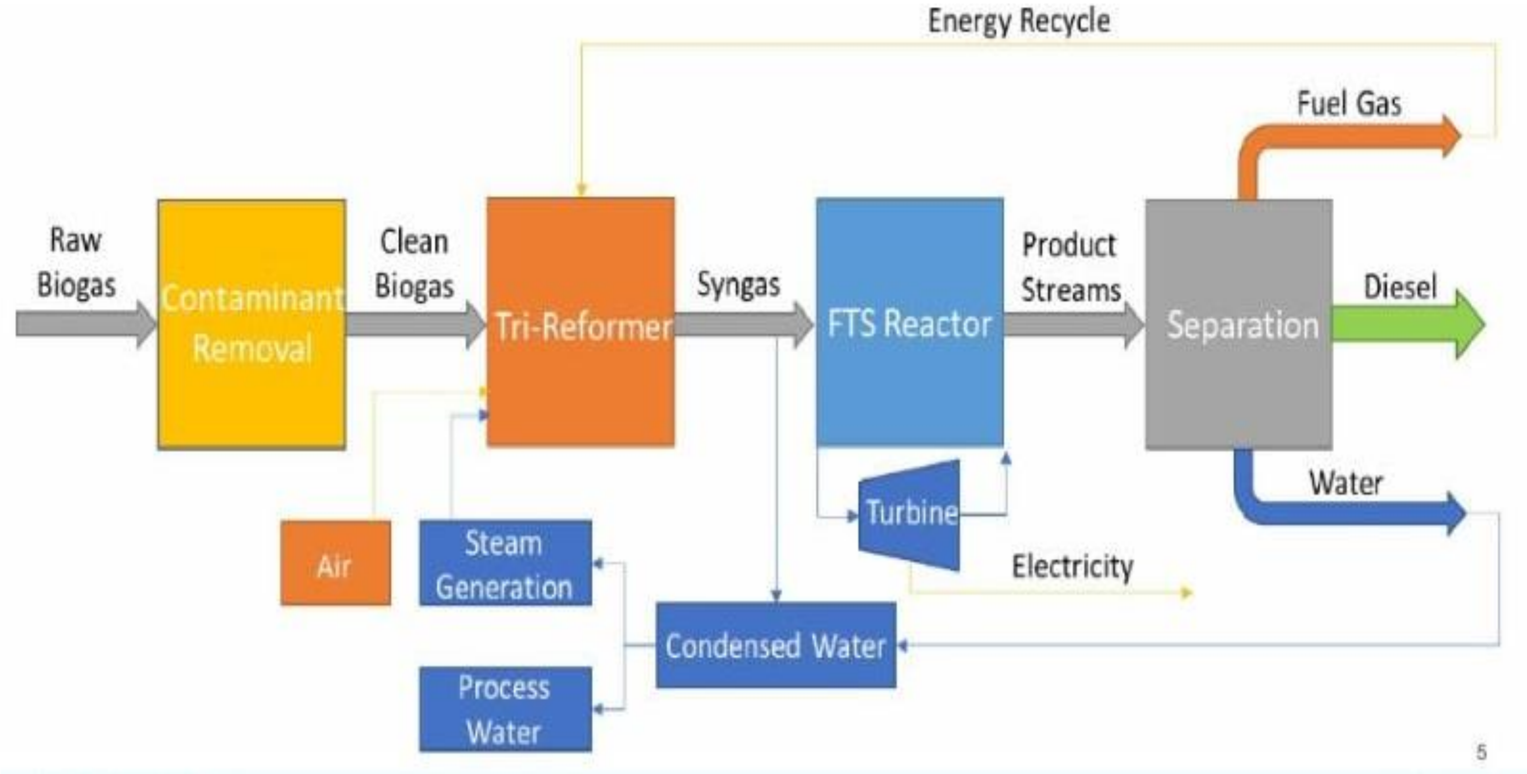
On Oct. 16, 2025, BioLNG was loaded onto the Coral Energy ship at the Klaipėda liquefied natural gas (LNG) terminal In Lithuania.

Biomethane for SAF and green methanol production

$$2CH_4 + CO_2 + 2H_2O = 3CO + 6H_2$$

Green aviation fuel

$$(2n+1)\,H_2 + nCO \rightarrow C_nH_{(2n+2)} + nH_2O$$



Green methanol

$$CO + 2H_2 \rightleftharpoons CH_3OH$$

The world's first green methanol powered container ship is running on bio-methanol provided by OCI.

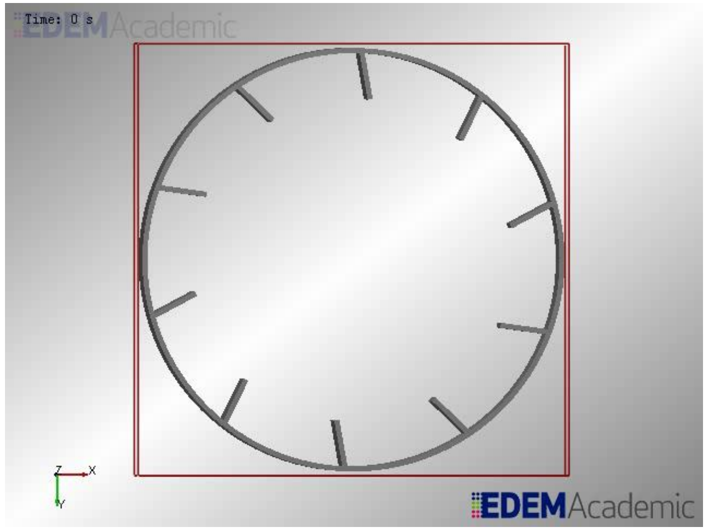
6. Challenges and solutions

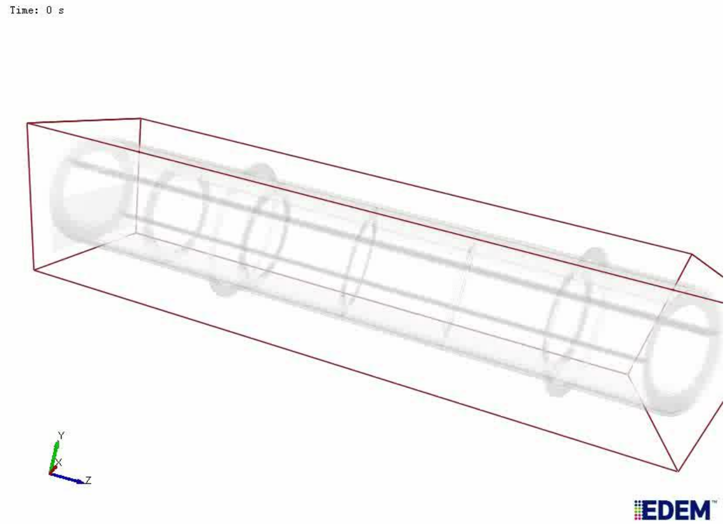
- ✓ Impact of mixed pulp of diversified biomass feedstock to the efficiency and operation of the digedtor.
- ✓ Issues caused by higher TS, such as floatation in the digestor, when the proportion of staw increases in the material.
- ✓ The treatment of liquid anaerobic digestate.

- ✓ Poor profit of biomethane producers.
- ✓ There is no subsidy police for biomethane.
- ✓ Management of different biomass feedstock.

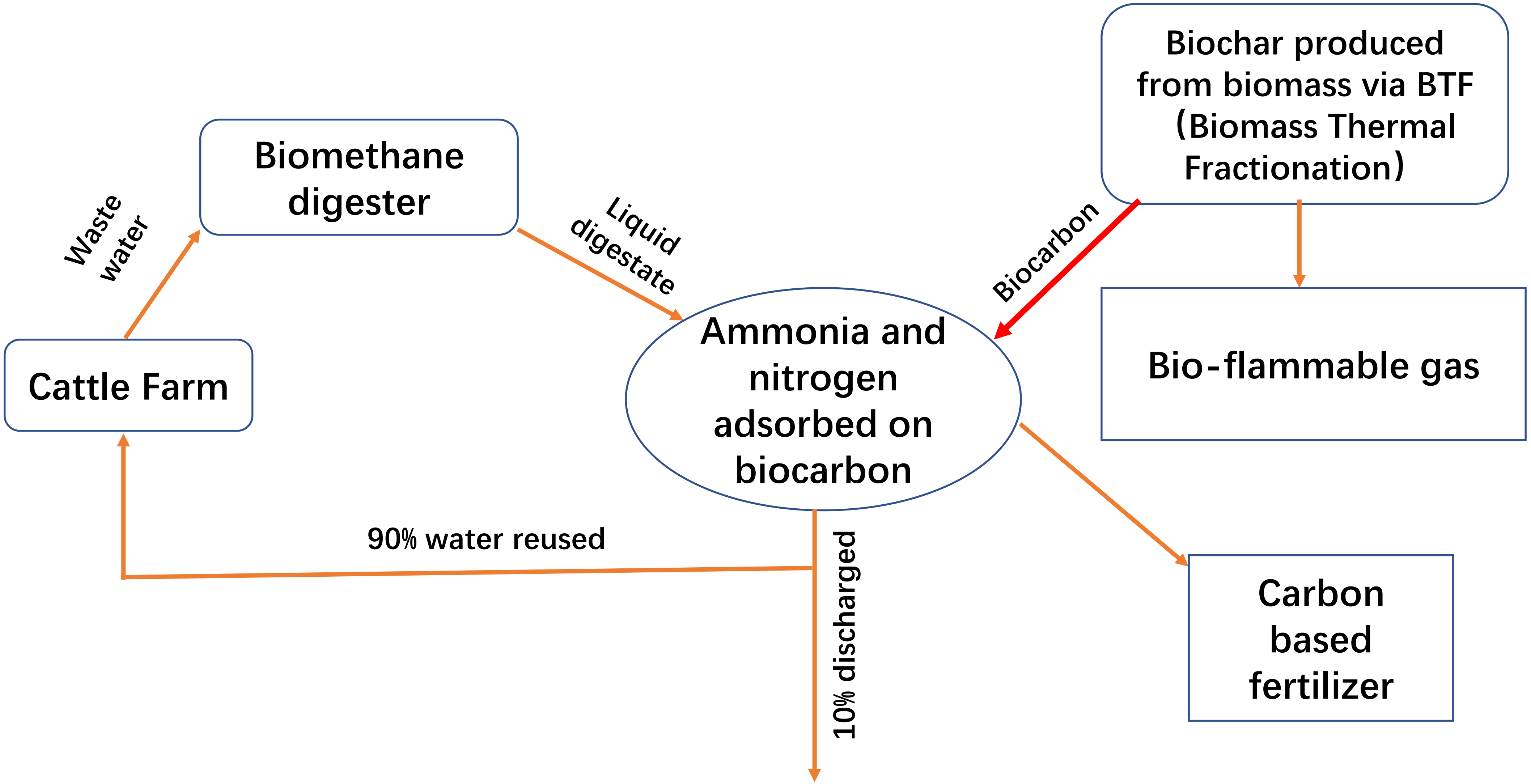
- ✓ Biogas electricity is difficult to sell to grid, and biomethane is not recepted by local natural gas network or the price doesn't make sense.
- ✓ The preferential policy of landuse and electricity price for biogas industry is hard to turn into reality.
- ✓ The percentage of central investment support that biogas projects could apply is very limited.

Using solid state digester to improve efficiency and avoid liquid digestate emission





Using biochar to solve the issue of anaerobic digestate liquid



Thank you!