Overview of China's Biogas Industry and Policies

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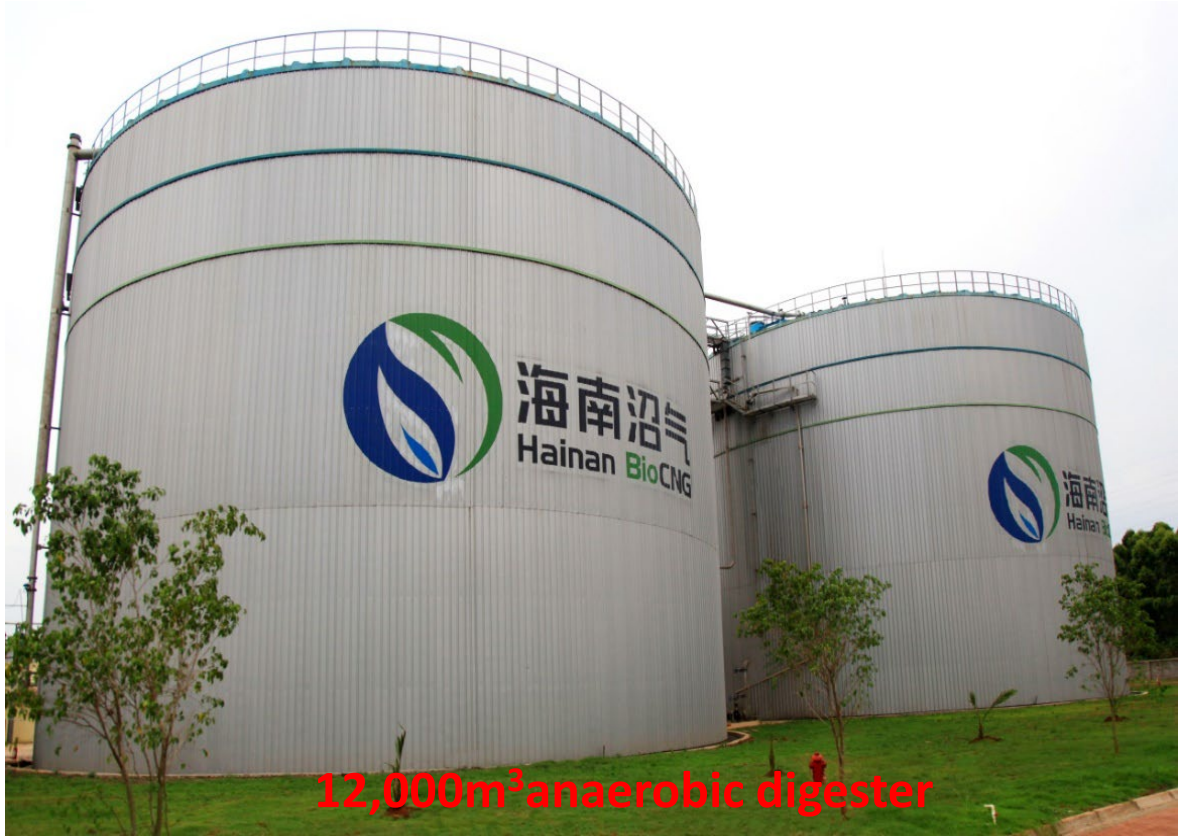
1. Overview



- ✓ Biogas has a long history in China, and received continuous support of state after 2000, from one billion yuan a year, to four billion, up to 6 billion, focused on small digester for farmers' household use.
- ✓ Since 2014, it gradually shifted to support large-scale and industrial biogas projects for transformation and upgrading of the industry. The potential of biomethane production in China is 150 billion to 200 billion Nm^3 annually.
- ✓ The biomethane industry is still in its early stage with an annual capacity of only **300 million Nm^3**. The policy and standard system needs to be formed and improved.

2. Guidlines on promoting the Development of the Biomethane Industry ——released by NDRC, NEA, MEE, etc., Dec 2019

☐ 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.

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

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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

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。

2. Guidlines on promoting the Development of the Biogas Industry ——released by NDRC, NEA, MOEE, etc., Dec 2019

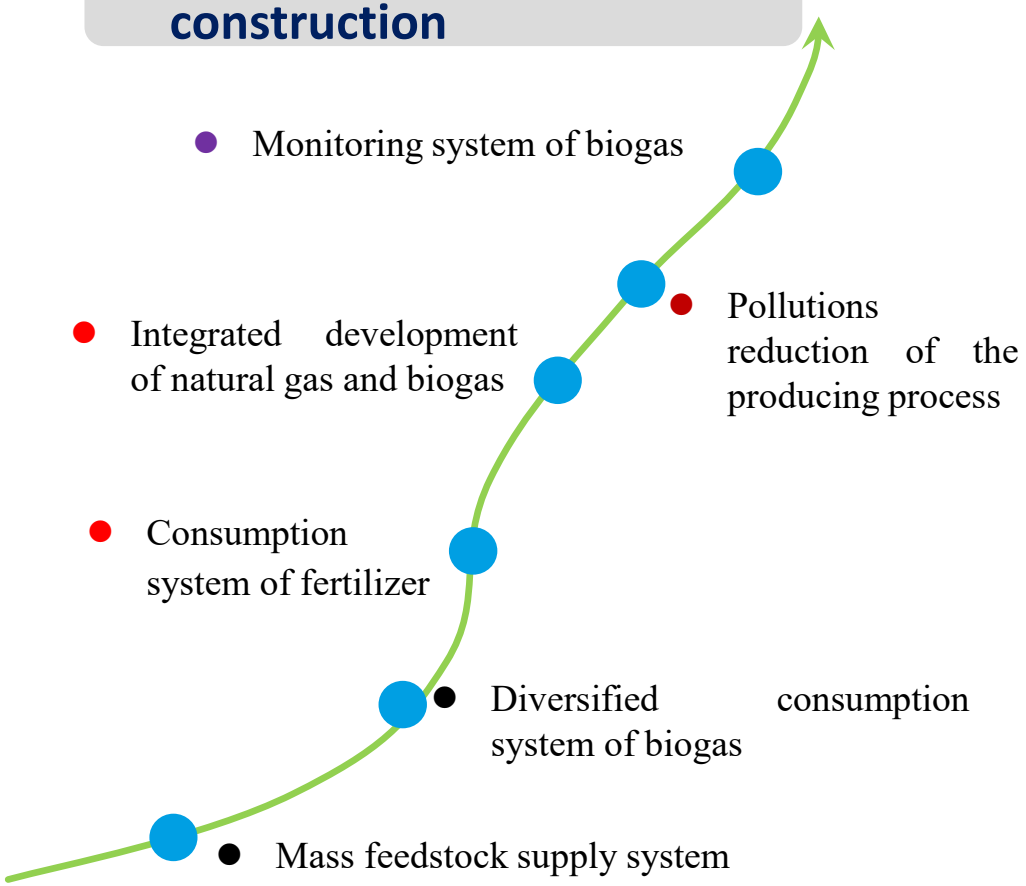
☐ Developing Plan

- ✓ National and Provincial levels of industry developing Plan and local levels of scheme.
- ✓ Integrated in natural gas developing Plan.
- ✓ Key bioenergy enterprices developing Plan.

☐ Support measure

- ✓ Priority of land use of project.
- ✓ Tax reduction & exemptions on utilization of resources, energy and water saving.
- ✓ Import duties concession on equipment procurement of project construction.
- ✓ Preferential electricity prices on agri-wastes feedstock pretreatement and fertilizer process.

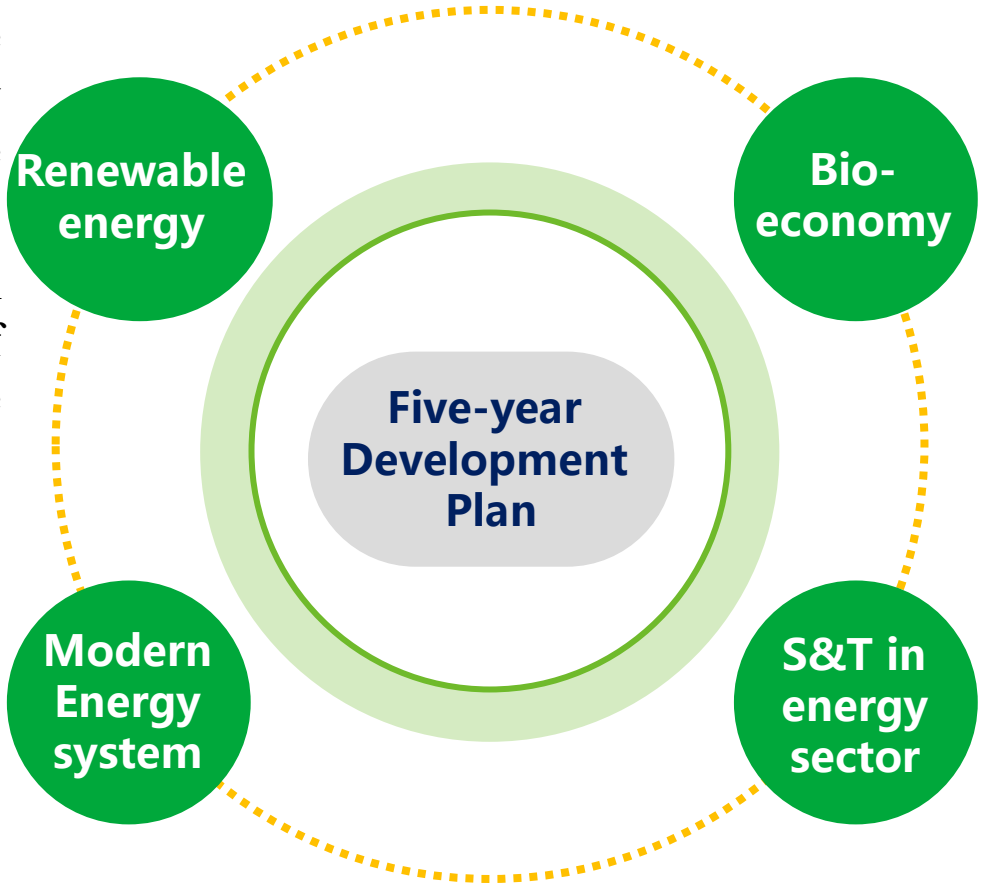
☐ Industry system construction



3. 14th Five-year Development Plan

- ✓ Renewable energy accounted for more than 50% of the increase in primary energy consumption, during the period.
- ✓ Implement demonstration project in the counties of major grain-producing, large amount of woody biomass and livestock residues.

- ● Diversify utilization of biomass.
- ● Plan biogas project in the major grain-producing areas and concentrated livestock-breeding areas.



□ Develop bioenergy:

—key technology research and equipment manufacture;
—fossil fuel substitution in municipal and transportation sector;
—green and low-carbon transition in energy system.

◆ Technical breakthroughs in the whole industrial chain:

—pretreatment of diversified feedstock;
—cost-effective anaerobic digestion;
—high-value use of by-products.

◆ Large-scale biogas demonstration projects of diversified feedstock, including crop residues, brewing wastes, kitchen wastes, etc.

4. Actions of synergy for reducing pollution and carbon dioxide emissions

(MOEE, MOF, NDRC, MOST)

Action Plan for Methane Emission Control

- ✓ Promote the utilization of livestock residue.
- ✓ Develop biogas in rural areas according to local conditions.
- ✓ Encourage mass production of biomethane in qualified areas.
- ✓ Build the incentive and constraint mechanism for the terminal use of biogas, to promote the application of biogas for centralized gas supply and heating, power generation, vehicle use and incorporation into gas pipeline.

- ● Other actions as:

— make efforts to key technologies innovation;

—improve relevant regulations, legal provisions and rules;

—establish and improve the system of technical standards;

—improve monetary incentives.

4. Actions of synergy for reducing pollution and carbon dioxide emissions

(NDRC, MOEE, MOA)

Action Plan for Pollution Prevention and Control in Agriculture and rural areas

- ✓ Recycling use of rural organic household waste, toilet waste and agricultural organic residues.
- ✓ Build a batch of facilities of disposal and comprehensive utilization of rural organic wastes, in unit of villages and towns.

Implementation Measures for National Cleaner Production in 2020-2025

- ✓ By 2025, the comprehensive utilization rate of straw stays stablely at more than 86%, and of livestock residue reachs more than 80%.
- ✓ Increase recycling use of livestock residues by developing biogas, according to local conditions.

5. Demonstration projects (NEA)

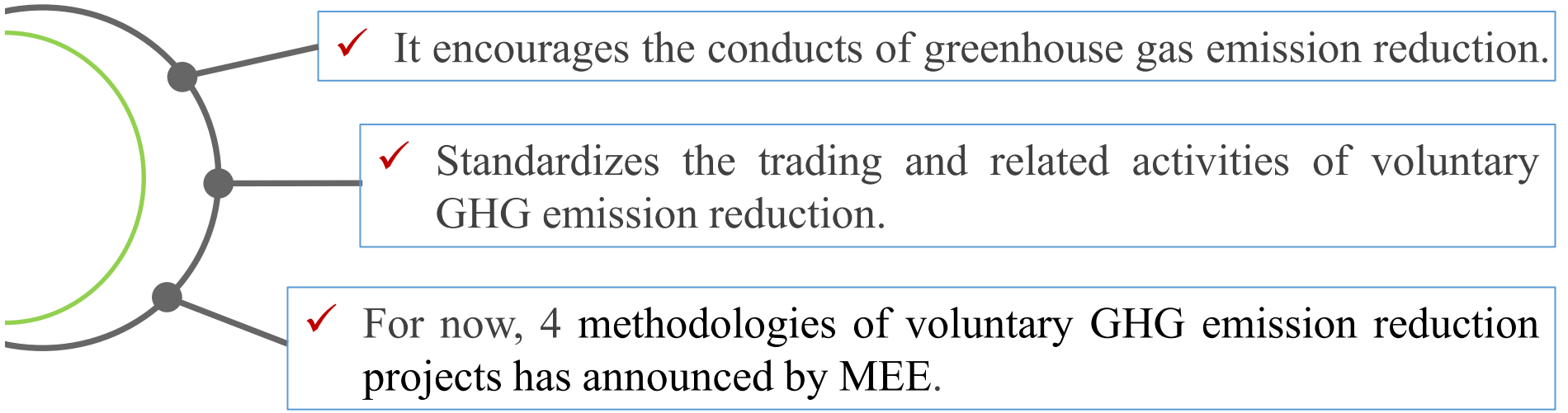
Pilot counties for energy revolution in rural areas

- ✓ By 2025, renewable energy in the pilot counties will account for more than 30% of the total primary energy consumption and more than 60% of the increase in primary energy consumption.
- ✓ Develop biogas projects in the areas with large amount of biowaste and great demand for gas.

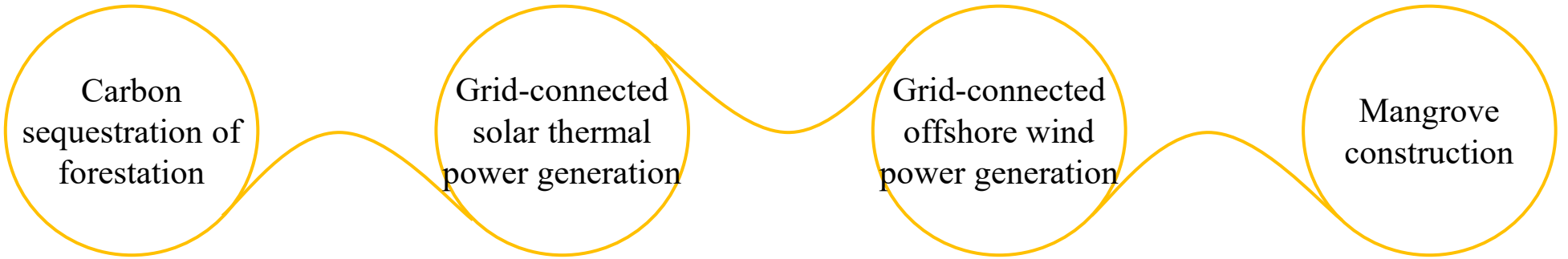
Demonstration of renewable energy development

- ✓ Support construction of annual output scale of 10 billion Nm^3 of biomethane demonstration projects, in the areas of major grain-producing, urgent task of livestock residue treatment and great demand for gas.
- ✓ Local gonernment deftly provide funding support to the biogas project, and optimize the approval process and land use.

6. Regulations (Trial) of Voluntary Greenhouse Gas Emission Reduction Trading, released 19 Oct, 2023 (MOEE)



- ✓ It encourages the conducts of greenhouse gas emission reduction.
- ✓ Standardizes the trading and related activities of voluntary GHG emission reduction.
- ✓ For now, 4 methodologies of voluntary GHG emission reduction projects has announced by MEE.



7. Financial support and tax credit (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.

8. Barriers

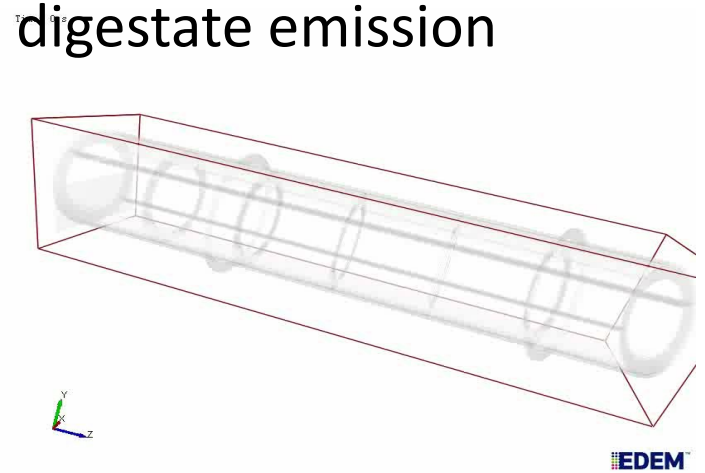
- ✓ Impact of mixed pulp of diversified biomass feedstock to the efficiency and operation of the digedtor.
- ✓ Issues caused by higher TS, such as floatation in the digestor, when the proportion of staw increases in the material.
- ✓ The treatment of liquid anaerobic digestate.

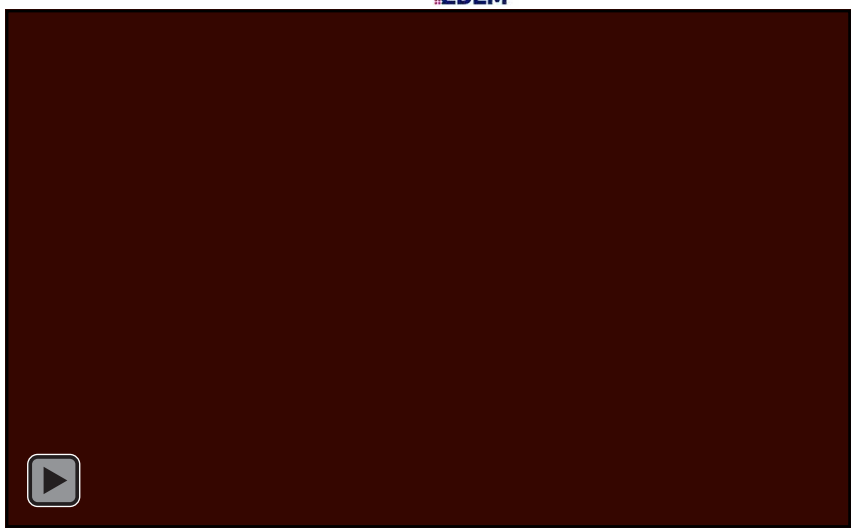
- ✓ Poor profit of biomethane producers.
- ✓ High cost of biomass feedstock
- ✓ There is no subsidy police for biomethane.
- ✓ Management of different biomass feedstock.

- ✓ 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.
- ✓ Some licies only last 1 to 3 years, which is difficult to maitain the healthy and sustainable development of the industry.
- ✓ Methodology and standard of biogas project has not announced, now it can not access to the carbon market.

9. Next steps

- ✓ Biomethane used as shipping fuel should be mandated
- ✓ Using solid state digester to avoid liquid digestate emission





- ✓ Using biogas to produce methanol directly via methane dry reforming

$$CH_4 + CO_2 = 2CO + 2H_2$$

$$CO+2H_2 \rightleftharpoons CH_3OH$$

Green methanol

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

Thank you