



Biogas Investments as a Profitable Business in China

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农业部科技发展中心
Center for Science and Technology Development

农业部能源环保技术开发中心
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可再生能源处
Division of Renewable Energy

中国沼气学会
China Biogas Society

中国农村能源行业协会
China Rural Energy Association

农业部微水电设备质量
监督检验测试中心
Test Center for Micro-hydro Power Equipment Quality

农业部节能产品及设备质量
监督检验测试中心
Test Center for Energy-saving Product/Equipment Quality

农业部沼气产品及设备质量
监督检验中心
Test Center for Biogas Product/Equipment Quality

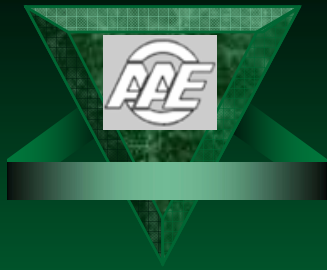
省级农村能源办公室
Rural Energy Office at Provincial Level

县级农村能源办公室
Rural Energy Office at County Level

乡镇级农村能源技术推广站
Rural Energy Station at Township Level

Organizational chart of
MOA Renewable
energy management
system

农业部的可再生能源
管理体系

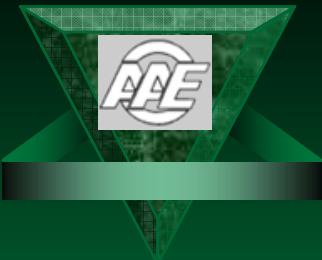


中国沼气发展回顾

Biogas in China--history

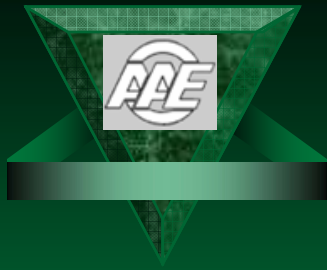
中国是很早就开始应用沼气技术的国家之一，至少在19世纪末就已经有了应用沼气的历史。

China is one of the countries in the world to have used biogas technology early in its history, at least since the end of the 19th century.



China governmental targets in the biogas sector for 2010 and 2020

	2010	2020	Source	Comments
Total share of RE among total energy production	10%	16%	NDRC, CS	
Share of biomass within total RE share	18.4%	18.5%	NDRC, CS	
Biogas: total production		24 Bn m³	State Company Grid	<i>About 3x more than in 2006</i>
Landfill biogas	0.2 GW	1 GW	NDRC	100 out of 580 potential sites
Medium & large scale biogas production from agriculture and industry	0.8 GW	3 GW	NDRC	
	4700 units		MOA: The Biogas Construction Plan	
Biogas generated from municipal wastewater & septic sludge treatment ¹⁴	100 Mio m ³		MOA	
Rural household biogas, small scale	11 Mio m ³	18 Mio m ³	NDRC	
	23 Mio units	56 Mio units	MOA	



China governmental targets in the medium and large scale biogas sector for 2010 and 2020

- ✓ *Targets for construction:*
 - Until 2010, the number of middle and large scale biogas plants should increase to 4,700 in total (now 4,000)
 - In 2020, the number of middle and large scale biogas plants will reach 10,000; the biogas systems for grey water treatment should increase by 120,000 accumulating to 260,000 in total.
- ✓ *Targets for biogas electricity power production with “feed-in-grid”:*
 - 2010: 0.8 GW
 - 2020: 3 GW
- ✓ *Targets of biogas construction and equipment manufacturing companies in 2010 and 2020*
 - 2010: more than 2,000.
 - 2020: more than 2,200.
- ✓ *Targets of service system in medium and large scale biogas in 2010 and 2020*
 - In 2010, there will be 60 service enterprises in charge of feasibility studies, design, maintenance and repairing for middle and large scale biogas plants.
 - In 2020, there will be 150 service enterprises for middle and large scale biogas plants.



Biogas system Gansu Holstein Cow Breeding Centre 甘肃Holstein奶牛养殖中心的沼气系统

✓ 2,600 dairy cows



2600头奶牛

2600 dairy cows

2 x 600 m³ UASB

2 x 96 kW_{el-instal}





大中型农业沼气工程

Large - medium agro-biogas plants

	Number of Projects	Total Volume (m ³)	Waste Treated (Mio tonnes)	Biogas Yield (Mio m ³)
2001	1359	639,200	34.039	168.69
2003	2355	882,900	58.01	183.9243
2004	2671	1,094,300	71.9	176.1892
2005	3764	1,724,100	122.82	341.1424
2006 (estimated)	4000	1,900,000	130	362.5



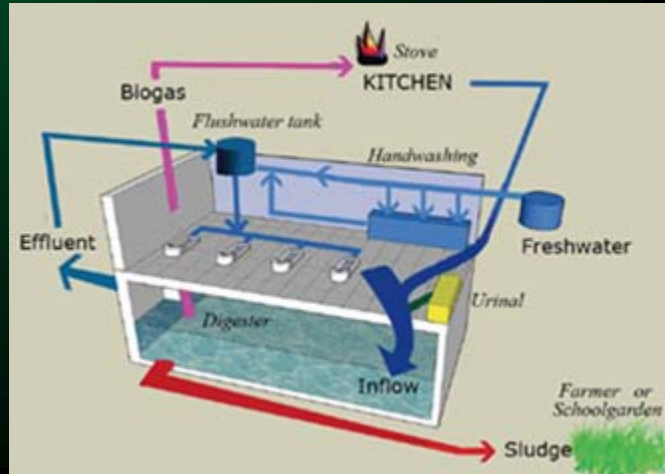
Biogas using industrial appliances 应用沼气的工业设备:



Biogas Market Asia, 14-15 June 2007,
Singapore

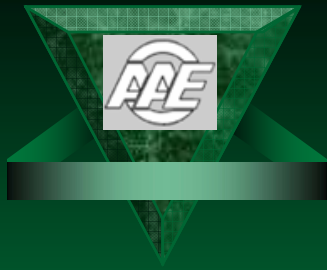


Biogas and eco-sanitation 沼气与生态卫生



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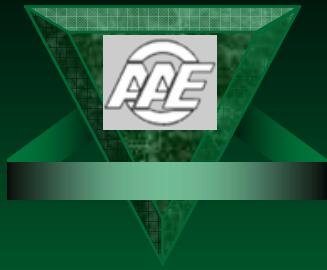




分散式废水处理系统中的沼气消化器

Biogas component in decentralized waste water treatment systems

Type	No. of Digesters	Total Volume(10 ⁴ m ³)	Daily Treatment (10 ⁴ m ³ /d)	Average Single Digester Volume (m ³)	Average Unit Volume / Daily Treatment (m ³ /m ³ *d)
Public Toilet	9650	56.68	11.95	58.73	0.21
Hospital	2224	15.54	2.84	69.87	0.18
Apartment	123567	493.67	131.29	39.95	0.27
Others	10197	71.02	17.36	69.64	0.24
Total	145638	636.91	163.44	238.19	0.26



Motivations of China's decision-makers to promote the production and the use of biogas

- ✔ to produce an environmentally friendly fuel which can replace fossil fuel (especially natural gas, petrol, kerosene or diesel) available to the rural energy market and under the overall feature of an increasing energy demand in China,
- ✔ to avoid uncontrolled greenhouse gas relevant methane emissions generated by manure, sewage and waste disposal and dumping,
- ✔ to minimize waste disposal and environmental pollution of water resources and land in the neighborhood of livestock and agro-industry,
- ✔ to provide rural customers with a reliable fuel at a reasonable cost-benefit ratio
- ✔ to increase the amount of renewable energy,
- ✔ to achieve more independency from fossil fuels and the target to reduce fossil borne GHG (CO₂) emissions,
- ✔ to use actual investment and funding support by providing electricity from renewable energy and CDM CO₂ emission trading credits.



Market Potential Summary

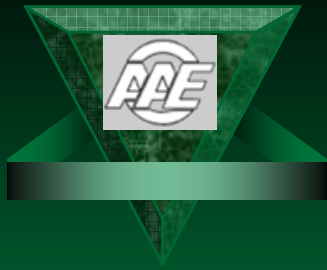
Type	Amount of pig on hand (head)	Amount of hen on hand (10000)	Amount of chicken on hand (10000)	Amount of milky cow on hand (head)	Amount of cattle on hand (head)
Medium scale	3000-10000	5-20	10-40	200-600	500-1200
Large scale	>10000	>20	>40	>600	>1200

- ✔ There are 10532 large-scale in China, which discharge 2 billion tons excrement and wastewater.
- ✔ The availability amount of excrement from husbandry, which can be used as potential feedstock for generating electricity, is about 55 million tce.
- ✔ In the next 5-year period, the investment from the Ministry of Agriculture in biogas plants is expected to be 2.5 billion RMB (310 million USD) every year.
- ✔ An estimated 75% of efforts are concentrated in the small scale rural biogas digester dissemination.



Pig, Cattle and Chicken Farms

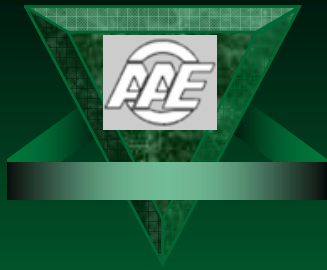
Type of animal	Total of PCC farms			Large PCC farms			
	Number of animals (Mio)	Faeces (Mio t per year)	Urine (Mio t per year)	Number of large PCC farms	Number of animals (Mio)	Faeces (Mio t per year)	Urine (Mio t per year)
Pig	233.9409 ^A	139.4288	230.0575	5254	39.6714 ^A	23.6442	39.0129
Cow	5.8212 ^B	57.3681	25.4969	1485	0.8505 ^B	8.3814	3.7251
Cattle	15.2273 ^A	355.7097	183.4128	1485	1.3802 ^A	32.2415	16.6245
Layer	1419.5547 ^B	62.1765	0.00	593	49.2025 ^B	2.1551	0.00
Chicken	4122.7354 ^A	64.3147	0.00	1715	6.07604 ^A	947.86	0.00
Total	5797.2795	67899.78	438.9673	10532	698.7088	7590.07	59.3624



China's Favorable Taxation Policy (1/2)

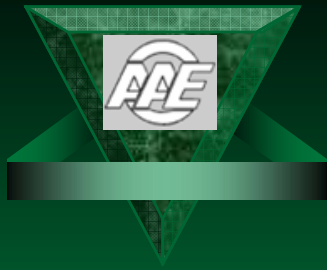
- ✓ China encourages foreign investment through a combination of income tax and value-added tax (VAT) incentives.
- ✓ According to the regulation issued by Ministry of Finance (MOF) and State Administration of Taxation (SAT) in December 2001, the VAT for municipal waste generated electricity is refunded totally since January, 1, 2001. MOF and SAT issued a replenish notice in 2004 to clarify that this VAT refund policy is only be suitable for the municipal waste electricity in which more than 80% of fuel is municipal waste.
- ✓ **VAT and VAAT:** Comparing general VAT and VAAT rates with those for biogas and wind enterprises.

– Items	Value-Added Tax	VAAT (Value-Added Annex Tax)
– General	17%	8% of VAT
– Biogas	13%	8% of VAT



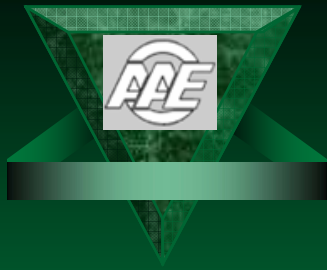
China's Favorable Taxation Policy (2/2)

- ✔ **Income tax:** The government collects business income tax from foreign investment enterprises at the rate of 33%, but collects only 15% from enterprises in special economic zones, the national hi-tech industrial zones, and national-grade economic and technical development zones.
- ✔ Foreign investment enterprises may also be eligible for a business income tax waiver during the first two years after they begin to make a profit and for a partial waiver during the next three years.
- ✔ Additionally, foreign investment enterprises in less developed regions may apply to the relevant State Council tax authority for a favorable tax policy after the initial tax exemption and reduction period. After approval, they can enjoy a 15-30% reduction in income tax over the next ten years.
- ✔ Enterprises in the biogas energy fields are eligible for an income tax rate of 15%



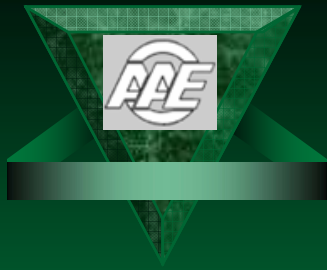
Import Duties

- ✔ Although no governmental policy specifically states that low import duties are applied to renewable energy products, many of the main components of enjoy favorable import duties compared with the average rates of 23% - 35%
- ✔ China approved efforts to reduce or exempt imported wind turbines and related equipment from import duty so that the actual duties paid were very low.
- ✔ This policy cannot always be applied to all bio-energy equipment. Import duty exemption depends on whether the equipment is considered to be a high-tech product. Some bio-energy equipment, like a power generator for biogas, is classified as high-tech and therefore is exempt from import duty.



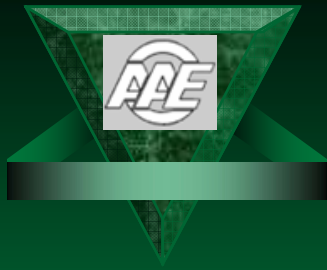
Policies, management regulations and technical standards developed to ensure the smooth implementation of Renewable Energy Law

- ✔ National Long & Medium Planning of Renewable Energy Development in China (2020)
- ✔ National Guide Catalogue of Renewable Energy Industry Development
- ✔ Management Regulation of Electricity Price and Additional Price Sharing System for Renewable Energy
- ✔ Management Regulation of Renewable Energy Electricity on Grid
- ✔ Management Regulation of Renewable Energy Fund
- ✔ Loan and Subsidy Incentive Regulation for Renewable Energy



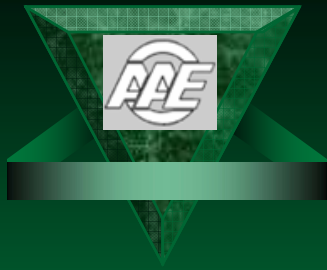
National Guide Catalogue of Renewable Energy Industry Development

- ✓ Small household biogas digester
- ✓ Large & medium scale biogas project
- ✓ Landfill gas utilization
- ✓ Bagasse CHP
- ✓ Crop straw generation power
- ✓ Biomass solidified fuel
- ✓ Biomass ethanol and biodiesel technology



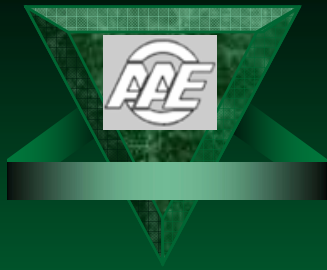
Management Regulation of Renewable Energy Electricity Price and Additional Price Sharing System (1/2)

- ✓ The feed-in tariff and price sharing system of renewable energy generation power is determined based on the principle of promoting development, advancing efficiency, enhancing management, and fair burden.
- ✓ The investment return rate of renewable energy generation power should be higher than the average return rate of normal power plant.
- ✓ For public generation power system off grid of renewable energy, the sale price for user will adopt the average sale price in the local electricity grid. If the maintenance cost of the system is higher than the average sale price in the local grid, the margin of cost can be acquired by the electricity additional price of renewable energy from user.



Management Regulation of Renewable Energy Electricity Price and Additional Price Sharing System (2/2)

- ✓ The electricity price of biomass generation power adopt the market price plus incentive price.
 - The market price is the normal price on grid of coal power plant in each province.
 - The incentive price was established according to the incentive principle. The incentive price is now 0.25Yuan/kWh.
- ✓ The guarantee period for biomass incentive price is 15 years since the operation. The incentive price will be cancelled after 15 years of operation.
- ✓ The incentive price catalogue for biomass generation power will be evaluated and published every two years.
- ✓ Beginning in 2010, the RE power subsidy price for new power projects approved each year will be 2% less than those approved in the previous year.



Risks and barriers

- ✓ Lack of standardization in design and construction of medium and large scale anaerobic digestion systems, as inappropriate separation, control, mixing and handling equipment
- ✓ Limited application of lessons learned locally and limited acquaintance with international best practices.
- ✓ Lack of transparency, with design institutions owning different levels of technology, and a low level of project information sharing.
- ✓ uneven enforcement of existing environmental regulations. Stricter enforcement of environmental wastewater regulations is obliging many industries to invest in wastewater treatment processes or face being closed down.
- ✓ Lack of familiarity with biogas investments amongst the financial community.

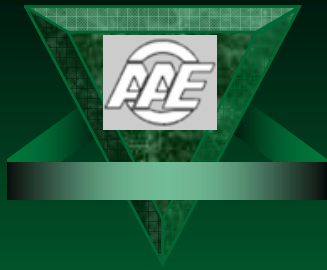


China Biomass Energy Players

- ✓ The National Development and Reform Commission (NDRC) is generally responsible for the supervision of the pricing system and the approval of investments in the energy sector. It is politically in charge of the whole energy sector, including biomass energy.
- ✓ The Ministry of Science and Technology (MOST) is responsible for R&D.
- ✓ The Ministry of Agriculture (MOA) is in charge of renewable energy applications in rural areas.
- ✓ The State Environment Protection Agencies (SEPA) takes on the tasks of defining and supervising environmental regulations.
- ✓ The local governments are supposed to follow the regulations of the central government in managing the local renewable energy project issues, such as approval procedures and local institutional co-ordination. The local power utility is controlled by the government.
- ✓ The producers and the distributors of energy, the grid companies: since 2002, 5 state-owned companies and about 40 smaller ones act as energy producers. The common platform of the electricity companies is “The China Electricity Council” (CEC).
- ✓ The China Electric Power Regulatory Commission (CERC) was set up to regulate the economic development of the electricity market.

Biogas Market Asia, 14-15 June 2007,

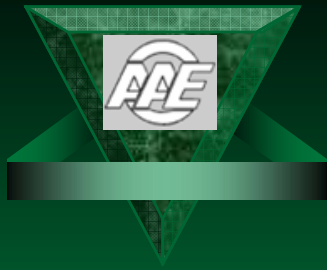
Singapore



China's Policy for Attracting Foreign Investment

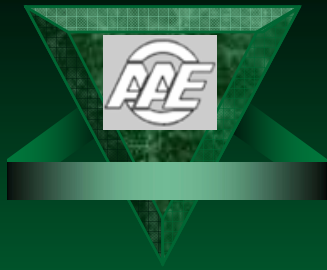
The four basic forms of foreign direct investment in China are:

- Wholly foreign-owned enterprises
- China-foreign joint ventures
- China-foreign cooperative enterprises
- Cooperative development



Opportunities

- ✔ Private investors has increasing opportunities to enter the Chinese biogas market, as advanced environmental standards will force medium and large scale livestock farms to invest in environmental technology.
- ✔ An interesting concept is the integrative approach promoted since one year by Investment Companies to establish centralized agricultural and agro industrial waste treatment companies, based on biogas technology and market electricity, fruits and vegetables – fertilized by the biogas plant effluent.
- ✔ Chinese investment companies are looking for European biogas technology providers and investors.



Business opportunities (1/2)

因此在这方面存在着商机:

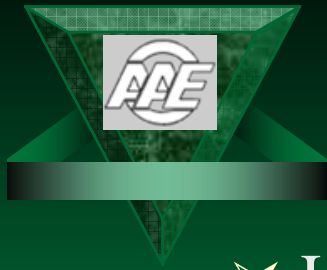
- 1. Training on Technology, Equipment and Service Requirement**
需要技术、设备及服务方面的培训
- 2. Development of high efficient fermentation technology for higher biogas yield**
发展高效发酵技术用于沼气的高产出。
- 3. Demonstration of new building material and technology for digester construction and biogas storage**
展示新的用于消化器建设的建筑材料和技术
- 4. Introduction of high pressure biogas storage**
引入高压沼气储存技术



Business opportunities (2/2)

因此在这方面存在着商机:

- 5. Reliable (more than 7000 h/year) biogas heat and power co-generation & biogas fuel cell development cooperation**
可靠的沼气热电联产系统和沼气电池技术
- 6. Economic use of heat use in tropical climate**
在热带地区经济地使用热能
- 7. Efficient post-treatment technology for water and solids after fermentation**
用于水或固体发酵后的后处理技术
- 8. Biogas purification with air intake (biological sulfur removal)**
沼气净化技术 (生物除硫)
- 9. Biogas processing for feed in natural gas grid and as transport biofuel**
用于天然气网络并且作为生物燃料输送的沼气处理技术



Conclusions

- ✓ Large-scale biogas investments are feasible by the soundest Chinese livestock firms.
- ✓ A UNDP/GEF PROJECT FOR COMMERCIALIZATION OF RENEWABLE ENERGY IN CHINA from 1999 to 2005 demonstrated that the top 20% of financially sound firms in the large-scale livestock and agro-industrial sectors are able to finance such investments themselves and see these investments as a necessary and acceptable cost of doing business.
- ✓ At present, investment in agro-industrial application of anaerobic digestion technology is low, even the fact is that the potential is still used as less than 10% of the potential.