New Developments in medium and large scale biogas technology in China

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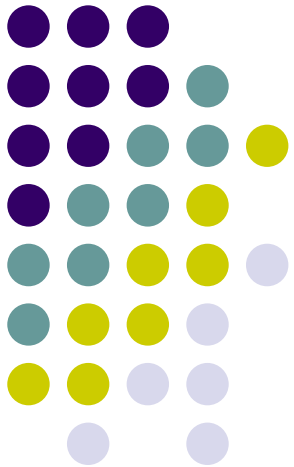


2005年底时的状况
Situation end 2005

	Agricultural Biogas Plants	Industrial Biogas Plants	Total
Operating Quantity (unit)	3,556	208	3,764
Digester Volume (m3)	1,005,600	718,500	1,724,100
Waste Treatment Amount	87,109,400	35,710,000	122,820,000
Biogas Output (m3)	229,851,100	111,291,300	341,142,400
Biogas Supply to Households (household)	131,981,500	6,384,700	138,366,200
Biogas Power Generation (kWh)	8,726,228	31,721,317	40,447,545
Installed Capacity (MW)	6.699	12.5	19.199
Commercial fertilizer (t)	3,031,000	1,499,100	4,530,100
Commercial animal feed (t)	37,800	722,600	760,400

大中型沼气工程

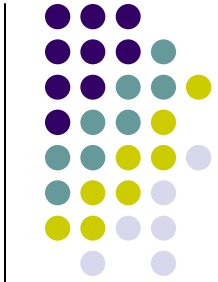
Large and Medium Size Biogas Plants

大中型沼气工程是指单体沼气发酵容积在300-500米^{3}的中型或500米^{3}以上的大型沼气发酵系统，包括料液前处理、沼气发酵、发酵排出液后处理以及沼气的输配、储用系统等，共同构成沼气工程的全部。

Large scale biogas plant: fermentation capacity of 500m^3

Medium size biogas plant: fermentation capacity between 300 to 500m^3

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

大中型沼气工程：保护环境、生产资源

Biogas Plants: Resource Generation and Environmental Protection

- 规模化畜禽场沼气工程；
- 食品加工厂有机污水处理沼气工程；
- 其他类型的沼气工程。

- Biogas Plants for medium and large livestock manure treatment
- Biogas Plants for food processing wastewater treatment
- Biogas Plants for other organic waste treatment

能源和生态模式？
Energy and ecological approach?

- ***Energy Approach能源模式***

(1) This option prevents releasing animal waste to surface water bodies.
这种模式防止将动物废弃物扩散到水体表面.

(2) After treatment of the semisolid or liquid animal wastes in a biogas digester, the effluent (liquid, centrifuged or dried) is applied as bio-fertilizer for food production farms in the vicinity of the biogas plant.
在消化器中将半固态或液态的动物废弃物处理之后,排出物(液态的、离心脱水或干燥过的）作为生物肥料用于附近的农场。

(3) This model has significant economic benefit while realizing a zero emission target of the organic waste treatment.
这种模式具有很好的经济效益，同时实现了有机废弃物处理的零排放。

(4) But it fits only in locations where sufficient agriculture lands, fish ponds or productive lagoons for further post-treatment are available.
但这种模式仅适用于具有足够农田、鱼塘或生产性湖泊以便进行进一步后处理的地区。

(5) Biogas output is higher compared to the second described environmental optimized approach.
与第二种所描述的环境优化模式相比，其沼气产量较高。

能源和生态途径？
Energy and ecological approach?

- ***Environmental Approach环境模式***

- After initial separation of liquid and solid wastes, the liquid part is sent to the anaerobic treatment and aerobic post-treatment to accomplish with the national standards for waste water effluent discharge at least for irrigation purposes.
  在初步固液分离之后，液体部分被厌氧处理和好氧后处理，以达到国家排放标准，最后液体用于灌溉。
- The solid parts are marketed as organic fertilizer after separate digestion, yeast fermentation, composting or drying.
  固体部分在经过分离消化、酵母发酵、堆肥或干燥之后成为有机肥。
- The cost of installation and operation is higher.
  其安装和运行费用较高。
- The biogas output is lower than for the previous described energy optimized approach due to separation and the necessity for two process lines for liquid and solids.
  其沼气产量比先前所描述的能源优化模式要低，因为需要进行分离并且需要两条处理线分别处理液体和固体。

可再生能源法
Renewable Energy Law

第十届全国人民代表大会常务委员会第十四次会议于２００５年２月２８日通过，自２００６年１月１日起施行。

Approved by the 14th Meting of Standing Committee of People's Congress on Feb. 28 and has been put into action since Jan. 1, 2006.

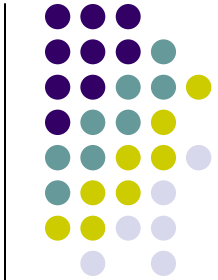
增加能源供应；Increase energy supply

改善能源结构；Improve energy supply structure

保障能源安全；Enhance energy security

保护环境。Protect environment

可再生能源法
Renewable Energy Law



可再生能源知识和技术纳入普通教育、职业教育课程；国家鼓励和支持可再生能源并网发电。

Knowledge and technology of Renewable Energy should be included in the education;
Renewable Energy electricity generation is encouraged.

其他法律
Relevant Laws and Regulations

固体废物污染环境防治法 Law on the Prevention and Control of Environmental Pollution by Solid Waste

环境保护法 Environmental Protection Law

水污染防治法 Prevention and Control of Water Pollution

农业法 Agriculture Law

节约能源法 Energy Conservation Law

农业技术推广法 Popularization of Agricultural Technology

地方政策
Provincial Acts

湖南省、四川省、浙江省、安徽省、广西壮族自治区、甘肃省和黑龙江省等地方政府分别出台农村能源和可再生能源的政策和法规，促进和规范大中型沼气工程的建设。

Hunan, Sichuan, Zhejiang, Anhui, Guangxi, Gansu, and Heilongjiang provinces launched regulations and policies for rural and renewable energy promotion, emphasizing on large and medium biogas plants application.

标准
Standards

畜禽养殖业污染物排放标准 Discharge standard of pollutants for livestock and poultry breeding	GB 18596-2001
污水综合排放标准 Integrated wastewater discharge standard	GB 8978-1996
农田灌溉水质标准 Standards for irrigation water quality	GB 5084-1992

农村沼气建设开始关注大中型沼气工程

Large and Medium Biogas Plants in Rural Biogas Development

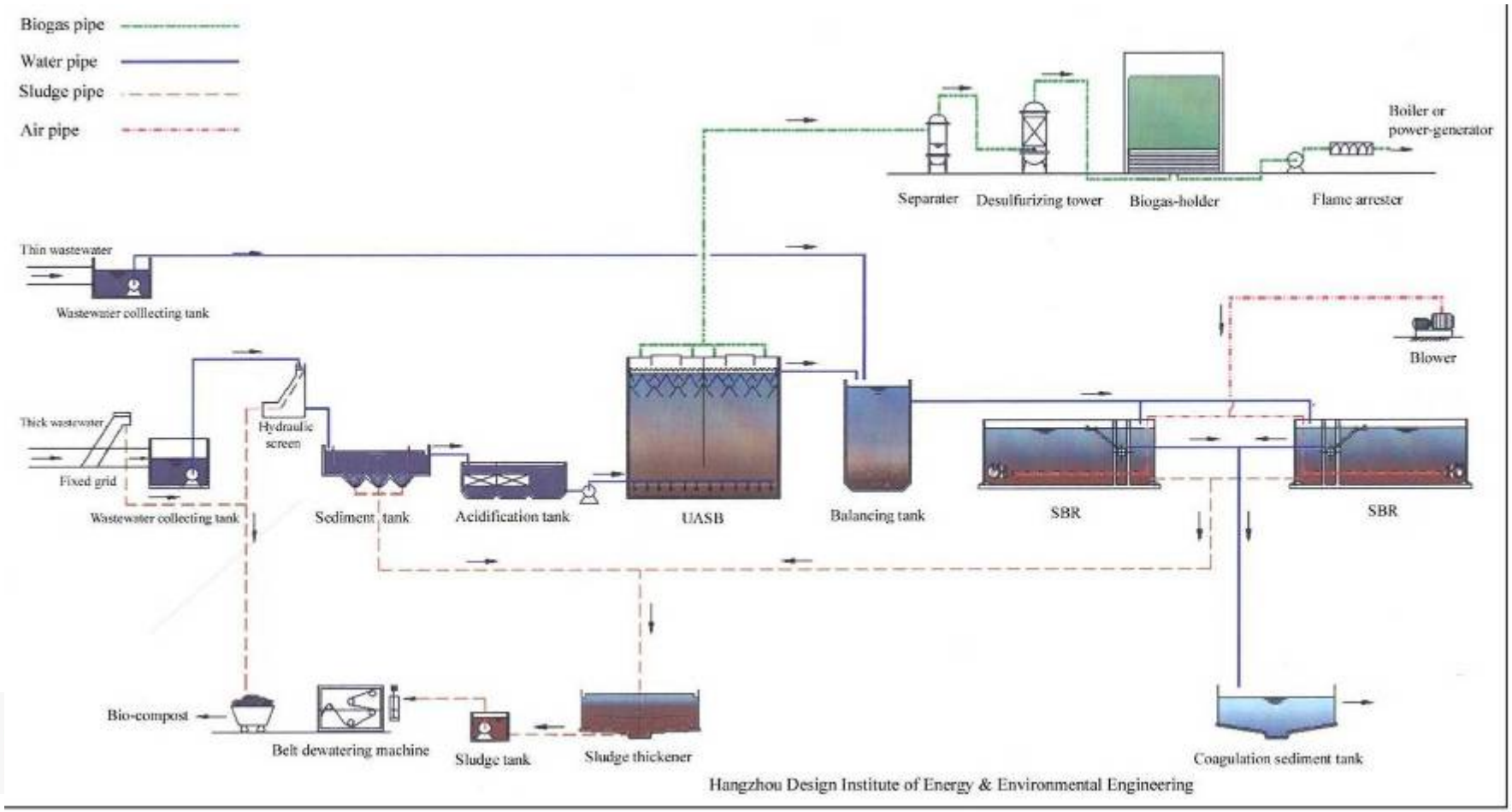
国家2006年起支持建设大中型沼气。中央投资农村沼气建设的国债资金从２００５年以前的每年１０亿元增加到２５亿元，其中２０亿元用于户用沼气池建设，５亿元用于大中型沼气池建设。

The Central Government put large funding for Large and Medium Biogas Plants promotion especially for livestock farms. In 2006 the State Funding for Rural Biogas Development has increased to 2.5B Yuan from 1 B Yuan before 2005. 200 M Yuan is used specially for Large and Medium Biogas Plant construction.

UNDP/GEF project: Hangzhou Dengta farm
UNDP/GEF 项目:杭州 Dengta 农场

- 处理能力： Q=3000t/d 6000m^3 UASB
- 沼气产量 Biogas production: 8500m^3/d,
- 沼气用于锅炉 Biogas is used for boiler,.

UNDP/GEF project: Hangzhou Dengta farm
UNDP/GEF 项目:杭州 Dengta 农场



Biogas projects in Yixing pig farm
Yixing 猪场的沼气项目

- 处理能力 Q=100t/d;
- 800m^3 CSTR
- 沼气产量 Biogas production: 500m^3/d
- 沼气用于发电 Biogas for generator

UNDP/GEF project: Hangzhou Tianyuan farm UNDP/GEF 项目:杭州Tianyuan农场

- 处理能力Q=1200t/d
- 2000m^3 CSTR
- 沼气产量
- Biogas production: 2000m^3/d
- 沼气用于锅炉Biogas for boiler

Biogas system Fujingda Farm in Zhejiang
镇江Fujingda 农场的沼气系统

2个消化器,每个300m^3

2 digesters of 300 m^3

Biogas system Hangzhou Fushan farm
Fushan 农场的沼气系统

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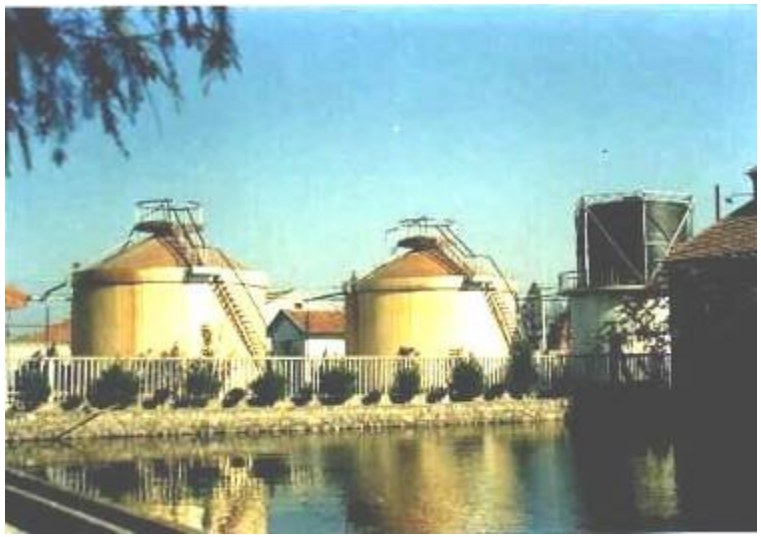


- 处理能力 Q=90t/d 700m^3 UASB
- 沼气产量 Biogas production: 600m^3/d
- 沼气用于烹饪 Biogas is used for cooking

上海Xinhuo 奶牛场的沼气系统
Biogas system Xinhuo Dairy Farm in Shanghai

6个450m3的消化器+肥料生产
6 digesters of 450m3
+ Fertilizer business

UNDP/GEF项目:北京 Shunyi 农场
UNDP/GEF project: Beijing Shunyi farm

- 处理能力
- Q=600t/d
- 2400m^3 UASB
- 沼气产量
- Biogas production: 2000m^3/d
- 沼气用于锅炉
- Biogas for boiler

北京Beilangzhong猪场沼气系统
Biogas system Beilangzhong Pig Farm Beijing

10000头猪

10,000 pigs

2 x 600 m3 USR

42 $kW_{el\text{-}instal}$

240个家庭烹饪

240 families are cooking

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

2600头奶牛

2600 dairy cows

2 x 600 m3 UASB

2 x 96 $kW_{el\text{-}instal}$

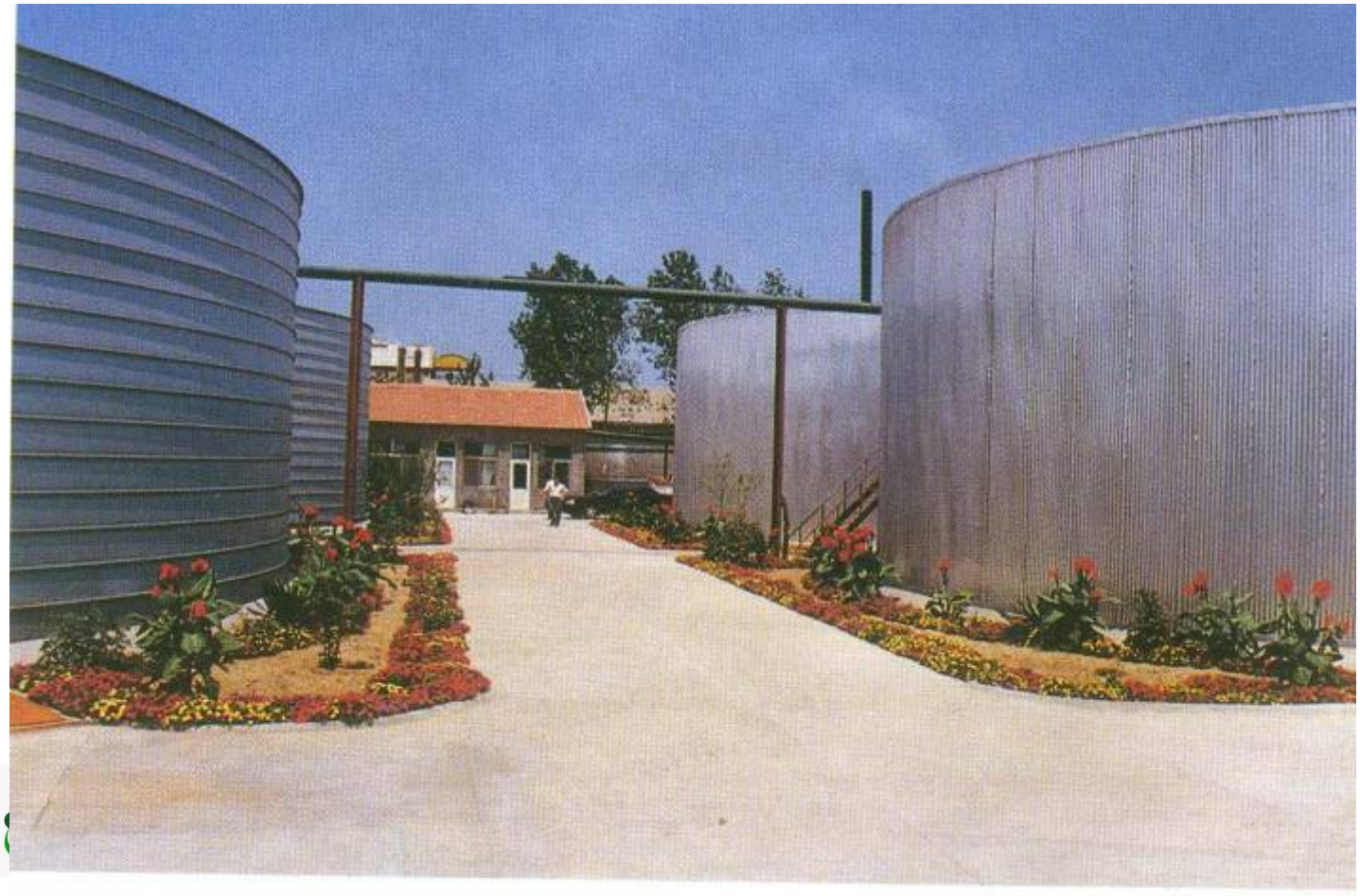
Biogas plant for wastewater from Mianzhu Distillery

Mianzhu酿酒厂用于废水处理的沼气系统

每天20000 **m3** 沼气

20,000 m3 biogas /d

Biogas plant for starch wastewater
Zhucheng Starch Joint-Stock Co. in Shandong
山东淀粉合资公司用于淀粉废水处理的沼气工程



处理能力
Q=6000t/d

New dry fermentation pilot project in Beijing Daxin

在北京大兴的新型干式发酵中试项目

- Biogas output:100M3/d
- 沼气产量:每天100M3
- Solid waste treated: 4t/d
- 固体废弃物处理能力:4吨/天
- Organic fertilizer production:1.5t/d
- 有机肥生产能力:1.5吨/天

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






Number of large and medium farms – potential customers for biogas
大中型农场-沼气工程的潜在用户数量

	Total of PCC farms			Large PCC farms			
Type of animal	**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

Employment and number of institutions and companies working in the biogas sector
沼气行业研究机关和公司的数量用职工数量

	Administration	R&D	Promotion	Constructor	Service
2001	11202	19130	20334	32514	18312
2003	13078	13000	26082	23351	15654
2004	12247	19800	26404	19412	15148
2005	14812	15130	29749	21660	14350

Employment

职工

	Administration	R&D	Promotion	Constructor	Service
2001	3786	1530	6815	1709	3038
2003	3693	1360	8535	1392	2501
2004	3604	2660	8957	1128	2240
2005	3915	1260	9584	1137	2189

Institutions & companies

研究所和公司

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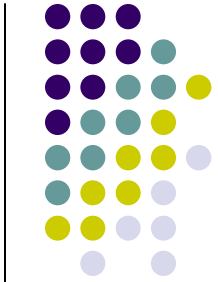
Technical, policy and financial issues - need to be solved
技术、政策和财力方面-还有问题需要解决

- Lack of standardization in design and construction of medium and large scale anaerobic digestion systems.
  在大型厌氧消化器的设计和建造上缺乏标准；
- Inappropriate separation, control, mixing and handling equipment;
  不适合的分离、控制、混合和处理设备；
- Limited application of lessons learned locally and limited acquaintance with international best practices.
  地方上使用经验不足，不熟悉国际惯例；
- The sector lacks transparency, with design institutions owning different levels of technology, and a low level of project information sharing.
  该领域的透明度不够，研究单位拥用不同水平的技术，项目信息共享水平低；

Technical, policy and financial issues - need to be solved
技术、政策和财力方面-还有问题需要解决

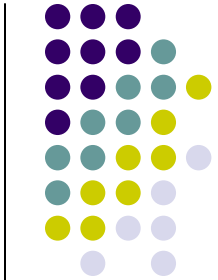


- Uneven enforcement of existing environmental regulations.
  现有环境法规的执行力度不均衡；

- Stricter enforcement of environmental regulations is obliging many industries to invest in waste treatment processes or face being closed down. In this context, anaerobic digesters producing valuable biogas represent the chance for industry to turn an environmental obligation into a business opportunity.
  要使各工业领域严格执行环境法规，以便投资污水处理行业。在此方面，厌氧消化器生产沼气使得环境义务变成了商机。

- Lack of familiarity with biogas investments amongst the financial community.
  在财务领域缺乏熟悉沼气投资的人

Large-scale biogas investments are feasible
大型沼气方面的投资是可行的



- 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.
  20%有大型养殖场不需要进行投资。

- The potential is still used as less than 10%.
  使用沼气的少于10%

- 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.
  私人投资者在中国沼气市场进入的机会增加。

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Pictures used from:

ADB – Asian Development Bank

BIOMA – Biogas Institute of Ministry of Agriculture

BRTC – Biogas Research and Training Centre for Asia and Pacific

CAREI – Chinese Association of Rural Energy Industry

CREED – China Rural Energy Enterprise Development (UNEP)

CREIA – China Renewable Energy Industries Association

HEEEC – Hangzhou Energy and Environmental Engineering Company

IBBK – International Biogas and Bioenergy Competence Centre Germany

IEEP – Institute of Energy and Environmental Protection (CAAE)

MOA – Chinese Ministry of Agriculture

RRL – Renewable Resource Laboratory (CAU)

Thanks!

谢谢

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中国沼气网

www.biogas.cn