Closing plenary discussion about large scale biogas plant development in China
闭幕讨论-大规模沼气工程发展

GIZ/FECC Training VII on
德国国际合作机构/农业部外经中心第七次培训

'Performance and Support Policy of Biogas Energy generating Biogas Plants'
for Biogas Plant Designers and Decision Makers, No.4
针对沼气厂设计人员与政策决策者第四次培训
"能源导向型沼气工程的运行绩效监测与支持政策"

16th to 18th May 2012, 3 days training, Nanjing
Cooperation Partner: DBFZ, DLG China
2012年5月16 – 18日（3天培训），南京
合办方：德国生物质研究中心，德国农业协会（中国）

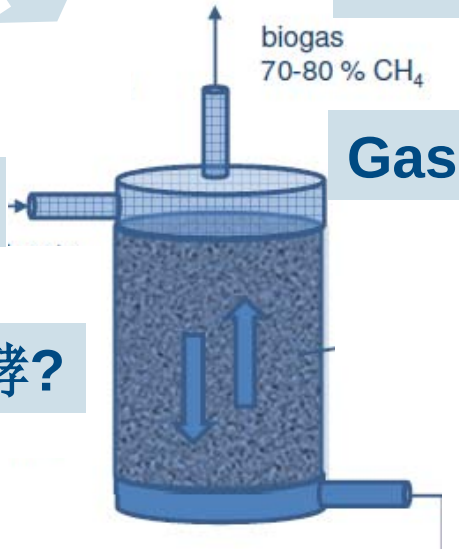
需要关注的问题
Issues to be focused on

Standards of super-large biogas plants
超大型沼气工程标准？

Subsidies 补贴方式?

Monitoring & Evaluation 监测评估?

Biomethane 压缩生物甲烷?



Gas yield 产气率?

Raw materials 原料?

Co-fermentation 混合发酵?

Digestate 沼渣和沼液?

Background info.
By Prof. Dr. Raninger

MOA 1: Relevant situation of biogas engineering
中国农业部 1：沼气工程相关情况

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需要关注的问题
Issues to be focused on

- **1. Investment scale needs to be enlarged 投资规模需要加大**
  - At present, the biogas project construction proportion of scale livestock and poultry farms is less than 1% of the total number suitable for construction. Calculated according to the total investment after new classification of biogas projects (the construction scale of new standard is expanded by 2.5 times on average, in which the small, medium and large projects are expanded by 3 times, 3 times and1.7 times, respectively, with the total investment expanded by 2-3 times on average), the standard of central subsidy is relatively lower. The subsidies have not been established for super-large biogas projects.
    目前规模化畜禽养殖场沼气工程建设比例还不到适合建设总数的1%，按新的沼气工程分类后的总投资计算(新标准建设规模平均扩大2.5倍，其中小型、中型、大型分别扩大3倍、3倍、1.7倍，总投资平均扩大了2-3倍)，中央补贴标准偏低。对特大型沼气工程没有制定补贴办法。

New: The type of the super-large biogas plants 超大型沼气工程标准:

Biogas production 日产沼气量	≥ 5000 m^3/d
Number of livestock on hand (pig equiv.) 畜禽存栏数目（猪当量）	≥ 50000
Volume of a single fermenter 厌氧消化装置单体容积	≥2500 m^3
Volume of total fermenters 厌氧消化装置总体容积	≥ 5000 m^3

(Source: the Department of Science & Education, the Ministry of Agriculture, P. R. China)农业部科技教育司

MOA 2: Relevant situation of biogas engineering
中国农业部 2：沼气工程相关情况

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需要关注的问题
Issues to be focused on

- **2. Raw materials need to be expanded 原料需要拓宽。**
  - At present, the central investment only supports the biogas projects in the breeding industry, but does not support the non-breeding enterprises to construct large-and-medium-sized biogas. The fermentation materials for biogas in many non-breeding farms have not obtained support.
    目前，中央投资只支持养殖业沼气工程，不支持非养殖企业建设大中型沼气。大量的非养殖场沼气发酵原料没有得到支持。

Resource type 资源类型	Quantity 数量 (mio tons百万吨)
Crops straw 农作物秸秆	340
The agricultural products processing (vegetables) wastes 农产品加工剩余物（蔬菜废弃物）	400
Livestock and poultry manure 畜禽粪便	300,000 (500 billion cubic meters of biogas can be produced theoretically) 300000(理论可生产沼气5000亿立方米）
Bioorganic municipal waste 城市生活垃圾	120
Organic waste water 有机污水	530,000 (30 billion cubic meters of biogas can be produced) 530000 （可生产沼气300亿立方米）
Kitchen waste 餐厨垃圾	14
Sewage sludge 污泥	

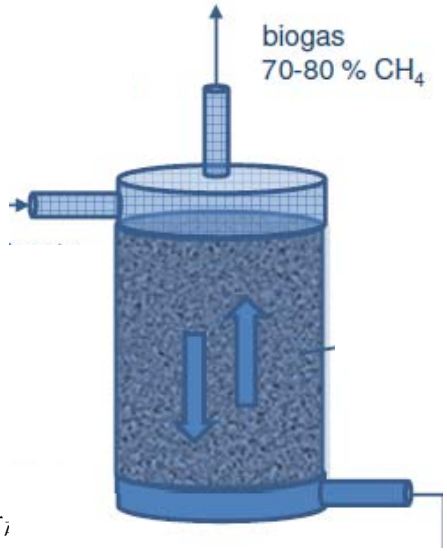
中国可用于生产沼气的资源种类及实物量
Type and substance quantity of resources available for biogas production in China

(Source: the Department of Science & Education, the Ministry of Agriculture, P. R. China)农业部科技教育司

MOA 3: Relevant situation of biogas engineering
中国农业部 3：沼气工程相关情况

需要关注的问题
Issues to be focused on

- **3. Biogas Plant performance:**
  Gas yield needs to be improved 产气率需要提高
  - China: ambient temperature fermentation 0.1-1.0 $m^3/m^3.d$, mostly <0.5$m^3/m^3.d$.
    中国： 常温发酵0.1-1.0 $m^3/m^3.d$，绝大部分<0.5$m^3/m^3.d$ 。
  - Temperature Germany: mesophil biogas fermentation (32-45 55°C) 1.2～1.8 $m^3/ m^3.d$
    德国： 中温沼气发酵装置1.2～1.8 $m^3/ m^3.d$
  - thermophil biogas fermentation (55°C)2.0～3.0 $m^3/ m^3.d$
    高温沼气发酵装置 2.0～5.0 $m^3/ m^3.d$



(Source: the Department of Science & Education, the Ministry of Agriculture, P. R. China)农业部科技教育

MOA 4: Relevant situation of biogas engineering
中国农业部 4：沼气工程相关情况

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Subsidies: For MLBGPs, the government will subsidize in the western areas 45% (max. 2.5 million CNY), in central areas 35% (max. 2 million CNY) and eastern regions 25% (max. 1.5 million CNY) of the total investment. The local governments will give additional support according to the standard not less than 5%, 10% and 20% of total investment.

补贴：对西、中、东部地区大中型沼气，中央分别补助项目总投资的45%、35%和25%，总量分别不超过250万元、200万元和150万元，地方分别按照不低于项目总投资的5%、10%和20%的标准予以配套投入。

National Subsidies for Middle and Large scale Biogas Plants
11th Five Year Plan 2006 - 2011(21 bn CNY)
2006年到2011年十一五规划中对大中型沼气厂的国家补贴（单位：十亿元人民币）

	2006	2007	2008	2009	2010
National Subsidies 国家补贴 (bn RMB 单位：十亿元人民币)	2.5	3,0	3,0	5,0	5,2
Middle and Large Biogas Plants (%) 大中型沼气厂	0	0	3	35	32

(Source: the Department of Science & Education, the Ministry of Agriculture, P. R. China)农业部科技教育司

MOA 4: Relevant situation of biogas engineering
中国农业部 4：沼气工程相关情况

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需要关注的问题

Issues to be focused on

- **4. End product use needs subsidies 终端产品利用需要补贴**
  - Subsidies shall be provided for biogas purification, thermal energy recovery, fertilizer use and so on. The dual goals of environmental management and energy development shall be integrated by setting up the positive development mechanism driven by the benefits. The issued power generation price for agriculture, forestry and biomass is relatively low, so the policy incentive effect is insufficient.
    应对沼气提纯、热能回收、沼肥利用等开展补贴，统筹环境治理和能源发展双重目标，建立效益拉动的良性发展机制。已出台的农林生物质发电价格偏低，政策激励作用不足。

The existing performance subsidy system (electricity feed in tarif) would be even sufficient for large and super large scale biogas plants if they would perform to > 90% of their design capacity and/or use co-feedstock!
如果沼气厂运行能力能够达到其设计数值的90%以上和/或应用混合发酵技术，现有补贴机制（发电并网补贴）对于大型甚至超大型沼气厂来说都是合理的。
(Source: Oos, Raninger, 2012 – Biogas Engineering and Application, Vol.3, in print 来源： Oos, Raninger, 2012 – 沼气工程与技术第三卷，筹备中)

(Source: the Department of Science & Education, the Ministry of Agriculture, P. R. China)农业部科技教育司

MOA 6: Why compressed biomethane (CBM) is the economic solution?
中国农业部6：为什么压缩生物甲烷是经济有效的解决方案？

Cost-Income-Analysis 投资回报分析 / Biogas Usage 沼气利用方式		Dimension 单位	Electricity 沼气发电上网	Biomethane(CBM) 沼气提纯
Cost 成本	Biogas production cost(large scale plant) 大型沼气厂沼气生产成本	CNY/nm^3	0.2 - 0.3	
	Transformation cost 转换追加成本	CNY/nm^3	0.5 - 0.6	0.7 - 0.8
	Total cost 总成本	CNY/nm^3	0.7 - 0.9	0.9 - 1.1
	1m^3 biogas can be transformed into 每方沼气可以转化为		2 kWh$_{el}$*	0.6 nm^3**
	Production cost of final product 终端产品成本	CNY	0.35 - 0.45 CNY/kWh$_{el}$	1.5 - 1.8 CNY/nm^3
Income 售价	Market price of Electricity/CNG 沼气发电上网电价和车用压缩天然气售价	CNY	0.75 CNY/kWh$_{el}$	4.5*** CNY/nm^3
	Income of biogas 沼气销售价格	CNY/nm^3	1.5	2.7
Revenue 利润	Revenue for 1 nm^3 biogas 每方沼气利润	CNY/nm^3	0.7	1.7
CBM: Δ=±1 CNY/nm^3 Biogas 沼气				

* CHP efficiency 40% 热电联产效率40%
** CH_4 content in biogas > 60% 沼气中甲烷含量大于60%
*** Beijing price in 2011 2011年车用天然气售价
**** No heat use 表格中并未计算热能的售价

MOA 7: Relevant situation of biogas engineering
中国农业部 7：沼气工程相关情况

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需要关注的问题
Issues to be focused on

7. Biogas project quality monitoring and operation evaluation mechanism has to be built 沼气工程质量监测和运营评估机制需要建立

- **BAT Biogas projects not used after construction or poorly operated shall be put in operation within a certain period of time and they shall receive punishment.**
  对建后不用或运营不善的沼气工程限期整改并给予相应处罚。

(Source: the Department of Science & Education, the Ministry of Agriculture, P. R. China)农业部科技教育司