



Renewable Energy: Finance Measures or Regulations? —Analysis on China Situations

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Goals of the RE development in long term (by 2020)

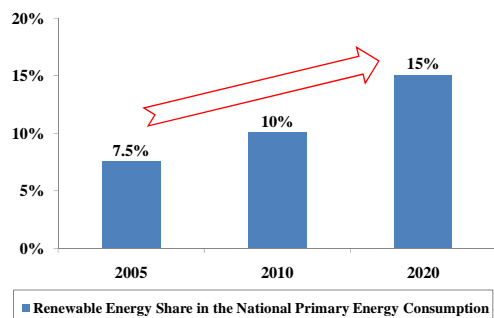


- Increase the ratio of RE in the entire energy mix, to 10% by year 2010, 15% by year 2020
- Take advantages of the local RE resources, to tackle the electricity access issues in remote areas, as well as the fuel shortage issues in rural households
- Promote the RE technology and industrial development, by introducing the global advanced experiences and followed by digestion, innovation efforts etc, to establish the manufacturing capability with own intellectual property rights by 2020



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General targets for REs



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Specific targets



Power targets summary (GW)

	2005	2010	2020
Hydro	117	190	300
Biomass power	2	5.5	30
Wind power	1.26	5	30
Solar power	0.07	0.3	1.8



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Specific targets



- Non-grain liquid fuel
 - 2010: bio-ethanol 2 million tons, bio-diesel 200,000 ton
 - 2020: bio-ethanol 10 mil. tons, bio-diesel 2mil. Tons
- Solar heat application
 - 2010, accumulated heat collection area 150 mil. m²; with the other heat application, totally substitute 30 mil. Tons of coal equivalent (TCE)
 - accumulated heat collection area 300 mil. m²; with the other heat application, totally substitute 60 mil. tce



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Biomass targets



	Year 2010	Year 2020
Biomass power generation (10MW)	550	3000
Biogas (100million m ³)	190	400
Bio-ethanol(10,000 ton)	200	1000
Bio-diesel (10,000 ton)	20	200
Briquette/pellet fuel (10,000 ton)	100	5000



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Milestones of the RE policy



- Incorporated into the legislation list at June 2003
- 2004 Jun. Bonn Conference, declaration of the RE law and the planning work
- 2005 Feb. release of the *China RE Law* (CRL)
- 2006 Jan. 1st CRL came into force, 10+ regulations afterwards released to help enforce the law
- 2007 Jun. *China National strategy on the Climate Change*, Wind, solar and biomass were prioritized
- 2007 Sep. *China RE Medium- and Long-term Planning*, RE targets identified
- 2007 Dec. White Book on Energy Status and Policy, RE identified as significant part



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RE Strategic Role and Targets



- CRL identified the significance of RE
 - Increase the energy supply, improve the energy structure, ensure the energy security, protect the environment, to achieve the sustainable development



International Forum on RE Legislation
2004. May



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Significance for developing RE

- Requirement for sustainable development
- Indispensable for well-off society building and socialism New Rural Countryside development
- Technical options for environment protection and GHG mitigation
- Opportunities to pursue new economic development area
- Security for future energy supply



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Major aspects identified by the law

- Establishing national RE general targets and plan
- Grid connection priorities
- Classifying tariffs for Renewable Power
- Sharing cost at national level
- Renewable energy special fund
- Policy on favorable credit and favorable tax treatment



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Regulations Progress

- Issued so far
 - Regulation and Management Measure of RE power (Jan. 2006 by NDRC)
 - Regulation on Renewable Power Pricing and Cost Sharing (Jan. 2006 by NDRC)
 - Guided Catalog of RE industry (Jan. 2006 by NDRC)
 - Some national standards (Standard for solar building, Geothermal heat pump by Ministry of Construction, Standard for Solar PV power and wind turbines etc by Standardization Administration of China.)
 - Fund earmarked for RE (May 2006, by Ministry of Finance)
 - 可再生能源发电附加
 - RE electricity surcharge (July 2006, NDRC)
 - 0.1 China Cents
 - 0.2 China Cents (July 2008)



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Major points of the new regulations

- Grid must allow the grid connection; mandated to buy all renewable electricity; all the extra costs will be shared by the final users——avoid market competition for RE with conventional energies
- Feed in tariff for Biomass
 - 0.25 Yuan/kWh + local coal fired power price
- Tender price for wind
 - Through a tender processing to determine the regional price standards for wind
- Approval price case by case for other RE projects
 - Project payback price for solar PV, geothermal etc.
- National Earmarked Fund for RE development
- Favorable tax regime to support RE development



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Quota system idea for RE



- MMS policies will be adopted for non-hydro renewable power generation according to the following targets:
 - In areas covered by large scale power grids, non-hydro renewable power generation's share of total power generation will reach 1 percent by 2010 and over 3 percent by 2020.
 - Power generators with self-owned installed capacity of over 5 GW will be required to have a non-hydro renewable energy installed power capacity self-owned that accounts for 3 percent of their total self-owned capacity by 2010 and for over 8 percent of their total self-owned capacity by 2020



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RE Market quickly expanded

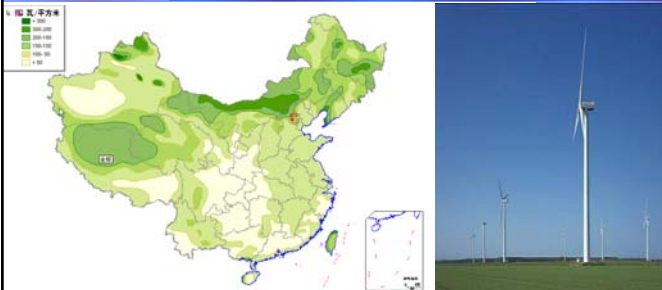


- Release of *CRL*: milestone of RE development (End of 2007), RE saw a unprecedented growth
 - Hydro: newly installed 10GW in 2007, accumulated 148GW, 37% of the economically viable potential



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Wind power

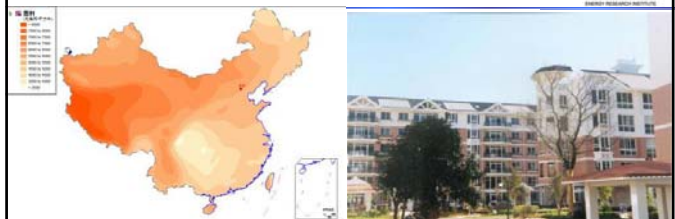


- Wind: 12.5GW (2008), exceeding the national wind target by 2010



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Solar energy



- Solar water heater: annual production 30 mil m², accumulated 130 mil m², 60% of the world (2008)
- Solar PV: a record manufacturing capacity 4GW (2008), increased from 3GW, 1st in the world



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Solar PV systems



青海30KW送电到乡光伏电站

Township Electrification PV Power Station 30KW
(Qinghai province)



深圳国际园林花卉博览园1兆瓦并网光伏电站

Roof-grid PV power system 1MW
(International flower garden in ShenZhen city)



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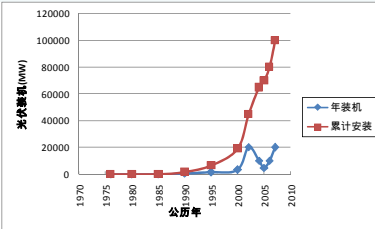
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China's PV market



中国光伏年装机和累计装机统计 (KWp) China's annual and accumulative capacity for PV

年度Year	1976	1980	1985	1990	1995	2000	2002	2004	2005	2006	2007
年装机 Newly installed	0.5	8	70	500	1550	3300	20300	10000	5000	10000	20,000
累计安装 Accumulated	0.5	16.5	200	1780	6630	19,000	45,000	65,000	70,000	80,000	100,000



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Biogas utilization



- Biomass: 22 mil household biogas, 3000 large biogas, total volume 10 billion m³; large livestock biogas plant > 800
- Gasification pilot plants > 600 in village level, to supply fuel for 120,000 households



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Industry quickly developed



- RE manufacture industry being forming
- Wind industries in China 100+
 - 60+ wind turbine assemblers
 - Capable to produce MW wind turbines in mass production (1MW, 1.5MW, 2MW)
 - Key components: gearbox, blades, generators
- 10+ PV manufacturers with capacity over 100MW
- SWH companies 3000+
 - 10+ revenue over 1 billion RMB
- Attract foreign RE giant players
 - GE, Gamesa, Vestas, Suzlon, Repower, Nordex



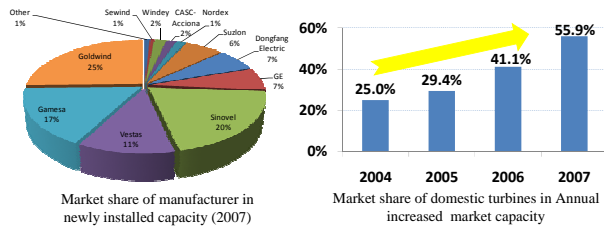
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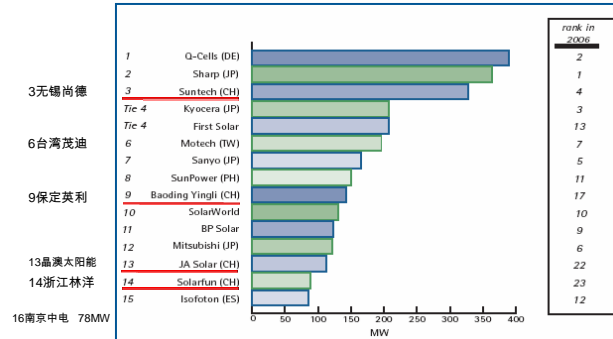
Wind industry



Market share of domestic turbines in annual increased-market growing



Solar PV manufacturers



Common Challenges Faced for RE Development



- General
 - High cost
 - Resource assessment to be strengthened
 - Limited R & D input
 - Weak industry capability
 - Capacity building need to be enhanced
- By technology
 - wind
 - 电网Power grid
 - solar energy
 - 硅材料expensive silicon
 - 成本高，一般为常规电力的10倍 High cost, 10times of the conventional electricity
 - biomass
 - 土地资源limited land
 - 技术瓶颈technical bottleneck
 - geothermal and marine energy
 - 资源评价弱，技术水平不高 weak resource assessment, low level of technology

Regulations (law) or Finance Measures for China RE Grid Connection?

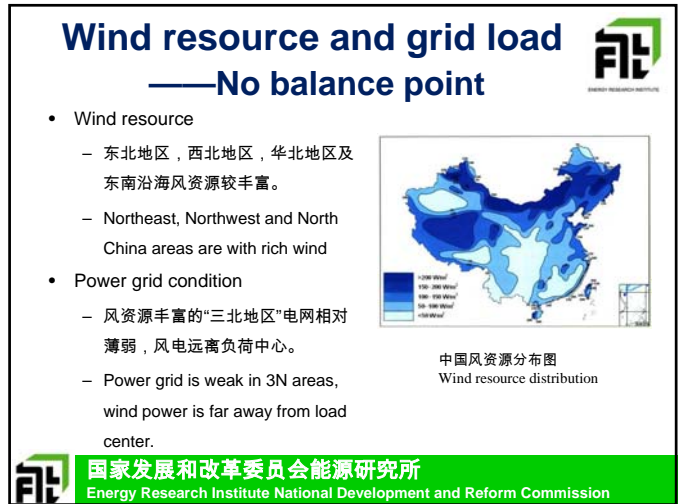
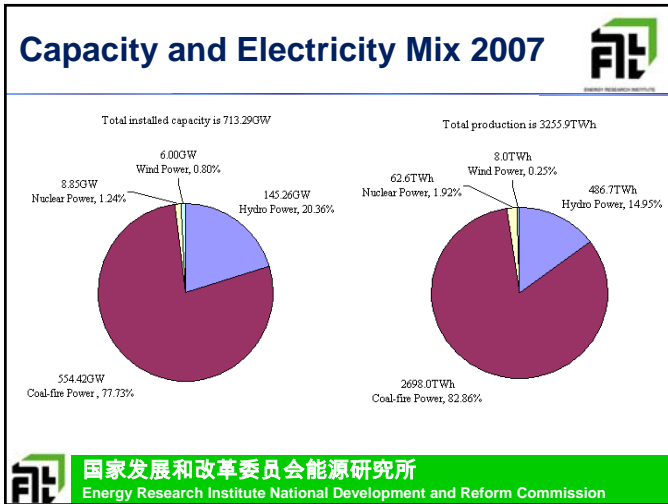




Wind power ratio

年份	2002	2003	2004	2005	2006	2007
中国总电源装机容量 Total Power (MW)	356,570	391,410	440,000	500,000	600,000	713,290
中国风电总装机容量 Total wind power (MW)	445.0	568.4	763.8	1260.0	2560.0	6050
中国的风电装机比例 Wind power proportion (%)	0.125	0.145	0.174	0.25	0.43	0.84
世界风电总装机容量 Global Total Wind Power (MW)	31,000	40,300	47,317	59,004	73,904	93,849

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Wind power grid integration status



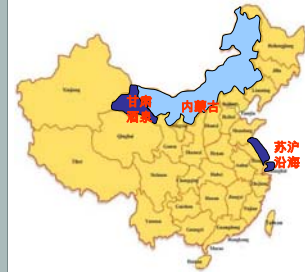
- 越来越多的大容量风电场 ($\geq 100\text{MW}$) 接入220kV甚至是更高电压等级的输电网中。
 - > More large scale wind farms ($\geq 100\text{MW}$) are connected into 220kV transmission network even higher voltage level transmission network.
- 百万千瓦风电基地, 千万千瓦风电基地
 - > 1000MW wind power base, 10 GW wind power base
- 发展特点: 建设大基地, 融入大电网。
 - > Characteristics: Constructing large wind power base, connecting into large power grid with higher voltage level.



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Resource and Load



- Several 10GW wind farms will be established in Gansu, Inner Mongolia and Jiangsu coast region



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Key Issue for RE grid connection



- How sent electricity from north west to east and south
 - Regional connected
 - Smart grid in region
- Grid company can't make decision
 - Need huge investment
 - Increase subside level



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Financing?

—One case on PV



Tenders	Biding price (China Yuan/kWh)	Average level
1	0.69	Exclude the lowest and Highest: Around 1.5 China Yuan/kWh Total investment: Around 250 million China Yuan
2	1.0928	
3	1.16	
4	1.39	
5	1.43	
6	1.4433	
7	1.45	
8	1.486	
9	1.518	
10	1.526	
11	1.658	
12	1.6978	
13	1.9208	



10 MW Project in Gansu

Reasons: reasonable?



- Concession bidding
 - Grid connection
 - Feed-in-tariff
 - Land free
- Quota will be launched
 - Most state owned companies
 - Occupied the market
 - Internal balance
- The scale of the project too small



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Conclusion: National strategies and Regulations Plus Finance measures



- Strategy should be made by the state council
 - Regional grids must connect each other
 - Smart grid in the region
 - Quota system should be established
 - Producers and Grids
 - Financing supports
 - Government direct investment
 - Surcharge level to end user should be increased
 - Subside to grid company
- Financing measures
 - Feed-in-tariff
 - PV could be next
 - Net metering
 - PV
 - Adjust the level existed feed-in-tariff
 - Distributed power connected
 - Biogas, Landfill gas, other
 - Resource assessment: National input (already started from wind)
 - Attractive investor and banker



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