Wind Power in China

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Wind Potential in China

- It was estimated by China Academy of Meteorology Sciences, that wind potential would be 253 GW on land and 750GW for offshore at 10m height.
- Some promising areas up to 3 million square kilometers were selected for mapping by UNEP/SWERA (Solar and Wind Energy Resources Assessment) programme, this wind map is available to the public on web site.
- The new national wind map made by China Meteorological Bureau maybe available by end of 2007.

Wind Potential in China

- The best areas for wind energy use are northern China, including Inner Mongolia, Xinjiang, Gansu, Ningxia, Hebei, Heilongjiang, Jilin and Liaoning province; and
- along the coastal areas and offshore, including Shandong, Jiangsu, Zhejinag, Fujian, Guangdong and Hainan.

- Annual average wind speeds measured by UNDP project at 70m height, on good sites in Inner Mongolia is 7.6m/s, in Gansu is 7.5m/s, in Jilin is 7.0m/s, in Fujian is 6.3m/s and in Guangdong is 5.9m/s.

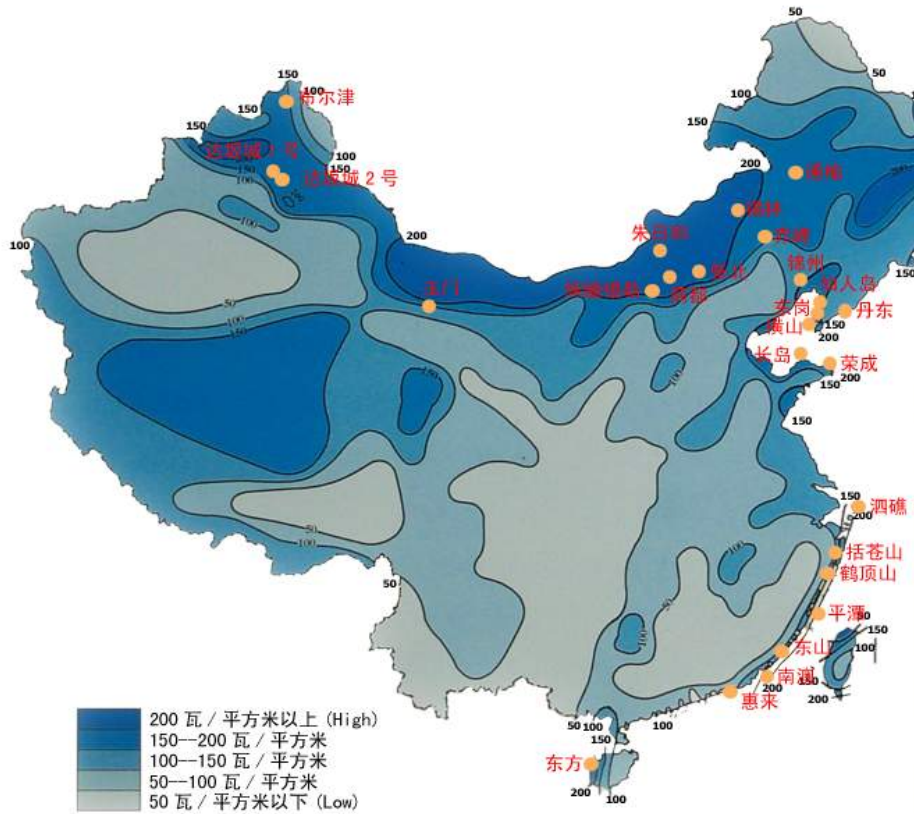
Wind Potential in China

- The only public paid on-site wind measurement programme is supported by UNDP, 10 sites had been selected, one 70m tower and four (or three) 40m towers erected on each site,

- most of them have collected one year data, the major results will be available to the public by end of 2006.

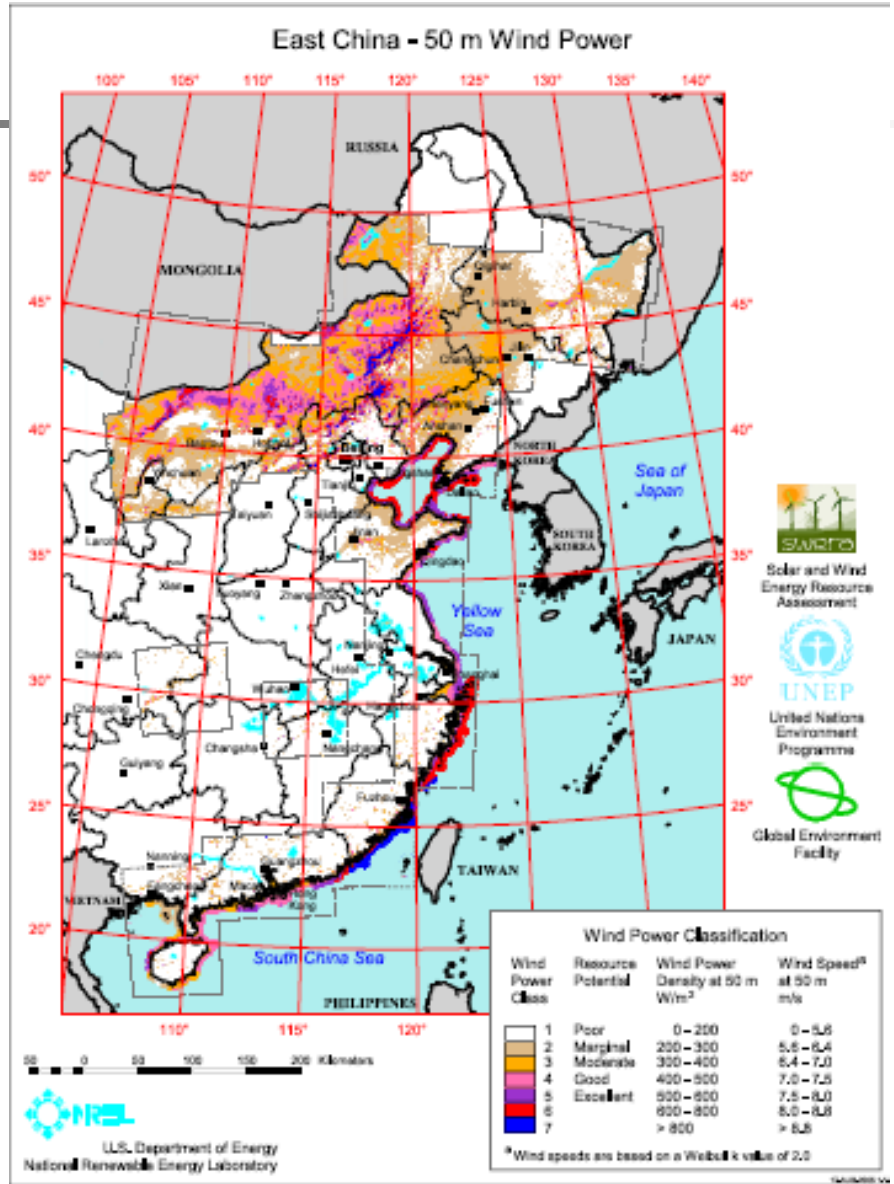
Wind Potential in China

附图 5



	风电场	台数	容量(kW)	估计年利用小时数
1	张北	24	9850	2500
2	朱日和	28	4200	2600
3	商都	17	3875	2400
4	锡林	4	1000	2600
5	辉腾锡勒	61	36100	2500
6	赤峰	9	6450	2600
7	东岗	26	12205	2000
8	横山	20	5000	2000
9	锦州	1	600	2100
10	仙人岛	9	5940	2000
11	通榆	11	7260	2200
12	荣成	3	165	2300
13	长岛	11	5510	2300
14	泗礁	10	300	2500
15	鹤顶山	19	10255	2100
16	括苍山	33	19800	2000
17	平潭	6	1055	2800
18	南澳	113	43280	2900
19	惠来	12	7200	2200
20	东方	19	8755	2100
21	玉门	4	1200	2200
22	达坂城1号	31	11500	2900
23	达坂城2号	116	59800	2900
24	布尔津	7	1050	2600
25	丹东	28	21000	2000
26	东山	10	6000	2800

Wind Potential in China



Legal aspects

- The Renewable Energy Law of The People's Republic of China (Hereinafter referred to as RELC, renewable energy referred as RE) was issued on 28 February 2005, and became effective on 1st January 2006. Only general principles are identified in the law, the government agencies are formulating detailed regulations to make it enable to be implemented.

- Major general principles related to wind power:

Legal aspects

Term	Principles
Development target	Energy authorities sets middle and long-term target of the total volume for the development of RE at the national level, which shall be released to the pubic after being approved by the central government.
Feed-in tariff	Feed-in tariff of RE power generation projects shall be determined by the price authorities in the principle of being beneficial to the development of RE and being economic and reasonable, where timely adjustment shall be made on the basis of the development of technology for the development RE. The Feed-in tariff shall be publicized

Legal aspects

Obligation of power grid enterprises	Power grid enterprises shall enter into grid connection agreement with renewable power generation enterprises that have obtained license, and purchase the electric energy generated by RE within the coverage of their power grid.
Right of power grid enterprises	Grid connection expenses paid by power grid enterprises for the purchase of electric energy from RE and other reasonable expenses may be included into the grid enterprise power transmission cost and retrieved from the selling price.
Share of incremental cost	The incremental cost of feed-in tariff with conventional energy shall be shared in the selling price. Price authority shall prepare specific methods.

Legal aspects

- In the beginning of year 2006 there were two regulations had been issued, one for the price and share of incremental cost, and the other for the administration of electric energy generation by RE.
-
- The most important two terms for wind power are:
- ● Power generation enterprise have the obligation to take a certain mandated market share of electric energy generation by RE, detailed quantity will be identified by the national authority in other regulation.
-
- ● Feed-in tariff of wind generated electric energy shall be “government guided price” which determined by the price authorities, based on the results of bidding process.

Legal aspects

- At the moment these two issues are big uncertainties, new completed wind power projects have to sale their electric energy at the price same as the local coal power projects.
-
- The price offered via bidding process by the winners of previous wind power concession projects are extremely low and definitely make the projects not profitable. The price and wind power density are listed bellow as reference.

- Price offered by winners (including 8.5% of VAT for sale electric energy, and 33% of income tax)

Legal aspects

Price offered by winners (including 8.5% of VAT for sale electric energy, and 33% of income tax)

Year	Project Name	Size (MW)	Annual Full Load Hours	Winner	Bidding price within 30000 full-load hours (Euro cents)	Guessing Price after 30000 full-load hours (Euro cents)	Average Price during lifetime 20 years (Euro cents)
2003	Rudong Phase 1 (Jiangsu province)	100	2191 h	Hua Rui	4.365*	3.300	4.033
	Huilai (Guangdong province)	100	1990 h	Yue Dian	5.013	3.038	4.527

Legal aspects

2004	Rudong Phase 2 (Jiangsu province)	150	2273 h	Long Yuan	5.190	4.500	4.955
	Huitengxile (Inner Mongolia)	100	2588 h	Bei Guo Dian	3.820	4.174	3.969
	Tongyu (Jilin province)	200	2309 h	Long Yuan	5.090	3.500	4.533
	Tongyu (Jilin province)	200	2524 h	Hua Neng	5.090	3.500	4.533

Legal aspects

2005	Dongtai (Jiangsu province)	200	2126 h	Guo Hua	4.877	0.4861	4.867
	Dafeng (Jiangsu province)	200	?	Zhong Dian Tou	4.877	0.4861	4.867
	Anxi (Gansu province)	100	2358 h	Zhong Dian Tou	4.616	3.800	4.317
	Jimo (Shandong province)	150	1686 h	Hua Dian International	6.000 (?)	?	?

Legal aspects

- Full English name of the winners:
- Hua Rui – Jiangsu UniPower Wind Power Co. Ltd., Farsighted Group
- Yue Dian – Guangdong YUDEAN Shibeishan Wind Power Development Co., Ltd.
- Long Yuan – China LONG YUAN Electric Power Group Corp.
- Bei Guo Dian – Beijing International New Energy Co., Ltd.
- Hua Neng – HUANENG New Energy Co., Ltd.
- Guo Hua – Guohua Energy Investment Corporation
- Zhong Dian Tou – China Power Investment Corporation

Legal aspects

- ● Foreign investors are allowed to develop wind power in China.

Energy supply

- ● The “utilities” in China has separated into two sectors:
- “power grid enterprise” for electricity transport and distribution, which is owned by the national government;
-
- “power generation enterprise” for electric energy generation, which can be owned by government, public or private.

Energy supply

- Currently exist a legal separation of electricity generation and transport, however, electricity transport and distribution has not separated. Both transport and distribution are managed by “power grid enterprise”;

- at the national level, only two power grid corporations:
- “State Power Grid Corporation” and
- “Southern Power Grid Corporation”,
- provincial power company are the subsidiaries of these two national power grid enterprise.

Energy supply

Source	Installed capacity		Electric energy generation	
	(GW)	(%)	(TWh)	(%)
Coal	384.4	75.6	2016.9	81.5
Water	116.4	22.9	396.0	16
Nuclear	6.9	1.35	52.0	2.1
Wind	1.2	0.23	1.5	0.06
Others	n/a	n/a	n/a	n/a
Total	508.4	100	2474.7	100

Energy supply

- ● Power grid enterprises are not interested in wind power since it is expensive and not dispatchable.
- Power generation enterprises are interested in wind power due to have to have madated market share of RE as obligation.

- ● Current regulations allow power generation enterprise using the advantages of RE law, however, not allow power grid enterprises and private individuals to install grid connected wind turbines.

Political aspects

- Reasons for the wind energy engagement:

- for the long term are energy supply, safety and environment protection;

- for the near term are creating a wind turbine manufacturing industry and speed up the economic development in remote windy areas.

- Local authorities can only offer limited additional support in reducing costs of land acquisition and income tax rate.

Economic aspects

- The reimbursement of electric energy from wind is identified by the government, at the moment is not a fixed value but just an uncertainty. No negotiations are available.

Economic aspects

- ● The average generation cost for the electric energy are different, depending on the price of coal and transportation in each province,

- the costs are 1.2 Euro cents/kWh in western China to 2 Euro cents/kWh in eastern China without tax,

- the feed-in tariff are 2.4 Euro cents/kWh to 4 Euro cents/kWh including income tax (33%), value added tax (17%) and some other taxes.

Economic aspects

- The rate of import duty for wind turbine:

- 5% based on the value of CIF price, however, the associated VAT is 17% and make the final result would be 23%.
- The same as components and measurement equipment.

Economic aspects

- There is no other support programmes for wind energy, but there are some possibilities to apply wind power projects to take the advantages from other industry support programmes,
- such as high technology industry, to reduce the income tax

Wind energy activities in China

- NDRC policy:
- 70% domestic made components, otherwise the project would not be approved
- Bundle of manufacturer with developer to guarantee the market size of 500MW each
- Goldwind vs Longyuan
- Huarui vs Huaneng

Wind energy activities in China

- Risk of wind power concession projects

- Large project size – 2250 MW in total
- Extremely low feed-in tariff – 3.8 to 5.1 Euro cents per kWh (2200 to 1800 full load hours)
- Requirement – 70% Domestic component
- Construction period 3 to 4 years

- To meet the above four conditions will lead to lose quality control – more trouble, less electricity!

Wind energy activities in China

- ● Both government owned power generation enterprise and a few of private enterprise operate wind farms.

- ● Institutions deal with wind energy are listed in the table bellow:

Wind energy activities in China

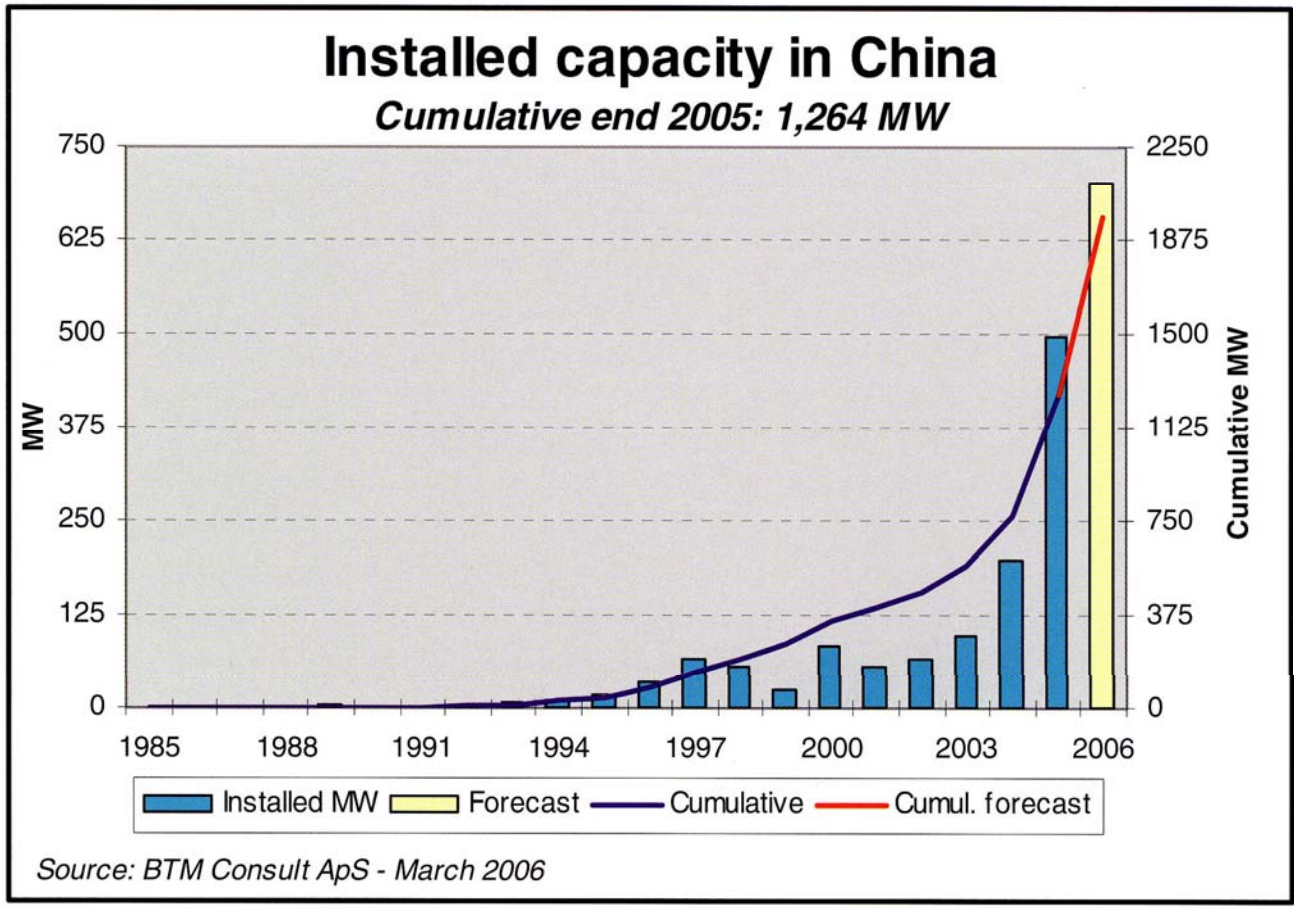
	Organization	Function	Organization	Function	Organization	Function
Government	NDRC	National planning and administratin, support industry	MOST	Support R&D	Provincial DRC	Provincial planning and Approval of wind power project small than 50MW
Associations	CREIA	Industry and policy	CWEA	R&D and training	CWTMA	Coordination for manufacturers
Consultant	CHECC	Technical support to NDRC				

Wind energy activities in China

- NDRC - National Development and Reform Commission
- MOST – Ministry of Science and Technology
- Provincial DRC - Provincial Development and Reform Commission
- CREIA – Chinese Renewable Energy Industry Association
- CWEA - Chinese Wind Energy Association
- WPMS – Wind Power Machinery Subcommittee of China Association of Agricultural Machinery Manufactures
- CHECC – China Hydropower Engineering Consulting Group Co,

Wind energy activities in China

Figure AP-4a: Installed capacity in China 1985-2005



Wind energy activities in China

- ● Total installation of wind energy in China by end of 2006 is 2589MW.
- The new increased in 2005 is 1334MW.

- ● Manufacturers in China and their market share see the table bellow.


以人为本 安全第一
金风科技

Wind energy activities in China

Increased market share of Domestic owned manufacturers in 2006

制造商 Manufacturer	容量 Capacity (kW)	占当年内资制造商比例 Percentage of Domestic manufacturers	占当年新增总装机比例 Percentage of increased total capacity
金风 Goldwind	445200	80.81%	33.38%
华锐 Huarui	75000	13.61%	5.62%
运达 Windey	19500	3.54%	1.46%
东汽 DFSTW	9000	1.63%	0.67%
哈电 HE	1200	0.22%	0.09%
惠德 Huide	1000	0.18%	0.07%
合计 Total	550900	100%	41.30%

Wind energy activities in China

Cumulative market share of Chinese owned manufacturers by end 2006

制造商 Manufacturer	容量 Capacity (kW)	占内资制造商比例 Percentage of Chinese manufacturers	占总装机比例 Percentage of total capacity	备注
金风 Goldwind	667350	83.36%	25.77%	含 XWEC-Jacobs 机组
华锐 Huarui	75000	9.37%	2.90%	
运达 Windey	31750	3.97%	1.23%	
东汽 DFSTW	15000	1.87%	0.58%	REpower 机组
万电 Wandian	2400	0.30%	0.09%	
其他 Others	1960	0.24%	0.08%	
一拖 Yituo	1500	0.19%	0.06%	HSM –Yituo 机组
杭发 HEEW	1200	0.15%	0.05%	Bonus-HEEW 机组
申新 Shenxin	1200	0.15%	0.05%	
沈工大 SUT	1000	0.12%	0.04%	
哈电 Hadian	1200	0.15%	0.05%	
惠德 Huide	1000	0.12%	0.04%	
合计 Total	800560	100.00%	30.92%	

Wind energy activities in China

内资与合资制造商全称　Full name of the domestic and Joint venture manufacturer

东汽	东方汽轮机公司
DFSTC	Dong Fang Steam Turbine Co.
哈电	哈尔滨电站设备集团公司
HE	Harbin Power Plant Equipment Corporation
哈飞	哈尔滨哈飞威达风电设备公司
Hafei	Harbin Hafei-Winwind
航天安迅能	南通航天万源安迅能风电设备制造有限公司
CASC-Acciona	Nantong CASC Wanyuan Acciona Wind Turbine Manufacture Co., Ltd
华锐	华锐风电科技有限公司
Sinovel	Sinovel Wind Co. Ltd
惠德	惠德风电工程有限公司
Huide	Huide Wind Energy Engineering Co., Ltd
金风	金风科技股份有限公司
Goldwind	Goldwind Science & Technology Co., Ltd
沈工大	沈阳工业大学风能研究所
SUT	Wind Energy Research Institute, Shenyang University of Technology
运达	浙江运达风力发电工程有限公司
Windey	Zhejiang Windey Engineering Co., Ltd

Wind energy activities in China

- Local companies solely owned by foreign manufacturers were established to assemble wind turbines and employ domestic made components, such as GE Wind, Gamesa Eolica, Suzlon and Vestas, etc., local made products are available.

- Major component manufacturer LM started the local made blade in 2002 in Tianjin.


风起能涌
苏司兰能源（天津）有限公司奠基仪式
SUZLON
奠基
二零零六年三月十五日

Wind energy activities in China

Increased market share of foreign owned manufacturers in 2006

制造商 Manufacturer	容量 Capacity (kW)	占当年外资制造商比例 Percentage of foreign manufacturers)	占当年新增总装机比例 Percentage of increased total capacity
Vestas	311550	42.48%	23.36%
Gamesa	212500	28.98%	15.93%
GE	169500	23.11%	12.71%
Nordex	27300	3.72%	2.05%
Suzlon	12500	1.70%	0.94%
合计 Total	733350	100%	54.98%

Potential Wind Market in China

- Currently 1500MW are under construction, more than 2000MW of wind farm projects have been approved.

- 4000MW of cumulative wind installation could be achieved by the end of 2007.

Potential Wind Market in China

- Considering more proportion of wind power in the fast growing power industry in China
-
- 30GW wind power has been planned for year 2020

- At that time wind power installation would be 3%
- wind generated electricity would be 1.5%
- of total power industry (1000GW) in China.

Potential Wind Market in China

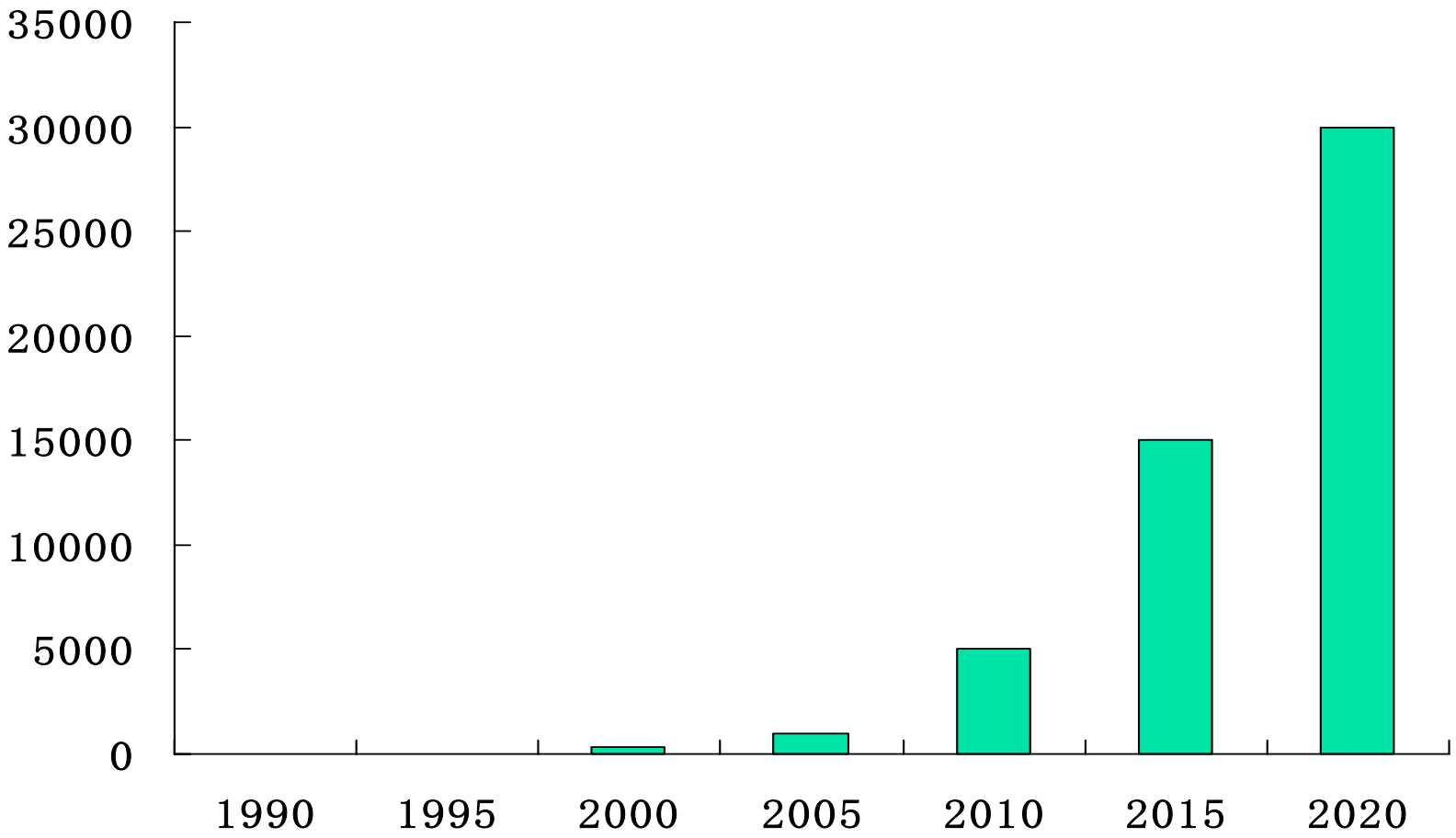
- Guessing:

- 2030 hydropower (400GW) will fully developed
- Wind power maybe 100GW

- 2050 coal power will be limited
- Wind power maybe 400GW

- Wind power market is enormous!

Installed capacity of wind power(MW)

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