

Status of Wind Energy in China

Expanding the Sino-German Cooperation for the Rapid Development
of the Chinese Wind Power Sector

Prof. Wang Weisheng

China Electric Power Research Institute

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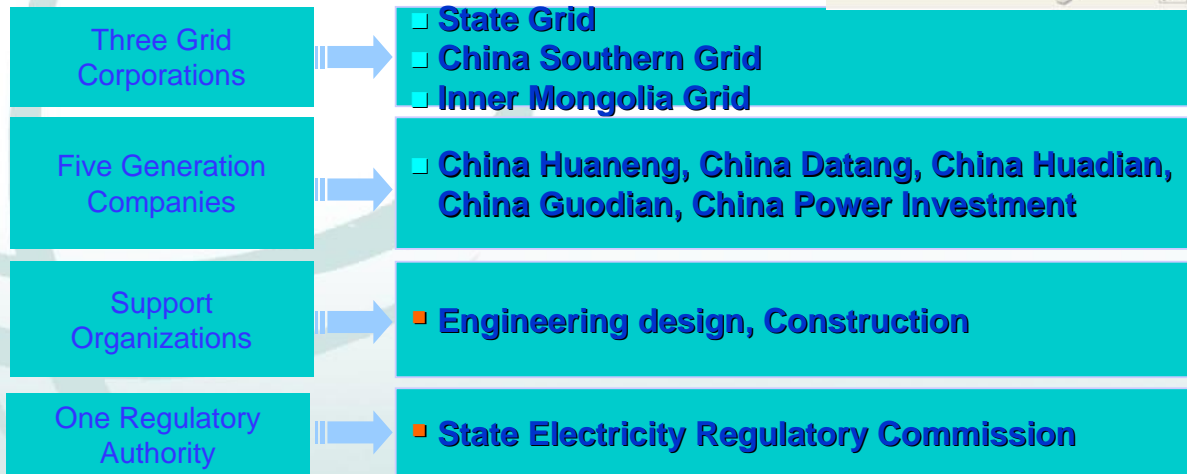
Guideline

1. Status of China Wind Power Industry
2. Challenges for Rapid Development of Wind Power in China
3. Main Achievements of Sino-German Cooperation:
Wind Power Research and Training Project
4. Suggestions on the Future of the Sino-German
Cooperation in the Wind Power Sector
5. Conclusions

1 Status of China Wind Power Industry



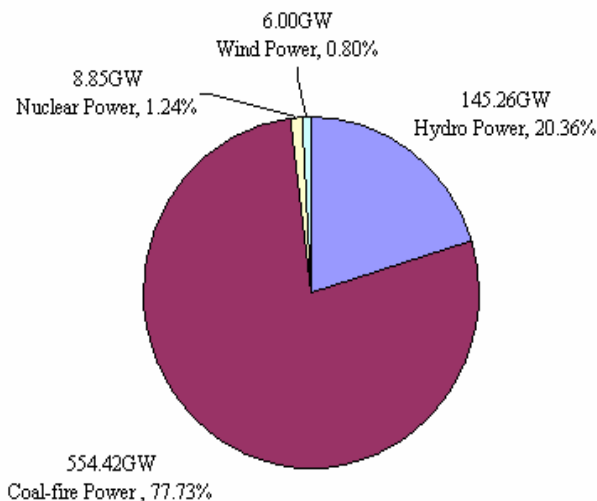
Power Industry Management Structure



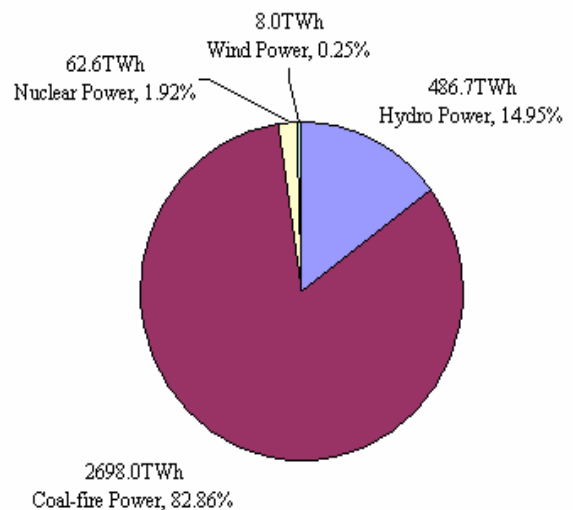
1 Status of China Wind Power Industry

- The total capacity of installed electric power generation was 713.29 GW by the end of 2007 with an annual production is 3255.9TWh in 2007.

Total installed capacity is 713.29GW

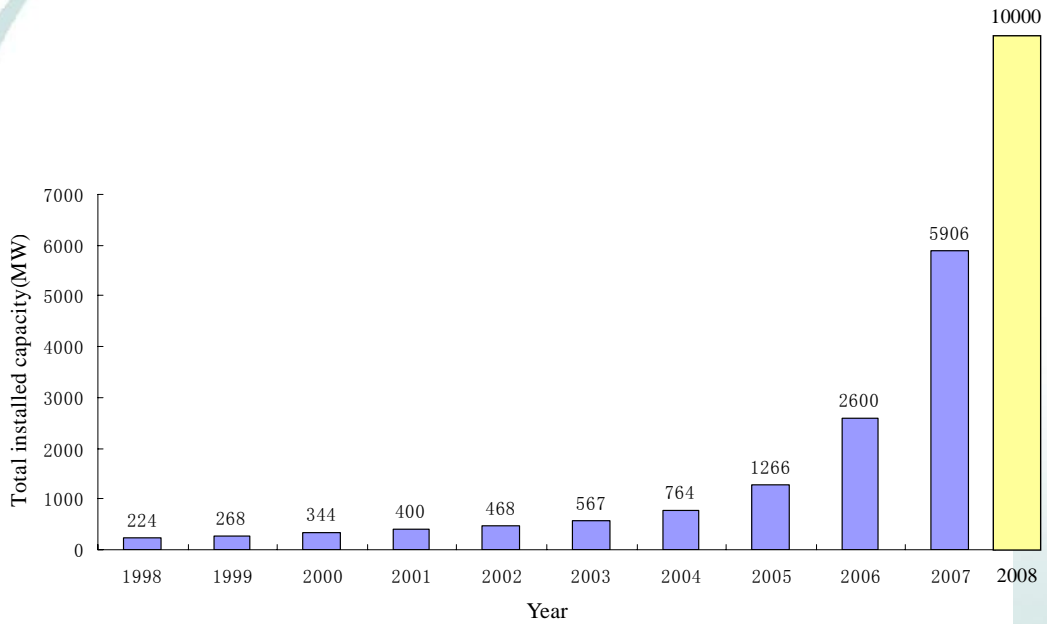


Total production is 3255.9TWh



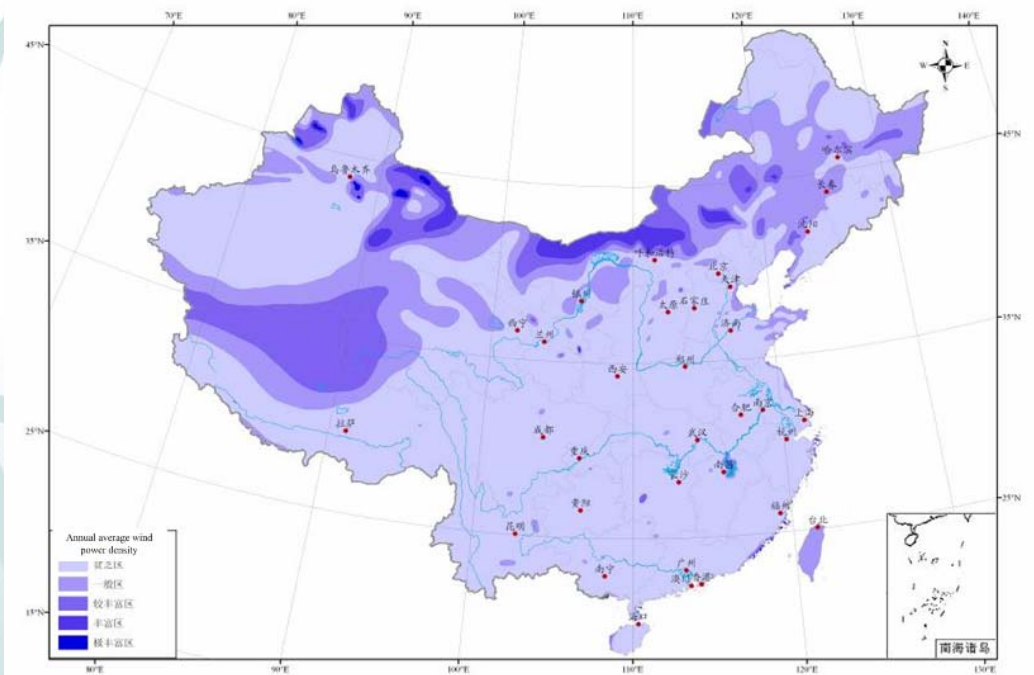
1 Status of China Wind Power Industry

Fig 1 Accumulative of Wind Power Capacity in China from 1998-2007



1 Status of China Wind Power Industry

Fig 2 Geo-Spread of Wind Resources in China



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Fig 3 Geo-Spread of Wind Power Capacity in China up to 2007



1 Status of China Wind Power Industry



Fig.4 Wind turbine manufacturers in China

1 Status of China Wind Power Industry

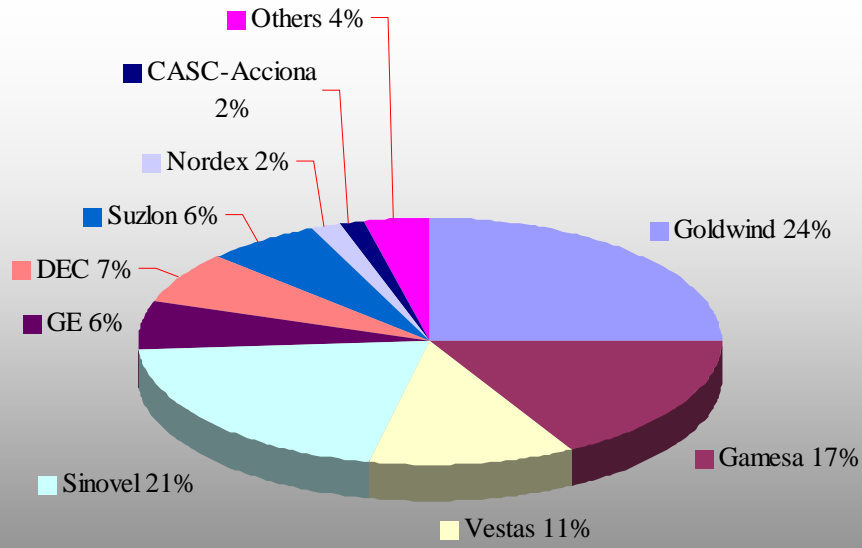


Fig.5 Market share of manufacturers in 2007

1 Status of China Wind Power Industry

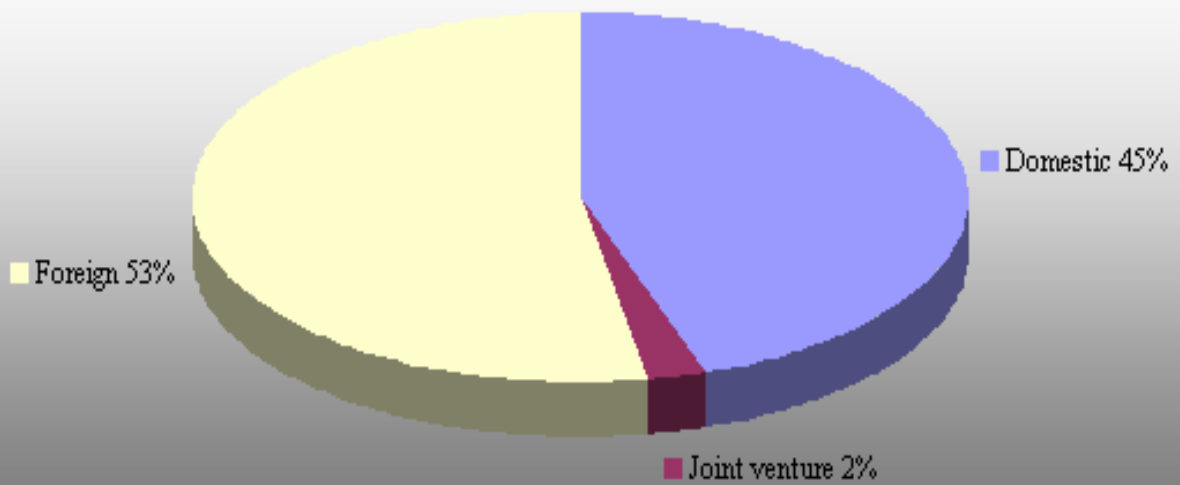


Fig.6 Installed capacity by manufacturers by the end of 2007

1 Status of China Wind Power Industry

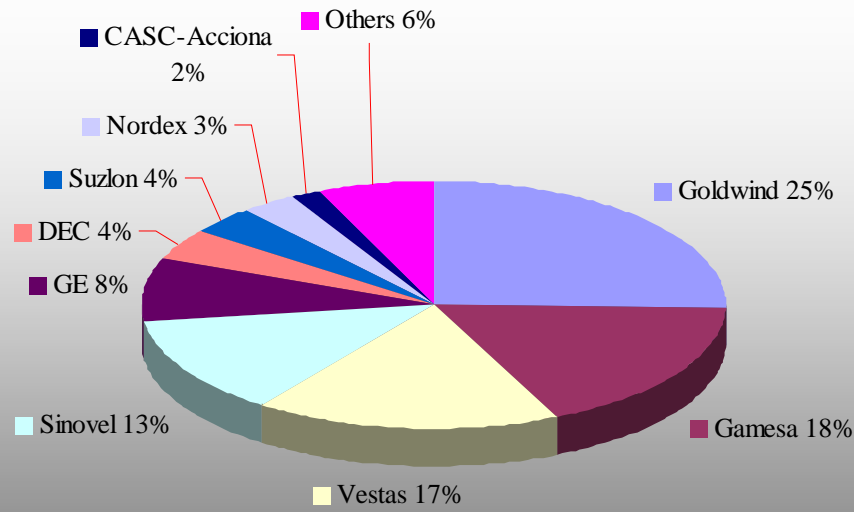


Fig.7 Installed capacity by manufacturers by the end of 2007

2 Challenges for Rapid Development of Wind Power in China

10GW Wind Power Base Map



2 Challenges for Rapid Development of Wind Power in China

Requirements of installed wind power capacity in China

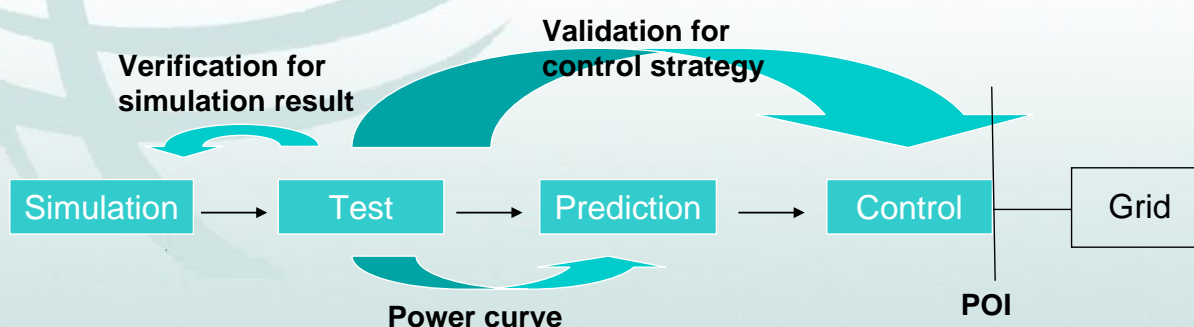
- If growth rate of electricity generation is 8%, the annual generation will reach 8000TWh in 2020 (today China 3200; Germany 600; Danmark 32TWh)
- The national average full load hours of wind farms is about 2000h.

Required installed wind power capacity to reach different percentages of overall electricity generation

Wind power generation (%)	1.0	2.0	3.0	4.0	5.0
Installed capacity of wind power (GW)	40	80	120	160	200

2 Challenges for Rapid Development of Wind Power in China

- Concentrated Development of large scale wind power in a few places
- Electricity sourced by wind should be transmitted to the load center by long distance EHV/UHV transmission lines up to 1000kV
- Grid expansion planning and wind power development planning are still done separately
- Most of wind turbines are connected to the grid without type test and certificate
- Wind farm output forecasting and control not yet implemented
- Insufficient qualified staff in wind power sector



3. Main Achievements of Sino-German Cooperation Wind Power Research and Training Project

Working areas of GTZ/China wind power project



3. Main Achievements of Sino-German Cooperation Wind Power Research and Training Project

■ Applied Research and Technical Consulting

- Wind power grid integration, using DIgSILENT/PowerFactory software
- Wind power Forecasting, cooperation with ISET
- Wind resources analysis, using WindPRO, WindSim...
- PCC testing of wind farm
- Study tour



3. Main Achievements of Sino-German Cooperation *Wind Power Research and Training Project*

■ Accreditation Support

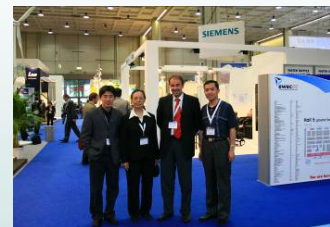
- CNAS accreditation for power performance and power quality measurement according to ISO/IEC 17025
- Power performance measurement of wind turbines, IEC 61400-12-1
- Power Quality measurement of wind turbines, IEC 61400-21
- Anemometer calibration
- Noise measurement, IEC 61400-11



3. Main Achievements of Sino-German Cooperation *Wind Power Research and Training Project*

■ Training courses and seminars

- Seminars on grid integration of wind farms, 3 times
- Seminar on wind measurement for power generation and related accreditation
- Seminar on wind turbine testing
- Training courses on software of DIGSILENT/PowerFactory, WindPro & WindSim, power prediction, power performance and quality measurement



4 Suggestions on the Future of the Sino-German Cooperation in the Wind Power Sector

- **Expansion of Wind Power Lab**
 - Calibration Capacity
 - LVRT Testing
 - Load Measurement
 - ...
- **Training Center for Engineers**
 - Long term training courses
 - Short term training courses
 - Online training courses
 - ...
- **Wind Power Test Center**
 - Test wind turbine for applied research and training
 - Component Testing
 - Drive Train Test Bench
 - ...



gtz

5 Conclusions

- Wind power is booming in China but there are problems
- Grid integration issues of large wind farms require more attention by grid companies, wind farm developers and wind turbine manufactures
- Development of simulation, test, prediction and control to solve problems is urgently required
- Rules and standards taking into account local conditions (cold climate and typhoon, etc) need to be developed jointly with industry and foreign partners
- Strengthening the international cooperation and learn from advanced expertise & experience from abroad

Thank you for your attention!

