



China's Wind Development: Experiences Gained and Lessons Learnt

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Liming Qiao, GWEC

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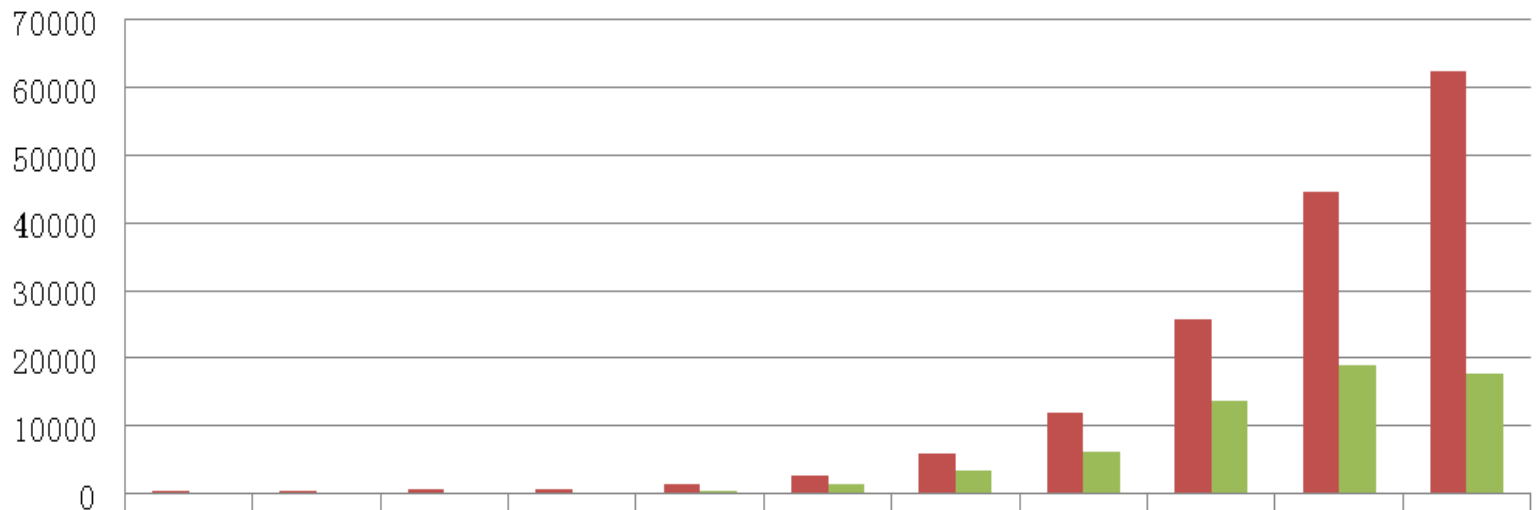
Outline

- Market overview;
- History and evolution of China's wind sector;
- Challenges and outstanding issues;
- Experiences gained and lessons learnt;

Market overview

- China's wind energy entered a exceptional growth after 2005, when the RE law was introduced; Wind market doubles for four years in a row since 2006;
- China has been the largest annual market since 2009 and the largest cumulative market since 2010;
- China has become leaders of the global wind market: In 2011, China's annual market accounts for 36% of the global annual market; in 2012, 43% of the global market;
- In 2011, four Chinese companies entered global top 10 manufacturer list, each with annual installation above 1GW; Chinese manufacturers start to set their foot in overseas market since 2009/2010

China: Cumulative and Annual Wind Installation 2001–2011



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
■ Cumulative (MW)	404	470	568	765	1272	2559	5871	12024	25828	44733	62364
■ Annual (MW)		66	98	197	507	1287	3312	6153	13804	18905	17631

History and evolution of China's wind sector

Phase I: Demonstration phase (1986-early 2000's)

- Demonstration projects: non-commercial; most projects enjoys favorable tariff with government subsidies;
- Industry players limited: Goldwind(domestic); Vestas;
- Turbine size: mainly 650-750kw;
- No tariff policy;

History and evolution of China's wind sector

Phase II: Early commercialization (2002-2005)

- Concession tender: projects of over 100MW size; developer and tariff determined by tender;
- Non concession projects: projects of less than 100MW; tariffs approved on a case by case base;
- Localization requirement start to kick in: 70% local content requirement;
- Industry players: Goldwind, Vestas, Nordex, Gamesa, GE

Phase III: Renewable Energy Law and Targets (2005 -2007)

- Renewable Energy Law: passed in 2005, entry into force in 2006;
- Set clear RE target in the supportive regulations: Medium and Long Term RE Development---wind target by 2010 and 2020;
- Mandate Share of RE by utilities; 3% of non hydro RE installation by the big utilities by 2010, 8% by 2020; ----- created huge momentum for the utilities to enter into the wind business;
- RE electricity has priority access to the grid and full amount of electricity produced will be purchased by the grid---Not enforced well due to grid reluctance in taking in wind and when wind is having a higher penetration rate in recent years;

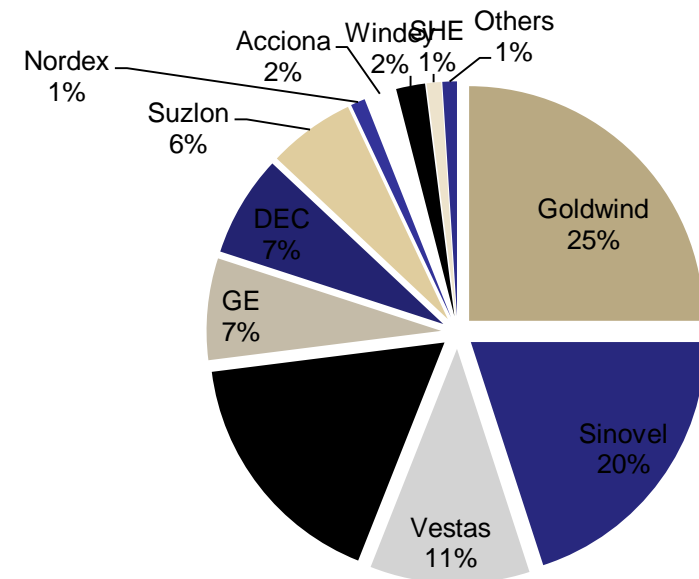
Phase III: Renewable Energy Law and Targets (2005 -2007)

- Cost sharing mechanism introduced: Cost of wind is shared by the whole grid; wind tariff is financed by RE premium put onto each kwh electricity produced in the grid;
- RE premium also finance grid infrastructure cost for integrating RE and other public RE projects’;
- Tariff: dual track of wind tariff approval process
 - tariff approved on a case by case base: regional tariff start to emerged;
 - concession project get tariffs by tender;

Phase III: Renewable Energy Law and Targets (2005 -2007)

- 70% local content requirement to further stimulate domestic industry; International player: Vestas, Nordex, Gamesa, GE, Suzlon all set up local facilities to meet the requirement;
- More Chinese companies start to enter this area: Goldwind, Sinovel, DEC, SHE, etc.

2007 Annual Market Share



Phase IV: Maturity of the wind market & FIT introduced & National Wind Base program (2008-now)

- 7 Wind bases totally 138GW by 2020;
- FIT introduced based on the regional tariff emerged during 2005-2007: four different levels associated with four levels of wind resources;

Phase IV: Maturity of the wind market and offshore development (2008-now)

- More domestic players: 30 turbine producers active in the market;
- New VAT rules to spur more development & Strong government support for wind development;
- Offshore demonstration kick in: Shanghai Donghai Bridge 102MW, 34 units of 3MW Sinovel turbines; 150MW Jiangsu Rudong offshore project by Longyuan in 2011; etc.

Challenges:

- Grid integration:
 - grid connection---gradually improving;
 - Grid curtailment--- becoming serious; 16.2% in 2011 of wind are curtailed;
- Technology development:
 - Most of the turbine manufacturers relied on licensing;
 - Only the top manufacturers started their own R&D in recent years;
- Lack of technical standards, turbine performance data and thus a fair assessment system : turbine manufacturers compete fiercely on turbine price;

Experiences gained:

- Strong long-term legislation: RE target; mandate RE market share;
- Clear tariff structure: FIT approved to be successful; tender was used in early phase as a way to drive macro-scale development and thus drive down the price of the equipment
 - Caution needed in tenders to avoid purely competing on cost
- Strong industrial base: local content requirement (abolished in 2009); favorable investment environment

Lessons learnt:

- Breakup of the grid monopoly and a liberal electricity market is needed, especially when wind reaches a higher penetration rate;
- Technology development and deployment strategy is needed as early as possible to increase the domestic R&D capacity;
- Standard setting, testing, certification, monitoring and reporting system need to be planned at an early stage;



Thank you!

Liming Qiao, China Director,
GWEC
Liming.qiao@gwec.net

Look forward:

- 2020 government target of 150GW;
- Offshore target: 5GW by 2015; 30 GW by 2020;

- Annual market can easily be 15-18GW/year; can reach 20GW if grid issue is tackled well;