



Introduction: Wind Power and Renewable Energy industry in China

Hugo Yu

June 04, 2012

YU Huajun (Hugo)

2005 Awarded with Electrical Engineering Doctoral Degree in Shanghai Jiaotong University.

Research on the inverter system of solar power generation.

2005 Shanghai Changjiang Kegongmao Co., Ltd.

Responsible for quality control on the washing machine controller.

2006 Shanghai Power Transmission and Distribution Co., Ltd.

R&D for wind turbine controller and frequency converter.

2009 Shanghai Electric Windpower Equipment Co., Ltd.

R&D for the wind turbine.

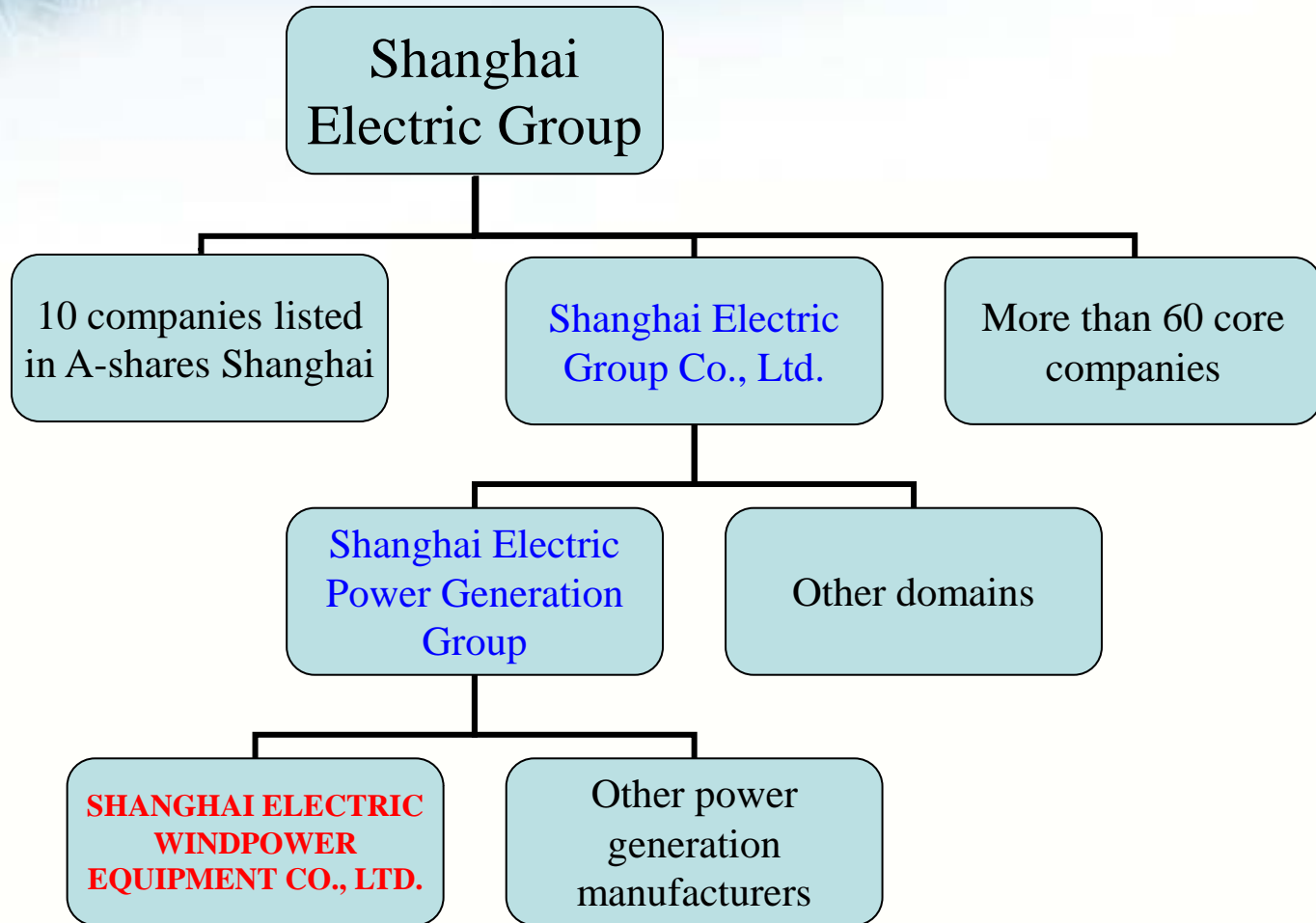
Research achievement:

1 patent authorised. More than 30 articles published.



- 1 • **Introduction of SEWIND**
- 2 • **Wind Market in China**
- 3 • **Background of China's Energy Structure**

Where we are:





Shanghai Electric (Group) Co., Ltd.

One of the largest equipment manufacturers

in China

History tracing back to 1902

Listed in Hongkong Stock Market in Apr. 2005

Listed in Shanghai Stock market in Dec. 2008

Including more than 60 core enterprises

Total employees: More than 30,000

2011 revenue: RMB 68.30 Billion

Products milestone:

First set of turbine generator in China

First unit of 10,000 ton hydraulic press in China

First unit of water inner cooled turbine generator in China

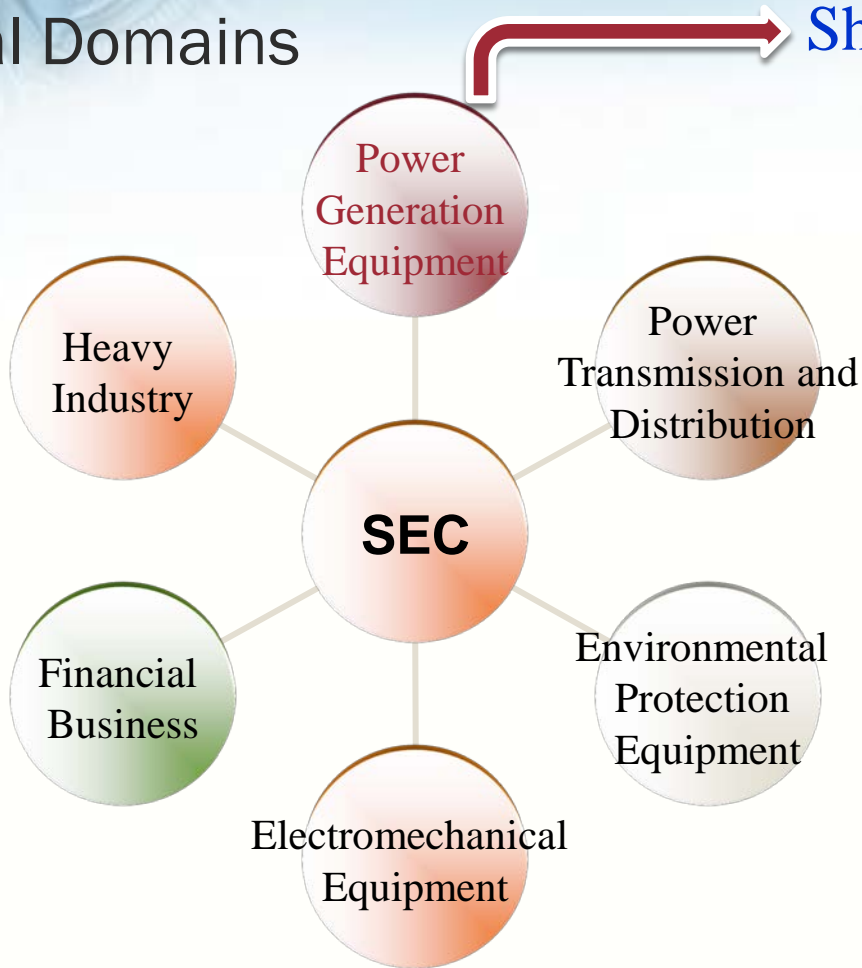
First electric motor for 2030 hot rolling mill in China

First unit of precision miller in China



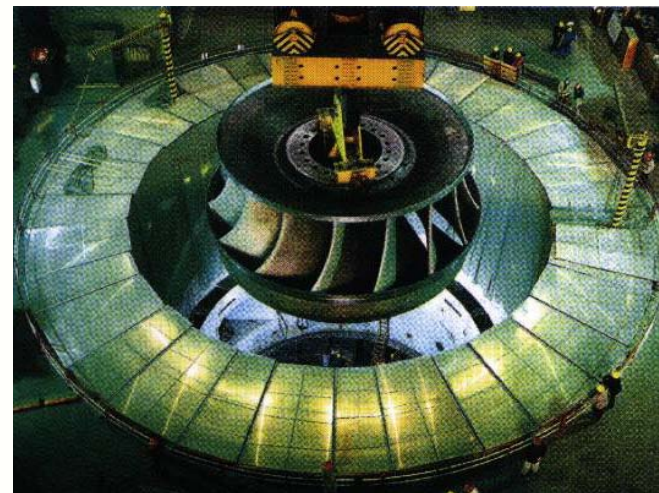
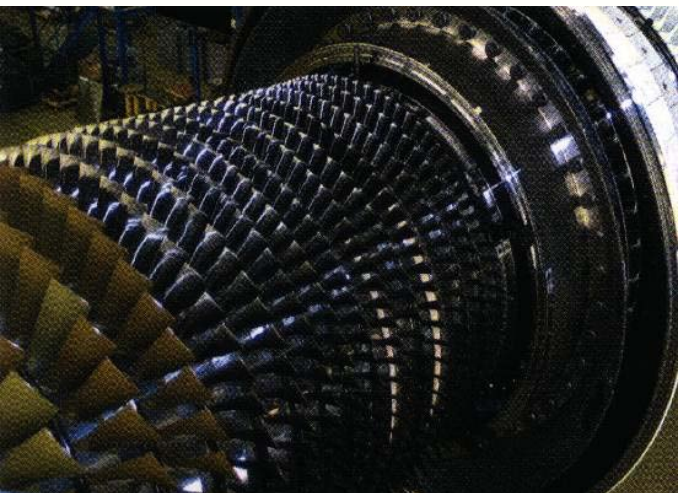
Industrial Domains

Shanghai Electric Power Generation Group



Shanghai Electric Power Generation Group

- ◆ One of the largest power generation equipment manufacturers
- ◆ Main products covering the equipments of fossil-fired power, nuclear power, gas turbine, hydro power and wind turbine generation etc.
- ◆ With top-ranking ability in research and manufacturing and an excellent engineering service team
- ◆ Output of fossil-fired power generation equipments ranking No.1 in the world
- ◆ 17% market share in the world

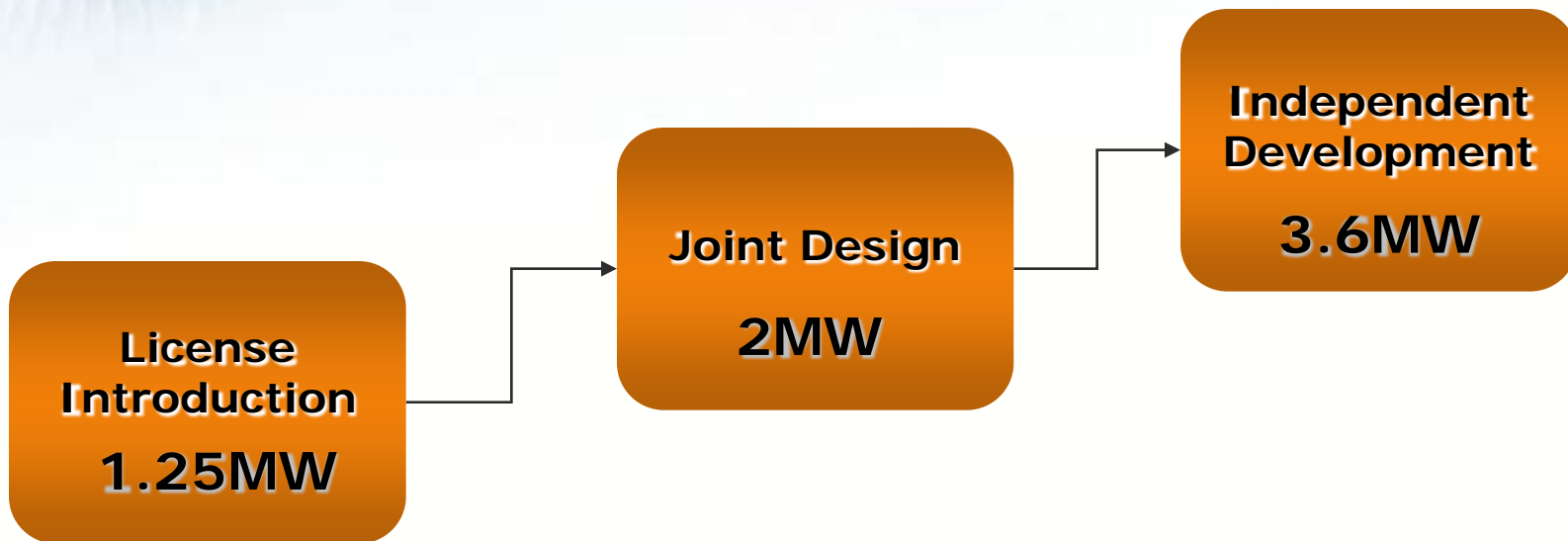


SHANGHAI ELECTRIC WINDPOWER EQUIPMENT CO., LTD.

With SEC as holding company, SHANGHAI ELECTRIC WINDPOWER EQUIPMENT CO., LTD. (SEWIND) was established in September 2006 and headquartered in Shanghai Zizhu Science-based Industrial Park with a registered asset of 0.9 Billion RMB.



Technical Route



By building its own R&D team and platform, Shanghai Electric Windpower takes the lead domestically in the design ability for complete machine and such key components as blade, controlling system and tower.

Product 1

W1250

License product from
Dewind Germany

TECHNICAL DATA	
Operation Data	
Rated Power [kW]	1250
Cut-in Wind Speed [m/s]	2.5 / 3 / 3.5
Rated Wind Speed [m/s]	12.5 / 12.3 / 11.5
Cut-out Wind Speed [m/s]	25 / 25 / 23
Wind Class – IEC	IEC IIA / IEC IIIA / IEC IIIB
Rotor	
Rotor Diameter [m]	62.3 / 64.3 / 70.3
Swept Area[m ²]	3048 / 3247 / 3882
Rotation Speed Range [1/min]	13.9-25.9 / 13.2 – 24.5 / 13.2 -24.5





Wind farm at highest altitude in the world(W1250)



Product 2

W2000

- Jointly designed with aerodyn, Germany
- SEWIND owns the Intellectual Property Right
- Advanced Aerodynamic Design



TECHNICAL DATA	
Operation Data	
Rated Power [kW]	2000
Cut-in Wind Speed [m/s]	3 / 3 / 3 / 3
Rated Wind Speed [m/s]	12.4 / 12 / 11.8 / 11.5
Cut-out Wind Speed [m/s]	25 / 25 / 25 / 20
Wind Class – IEC	IEC IIA + / IEC IIIA+ / IEC IIIA / IEC S
Rotor	
Rotor Diameter [m]	87 / 93 / 99 / 105
Swept Area[m ²]	5945 / 6793 / 7698 / 8659
Rotation Speed Range [1/min]	8.33-16.8 / 8.33-16.8 / 8.33-16.8 / 8.33- 16.5

2MW Intertidal type



2MW offshore type



Product 3

3.6 MW Offshore Wind Turbine

- Independent Development
- Launched in July, 2010

TECHNICAL DATA	
Operation Data	
Rated Power [kW]	3600
Cut-in Wind Speed [m/s]	3.5 / 3.5
Rated Wind Speed [m/s]	12 / 11.5
Cut-out Wind Speed [m/s]	25 / 25
Wind Class – IEC	IEC IIA / IEC IIIB+
Rotor	
Rotor Diameter [m]	116 / 122
Swept Area[m ²]	10568 / 11690
Rotation Speed Range [1/min]	8.3 – 15.4





Lingang Base



**Located in Shanghai
Lingang heavy
industry and logistic
park with an area of
more than 40,000 m².**

Workshops located out of Shanghai

Dongtai, Jiangsu Province



Beian, Heilongjiang Province



Order Book: 708 units of W1250 for Domestic Project



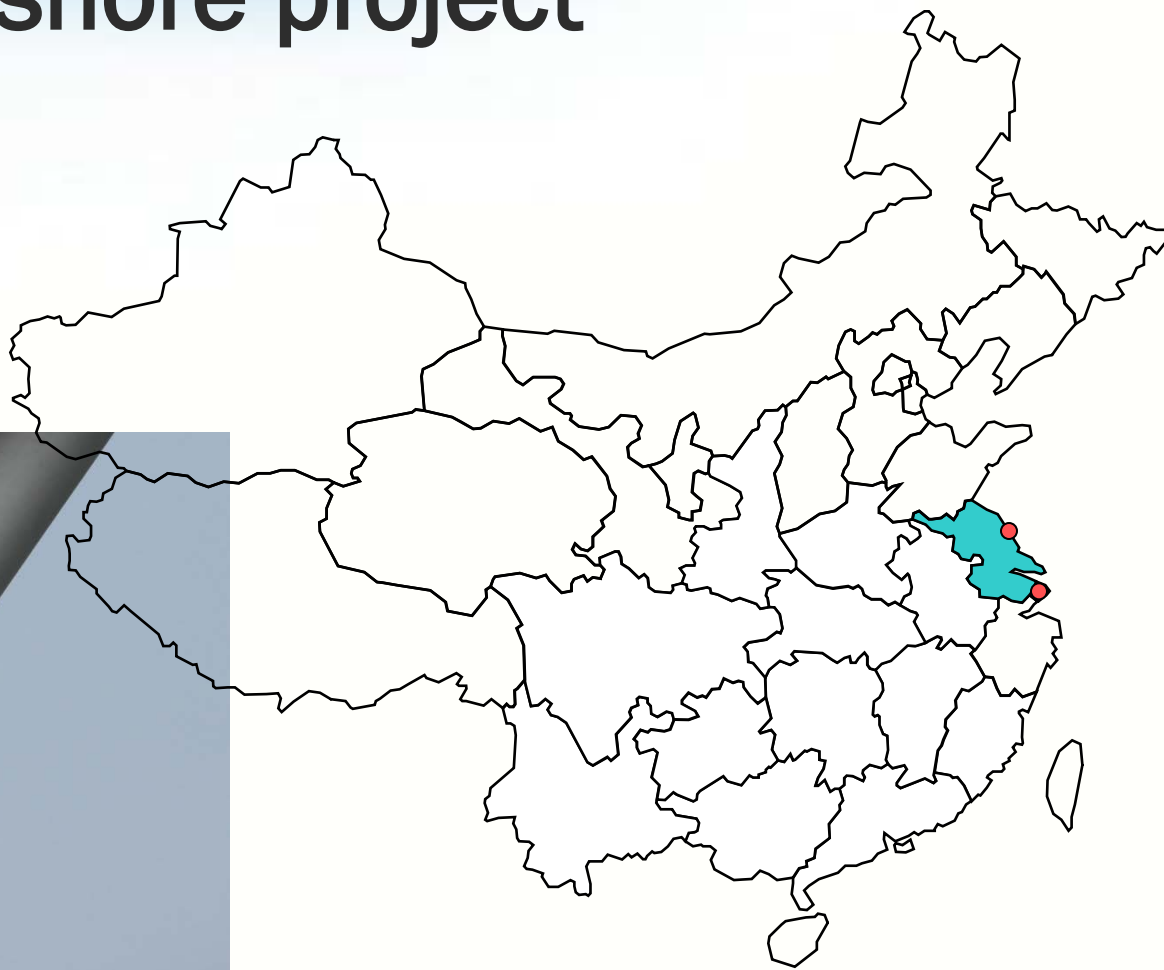


Order Book: 829 units of W2000 for Domestic Project



Offshore project

Order Book:
83 units of W3600
for Domestic Project



Reference, Export



Britain



Thailand

Thailand: W1250 X 2, Dec. 2008

UK: W1250 X 3, Feb. 2009

Thailand Project





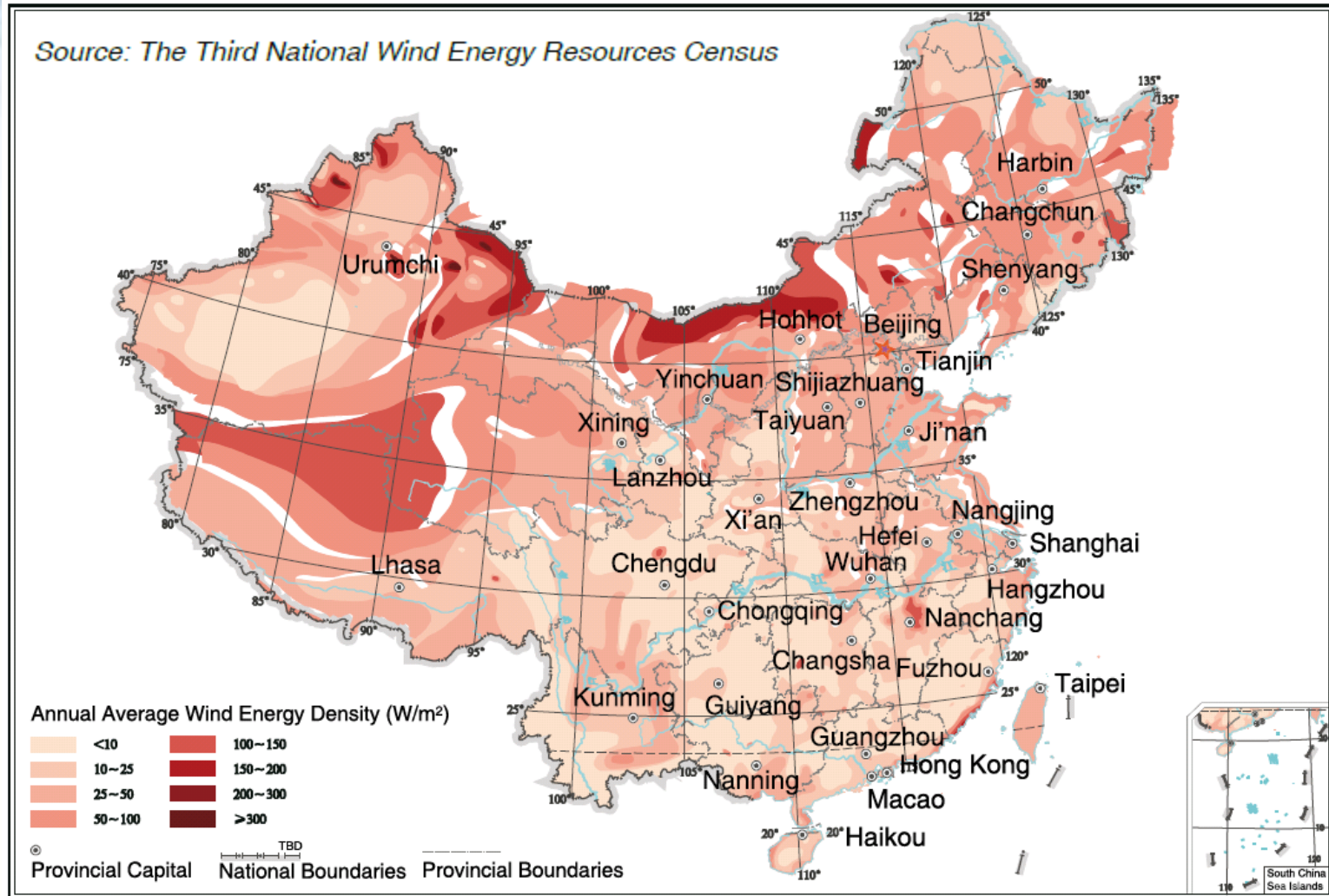
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- Wind Resources and Developing Status
- Policies, Standards and Process for Developing
- Developers and Suppliers

The data and viewpoints followed are from the public research report or myself, but not from my company.

Wind Resources



Wind Resources

Technically exploitable capacity

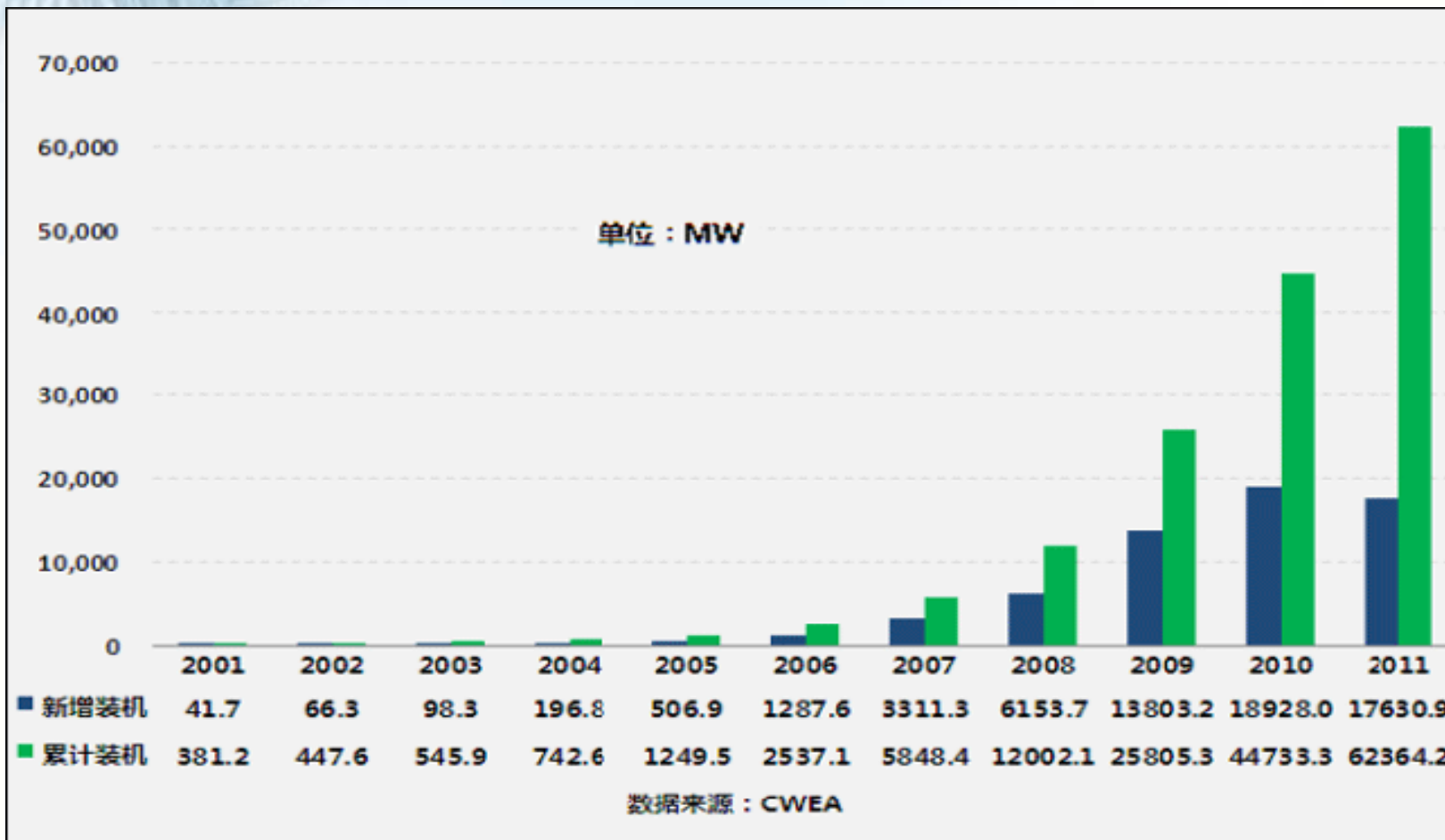
On land: 600-1,000 GW

Offshore: 100-200 GW

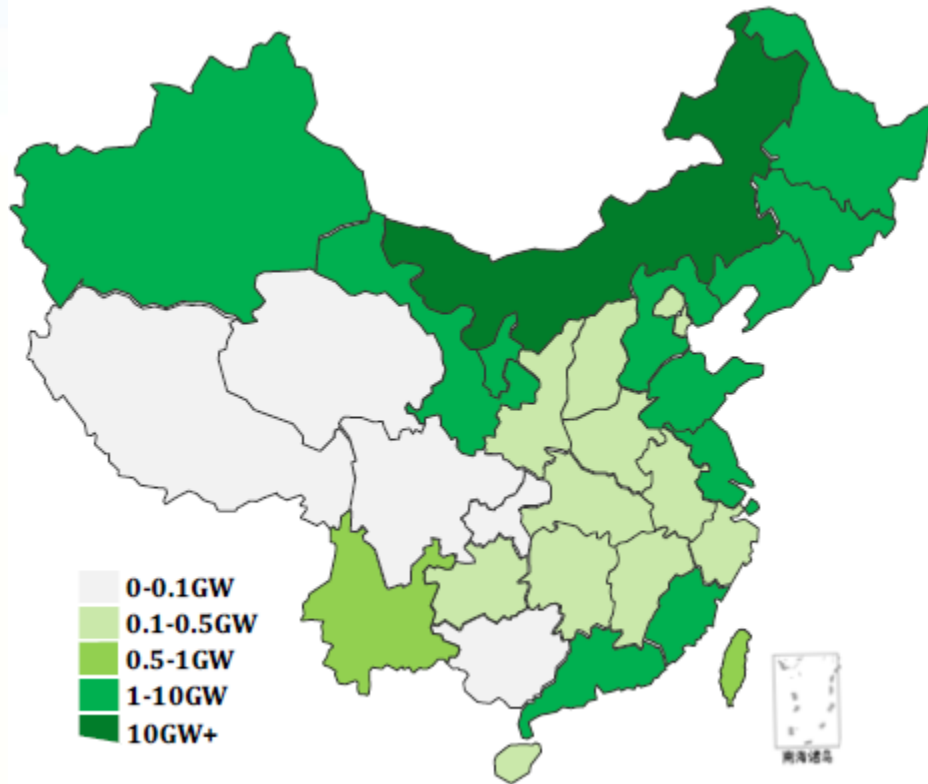
Two major characteristics

- Winds are plentiful in spring, autumn and winter but lower in summer. (Good complementary to the country's hydro-energy resources.)
- The geographical distribution of wind energy resources is mismatched with the electrical load.

Developing Status



Developing Status



Cumulated capacity distributed in China at the end of 2011 (source: CWEA)

Developing Status

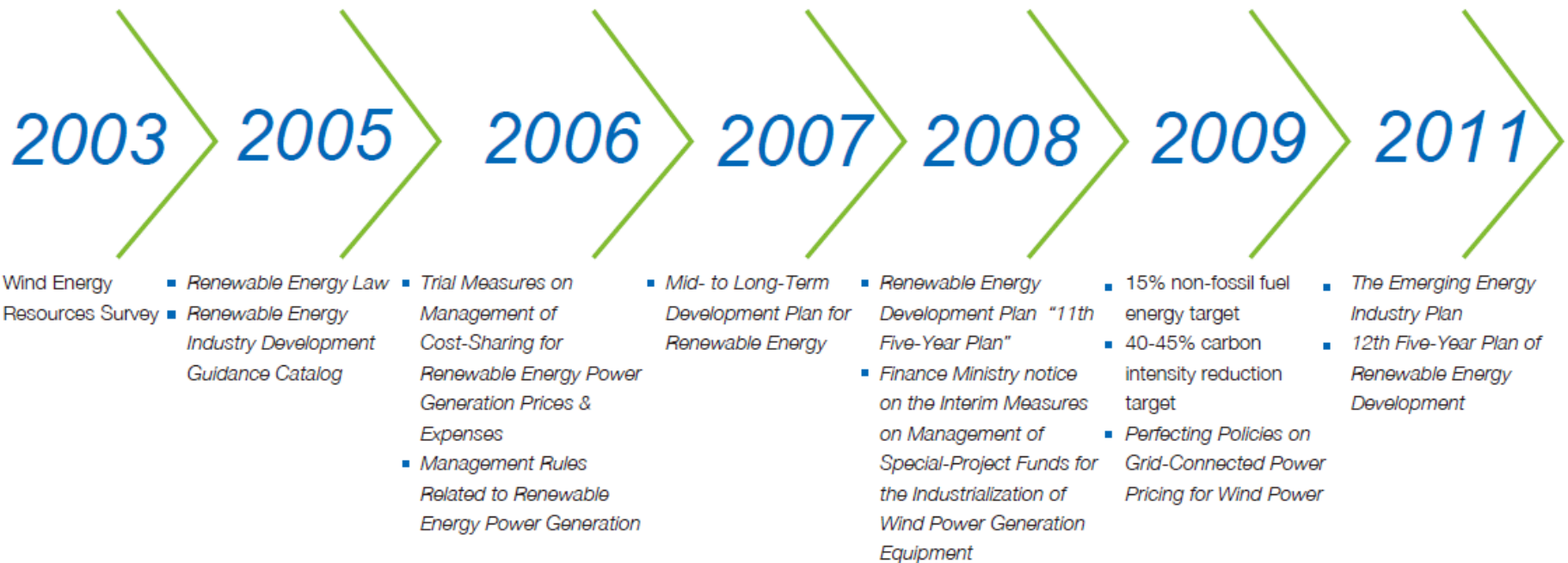


The total capacity of projects reserved by developers will reach about **45 GW** in total in 2012, roughly **100 GW** in 2015 and approximately **210 GW** in 2020

Reserves and Distribution of Wind Power Development Projects

Policies Related

The figure below outlines the key policies that have influenced China's wind power sector.



Reference from China Wind Power Outlook 2011-GREENPEACE



Policies Related

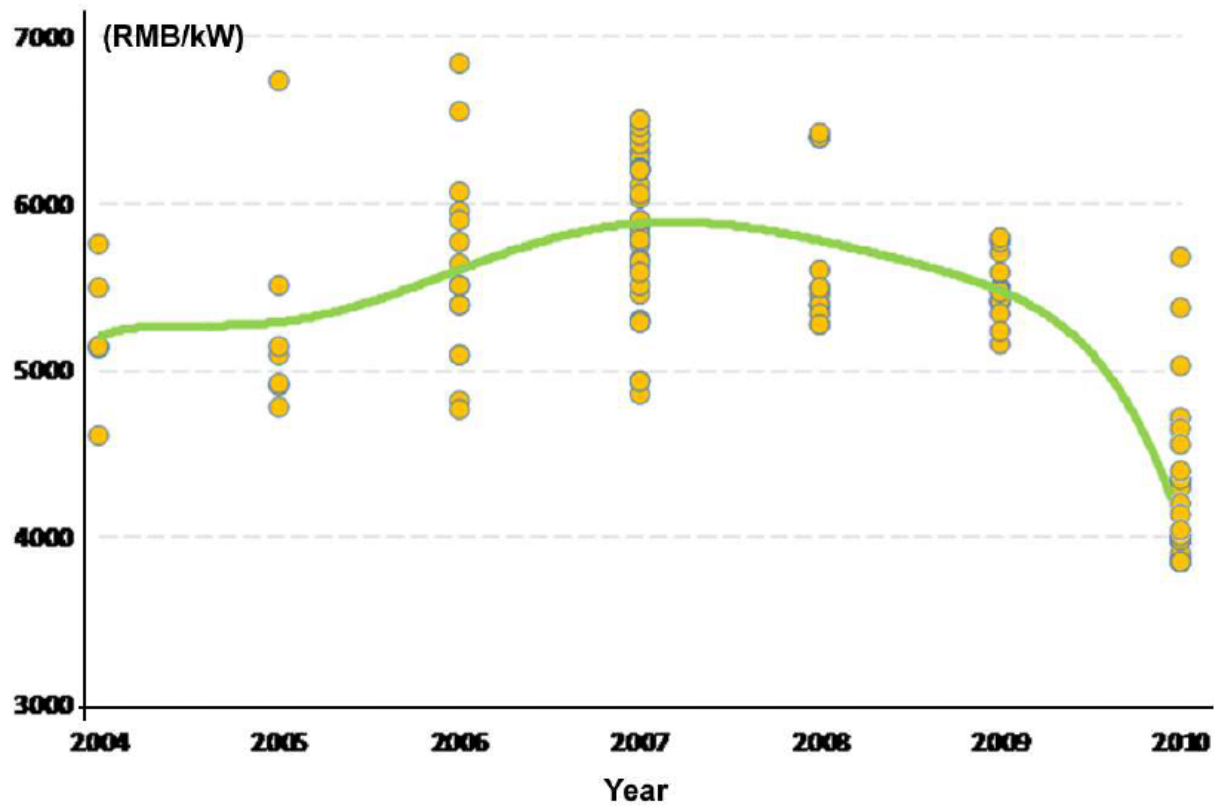


Regional divisions for feed-in tariff in China



Policies Related

Domestic WTGS Market Price



SOURCE: CWEA



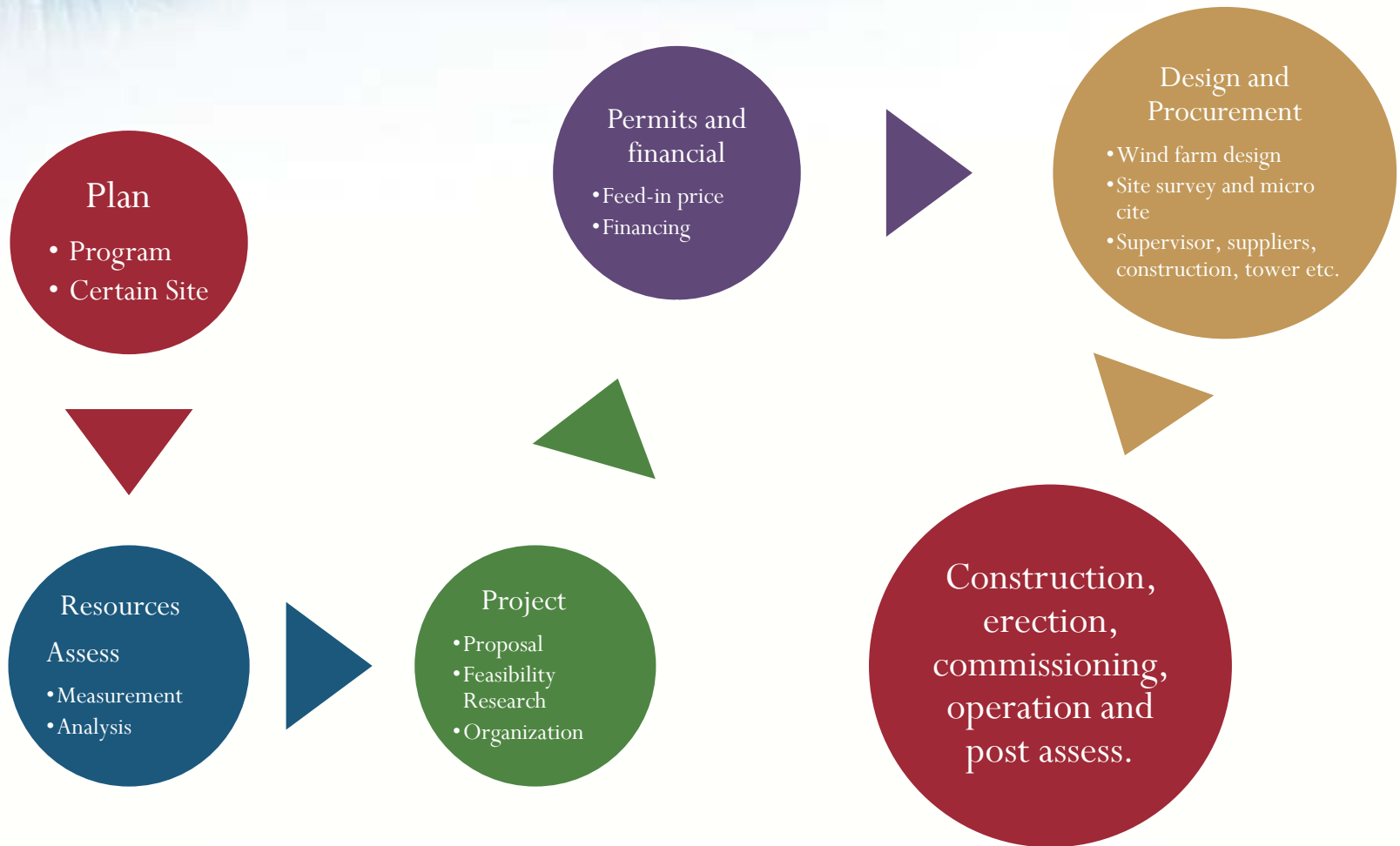
上海电气风电设备有限公司
SHANGHAI ELECTRIC WINDPOWER EQUIPMENT CO., LTD.

New Standards





August, 2011

18 standards are announced, in which are involved with the grid connection, construction of offshore wind farm, condition monitoring of WTGs, power quality of wind farm, manufacture of key components of WTG, etc.

Basic Process of Wind Farm Developing



Developers

Company	Specification	
China Huaneng	<ul style="list-style-type: none"> • Based in Beijing • Revenue: RMB 227 billion (2010) • Employees: 120,000 	
China Guodian	<ul style="list-style-type: none"> • Based in Beijing • Revenue: RMB 165 billion (2010) • Employees: 120,000 	
China Datang	<ul style="list-style-type: none"> • Based in Beijing • Revenue: RMB 147 billion (2009) • Employees: 102,089 	
China Huadian	<ul style="list-style-type: none"> • Based in Beijing • Revenue: RMB 129 billion (2010) • Employees: 90,000 	
China Power Investment	<ul style="list-style-type: none"> • Based in Beijing • Revenue: RMB 127 billion (2010) • Employees: 104,018 	

Who they are? Big Five Chinese power generation players and others.

WTG Suppliers

No.	Manufacturer	New Capacity(MW)	Market Share
1	Goldwind	3600	20.4%
2	Sinovel	2939	16.7%
3	United Power	2847	16.1%
4	Mingyang	1177.5	6.7%
5	Dongfang	946	5.4%
6	XEMC	712.5	4.0%
7	Shanghai Electric	708.1	4.0%
8	Vestas	661.9	3.8%
9	Huachuang	625.5	3.5%
10	Nanche	451.2	2.6%

Top 10 manufacturers considering the new capacity installed in 2011 (Source: SWEA)



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- Exploitable Resources, Producing, and Consumption
- Strategy and Steps to the Future
- Renewable Energy Development and Investment

Exploitable Resources

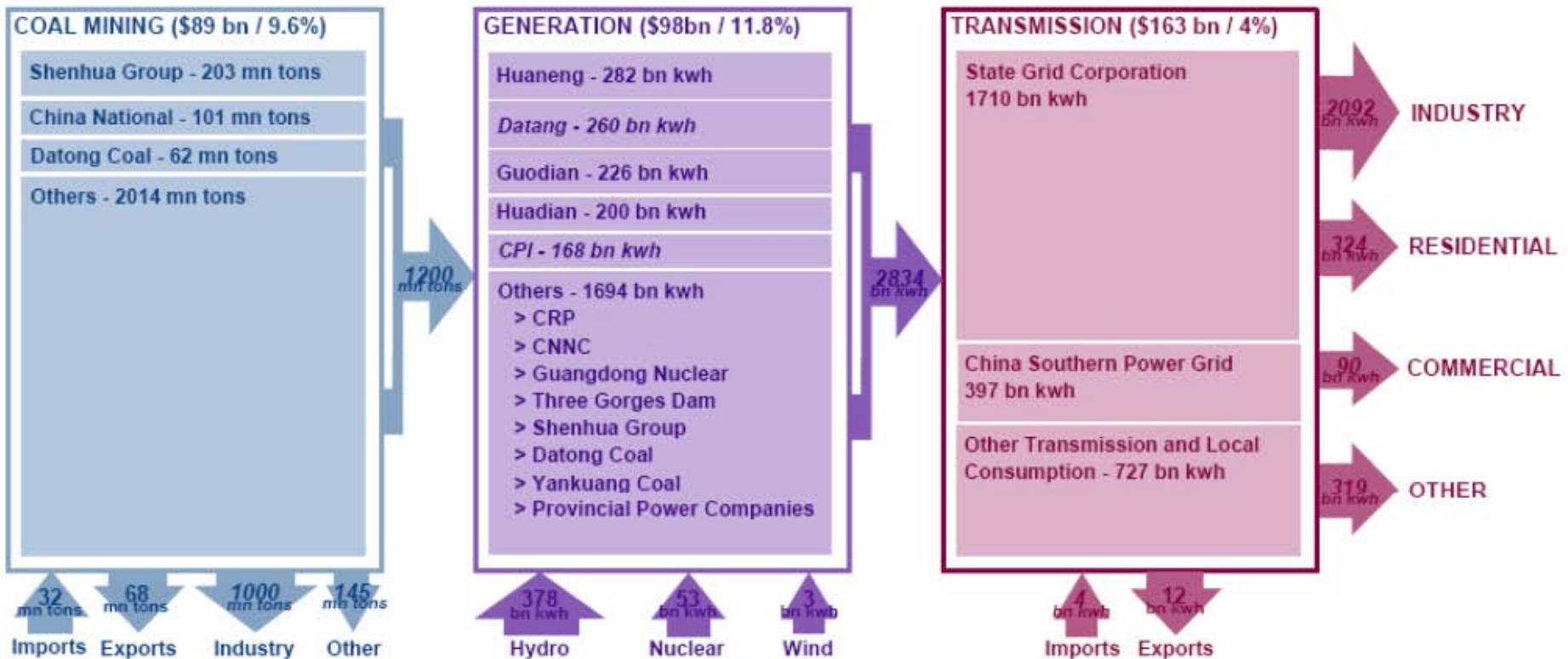
Resources		Capacity (proved)
Coal	(Ton)	1,003 Billion
Oil	(Ton)	21.2 Billion
Nature Gas	(m3)	22 Trillion
Hydro Power	(kW)	378 Million
Wind Power	(kW)	1200 Million

Exploitable Resources

Five features:

- 1. Abundant deposit of coal but comparatively inadequate reserves of oil and natural gas**
- 2. Rapid increase of demand**
- 3. Reliance on coal as a primary source of energy**
- 4. Absence of a unified power grid**
- 5. High potential in developing renewable energy**

Producing



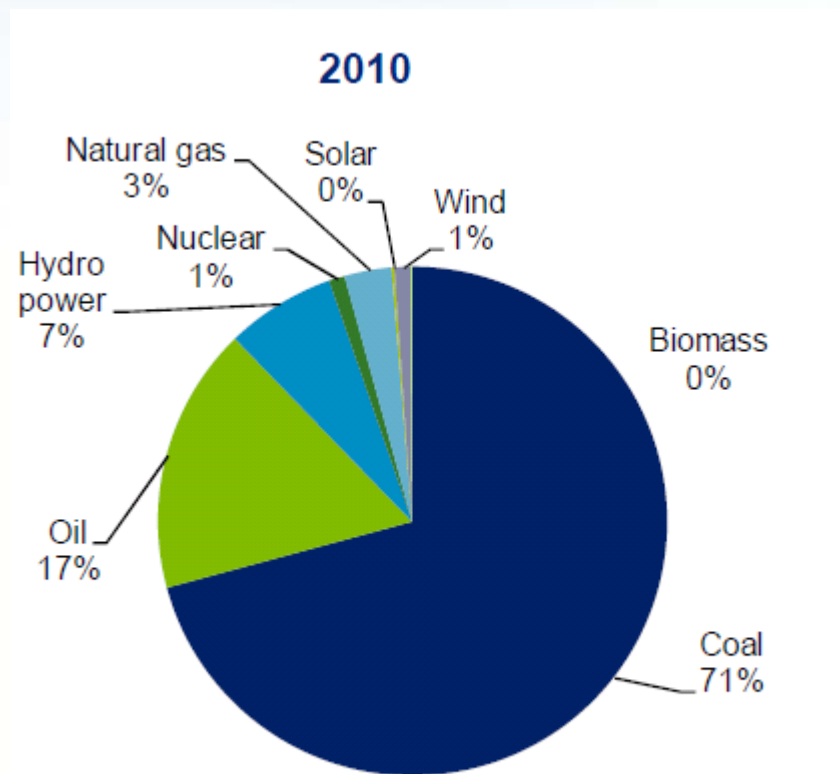
Source: Center for Strategic and International Studies and the Peterson Institute for International Economics 2009

Consumption

- Nearly 97 percent of China's coal is consumed in five sectors: **power generation, industrial sectors, coking, residential use, and heating supply.**
- China has become the world's largest energy consumer and the second largest oil importer/ consumer
- China's energy demand growth is estimated at 4% **CAGR** during 2011-2020
- Key factors driving China's consumption growth are **relative rapid economic growth, industrial structure upgrade, urbanization, improving but still inefficient energy use.**

CAGR - Compound Annual Growth Rate

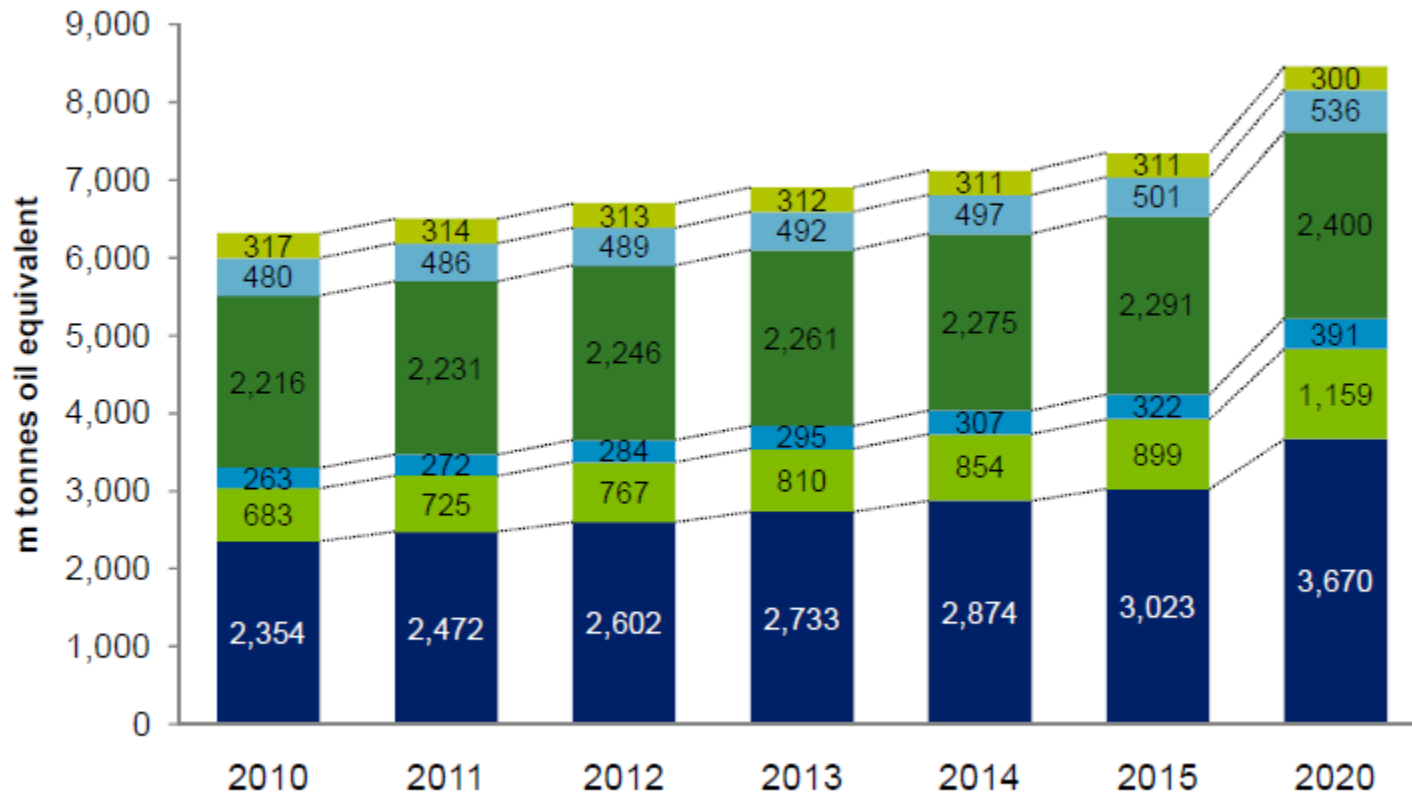
Consumption



Source: SYWG analysis

Consumption Estimated

International Comparison of Energy Consumption



Source: Deloitte analysis

■ China ■ India ■ Brazil ■ US ■ Japan ■ Germany



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Strategy to Future

Developing Clean Coal Technology

More Nature Gas Supplied

Energy Conservation and Carbon Emission
Reduction

Sustainable development



Steps to the Future

	11 th FYP (2006- 2010) (Target)	11 th FYP (2006- 2010) (Actual)	12 th FYP (2011- 2015) (Target)	13 th FYP (2016- 2020) (Target)
GDP annual growth	7.5%	10.8%	7%	-
Primary energy consumption annual growth	4%	6.3%	3.75%-5%	5.5%
Energy consumption (billion tce)	2.7	3.3	4.2-4.5	<4.9
Non-fossil as total primary energy consumption	10%	8.3%	11.4%	15%
Energy intensity (% reduction in 5 years)	20%	19.1%*	16%	-
Carbon intensity (% reduction in 5 years)	-	-	17%	40%-45% vs. 2005

Power Industry Investment in 2011-2015: RMB 5.3 trillion

* 19.1% is officially reported, but the independent estimates is less than 10%

Source: Deloitte China Research and Insight Centre

Renewable Energy Development

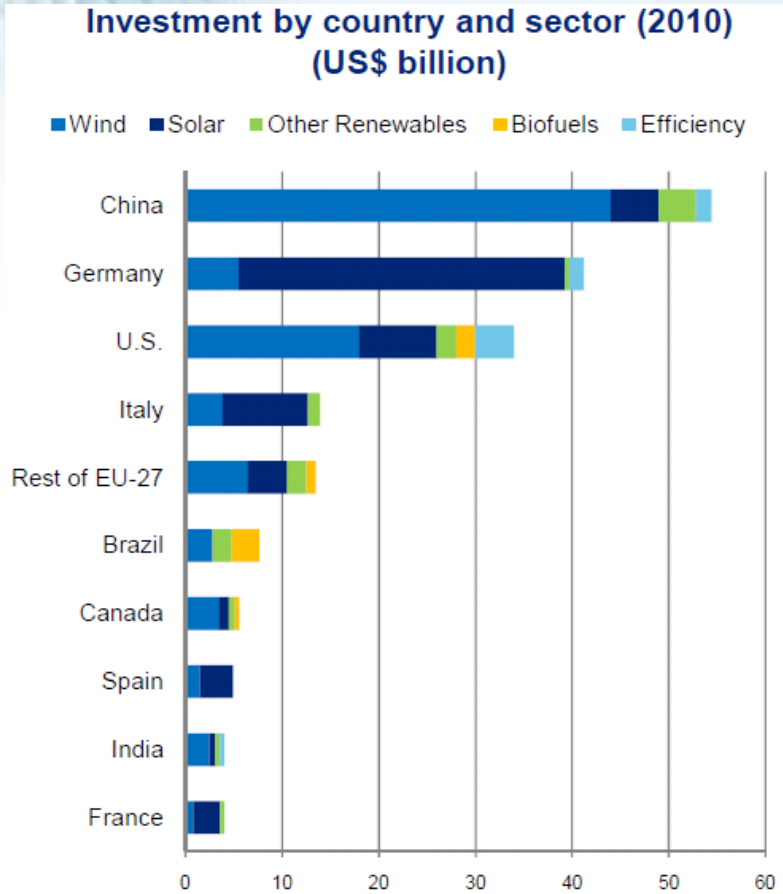
TOP FIVE COUNTRIES – Annual additions in 2010 Source: REN21 analysis

	New capacity investment	Wind power	Solar PV	Solar hot water/heat ²	Ethanol production	Biodiesel production
1	China	China	Germany	China	United States	Germany
2	Germany	United States	Italy	Germany	Brazil	Brazil
3	United States	India	Czech Republic	Turkey	China	Argentina
4	Italy	Spain	Japan	India	Canada	France
5	Brazil	Germany	United States	Australia	France	United States

Renewable Energy Development

	World Total	Developing Countries	EU-27	United States	China	Germany	Spain	India
Technology	GW							
Wind power	198	61	84	40	45	27	21	13
Biomass power	62	27	20	10	4	5	0.5	3
Solar PV	40	n/a	29	2.5	0.9	17.3	3.8	~ 0
Geothermal power	11	5	1	3.1	~ 0	0	0	0
Solar thermal power (CSP)	1.1	0	0.6	0.5	0	0	0.6	0
Ocean (tidal) power	0.3	0	0.3	0	0	0	0	0
Total renewable power capacity (not including hydropower)	312	94	135	56	50	49	26	16
Hydropower	1,010 ¹	n/a	130	78 ²	213	5 ²	16	40 ²
Total renewable power capacity (including hydropower)	1,320¹	n/a	265	134	263	54	42	56

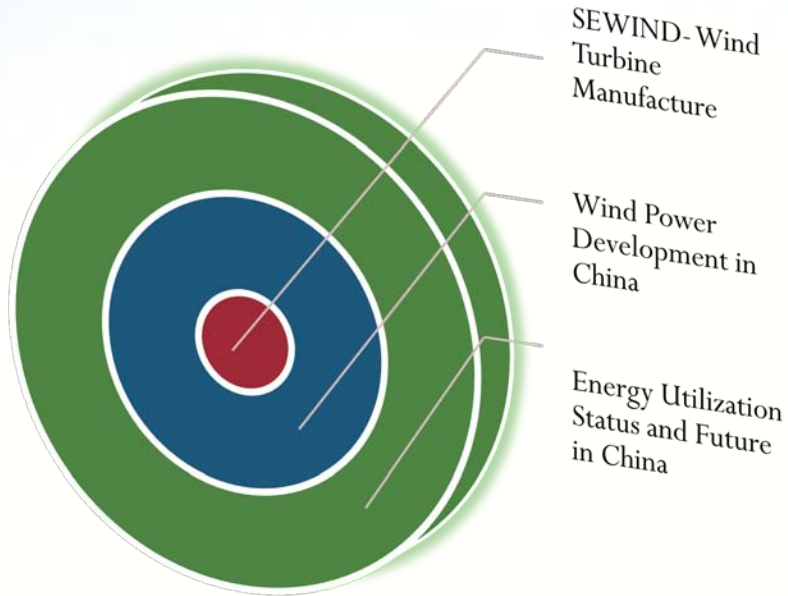
Renewable Energy Investment



Source: Deloitte analysis

China will spend an estimated US\$ 1.54 trillion on clean energy projects in the next 15 years. (Source: *An Overview of China's Renewable Energy Market - By Jane Shi etc.*)

Conclusion



A photograph of a wind turbine on a beach. The turbine is white with red tips on its blades. It stands on a dark, wet beach. In the background, a small orange boat is in the water. The sky is a pale blue. The text "Thank you!" is overlaid in a dark blue, serif font on the right side of the image.

Thank you!