



21th Century Grids

Global Energy Interconnection

Prof. Dr. Xianzhang Lei
State Grid Corporation of China
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SGCC Overview



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STATE GRID



■ Geographic Coverage

88% of China's territory

■ Customers

Serving over 1.1 billion population,

■ Employee

1.87 million

■ Key Figures (2015)

Assets: **€445Bn**, Revenue **€296.4Bn**

■ Core business

Power grid construction and operation,
R&D

■ Overseas business

Runs overseas business in the Philippines,
Portugal, Brazil, Australia, Italy, etc.

■ R&D

4 Research institutes

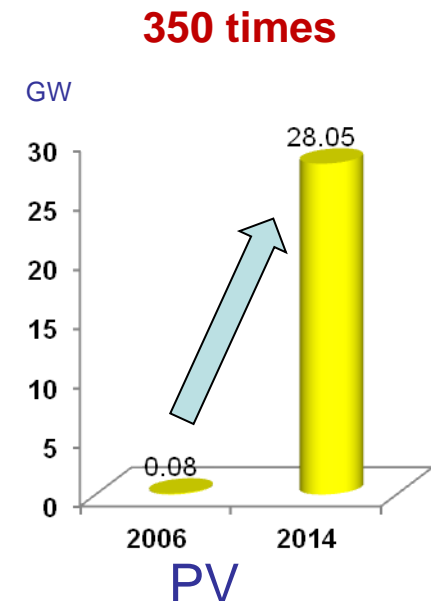
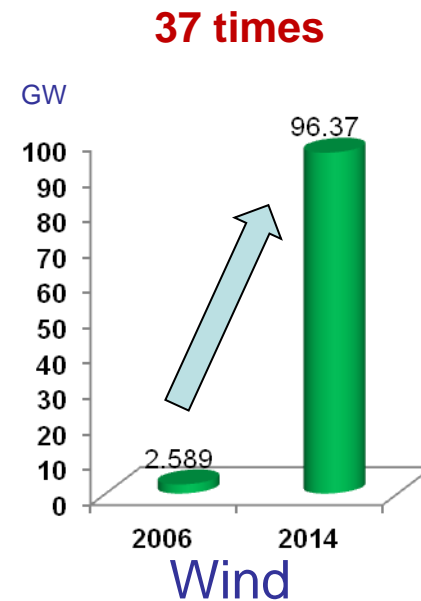
24,000 Researchers & Developers

■ Ranked 5th Fortune Global 500

1.1 Development of Renewable Energy



- ◆ **Hydro power** : 290 GW, ranking **No.1** in the world;
- ◆ **Wind power** : 145 GW, ranking **No.1** in the world;
- ◆ **PV power** : 43.18 GW, ranking **No.1** in the world;
- ◆ **Wind power** has been the **third biggest power source** in China.

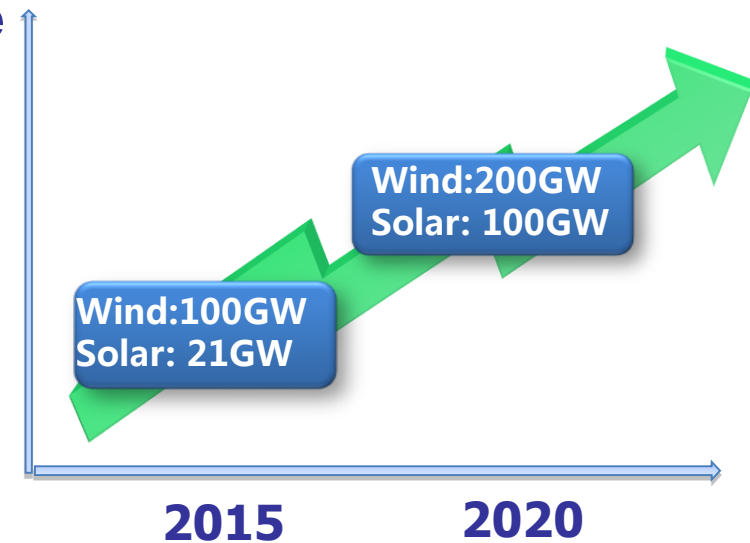


Wind and PV power capacity growth from 2006 to 2014

1.2 Development of Renewable Energy



- 9 large-scale wind power bases are in plan and construction, each of them is with the capacity of more than 10GW.
- Large size of Offshore wind farm
- large and distributed PV and wind turbines



Wind, Solar, Storage Pilot Project

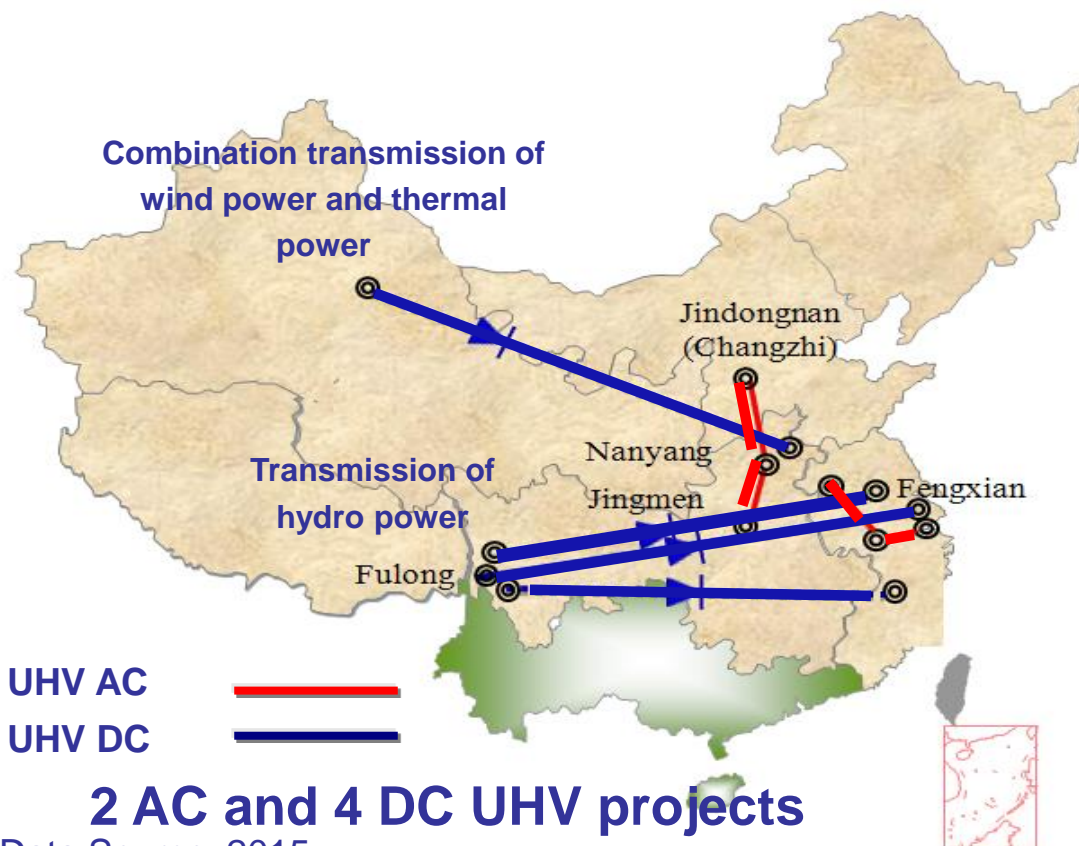
Wind: 600MW
Solar: 60MW
Storage: 50MW

2.1 UHV Power Transmission in China



◆ Engineering construction:

- Completed 2 AC and 4 DC UHV projects
- Delivered over 200TWh electricity in total



Commissioned UHV projects

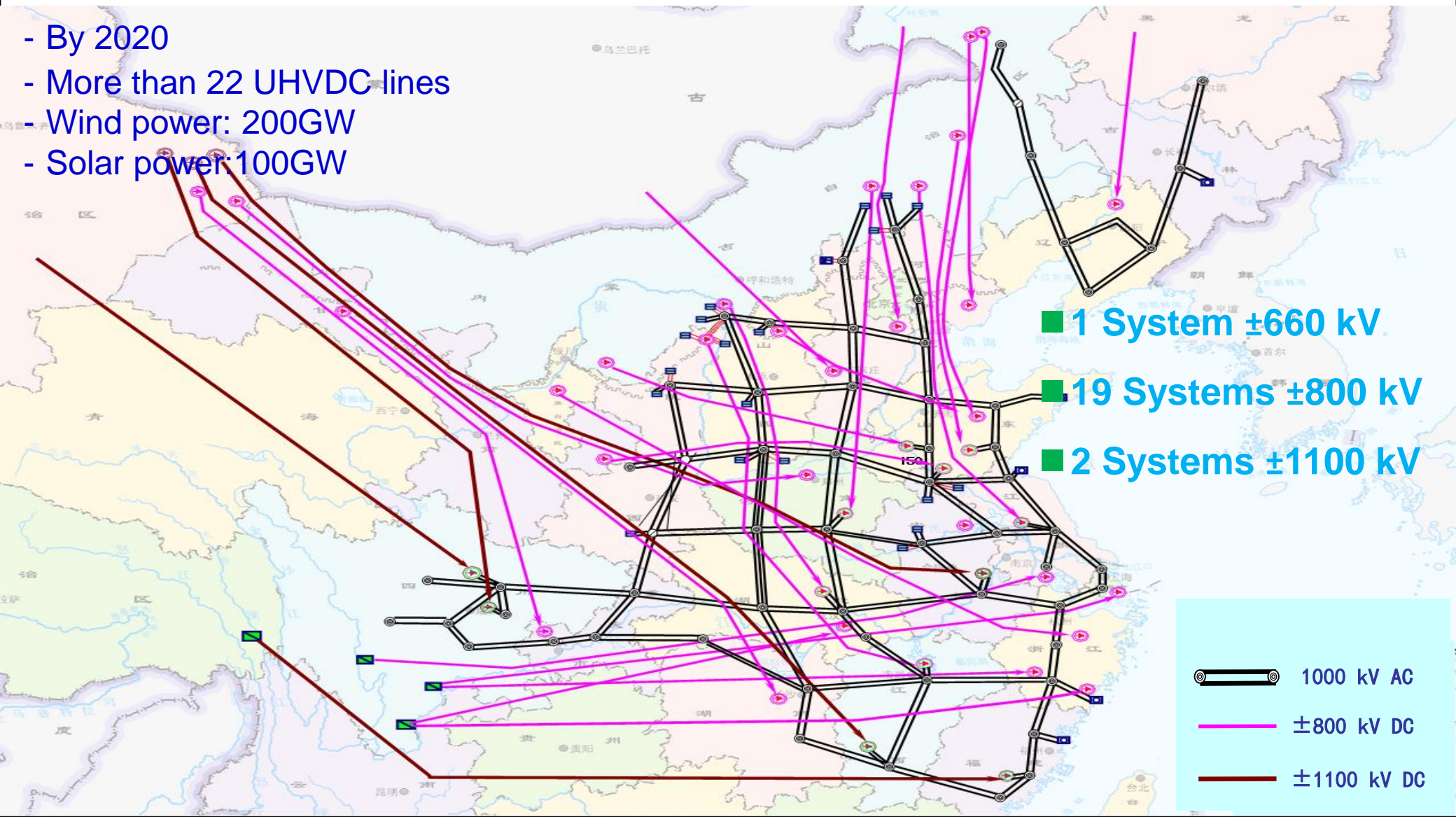
Projects	Length of line	Conversion capacity	Annual CO2 emission reduction
1000kV Jindongnan--Jimen	640km	18GVA	--
±800kV Xiangjiaba-Shanghai	1,907km	12.8GW	26.0 million tons
±800kV Jinping-Sunan	2,059km	14.4GW	32.4 million tons
1000kV Huainan-Zhebei-Shanghai	2×649km	21GVA	--
±800kV Haminan-Zhengzhou	2,210km	16GW	40 million tons
±800kV Xiluodu-Zhexi	1,669km	16GW	34.0 million tons
Total	9,782km	98.20G	132.4 million tons

2.2 UHV Power Transmission in Future



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- By 2020
- More than 22 UHVDC lines
- Wind power: 200GW
- Solar power: 100GW



■ 1 System ±660 kV

■ 19 Systems ±800 kV

■ 2 Systems ±1100 kV

⊖ ⊕ 1000 kV AC

— ±800 kV DC

— ±1100 kV DC

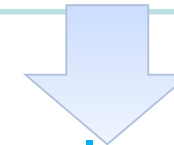
3.1 Multi-Terminal HVDC



In service	4 th July 2014
Rated capacity	400/300/100/100/100 MW
Rated DC voltage	± 200 kV

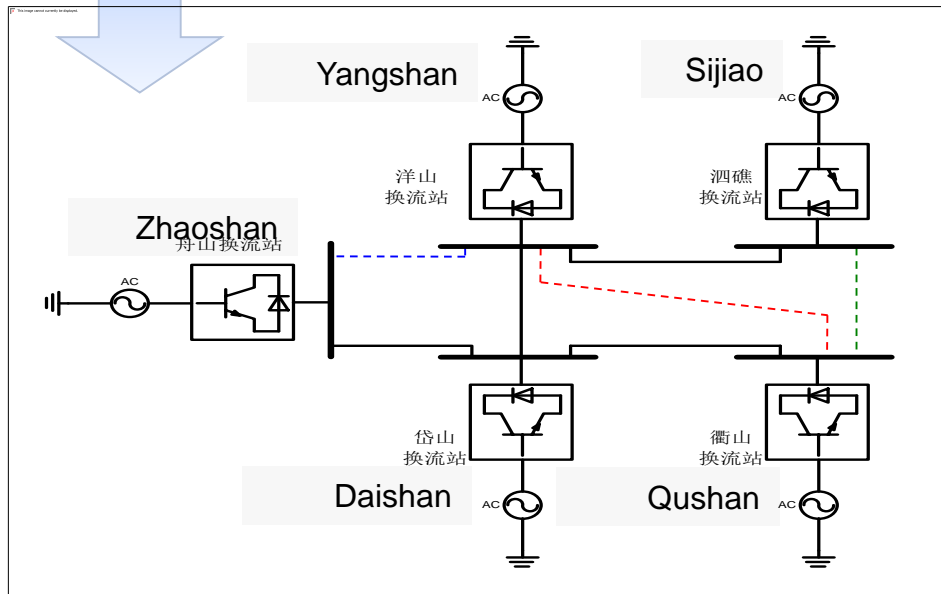
Current status

- Power supply to islands
- Wind power integration



Upgrade plan

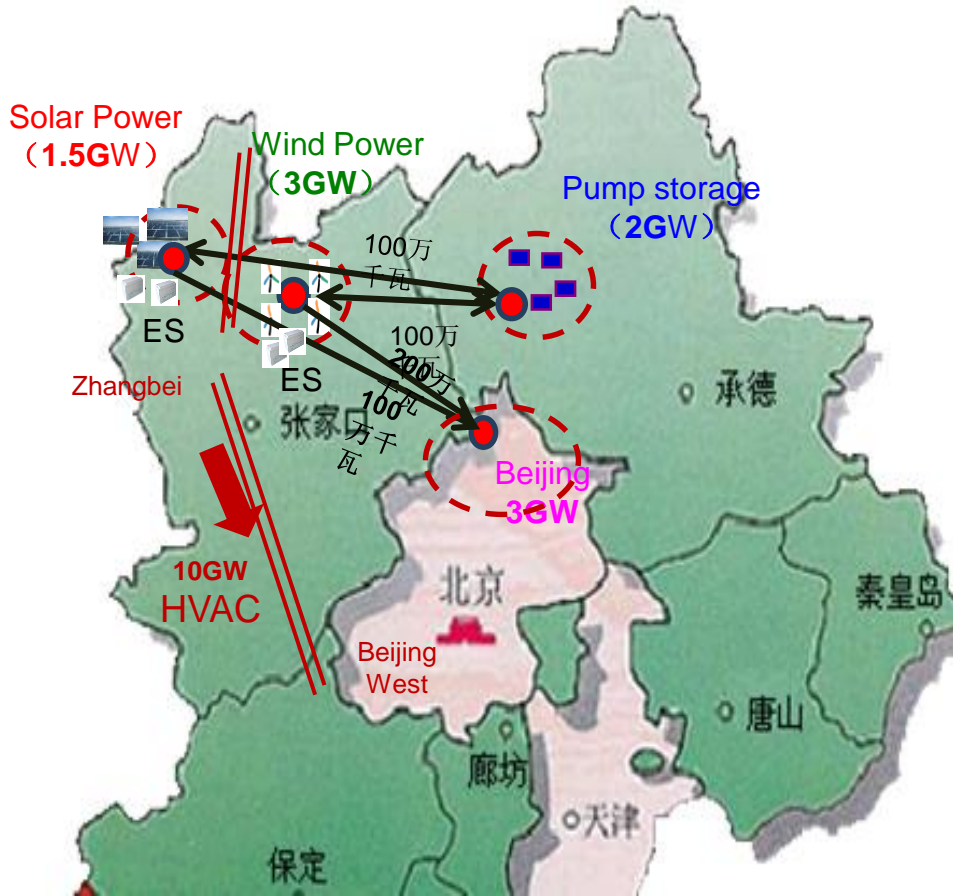
- Transform to HVDC grid
- Solution 1 – dashed blue line
- Solution 2 – dashed red line
- Solution 3 – dashed green line
- Redundancy
- Grid reliability and security
- **DC CBs** → DC side fault clearance



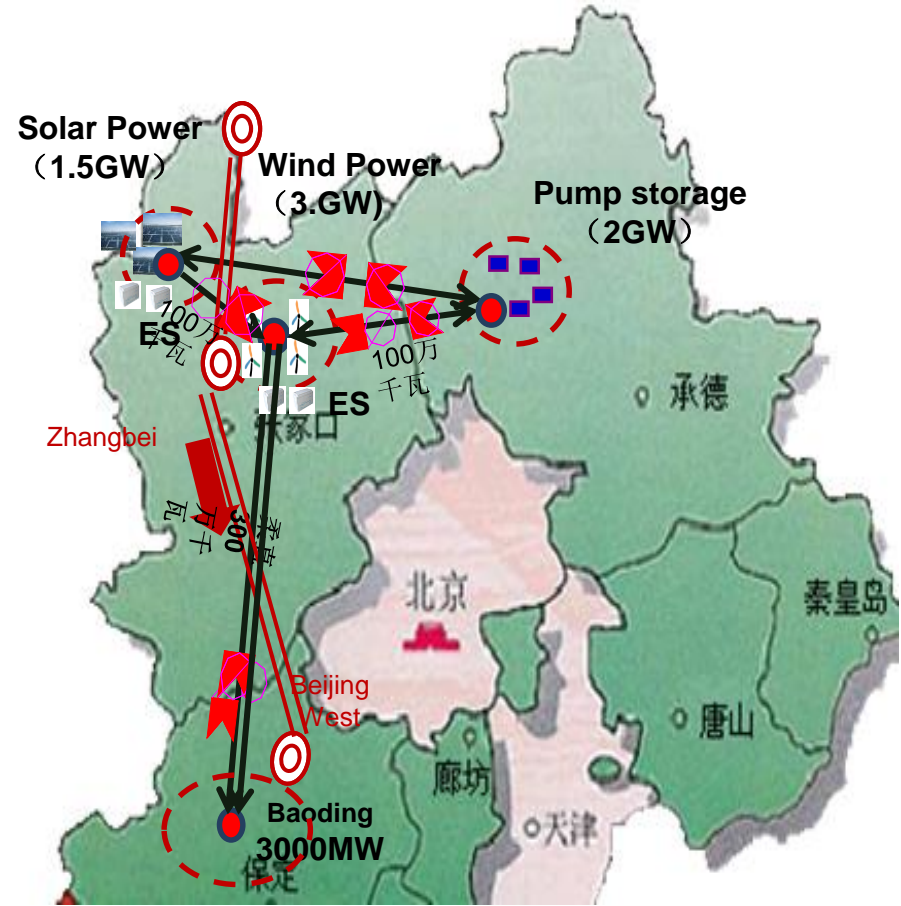
3.2 ±800kV DC GRID



Winter Olympic 2020 – DC Grid Demo Project



Proposal 1



Proposal 2

3.3 Wind-PV-Storage Pilot project



Phase I: 100MW Wind, 40MW PV, 20MW storage

Phase II: 400MW Wind, 60MW PV, 50MW storage

In total: 500MW Wind, 100MW PV,
70MW storage

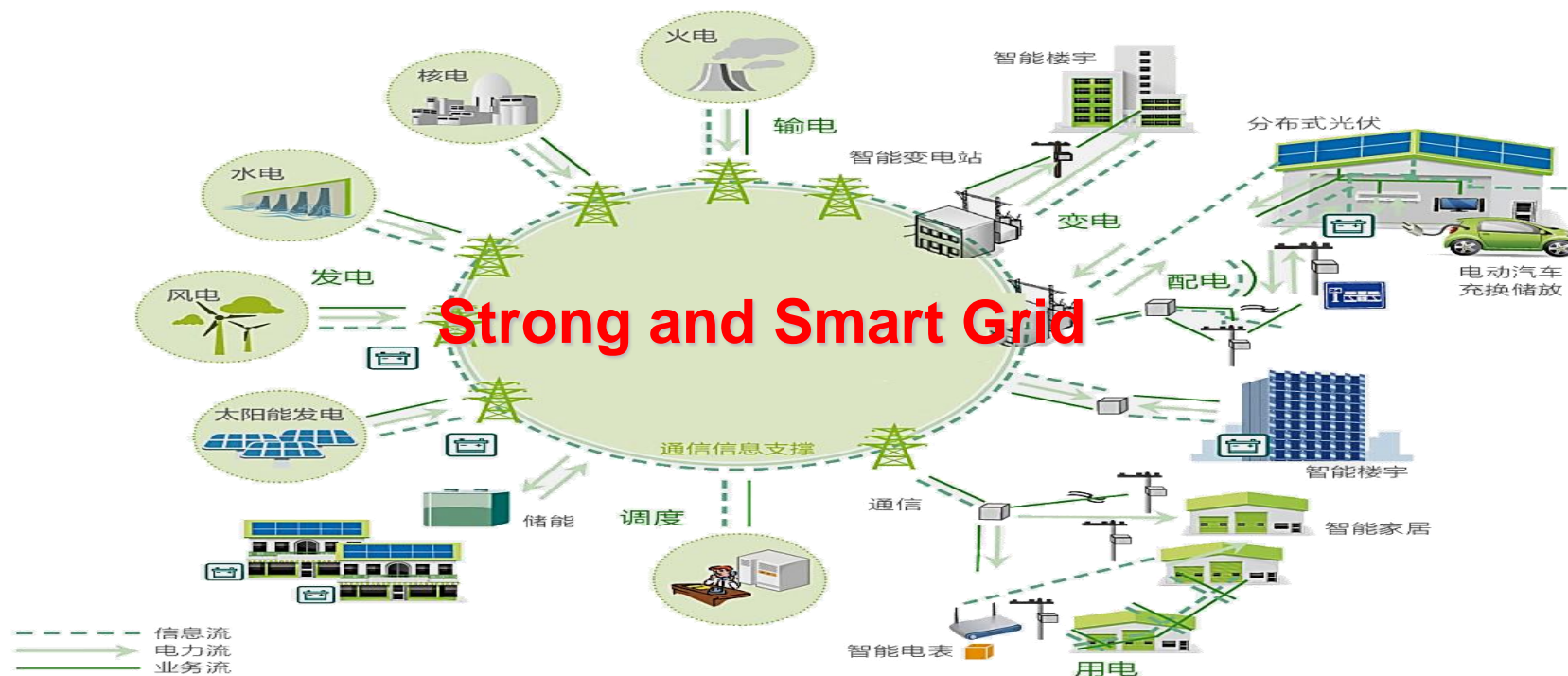


4.1 Smart Grid for Distributed RE



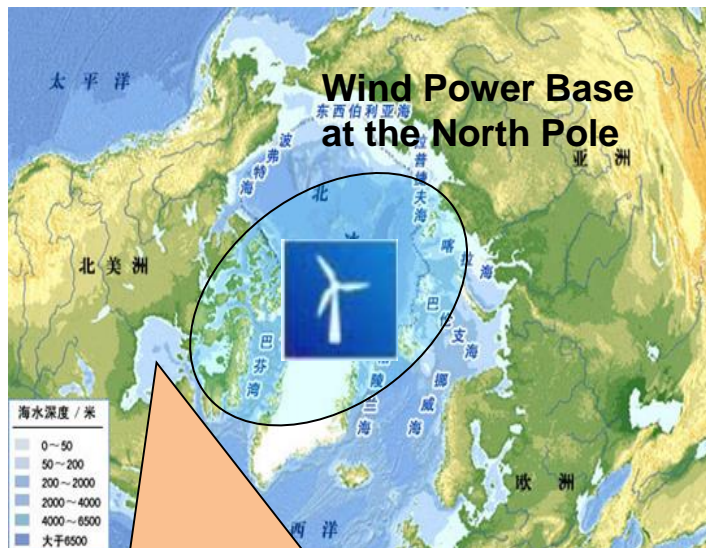
- Pumped Storage (57 Plants): **65 GW**
- Operation (29 Plants): **25 GW**
- Constructing (15 Plants): **21 GW**
- Planed (13 Plants): **19 GW**

- Smart Substations: **1400**
- Smart Meters: **230 million**
- EV Charging Stations: **570**
- EV Charging Poles: **23000**



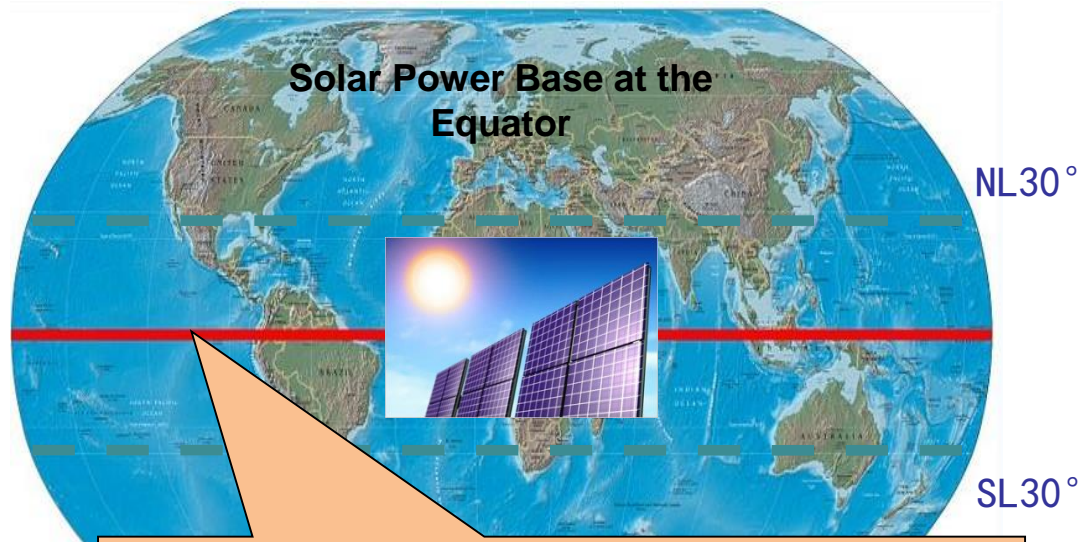
Strong and Smart Grid

5.1 Renewable Energy at the North Pole and the Equator



North Pole:

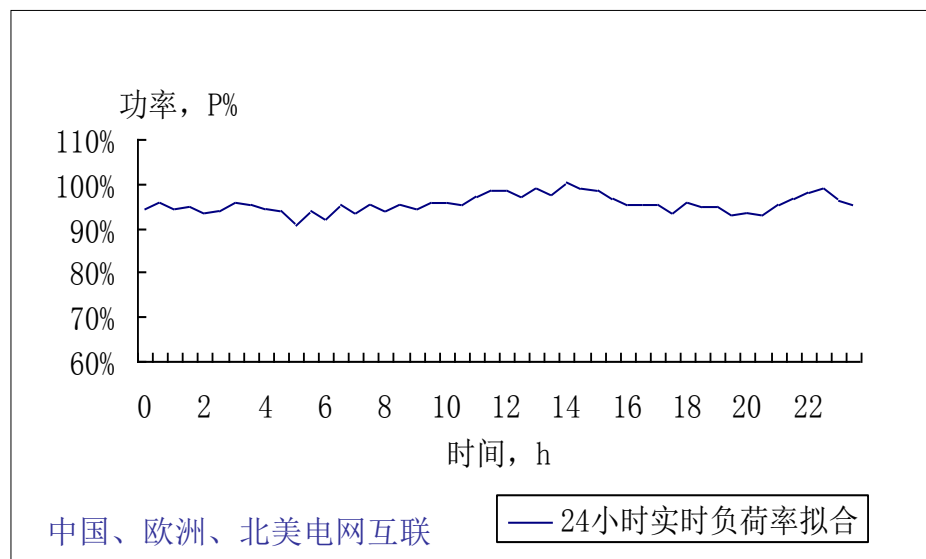
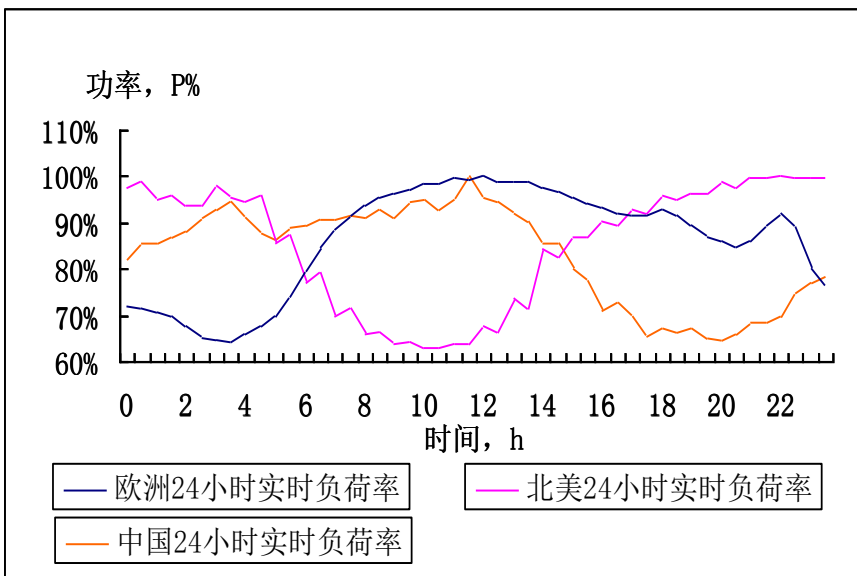
- Energy density: 400W/m²
- Resource > 80,000TWh/year



Equator:

- North Africa: 27,000TWh/year
- Middle East: 9,000TWh/year
- Australia: 15,000TWh/year
- South America: 5,000TWh/year

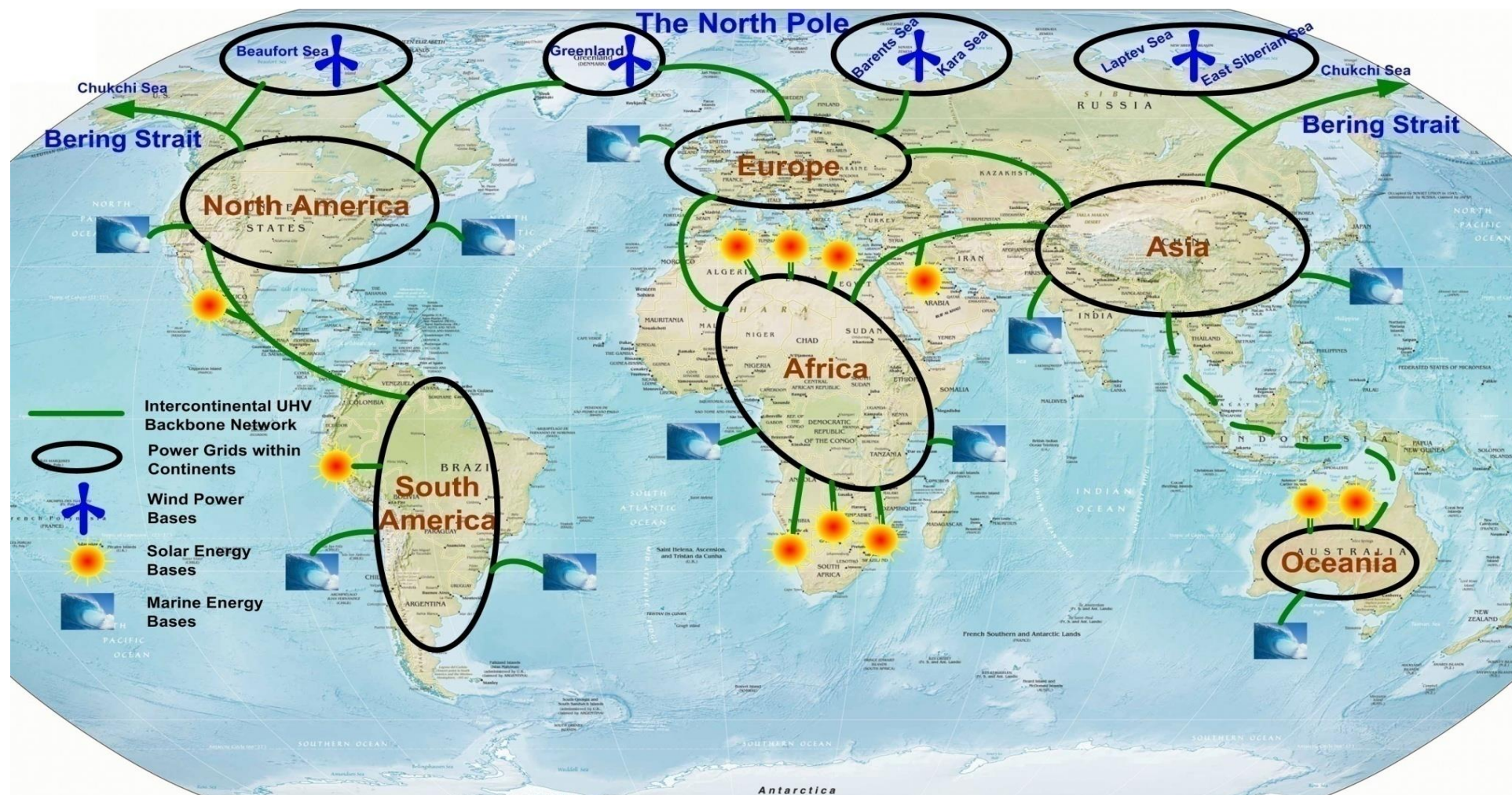
5.2 Global Energy Interconnection



24 Hour Power Curves each of China, Europe, North America

24 Hour Power Curve resulted from China, Europe, North America

5.3 Global Energy Interconnection





Thank you for your attention!

