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# A Global Energy Interconnection to Promote Clean and Green Development

State Grid Corporation of China

July 27 2016



"China will propose discussion on establishing a Global Energy Interconnection to facilitate efforts to meet the global power demand with a clean and green alternatives".

- Speech of President Xi Jinping at the UN Development Summit



The premiere of **Chinese edition** of *Global Energy Interconnection* was held in **Beijing** (February 3, 2015);



The premiere of **English edition** of *Global Energy Interconnection* was held in **New York** (September 14, 2015) <sup>1</sup>



1

**Why Global Energy Interconnection**

2

How to build global energy interconnection

3

Jointly Promote innovative development of global energy interconnection



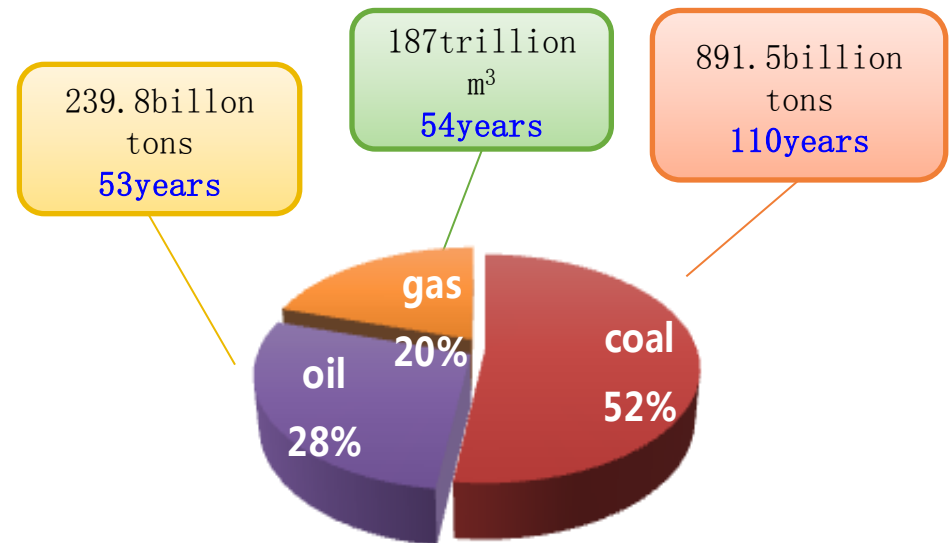
# 1.1 Challenges to world energy development



Energy is the blood of our economy and society. Since the industrial revolution, the world has been facing three major challenges caused by fossil fuel's domination in energy mix.

## 1. Resource Constraints

- ◆ Proven reserve of coal : 110 years
- ◆ Proven reserve of oil : 57 years
- ◆ Proven reserve of gas : 54 years



Global Proven Reserve of Fossil Energy

# 1.1 Challenges to world energy development



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## 2. Environment Pollution

- ◆ Large scale exploration, production, transportation, storage and use of fossil energy have caused acute pollution and serious damages to air, water, and soil, and posed great threat to human health.
- ◆ In many regions, the damages are beyond the limits of the environment, resulting in the loss of the self-recovering ability of mother nature.

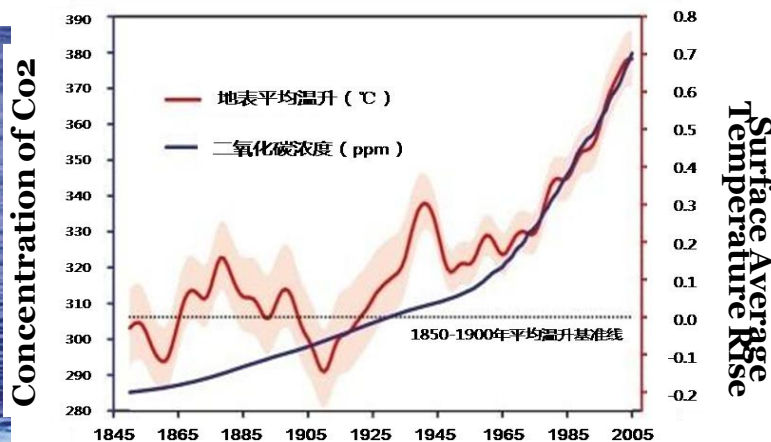


# 1.1 Challenges to world energy development



## 3. Climate warming

- ◆ The carbon emission from combusting fossil is a major cause for global warming. Global temperature has risen by an average of 1°C since 1850.
- ◆ If no actions were taken, by the end of this century, global temperature rise would exceed 4°C, resulting in melting of icebergs, rising of sea level, species extinction and grain output reduction. All will severely threaten human existence.



Atmospheric Concentrations of CO<sub>2</sub> and average global temperature rise





# 1.2 Countermeasures-Two replacements



To adopt the target agreed at COP21 【UN climate change conference in Paris】 that aims to hold the increase in the global average temperature to well below 2 centi-degree, it is urgent to push forward global energy transition.

## ◆ Two replacements

**Clean replacement:** in energy generation, solar energy, wind energy, hydroenergy and other clean energy replace the fossil energy

**Electric energy replacement:** in energy consumption, the electric energy replaces the direct consumption of coal, oil and other fossil



# 1.3 Global Energy Interconnection



- The development of **5/10000** only can meet the energy demand of human society.

Variety	Total Resources in the World ( KW )
Hydro energy	More than 10 billion
Land wind energy	More than 1 trillion
Solar energy	More than 100 trillion

Unit: Trillion  
KWH/Year

Hydro energy



Wind energy



Solar energy



Distribution of global hydro energy, wind energy and solar energy resources



# 1.4 Global Energy Interconnection

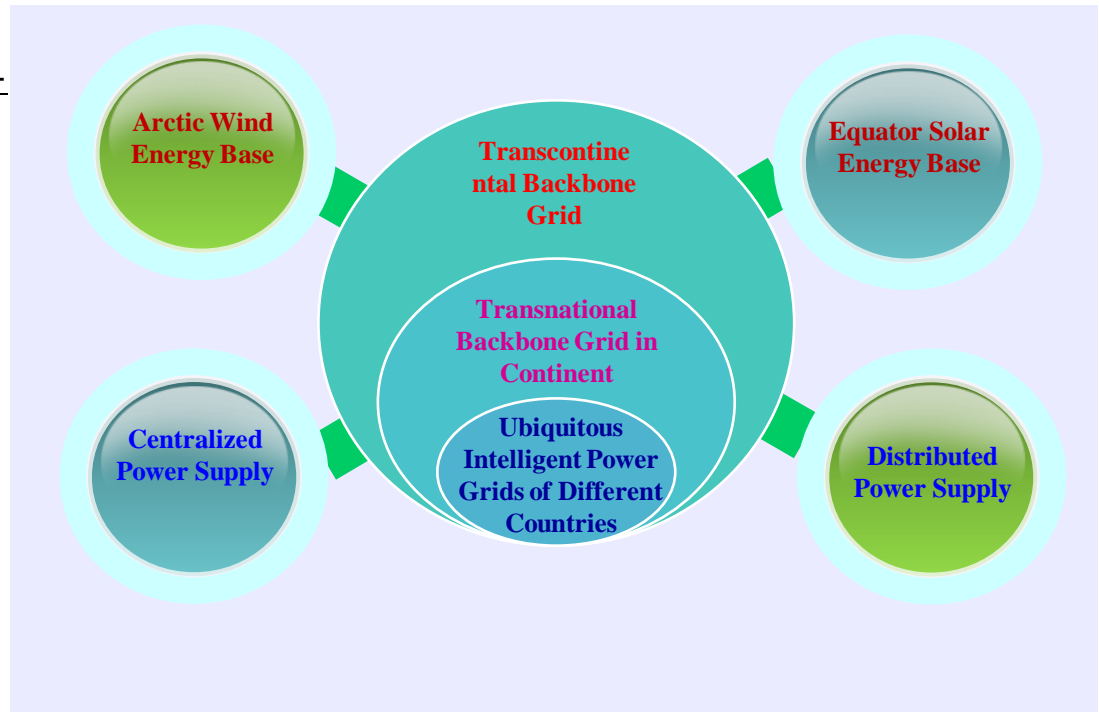


## ◆ Definition

"The **Global Energy Interconnection (GEI)** is the globally interconnected **strong intelligent power grid** with the ultra-high voltage power grid as backbone grid and the transportation of clean energy as domination and is the green and low-carbon **global energy allocation platform** characterized by broad service scope, strong allocation capacity, and high safety reliability"\*.

■ GEI = Smart Grid + UHV Grid + Clean Energy

- UHV grid is the **Key**
- Smart grid is the **Foundation**
- Clean energy is the **Priority**





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# 2.1 Development roadmap of Global Energy Interconnection



**NOW**

**2020**

**2030**

**2050**

Phase one: domestic interconnection

- Promote clean energy development
- Promote domestic grid interconnection

Phase two: intracontinental interconnection

- Promote the development of large clean energy bases
- Promote intra-continental interconnection

Phase three: intercontinental interconnection

- Develop energy bases at the Arctic (wind power) and Equatorial regions (solar power)
- GEI will basically come into being



## 2.2 Prospect by 2050



### 1. Realize clean development

If clean energy can maintain an average annual growth of 12.4%, the proportion can be above 80% by 2050

- Sustainable supply of clean energy

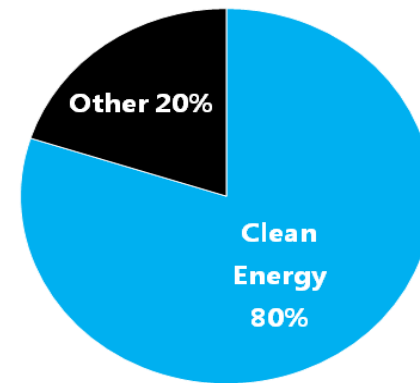
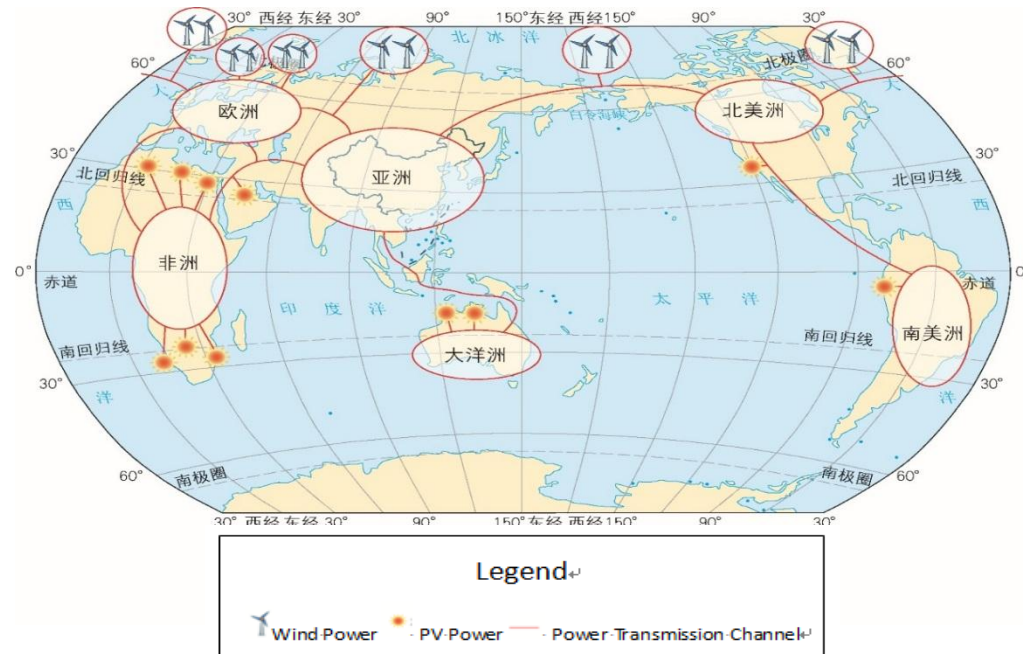
### 2. Cope with climate change

The Carbon Dioxide emission of world energy can be controlled at 11.5 billion tons by 2050

- Limiting global temperature rise within 2° C

### 3. Promote peaceful development

- Deepen worldwide cooperation, curb international disputes.
- Turn the world into a peaceful and harmonious global village with sufficient energy.



Energy-mix in 2050

## 2.3 Practice in China - UHV Power Grid

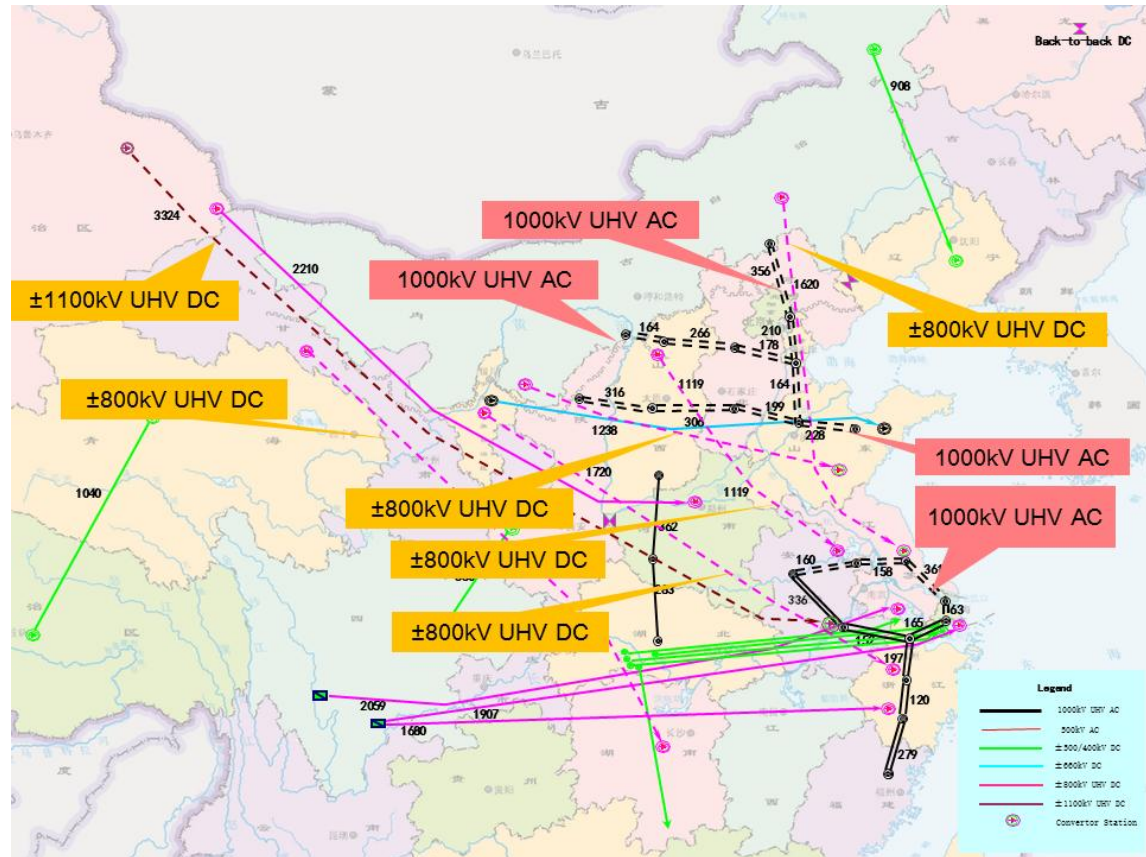


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### 1. Acceleration of development of ultra-high voltage power grid

Construction of a batch of world-leading ultra-high voltage projects

- ◆ Completion and operation of “3-AC and 4-DC” Project;
- ◆ “4-AC and 6-DC” Project under construction;
- ◆ The length of UHV lines in operation and under construction is more than 22,000km and the power transformation (current conversion) capacity is more than 230,00MVA.



### 2. Acceleration of construction of intelligent power grid

SGCC has made smart grid development plans involving construction of all sections from electricity generation, transformation, distribution, consumption to dispatching.

- ◆ 2,554 smart substations, 35,000 unattended substations, 310 million smart meters
- ◆ Over 1500 EV charging and battery swapping stations and 30,000 charging poles



Charging station of electric vehicle



Zhoushan  $\pm 200\text{KV}$  Five-terminal  
Flexible DC Power Transmission  
Project



Smart meter



### 3. Positive promotion of new energy development

Based on the ultra-high voltage and cross-regional networking, the rapid development of clean energy is robustly promoted.

As of June 2015:

- ◆ The installed capacity of hydropower was **320,000MW, No. 1** in the world;
- ◆ Grid connected wind power was **130,000MW, No. 1** in the world;
- ◆ Grid connected photovoltaic power was **42,000MW, No. 1** in the world.

Phase I-Operation 2012

- ◆ Wind power capacity **100MW**
- ◆ Solar power capacity **40MW**
- ◆ Storage capacity **20MW**

Phase II - Under construction

- ◆ Wind power capacity **400MW**
- ◆ Solar power capacity **60MW**
- ◆ Storage capacity **50MW**



Zhangbei National Wind and Solar Power Generation,  
Storage and Transmission Demonstration Project



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# 3.1 Global Energy Interconnection Development and Cooperation Organization Founded



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- ◆ **Time: 30 of March 2016**
- ◆ **Jointly hosted by:  
SGCC,C4C,IEA ,EEI**
- ◆ **Co-hosted by:  
CEC, CSEE,  
CMIF,IEC,IEEE.**
- ◆ **The Global Energy Interconnection Development and Cooperation Organization (GEIDCO) was founded**
- ◆ **ELETROBRAS is one of The 15 Founding Members Of GEIDCO**



**Global Energy Interconnection Conference  
30 March 2016 Bei Jing**



## 3.2 Way forward



**GEIDCO will dedicated in the development of GEI. Since Global energy interconnection is an unprecedentedly huge and systematic project, covering every aspect of international politics, economy, diplomacy, national defense, and climate change etc. It therefore requires concerted efforts from every party.**

- **Firstly, to promote extensive consensus.** Strength cooperation among governments, industrial organizations, social groups and energy companies, under the strong leadership of United Nations, to pool all forces to address policy, marketing, and finance problems facing the development of global energy interconnection.
- **Secondly, to enhance technology innovations.** The focus is to speed up R&D on advanced, efficient and safe clean energy generation technologies, FACTs, energy storage, large-grid control and modern information and communication technologies, so as to enhance the safety, economic efficiency and reliability of global energy interconnection.
- **Thirdly, to build a coordinated development mechanism.** By building up a regular coordination mechanism and enhancing top design and macro planning, we can then explore and develop a global electricity trading mechanism and promote the sound development of a global energy interconnection.

## 3.3 Prospect of GEI in Brazil and South America



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**Brazil (South America) has a great energy development demand, rich resources, and huge market size and potential, and broad prospects and will play the demonstration Important role in the development of Global Energy Interconnection in the future and will further drive the technological innovation, equipment upgrade, regional energy mutual aid and international energy cooperation.**





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Obrigado!

