

Global Energy Interconnection: An Innovative Global Solution for Implementing *Paris Agreement*

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I. Where are we?

It is urgent that climate change be addressed worldwide. It is vital that a global systematic innovative plan be formulated to help countries enhance their mitigation ambitions.

Transition to clean and low-carbon energy is ultimate approach to tackling the issue of climate change. The key to energy transition consists in accelerating a modern energy system dominated by clean energies, centered on electricity and capable of global allocation by transmission.

Unbalanced and insufficient energy and power development in the world is still a conspicuous problem. At present, there are still more than 1 billion people without access to electricity worldwide.

II. Where do we want to go?

Our strategic orientation is establishing Global Energy Interconnection (hereinafter “GEI”) to address the climate change from the root and pursue sustainable development by satisfying the global energy and power demand in a clean and green way. Specifically, the objectives are as follows:

- To promote the achievement of the long-term goal of the temperature rise within 2°C by the end of the 21st century set in the *Paris Agreement* and to realize net zero emission after the middle of this century.

- To promote national implementation of NDCs in mitigation.
- To promote the realization of the Sustainable Development Goals (SDGs) globally, as well as the green transition in global economic and social development.

III. How do we get there?

1. Featuring mature technology, high economic efficiency, safety and reliability, GEI is an global innovation plan for achieving the goals in *Paris Agreement*.

GEI is a robust and smart power grid with Ultra-High Voltage (UHV) power transmission as the backbone framework, and a basic platform for the large-scale development, transmission and utilization of clean energies across the world. Its essence is “Smart Grid + UHV + Clean Energy” with strong economic competitiveness. **Technically**, the advanced and mature technology in UHV power transmission is capable of high-capacity and long-distance (>5000 km) power transmission, with lower loss and less land occupation. The extensive utilization of intelligent power grid technology can meet the requirements for flexible integrating wind, photovoltaic, hydropower and other intermittent power supplies. **Economically**, the cost of wind and photovoltaic power generation has continued to drop rapidly. It is estimated that by 2025, clean energy resources will be more competitive than fossil fuels. GEI can comprehensively enhance the operating and economical efficiency of the global energy system with its advantageous ability to draw on the differences in resources, time zones, seasons and electricity prices of different regions.

GEI is a global emission reduction plan than can achieve the goals in *Paris Agreement*. **At the global level**, by accelerating the development and interconnection of clean power and electrification globally, GEI can ensure the rapid drop in global CO₂ emission before 2030 when it is expected to reach the peak and consequently achieve net zero emission before 2070, so as to grant the emission paths required for controlling global temperature rise within 2°C. **At the**

national level, GEI construction will promote the achievement of NDCs for all countries. Take China for example, by the development of domestic energy interconnection, the installed capacity of non-fossil energy will reach 1700 GW and is expected to help China realize its goal of 2030 NDCs in non-fossil fuel percentage and emission peak year ahead of schedule. ¹

The core of GEI consists in promoting global power grid interconnection, realizing large-scale development of renewable energy and its optimized extensive allocation and efficient application. Clean energy in the world is unevenly distributed, intermittent and volatile. It has to be integrated into the macro power grid for better development on a greater scale. By 2017, the number of Chinese UHV projects under construction or in operation had reached 25. Covering 37,000 kilometers of transmission lines in total, and embracing a transmission capacity of more than 210 GW², they have laid a solid foundation for China to become the largest country in integrated installed capacity of hydro, wind and PV power in the world. ³ In 2017, the ±800kV Belo Monte Hydropower UHV Transmission Project was completed in Brazil, making it possible to transmit the abundant hydropower in the north to load centers in the southeast. In Europe, 5 synchronized power grids covering the European continent, the northern Europe, the Baltic, the United Kingdom and Ireland have been established, providing important guarantee for the rapid development of clean energy in Europe. ⁴

2. The GEI plan can be comprehensively docked with the *Paris Agreement* to enrich and improve the current system and international cooperation modes for global climate efforts.

¹ Global Energy Interconnection Development and Cooperation Organization: *Research Report on China's Energy Interconnection Development*, internal report, August of 2017.

² Global Energy Interconnection Development and Cooperation Organization: *2017 Development and Prospect of Global Energy Interconnection*, 2017.

³ Global Energy Interconnection Development and Cooperation Organization: *Research Report of China Energy Interconnection Development*; August of 2017.

⁴ Global Energy Interconnection Development and Cooperation Organization: *Global Energy Interconnection Development Index*, March 2018.

The GEI plan can be comprehensively docked with the *Paris Agreement* in mitigation, adaptation, financing, technology, capacity building, transparency and other aspects for climate governance.

(1) **Mitigation:** Establishing GEI to achieve the mitigation targets and the goal of controlling temperature rise within 2°C set in the *Paris Agreement*; helping countries realize their respective NDCs by energy interconnection and cross-border power grid interconnection;

(2) **Adaptation:** Enhancing the resilience of the energy and power infrastructure to improve the countries' capabilities in adapting to climate change and disaster risk management by universal popularization of access to electricity and construction of intelligent power grids;

(3) **Financing:** Establishing a global clean energy transaction mechanism featuring high integration of power flow, carbon flow and capital flow through innovating in business modes, so as to solve the financing problem with market mechanisms;

(4) **Technology:** Enriching the technology and equipment system for climate change mitigation and adaptation by speeding up technological innovation and diffusion through national energy interconnection development and cooperation;

(5) **Capacity building:** Enhancing the global capability to combat climate change by providing new framework of climate governance, and planning system of global energy transition, as well as talent training and international cooperation mechanisms;

(6) **Transparency:** Establishing statistic and accounting standards and data exchange protocol, promoting the implementation of global stock-taking by building the GEI data platform for mitigation.

3. GEI promotes the realization of sustainable development goals.

The GEI plan has already been officially incorporated into the framework of **UN 2030 Agenda for sustainable development**. GEI will help the realization of global SDGs in 2030: ⁵

(1) **GEI fosters economic growth and promotes social development.** Total investment in GEI will reach USD 38 trillion by 2050, promoting 0.5% growth in the global economy. ⁶The global average cost of electricity will be reduced by 2.8 cents/kWh from the current value; the social development cost will be down by USD 1.8 trillion each year; more than 100 million jobs will be created in aggregate.

(2) **GEI reduces global poverty and promotes equal development.** By 2030, global population without access to electricity will be reduced to below 500 million (Fig.1), and electricity penetration will be raised to over 94%; in 2050, all population will have access to electricity and the goal of providing affordable and reliable modern energy services will be realized. Developing countries will become the mainstay of investment destination and exporter of clean energy.

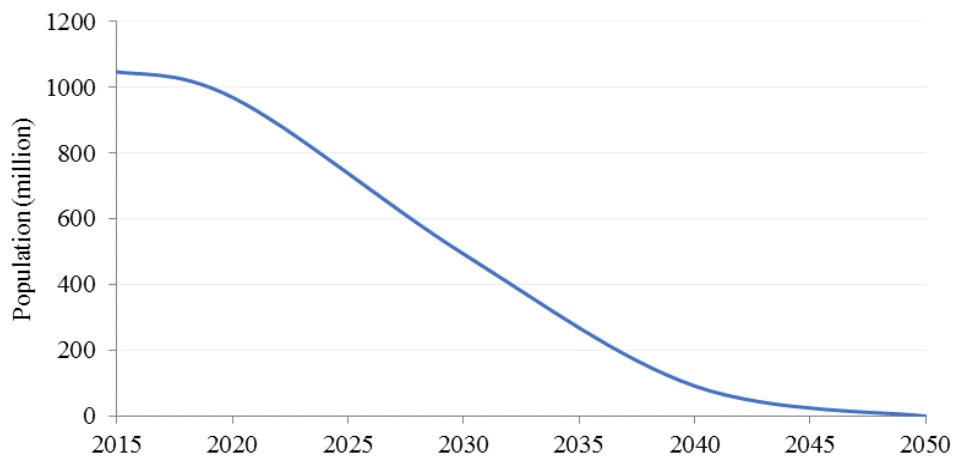


Fig. 1 Global Population without Access to Electricity

⁵ Global Energy Interconnection Development and Cooperation Organization: *Backbone Framework Research of Global Energy Interconnection*, March of 2018.

⁶ Assuming the world economy grows by around 3% annually.

(3) **GEI improves ecological environment and promotes ecological restoration.** By 2050, fossil fuels replaced by clean energy will reach 18.6 billion tons of stand coal equivalents each year, reducing SO₂, NO_x, and dust emission by 250, 240 and 140 million tons respectively, and saving over 100 billion m³ of water each year.

(4) **GEI enhances energy cooperation and ensures energy security.** GEI promotes the formation of a clean energy supply system dominated by clean energies, centered on electricity and featuring interconnection, co-construction and sharing. Countries around the world will be relieved from their dependence on fossil energy and realize sustainable supply of clean renewable energy, thus promoting the transition and upgrade of global energy system and guaranteeing energy security for all countries.

4. Roadmap of GEI Development

The development of GEI will follow the three-stage roadmap aiming at achieving domestic, regional and global interconnection respectively.⁷

By 2035, power grid interconnection will be realized for main countries in each continent, and regional energy interconnection will be basically formed. The global clean energy will account approximately 40% of all the primary energy (Fig. 2), and 61% of all power generation (Fig. 3); the scale of transcontinental and transregional power flow will reach 280 GW; CO₂ emission from the energy sector will drop to 25.5 billion tons.

By 2050, main intercontinental interconnection channels will be completed (Fig. 4), and power grids of all continents will be interconnected. The global clean energy will exceed 70% of all the primary energy and reach 81% of all power generation; the scale of transcontinental and transregional power flow will reach 720 GW; CO₂ emission from the energy sector will drop to 11.8 billion tons.

⁷ Global Energy Interconnection Development and Cooperation Organization: *Backbone Framework Research of Global Energy Interconnection*, March of 2018

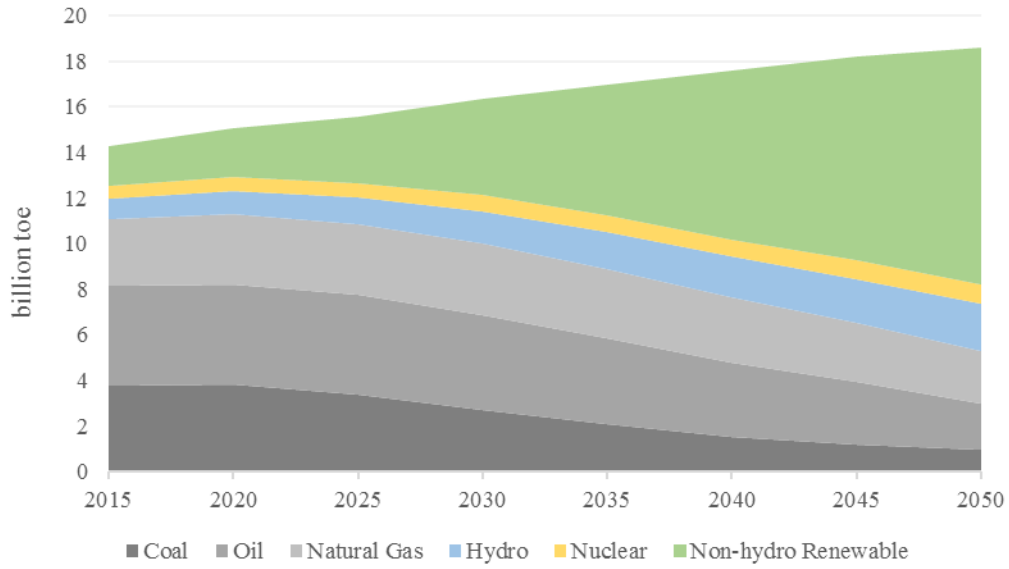


Fig. 2 Global Primary Energy Supply by Type

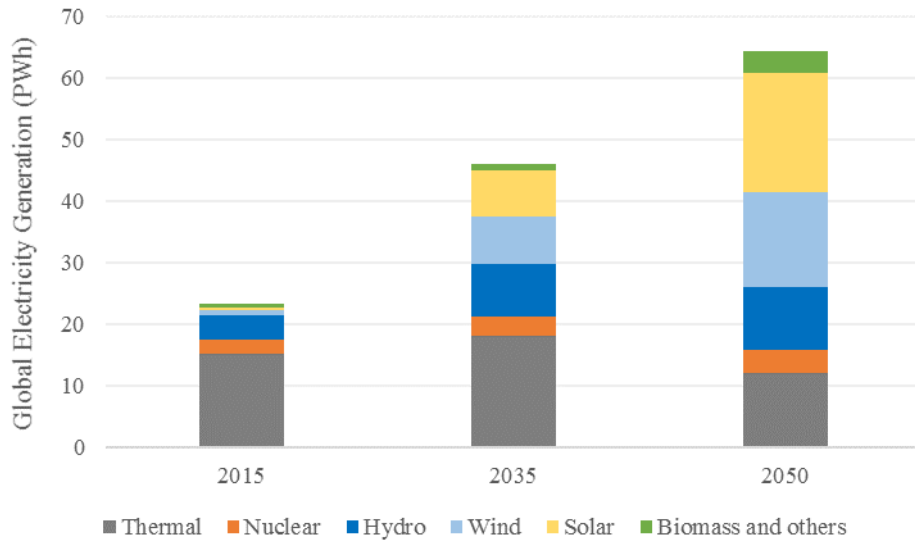


Fig. 3 Growth Trend in Global Electricity Generation

