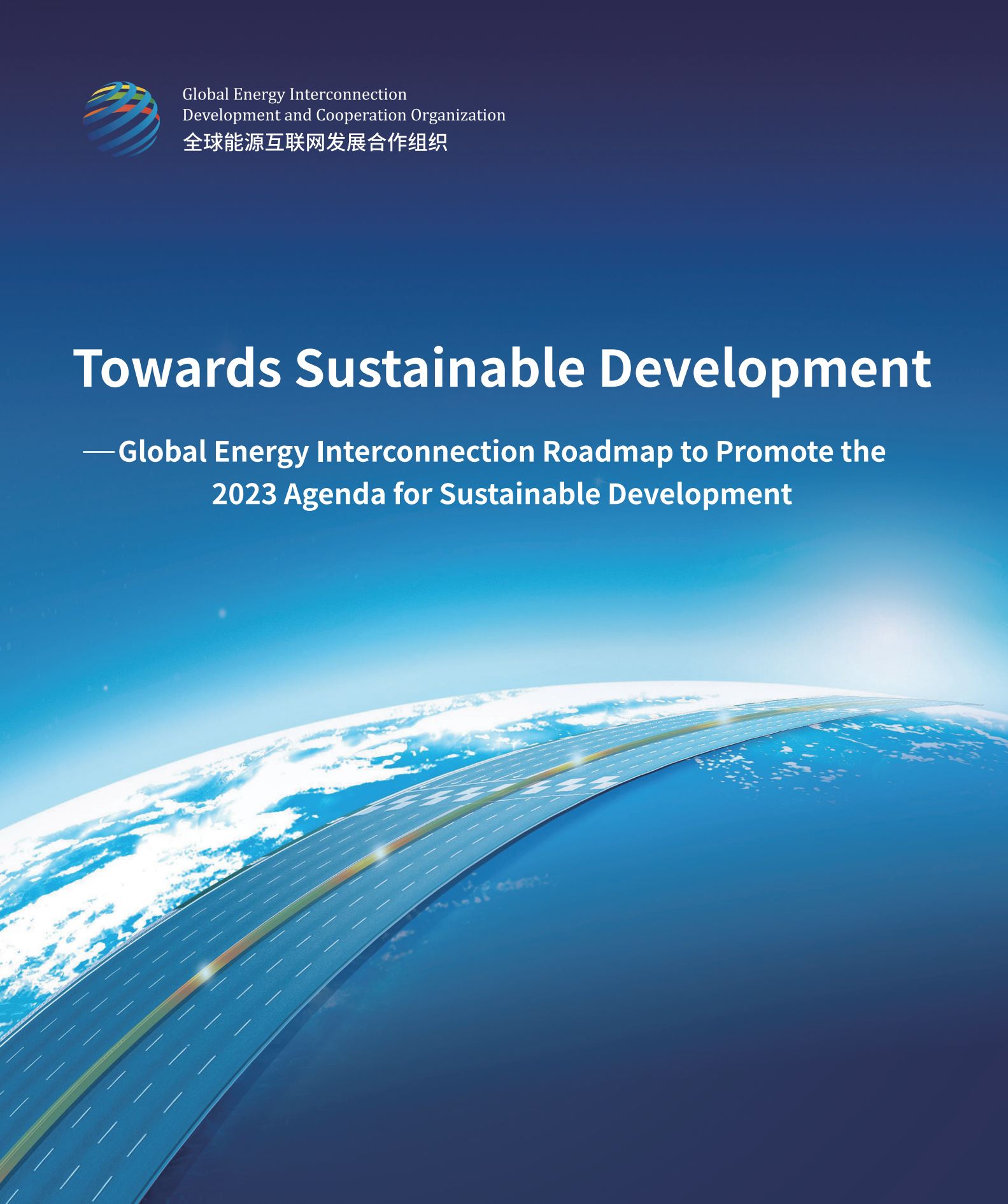
Global Energy Interconnection
Development and Cooperation Organization
全球能源互联网发展合作组织

Towards Sustainable Development

—Global Energy Interconnection Roadmap to Promote the 2023 Agenda for Sustainable Development




SECRETARY-GENERAL

GEI is in the centre of the two central concepts (sustainability and inclusiveness) of our commitment to 2030 Agenda and with our objectives in relation to climate change.

— UN Secretary General António Guterres

1 The 2030 Agenda for Sustainable Development

Major Challenges Facing Sustainable Development

01 Sustainable Economic Development

Poverty remains a challenging issue

More than 650 million people worldwide live in extreme poverty

Natural resources are depleting

Coal, oil and natural gas will be depleted in 132, 50 and 50 years

World economic growth is losing steam

Global GDP growth slowed from 4.3% in 2010 to 3.4% in 2022

02 Sustainable Social Development

Acute Development Gaps

The GDP per capita of developed countries is dozens of times that of underdeveloped countries

Escalating Conflict and Violence

A quarter of the world's population lives in conflict-affected countries

Prominent Health Issue

About one tenth of the world's population suffers from hunger

03 Sustainable Environmental Development

Climate change becomes ever more pressing

Global average temperature is 1.2°C higher than the pre-industrial level

Environmental pollution is serious

Around 4.2 million people die each year from air pollution

Environmental degradation is getting worse

Global desertification area reaches 36 million km2, accounting for one quarter of the total land area

Historic Evolution of Sustainable Development

1972
UN adopted Declaration of the United Nations Conference on the Human Environment

1987
The World Commission on Environment and Development published *Our Common Future*, which for the first time expounded the connotation of sustainable development

1992
The UN Conference on Environment and Development adopted Rio Declaration and *UN Framework Convention on Climate Change*

1997
The COP3 adopted *Kyoto Protocol*

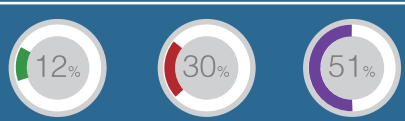
2000
The 55th Session of the General Assembly of the United Nations adopted *the United Nations Millennium Declaration*

2015
The UN Sustainable Development Summit adopted *the 2030 Agenda for Sustainable Development*

2016
The COP21 adopted the *Paris Agreement*

- The 2030 Agenda provides a shared blueprint for all countries to pursue sustainable development, including **17** SDGs and **169** targets from economic, social and environmental aspects.

Implementation status



Implementation Challenges

- World economy is stagnating
- Development gap is widening
- Climate change is increasingly severe

- Workable and applicable holistic solutions are crucial
- Sustainable development models need to be innovated
- Mechanisms and platforms for international cooperation need to be strengthened

2 Global Energy Interconnection

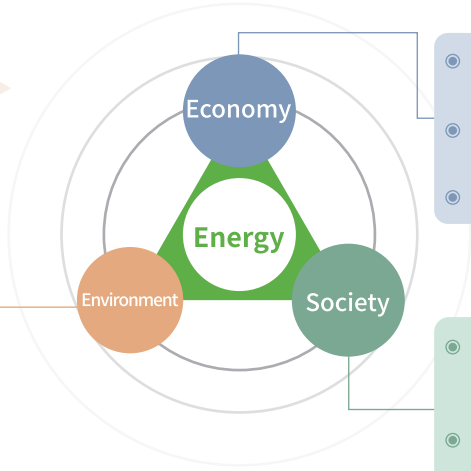
Overall Impact of Energy on Sustainable Development

Sustainable economic development

- Energy sector is a crucial part of economic system
- Energy provides a fundamental guarantee for economic development
- Energy boosts a wide range of industries

Sustainable environmental development

- Excessive consumption of fossil fuels is the root cause of climate change
- Energy is the key to address global environmental problems



Sustainable social development

- Energy is a key element in the development and transformation of social system
- Energy plays a key role in international order and landscape

Challenges of accelerating energy transition

Scale and speed of clean energy development need to be improved	Energy electrification needs to be accelerated	Energy network interconnection needs to be strengthened

GEI Accelerates Global Energy Transition

Concept Connotation

GEI is an interconnected modern energy system, dominated by clean energy and centering on electricity, and an important carrier for safe, cost-effective and efficient energy transition and transformation.

Production

Through large-scale development, clean energy such as solar, wind, and hydro power will replace fossil fuels as dominant energy source

Consumption

The large-scale use of electricity will replace the direct combustion and utilization of coal, oil and gas in final energy consumption for further electrification in energy consumption

Allocation

The strong smart grid will promote the extensive interconnection of energy networks to ensure the optimal allocation and secure supply of clean energy within countries, across borders and continents, and even globally

Implementation Pathway

"Two Replacements"

Implement clean replacement in energy production and electricity replacement in energy consumption

"One Increase"

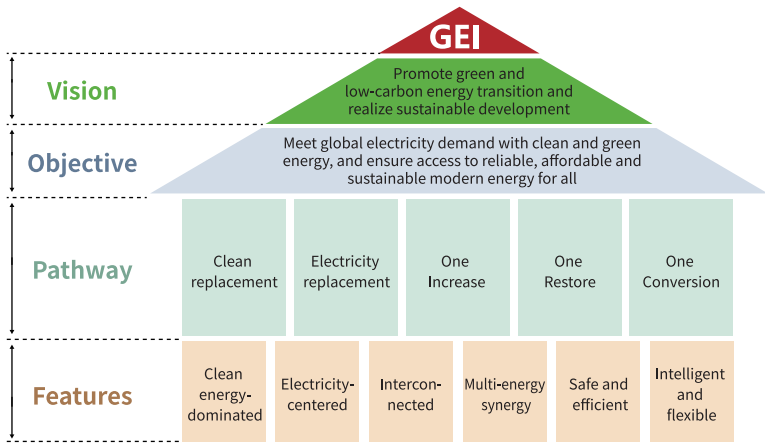
Increase the electrification level of the whole society

"One Restore"

Restore coal, oil and gas to their basic attributes as industrial raw materials

"One Conversion"

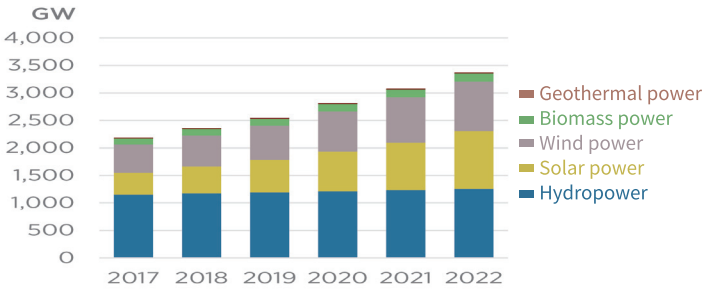
Convert water, CO_2 and other substances into fuels and raw materials such as E-hydrogen, E-methane and E-methanol



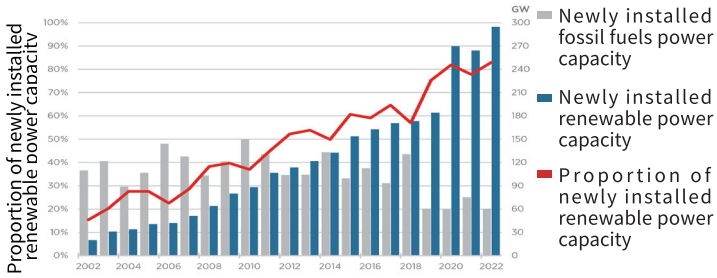
Progress in GEI Development

Energy Production

Through leapfrog development, the global installed clean power capacity exceeded 3,300 GW, with an increasing proportion of clean energy in primary energy.



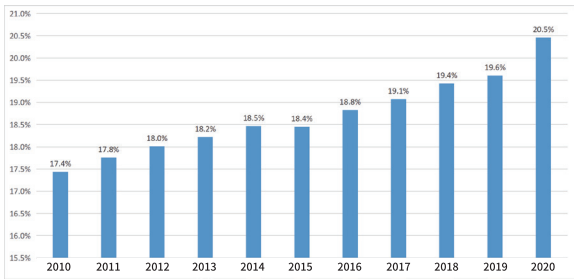
• Installed renewable power capacity



• Proportion of newly installed renewable power capacity

Energy Consumption

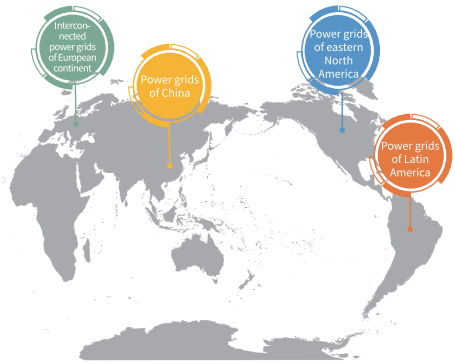
Electricity replacement accelerates in industry, transportation, agriculture, residential and commercial use, with an increasing share of electricity consumption in total final energy consumption.



• Electricity consumption in total final energy consumption

Energy Allocation

China, eastern North America and the European continent have achieved interconnection of large power grids, and Latin America is speeding up its grid interconnection, with rapid improvement in power grid connectivity around the world.



Energy Technology

Rapid development and wide application of clean energy, strong & smart grid and electricity utilization technologies, and in-depth integration of modern information and communication technologies with energy technologies.

Prospects on GEI Development

Development Roadmap

Now

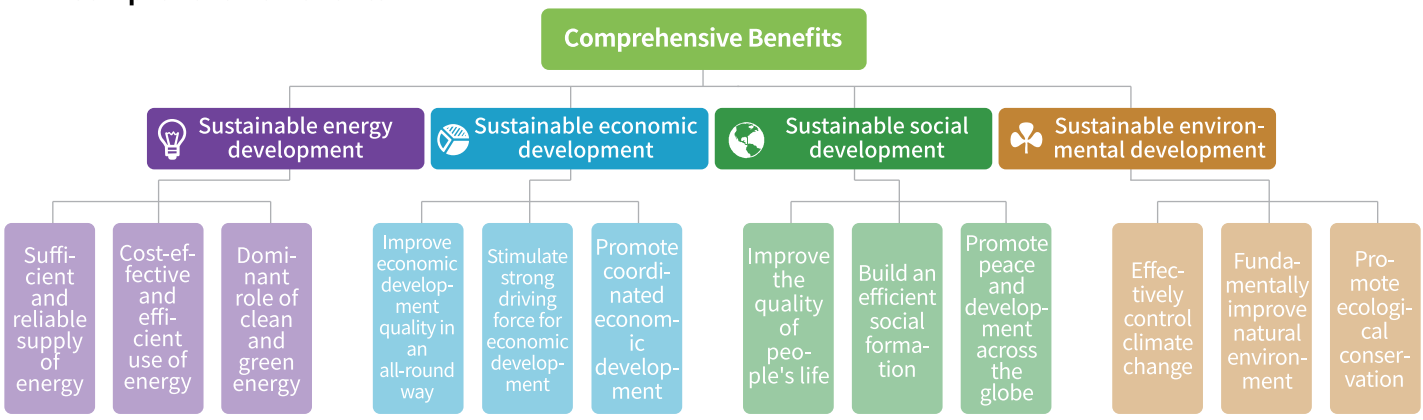
2035

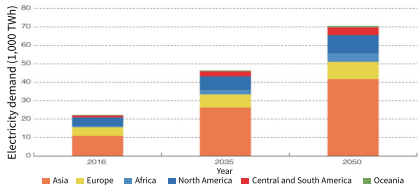
- Global installed capacity of power generation will come to 19 TW, and the installed clean power capacity will account for **83%**
- Electricity consumption will account for **41%** in total final energy consumption
- Construction of domestic and transnational power grids will accelerate

2050

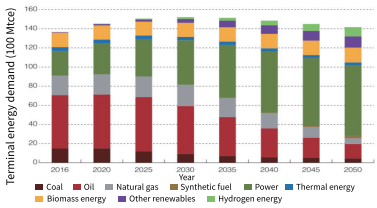
- Global installed capacity of power generation will reach 31.2 TW, and the installed clean power capacity will account for **91%**
- Electricity consumption will account for **67%** in total final energy consumption
- A global pattern of clean energy development, allocation and use will take shape

Comprehensive Benefits





• Estimated global electricity consumption



• Estimated share of electricity consumption in total final energy consumption

By 2050

- To lower average power generation costs by **40%** compared with 2020
- To reduce energy consumption per unit of GDP by **50%** compared with 2018
- To contribute an average of **2%** to global economic growth

- Reduce CO_2 emissions from energy systems
- Reduce SO_2 emissions
- Reduce NO_X emissions
- Reduce $PM_{2.5}$ emissions
- Reduce related diseases

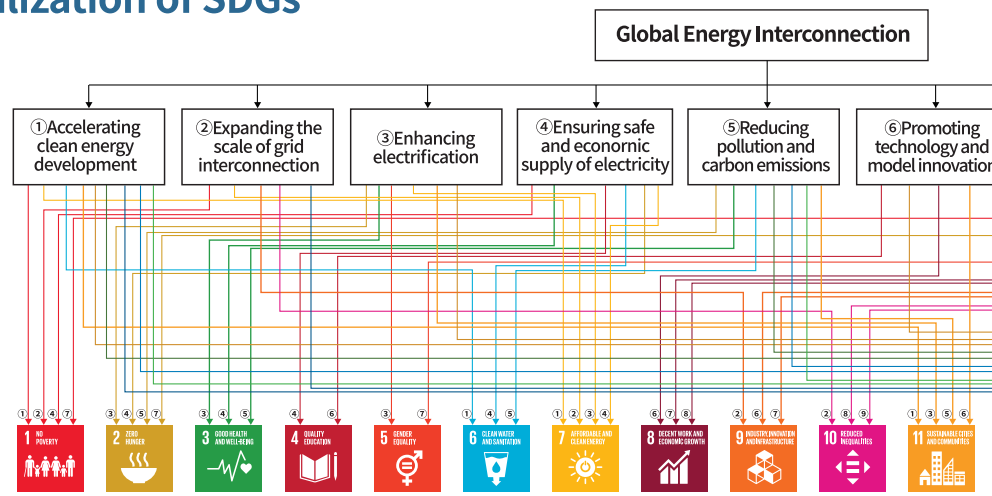
3 GEI Alignment with the 2030 Agenda

GEI Contributes to the Realization of SDGs

GEI

Nine functions and benefits

17 SDGs

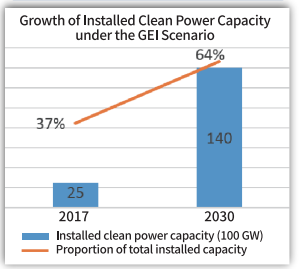


GEI Advances Sustainable Energy Development

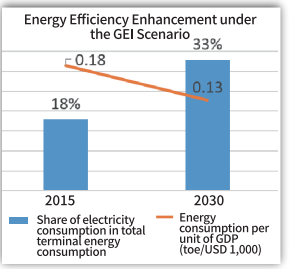
Sustainable Energy for All

GEI can accelerate clean replacement through the large-scale development of clean energy and electricity replacement through comprehensive electrification, and address limited electricity access through the extension of power grids, so as to provide sustainable energy for all.

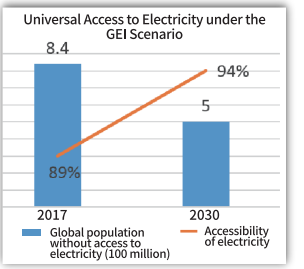
Drive clean replacement



Boost electricity replacement



Address limited electricity access



GEI Promotes Sustainable Economic Development

Stimulate driving force for economic development

GEI development requires combined efforts to create a new dynamic growth model, boost emerging industries such as new energy, new materials, high-end equipment, and intelligent manufacturing, and add momentum for global economic growth.

Key data on GEI boosting economic development

- Investment in GEI will total USD 3.8 billion by 2050
- 300 million new jobs will be available globally by 2050

Accelerate infrastructure development

GEI accelerates the construction of energy and power infrastructure such as UHV, smart grid, clean energy, and energy storage for the leapfrog development of global infrastructure.

Key data on GEI accelerating infrastructure construction

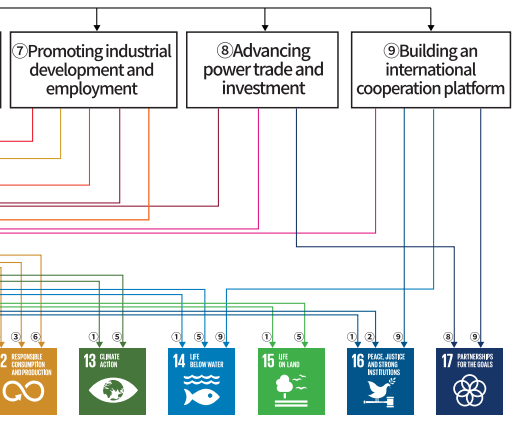
- By 2030, the length of high-voltage transmission lines of 220 kV and above will double to 5.3 million km compared to 2015
- By 2035, the installed clean power capacity will total 19 TW
- By 2050, the installed new-type energy storage capacity will reach 1.35 TW

Reduce and Eradicate Poverty Worldwide

GEI provides adequate energy supply for the economic development of underdeveloped countries. Through the development of clean energy and poverty alleviation industries, it increases the income of the poor, improves their living standards, and lifts them out of poverty.

Key data on GEI reducing global poverty

- By 2050, the energy and related industries will create new job opportunities, benefiting 100 million people in Asia, 150 million in Africa, and 5 million in Central and South America

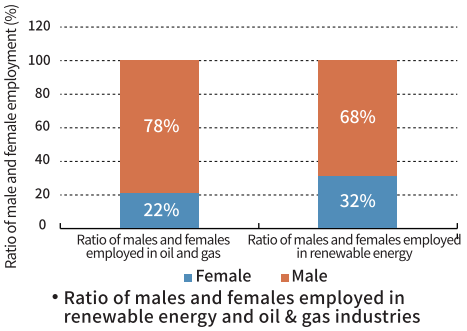


GEI Propels Sustainable Social Development

Ensure Equitable Education and Gender Equality

GEI propels the development of technology-intensive industries such as renewable energy and increases the proportion of women in the workforce, so as to ensure gender equality.

GEI improves the educational attainment rate through poverty reduction and teaching conditions through electricity supply, so as to ensure equitable education.



• Ratio of males and females employed in renewable energy and oil & gas industries

Promote Balanced Development among Countries and Regions

GEI leverages the complementary advantages of developed and developing countries in technology, market and resources, and help turn clean energy resource advantages of developing countries and regions into economic advantages, so as to promote the balanced development among countries and regions.

Ensure Global Peace and Harmony

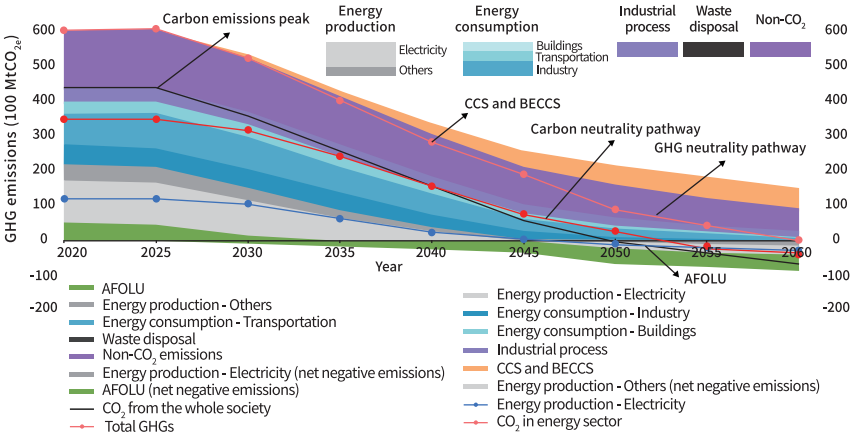
GEI builds an energy community based on extensive consultation and joint contribution, accelerates the shift from competition and conflict for fossil fuels to sharing and cooperative development of clean energy, and enhances mutual trust among people, so as to achieve common prosperity and peaceful development.

GEI Catalyzes Sustainable Environmental Development

Address Climate Change

GEI accelerates the comprehensive replacement of remaining fossil fuel by clean energy, decarbonizes all sectors in a deeper way through natural carbon sink, carbon capture, utilization and storage and other measures. It aims to neutralize global carbon emissions by 2050 and global GHG emissions by 2060.

GEI provides a technologically advanced, economically efficient, scalable and applicable solution for achieving the temperature control targets of the Paris Agreement.



Protect Ecological Environment

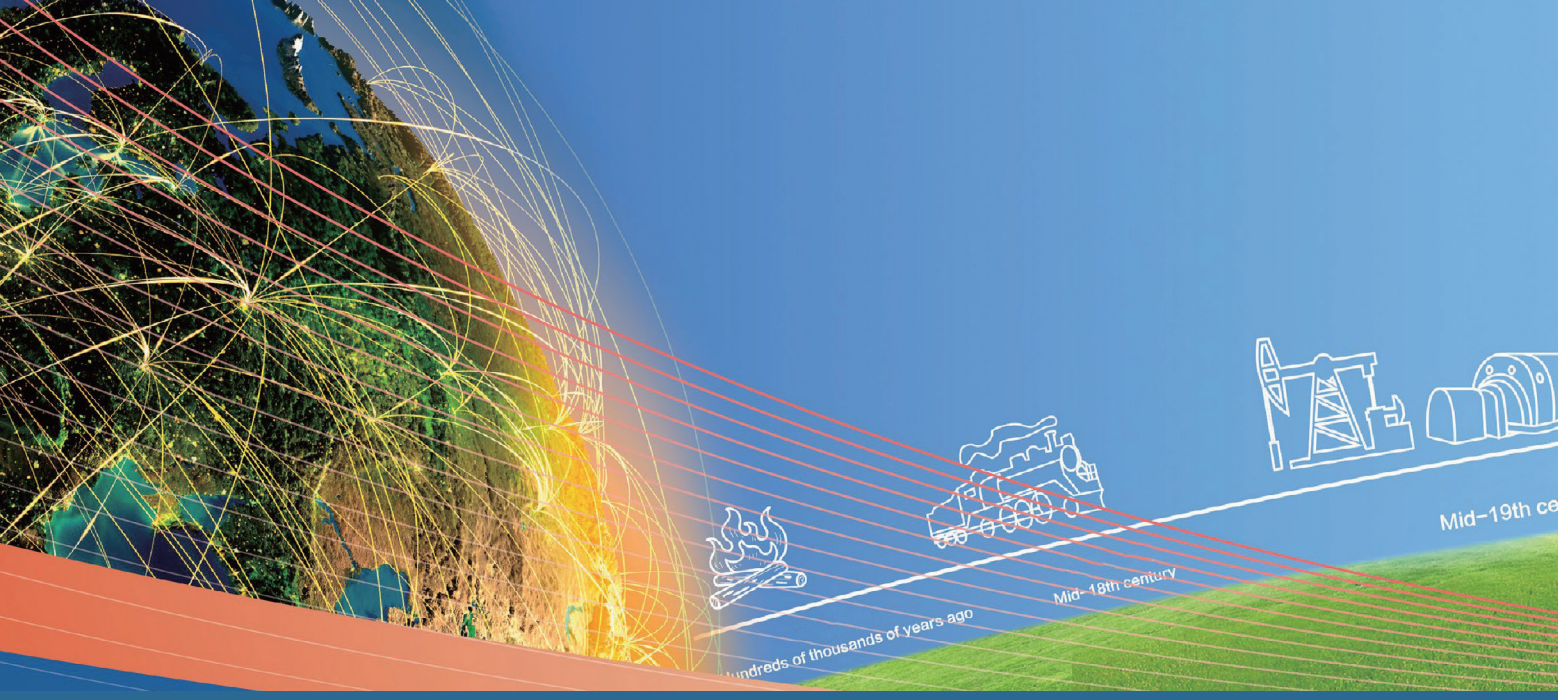
By significantly reducing the exploitation of fossil fuels, GEI curbs pollutant emissions, alleviates environmental degradation, and conserves biodiversity.

Key data on GEI enhancing environmental protection

- By 2050, the world's annual capacity of clean power generation will reach 70,000 TWh, which is equivalent to an annual reduction of 64 million tons of SO_2, 100 million tons of NO_X, and 14.6 million tons of $PM_{2.5}$
- By 2050, PV power stations in desertification areas will cover an area of 650,000 km², restoring nearly 1 million km² of desertification areas

Ensure Fresh Water Supply

As an innovative model of GEI, the new-type pumped storage uses renewable energy to lift water from the river channel to a higher reservoir for energy storage. The water is then diverted across river basins through water canals for wide-area water transfer. It can not only alleviate water shortage, but also improve the regulation capacity of power system, with broad application prospects.



4 GEI Action to Implement the 2030 Agenda

Ten GEI Actions to Implement the 2030 Agenda

GEI development requires combined efforts with the UN leading the way and strengthened cooperation between governments, industry organizations, social groups and energy enterprises.

▶▶▶Action on Clean Development

Accelerate the global exploitation of clean energy, significantly increase the proportion of clean energy in the energy mix, and ensure adequate supply of clean energy

Global development of large-scale clean power generation bases

Project	Solar power base	Wind power base	Hydropower base
Number	9	16	15
Scale by 2035	1.71 TW	900 GW	880 GW
Scale by 2050	3.82 TW	1.49 TW	1.3 TW

▶▶▶Action on Power Grid Interconnection

Strengthen domestic and transnational grid interconnection and build safe, inclusive and efficient power infrastructures

Representative projects of power grid interconnection

Region	Major project	Voltage level	Length	Investment
Asia-Europe	Aktobe-Munich DC Transmission Project from Kazakhstan to Germany	±800kV	3500km	USD 6.2 billion
Asia-Africa	Tabuk-Cairo DC Transmission Project from Saudi Arabia to Egypt	±660kV	2000km	USD 2.2 billion
Europe-Africa	Tunisia-Rome DC Transmission Project From Tunisia to Italy	±800kV	1300km	USD 4.4 billion
North America-Central and South America	Mexico City-Peru Ingilto DC Transmission Project	±800kV	5200km	USD 11.5 billion

▶▶▶Action on Universal Access to Electricity

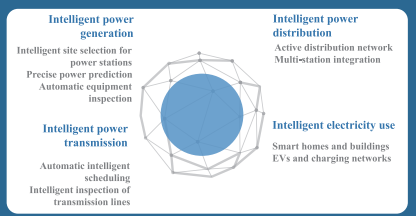
Promote and achieve universal access to electricity and ensure affordable, reliable, sustainable and modern energy for all

▶▶▶Action on Electricity Replacement

Replace coal, oil, gas and firewood with electricity in industry, transportation, commercial and residential use to significantly increase the share of electricity in the total final energy consumption

▶▶▶Action on Smart Power Grid

Promote the application of intelligent technologies and equipment in the power system to meet the needs of large-scale interconnection and consumption of clean energy, as well as meet users' needs on interactive and diverse services



▶▶▶ Action on Energy Efficiency Enhancement

Reduce energy intensity and establish an efficient and sustainable pathway for energy development through technology advancement, management innovation, and shifts in energy production and consumption patterns

Energy Production	Energy Allocation	Energy Consumption
◉ Improve the efficiency of clean power generation ◉ Improve the efficiency of coal use ◉ Accelerate the application of energy-saving technologies and equipment ◉ Enable universal access to modern energy	◉ Promote the application of advanced transmission technologies ◉ Build an efficient and intelligent distribution network	◉ Promote energy-saving technologies in industrial production ◉ Enhance energy conservation in transportation and building sectors

▶▶▶ Four Supportive Actions

◉ Innovation driven

Provide technical and financial guarantee for the smooth implementation of engineering projects with focus on the innovation of technology, finance and modes

◉ Capacity building

Help developing countries accelerate the enhancement of their capabilities in development, science and technology, and research through international assistance, cooperation and exchanges

◉ Policy support

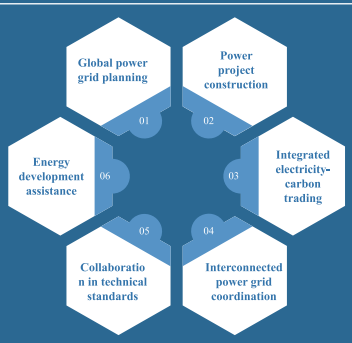
Leverage the guiding and coordinating role of international organizations, encourage governments to formulate relevant policies, plans and measures for GEI development, and promote policy coordination among countries

◉ Concept promotion

Mobilize forces from all sectors of society to enhance the concept promotion, consolidate the foundation for GEI development, and create a favorable atmosphere for all parties to make concerted efforts

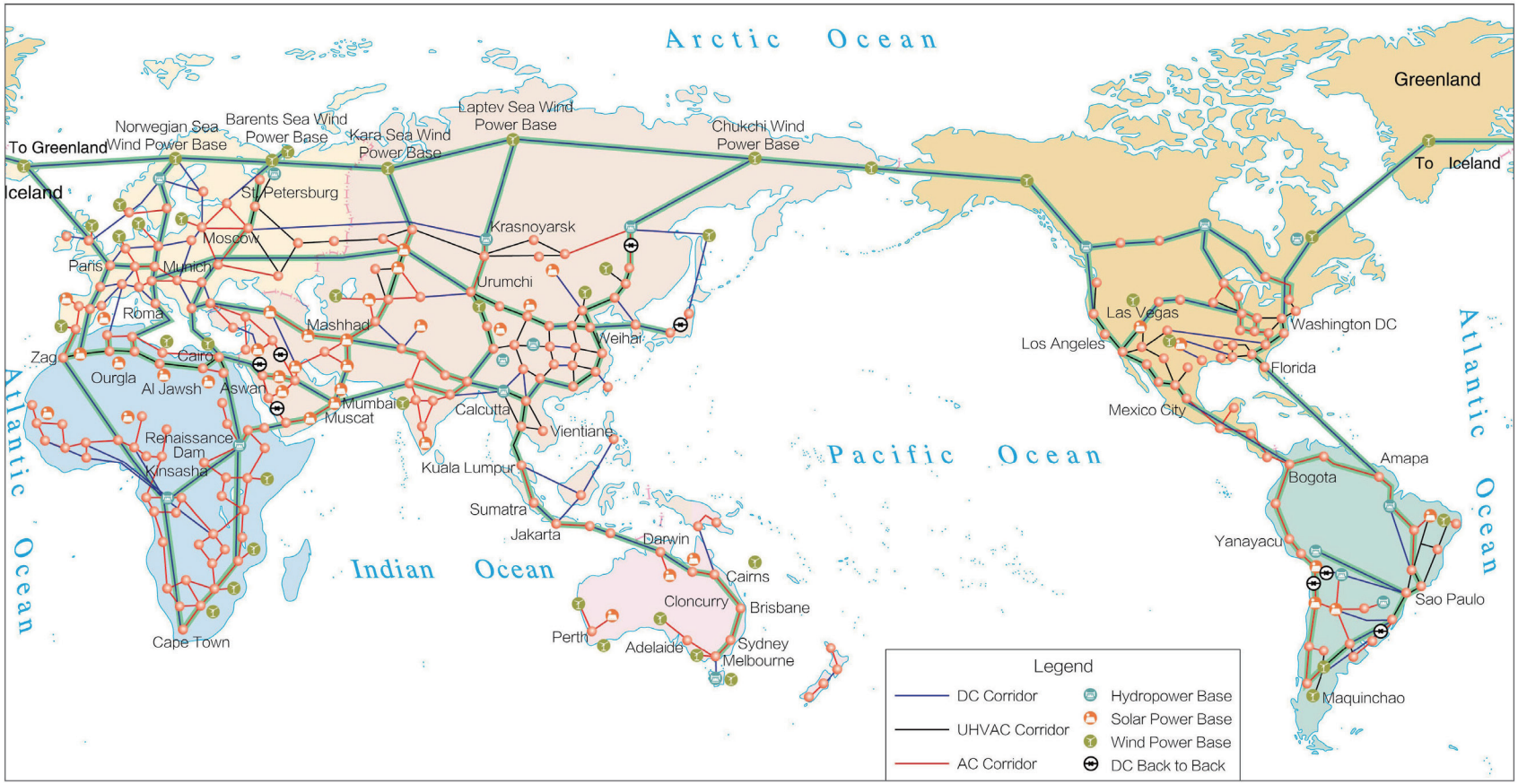
GEI Cooperation Mechanism

GEI development requires an efficient cooperation mechanism to combine efforts of all parties, covering energy, economy, society and other fields, involving the demand side, investors, service providers and other entities.



Overall Layout of Backbone Grid of Global Energy Interconnection

In-depth research has been conducted on the resource endowment, energy demand, economic and social conditions across major continents worldwide. This groundbreaking research has led to the development of two innovative "1+6" planning frameworks. One is about the energy interconnection research outlook covering major continents worldwide. The other is about the development and investment in clean energy resources. They provide an action guide for global energy interconnection construction.



GEIDCO Wechat

GEIDCO Weibo

Wechat Video Channel

GEIDCO TikTok

Twitter
@GEIDCO_Official

Facebook
@GEIDCO

WEI Mobile App
APP Store Android