



Towards Sustainable Development

Global Energy Interconnection Roadmap to Promote the *2030 Agenda for Sustainable Development*



**Global Energy Interconnection Development and
Cooperation Organization
September 22, 2020**



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

On September 26, 2015, Chinese President Xi Jinping proposed discussions on " **developing Global Energy Interconnection to facilitate efforts to meet global power demand with clean and green alternatives** " at the UN Sustainable Development Summit.



At the Belt and Road Forum for International Cooperation on May 14, 2017, President Xi again proposed to "**develop Global Energy Interconnection and achieve green and low-carbon development**".



On November 1, 2017, UN Secretary General António Guterres remarked that "**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**" at a high-level symposium on Global Energy Interconnection held at the UN Headquarters.





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1. Proposal and Development of 2030 Agenda and GEI

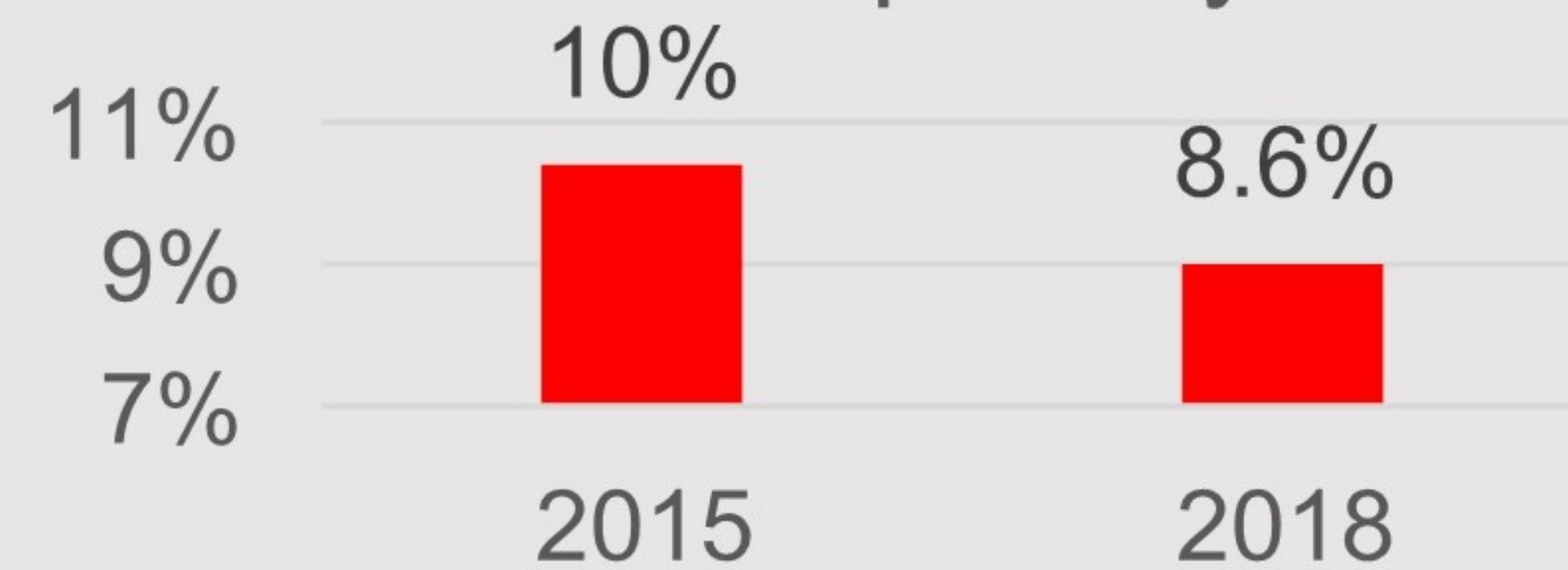
1.1 2030 Agenda Defines New Goals for Sustainable Development



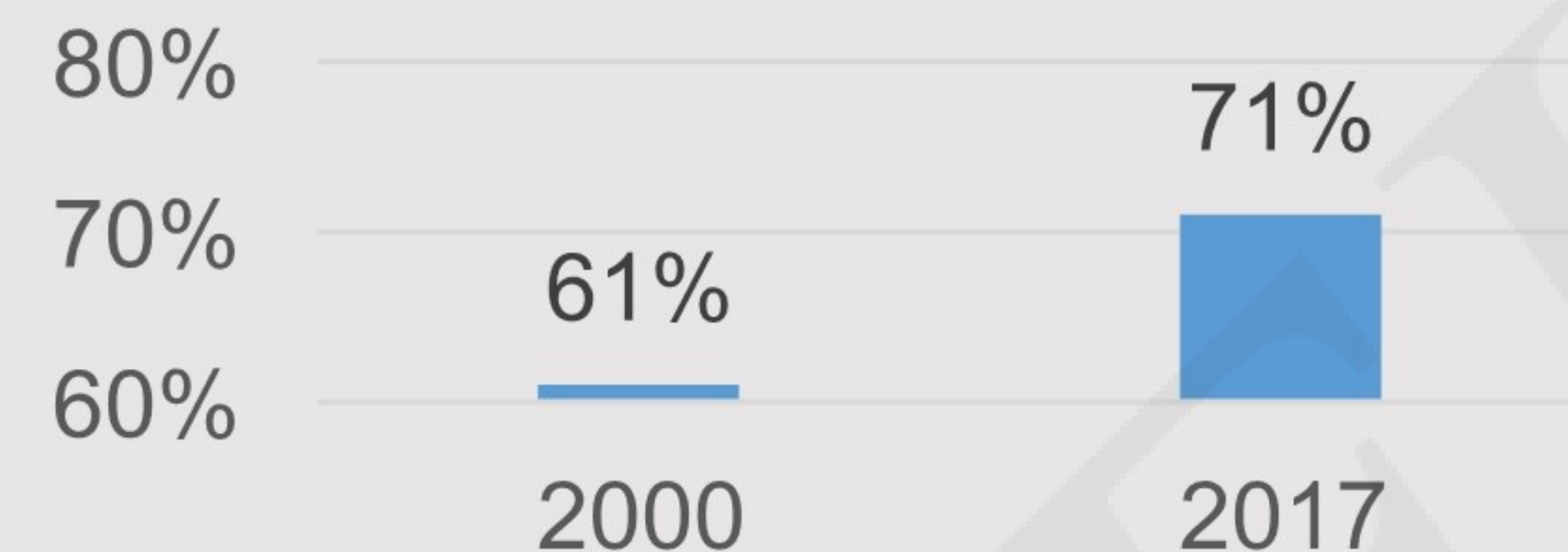
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In September 2015, the *Transforming Our World: The 2030 Agenda for Sustainable Development* was adopted at the UN Sustainable Development Summit, which set out the goals to be achieved by 2030, including 17 sustainable development goals (SDGs) and 169 sub-goals.

Proportion of population living below the international poverty line...



Proportion of population with access to safe drinking water



Economy

- Poverty remains a challenging issue
- Natural resources are depleting
- World economic growth momentum is weak

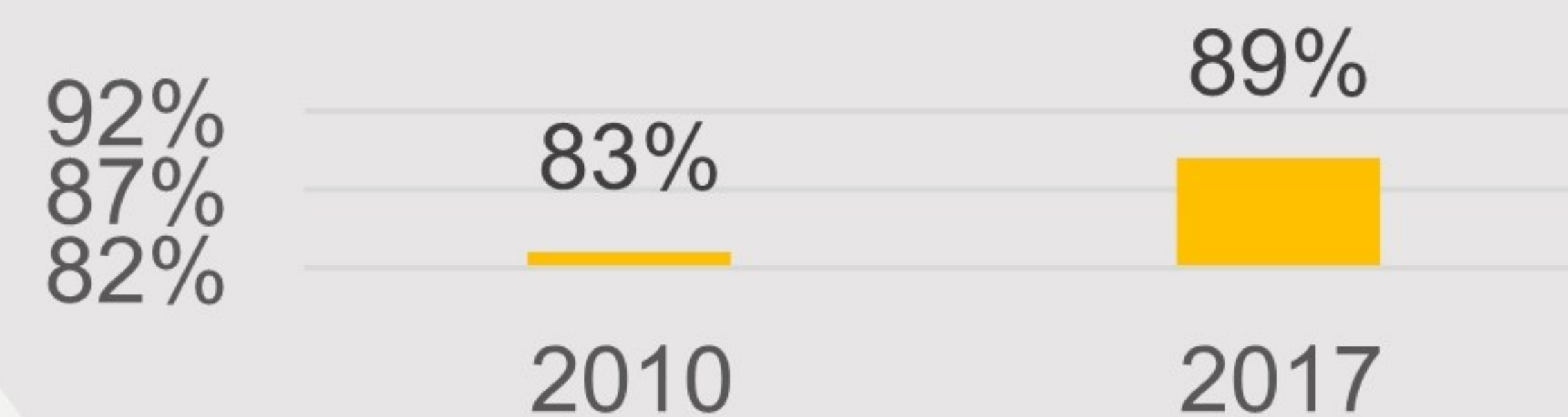
Society

- Imbalance and inequality issues are acute
- Conflict and violence intensifies social unrest and insecurity
- Health problems restrict well-being and sustainable social development

Environment

- Climate change grows ever more pressing
- Environmental pollution poses a serious threat to human survival
- Environmental degradation is getting worse

Proportion of population with access to electricity



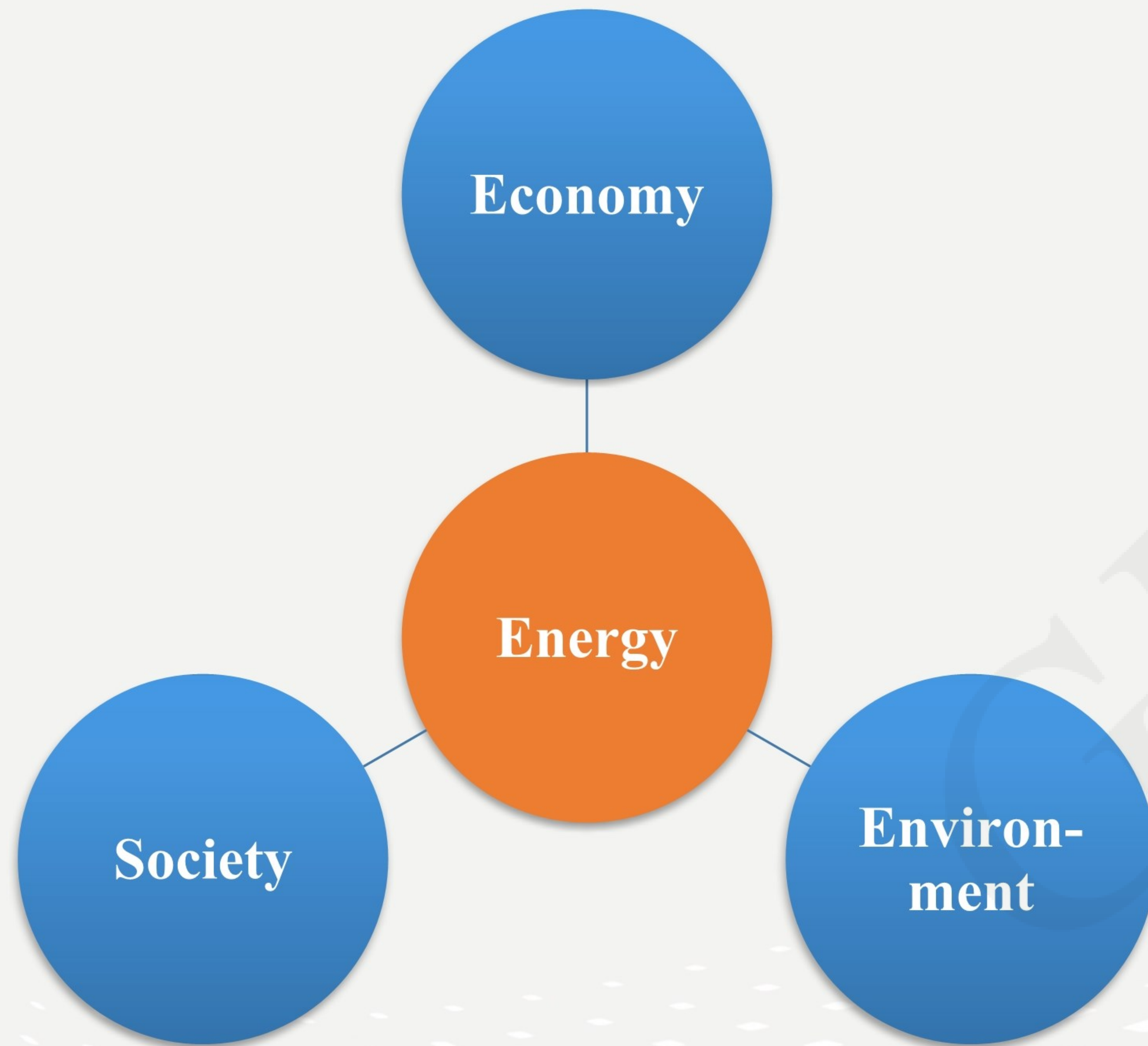
Global R&D investment (USD 100 million)



Achieving sustainable development requires top-level design and the joint participation of governments, businesses, institutions and civic societies. Taking key areas as a breakthrough point, we urgently need to find an implementable and scalable systematic solution.



■ Energy is in the leading position in sustainable development



- **As for economy**, energy production and consumption are involved in the whole process of economic activities and play a vital role in ensuring and promoting economic development and productivity improvement.
- **As for society**, in addition to propelling the progress of social productivity, energy also advances the formation and development of production relations to a large extent, thus exerting a great effect on social forms, structures and operating modes.
- **As for environment**, energy development and utilization have a huge impact on the ecological environment. In particular, fossil energy-based development pattern is the root cause of climate and environmental issues.

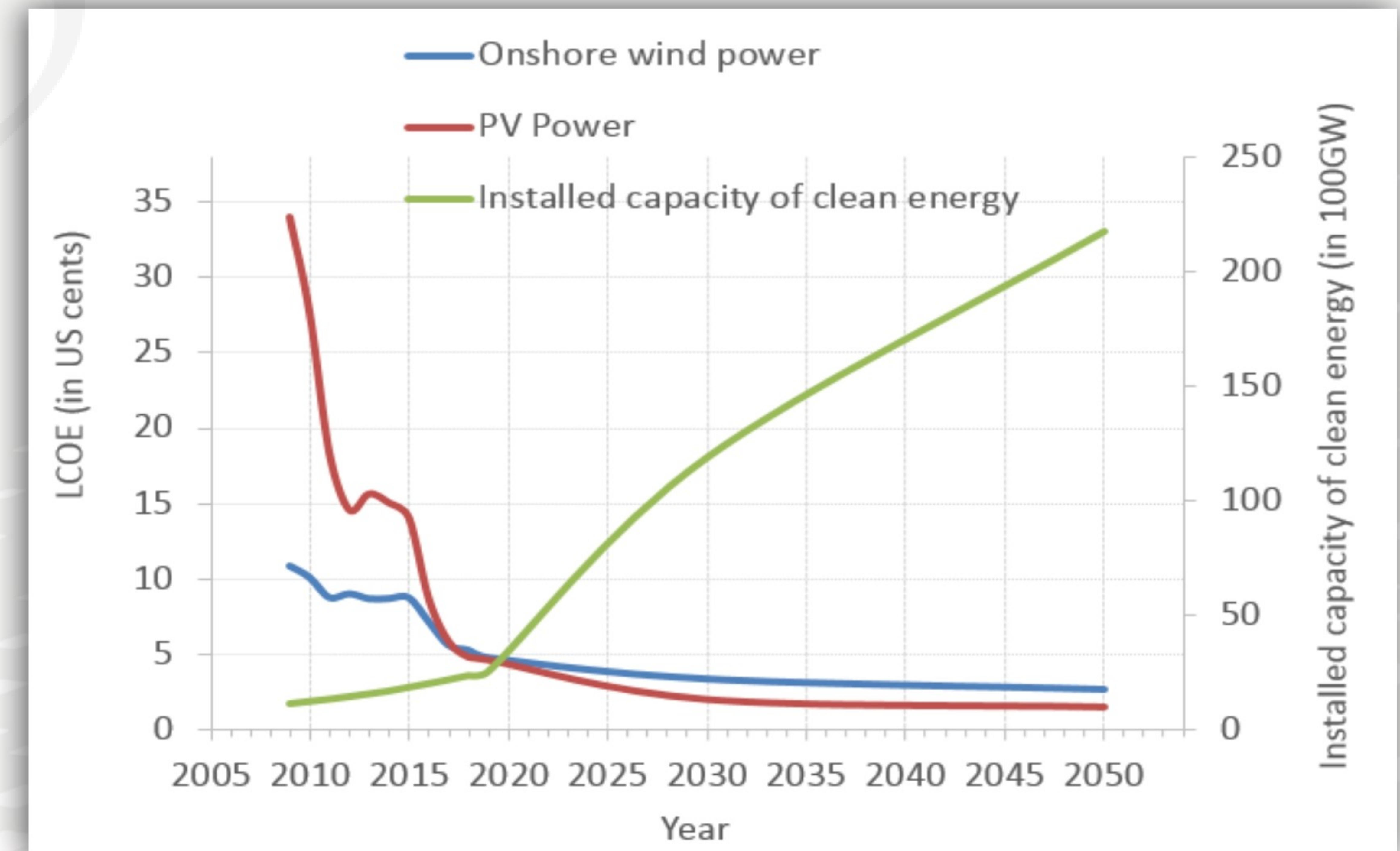
Energy is a key aspect of sustainable development, for which clean energy is essential.

1.2 GEI Opens up A New Clean Development Path



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- The core of sustainable development lies in clean development.
- As a significant platform for large-scale exploitation, transmission and consumption of clean energy at a global scale, GEI is an important enabler for energy transition and upgrading, emission reduction and efficiency enhancement. In essence, it is the combination of **"Smart Grid + UHV Grid + Clean Energy"**.
- GEI will boost **"three shifts"** in the energy system, steering toward a path of clean development
 - Energy production shifts to **"clean energy-dominant approach"**.
 - Energy allocation shifts to **"global interconnection"**.
 - Energy consumption shifts to **"electric-centered approach"**.



Installed Capacity Growth and Cost Reduction of Clean Energy under the GEI Scenario

1.2 GEI Opens up A New Clean Development Path



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■ GEI from China's Initiative to Global Action

Concept promotion

- GEI has been incorporated into the frameworks of the 2030 Agenda, the Paris Agreement, global environmental governance and the solution to address electricity access, poverty and health issues.
- GEI has been included in the policy recommendations of the UN high-level political forum for three consecutive years.

Research innovation

- The theoretical systems of "two replacements" and "energy, transportation and information integration (ETI)" have been established.
- The reports for research and outlook on global and six continents' energy interconnection ("1+6") have been released.
- The GEI Standards System and Technology & Equipment Innovation Outline have been released.

Project promotion

- Great progress has been made in advancing the China-ROK, China-Myanmar-Bangladesh, as well as Ethiopia and Gulf States grid interconnection projects.
- The development of energy interconnection has been furthered in Africa, Southeast Asia, Latin America and other regions through the co-development of electricity, mining, metallurgy, industry and trade.

Cooperation platform

- Membership network: GEIDCO has more than 1000 members, covering 125 countries.
- Alliance network: GEI university alliance, GEI think tank alliance, GEI finance alliance and GEI equipment alliance have been established.
- Operating network: 7 regional offices and 62 country offices have been set up across the globe.
- Communication network: GEI journals in Chinese and English have been established.



Examples of GEI Research Results



GEIDCO, GCCIA, and MWIE Signed A
Tripartite Cooperation Agreement

1.2 GEI Opens up A New Clean Development Path



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■ Major progress has been made in developing GEI in China.

UHV Grid

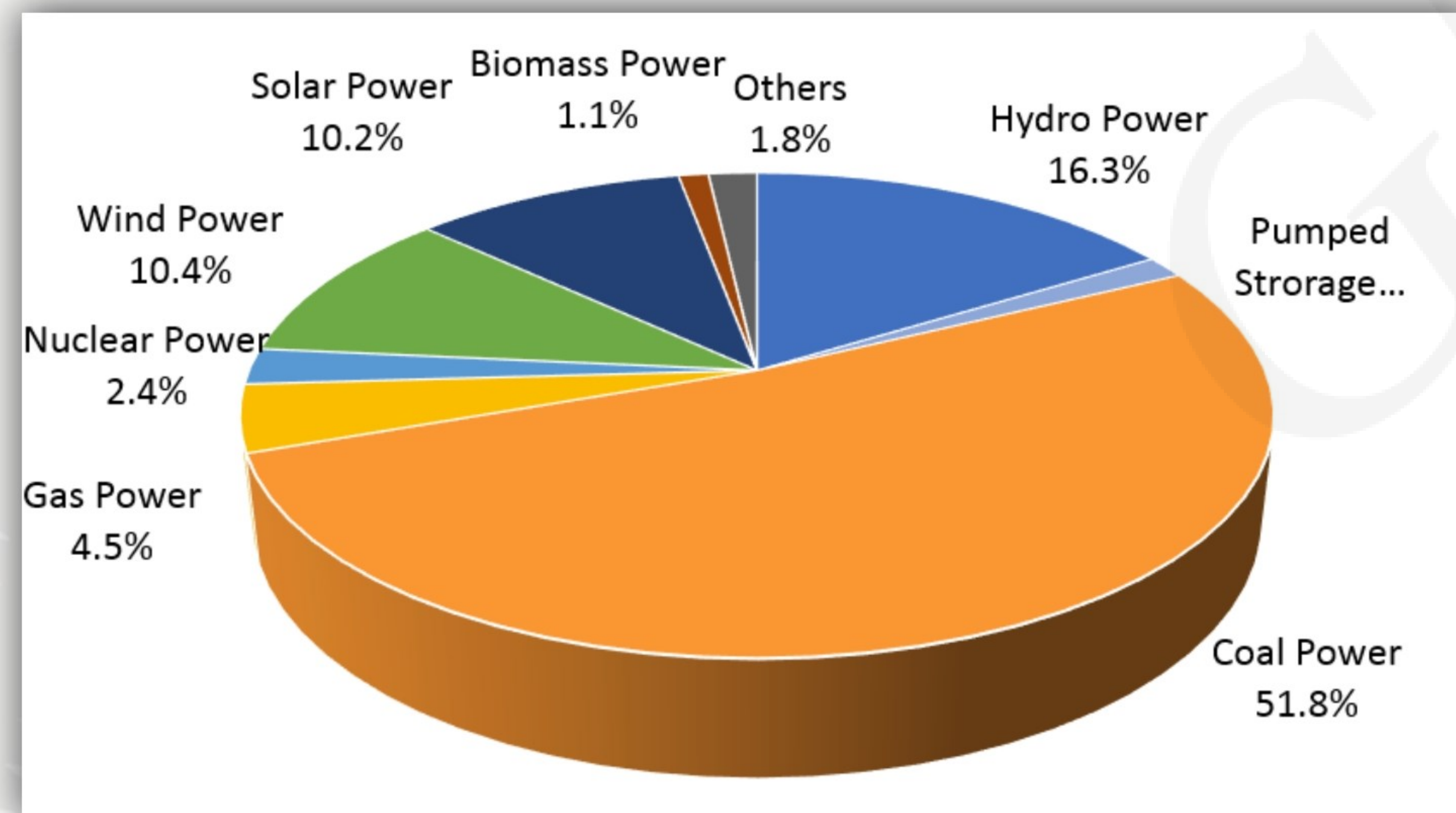
- 11 UHV AC projects and 14 UHV DC projects have been completed and put into operation
- 3 UHV AC projects and 4 UHV DC projects are under construction
- A line length of 45,000 km
- Power transformation (conversion) capacity of 450 million kVA

Smart Grid

- Zhangbei VSC DC Project, National Wind, Solar, Storage and Transmission Demonstration Project
- Energy storage capacity of 32 GW
- 600 million smart meters
- 1.22 million charging piles

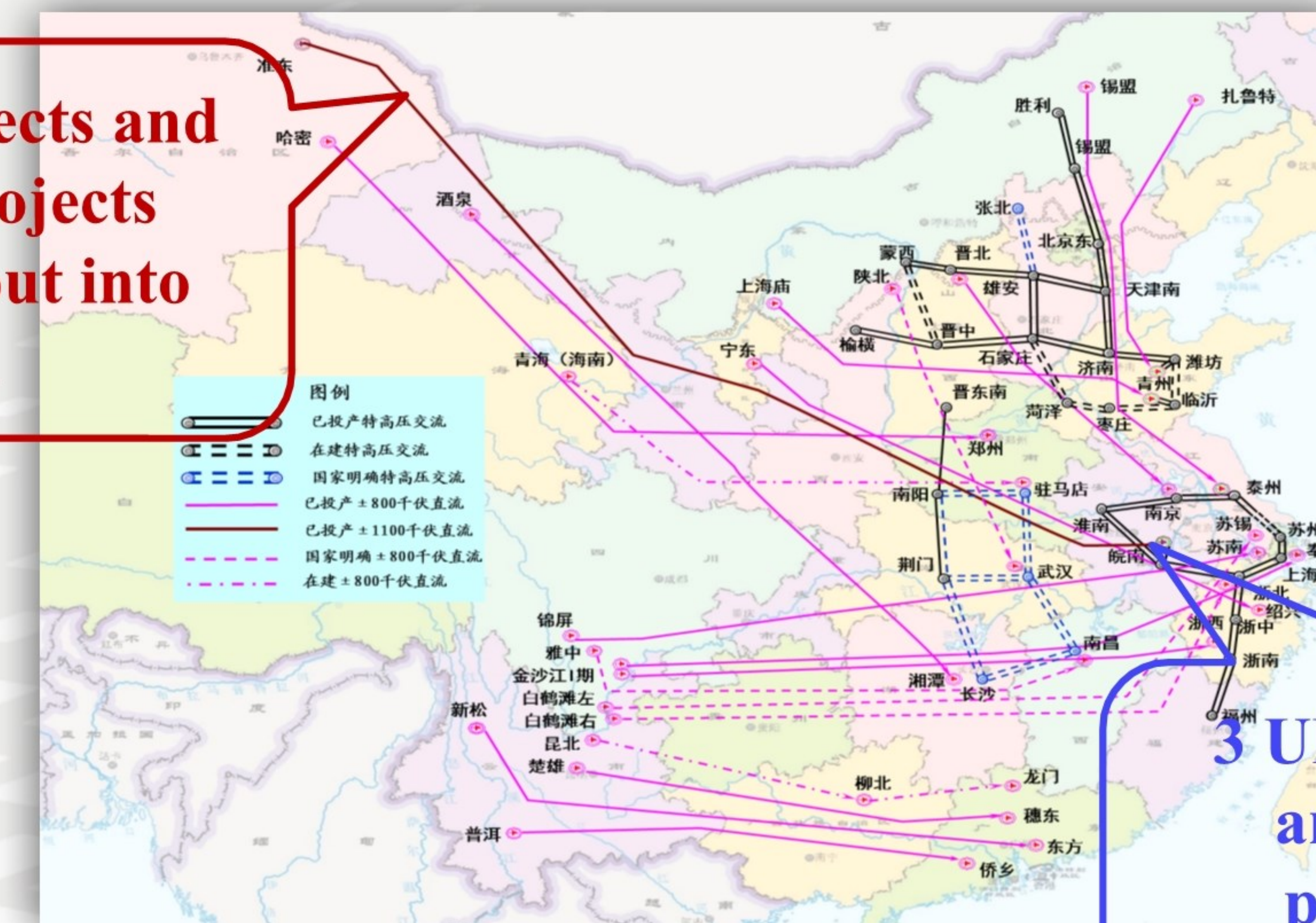
Clean Energy

- Hydropower capacity of 360 GW
- Wind power capacity of 210 GW
- Solar power capacity of 200 GW
- Qinghai Province power network runs entirely on renewable energy for 31 consecutive days



Proportion of Installed Capacity of Various Power Sources in China in 2019

11 UHV AC projects and 14 UHV DC projects completed and put into operation



UHV Development in China

3 UHV AC projects and 4 UHV DC projects under construction



2. GEI Alignment with the 2030 Agenda for Sustainable Development

GEI contributes to the realization of SDGs in 2030 Agenda

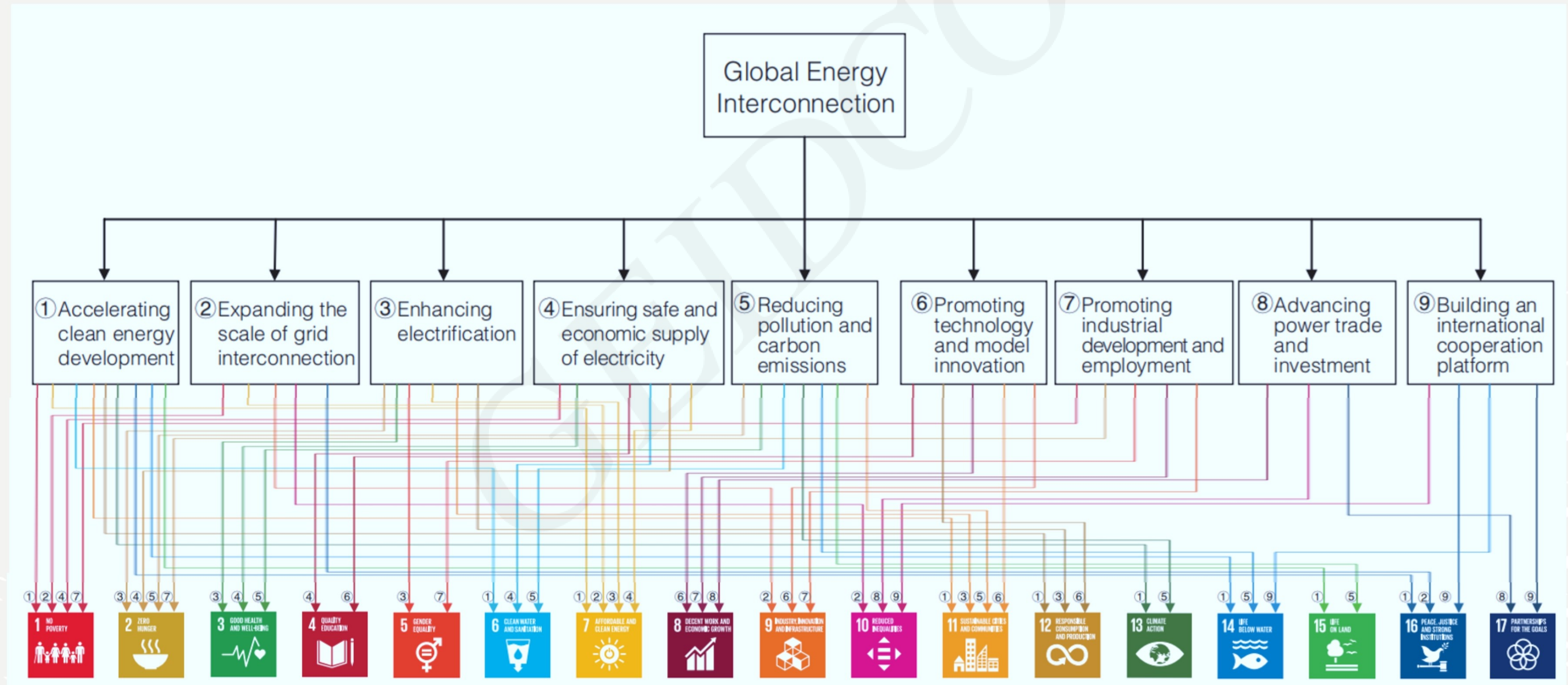


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GEI

Nine Direct Benefits

17 SDGs



Correlation Model between GEI and SDGs of 2030 Agenda

GEI contributes to the realization of SDGs in 2030 Agenda



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(1) Decisive and Overall role

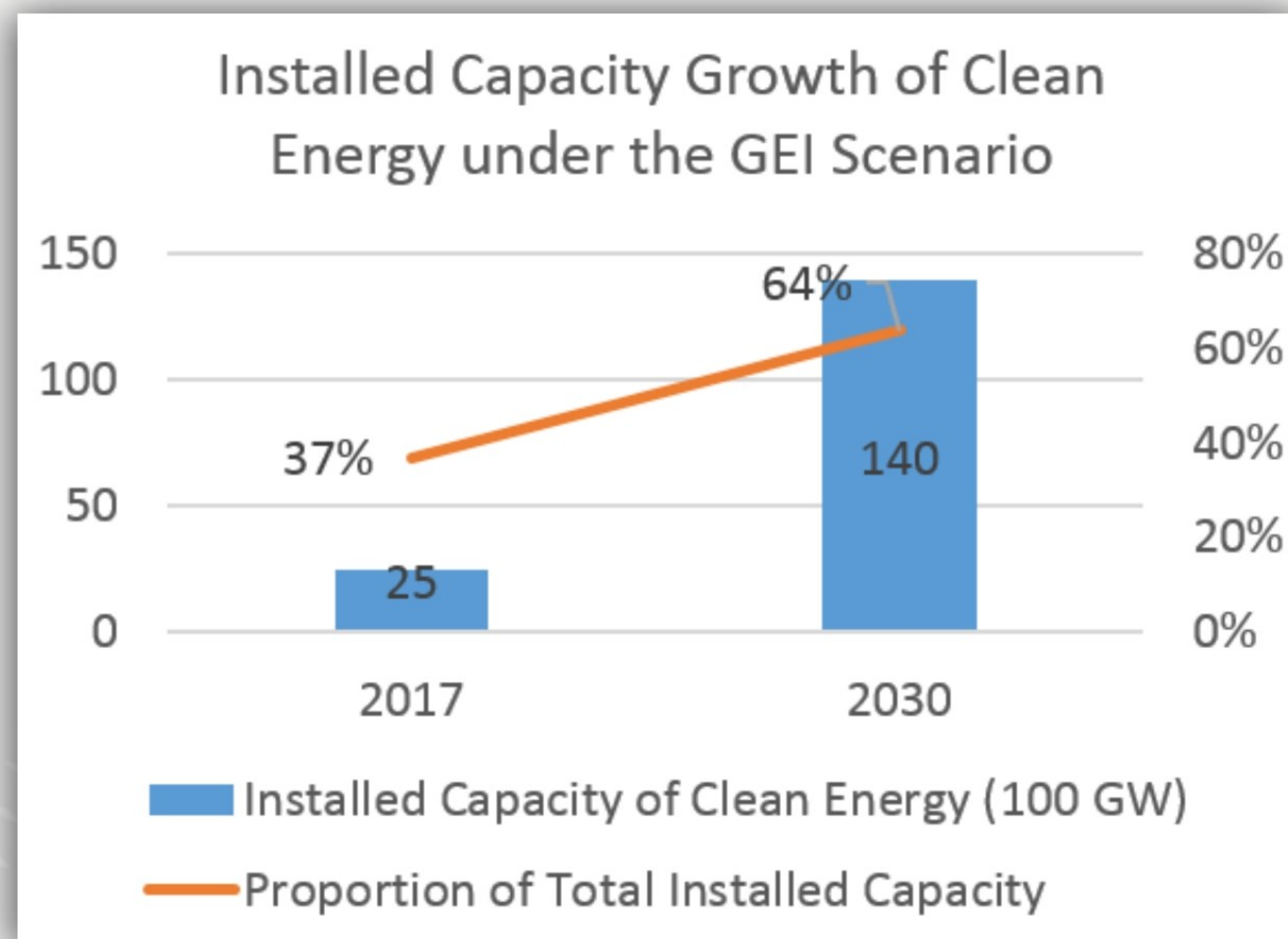


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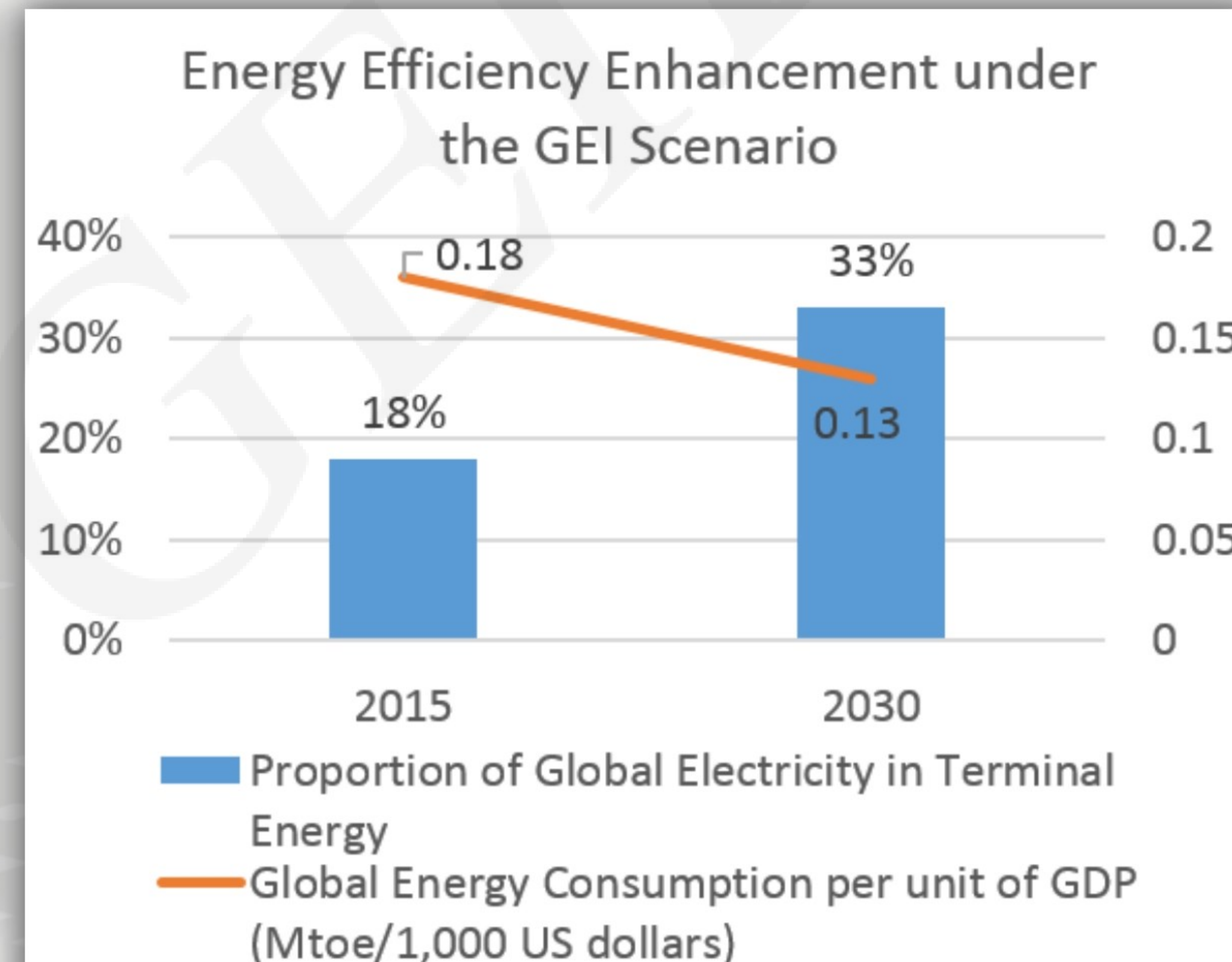


Expedite large-scale exploitation of clean energy to **drive clean replacement**
Comprehensively accelerate electrification to **boost electricity replacement**
Expand power grids and develop distributed power supply to **solve the problem of population without electricity access**

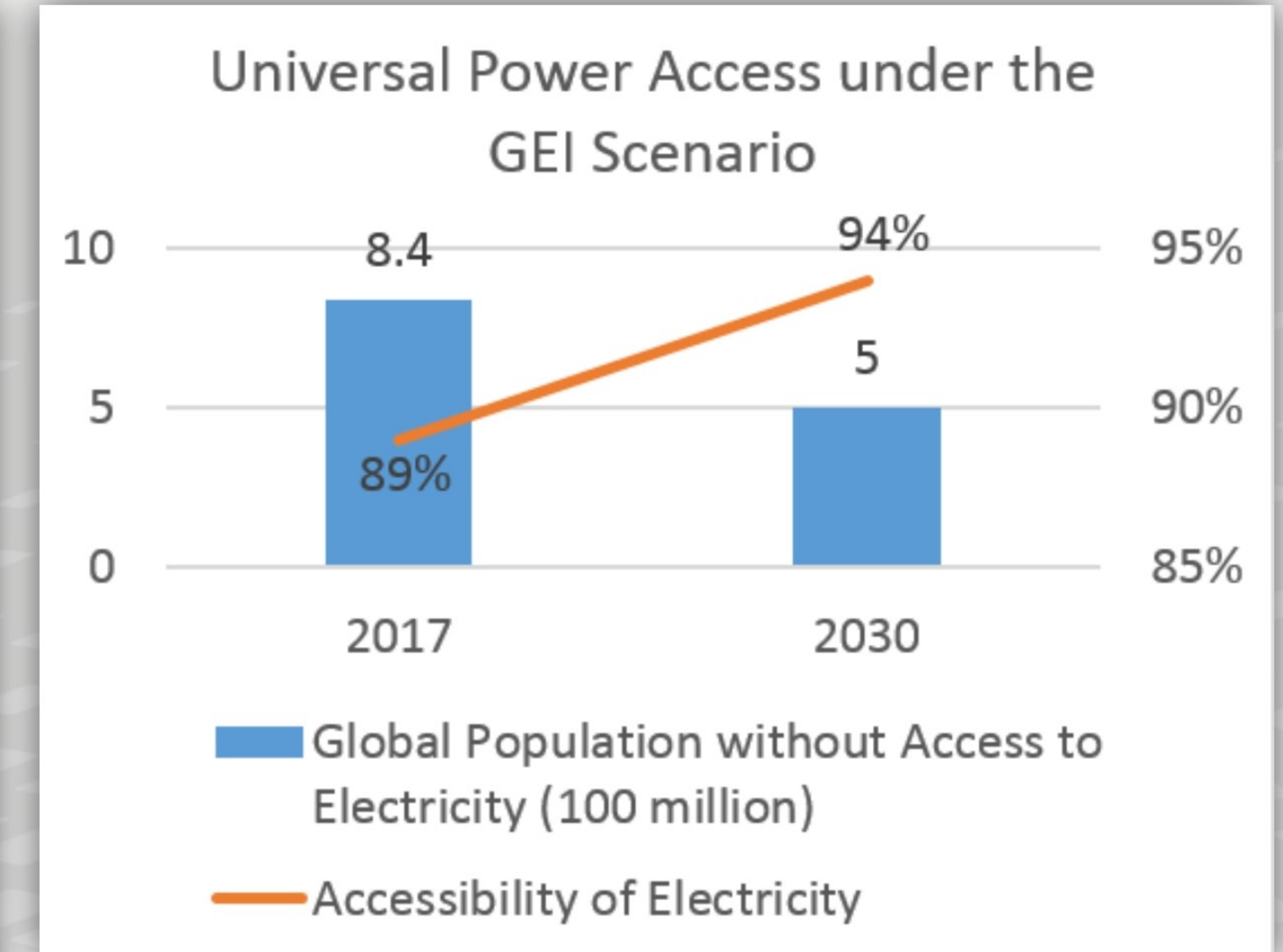
Drive clean replacement



Boost electricity replacement



Address limited electricity access



(1) Decisive and Overall role

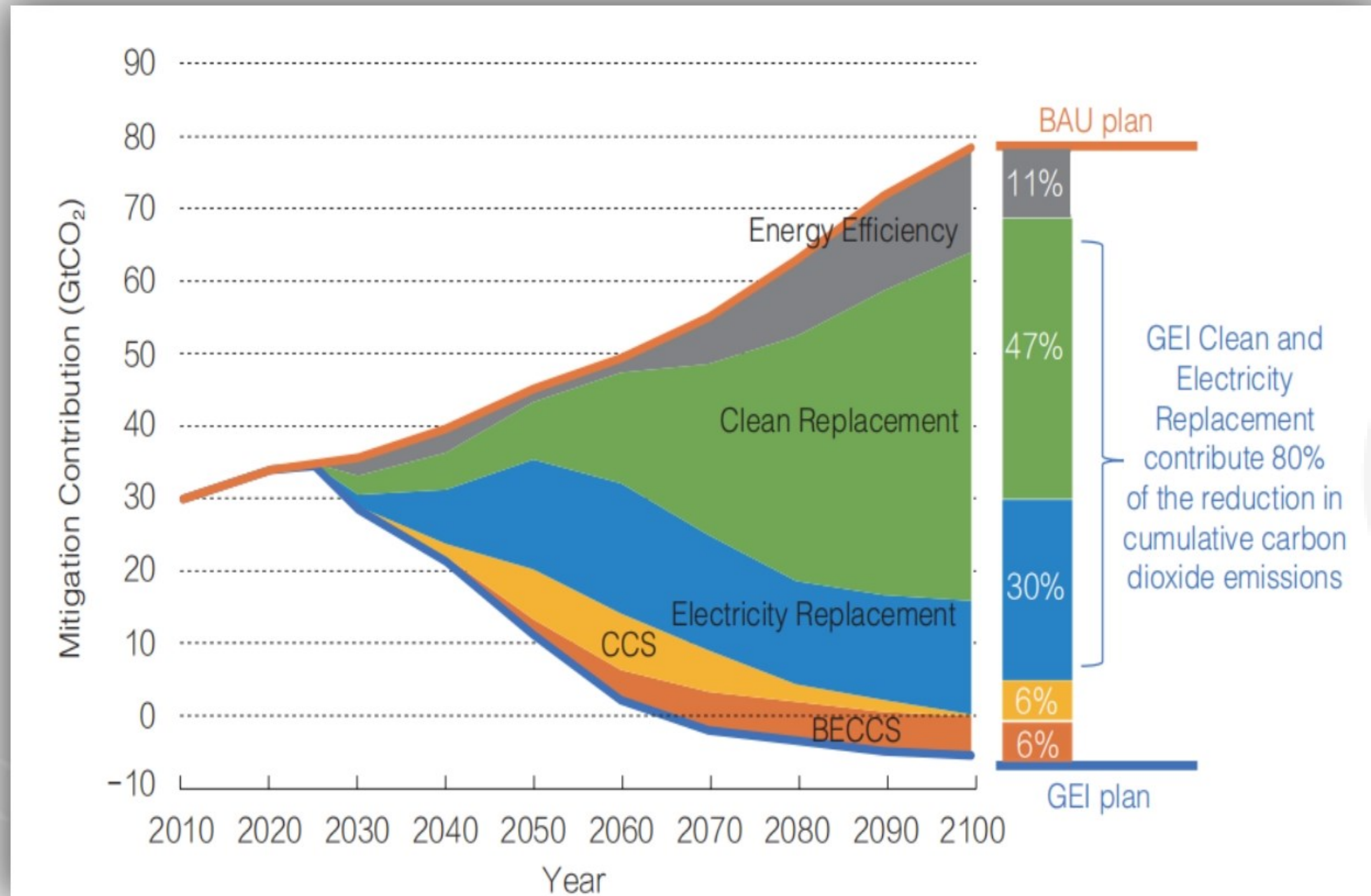


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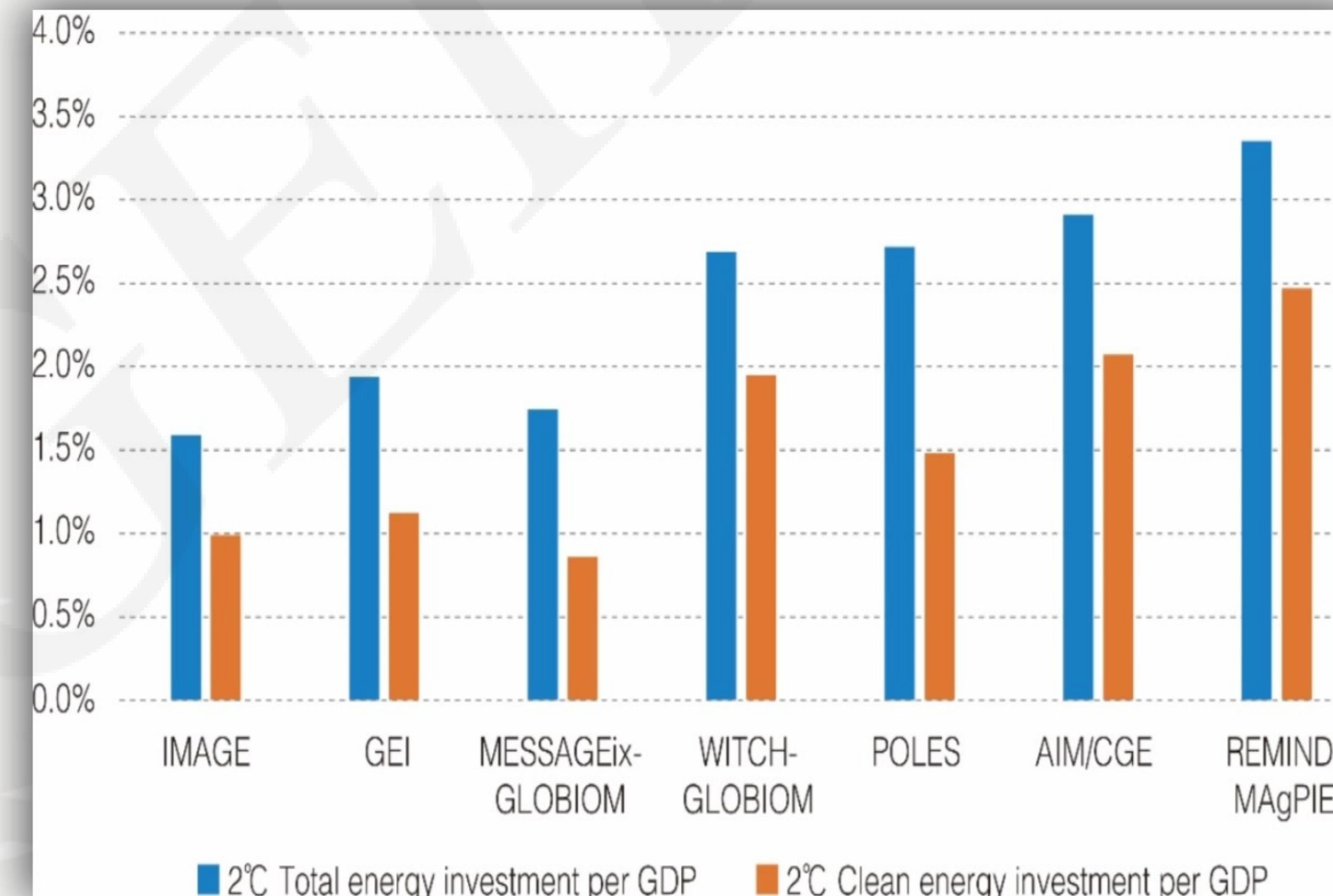
Accelerate the decarbonization of energy system to **achieve carbon reduction targets**
Promote energy transition in a more economical way to **reduce mitigation cost**
Deliver USD 9 in social benefits for every USD 1 invested in energy system to **improve mitigation efficiency**

Achieve carbon reduction targets



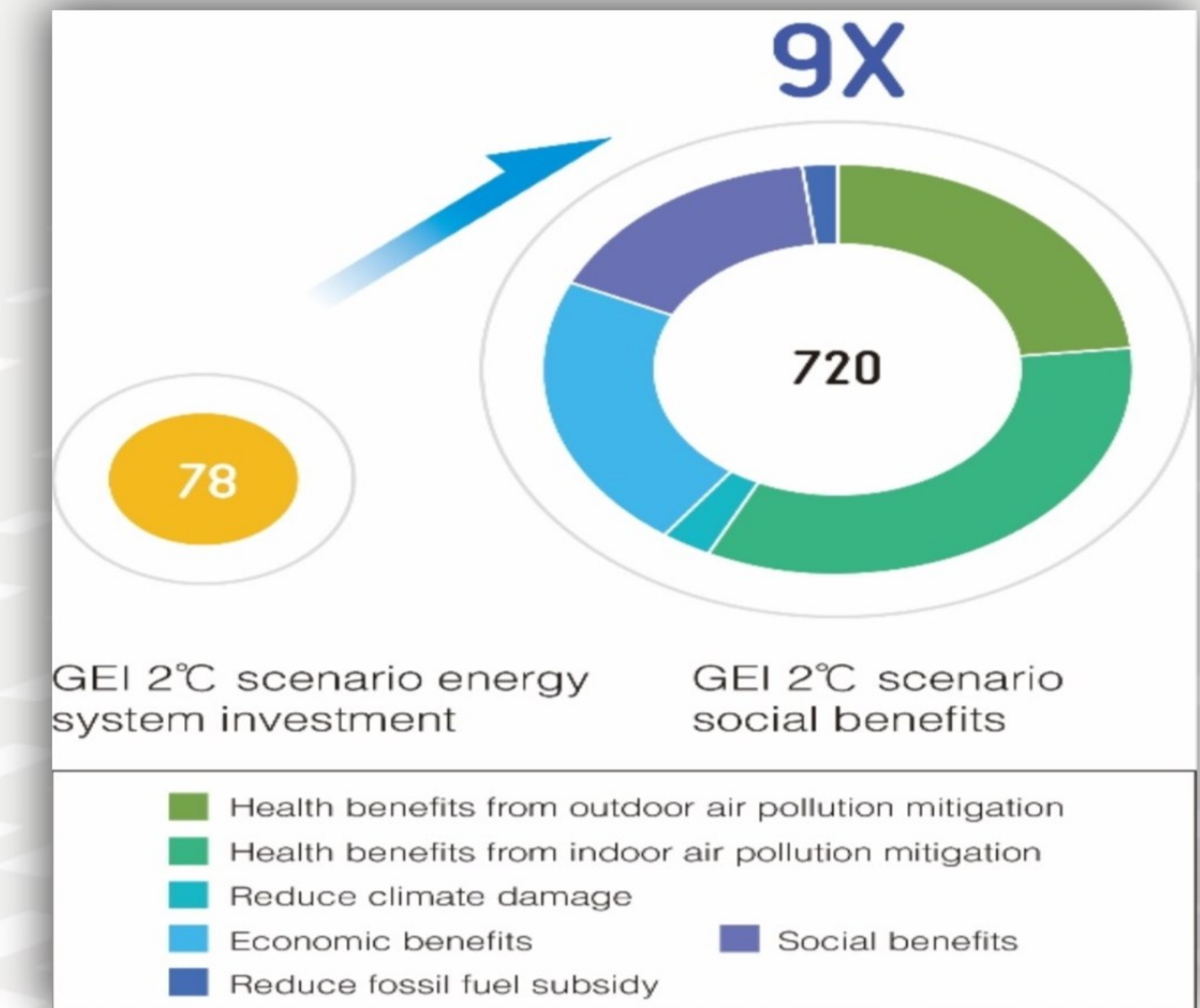
GEI Mitigation Roadmap

Reduce mitigation cost



GEI Investment vs. Other Scheme Investment

Improve mitigation efficiency



GEI Increases Social Benefits

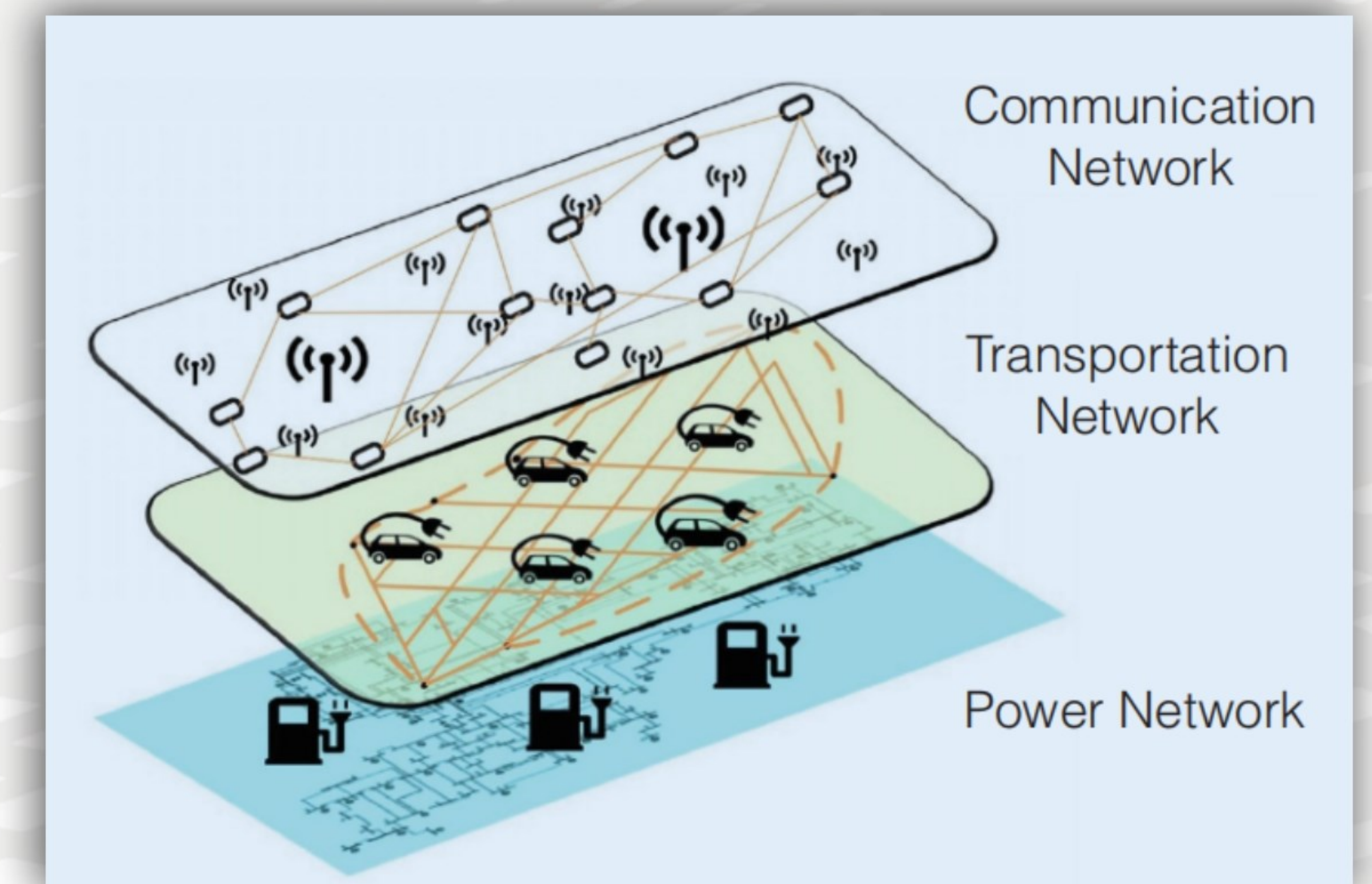
(2) Critical and Leading role



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Key Data on GEI Boosting Economic Development

Year	Achievements
2030	Cross-border electricity trade volume will reach 8,000 TWh, with a value of about USD 700 billion
2050	The total investment in GEI will exceed USD 30-40 trillion
2050	A total of 300 million new jobs will be created globally



ETI Development Model



Alleviate environmental pollution through replacing fossil fuels with clean energy
Improve medical and sanitary conditions through ensuring electricity supply
Enhance the welfare of disadvantaged groups through advancing modern electrical civilization



Ensure water supply through developing seawater desalination and reducing water use of energy industry
Relieve water quality deterioration through reducing waste discharge and promoting sewage treatment
Reduce waste pollution through promoting energy-from-waste and biomass power generation



Promote electricity investment and trade through energy innovation and transition
Offer more jobs through integrated development of upstream and downstream industries
Bolster industrial upgrading and model innovation through green and low-carbon development



Upgrade infrastructure through ETI
Drive industrialization in developing countries through electrification
Boost technological innovation through R&D and application of key equipment

(2) Critical and Leading role



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Accelerate China's urbanization process through building energy facilities
Accelerate green and low-carbon urban development through clean energy development and electrification
Promote the development of smart cities and communities with smart devices



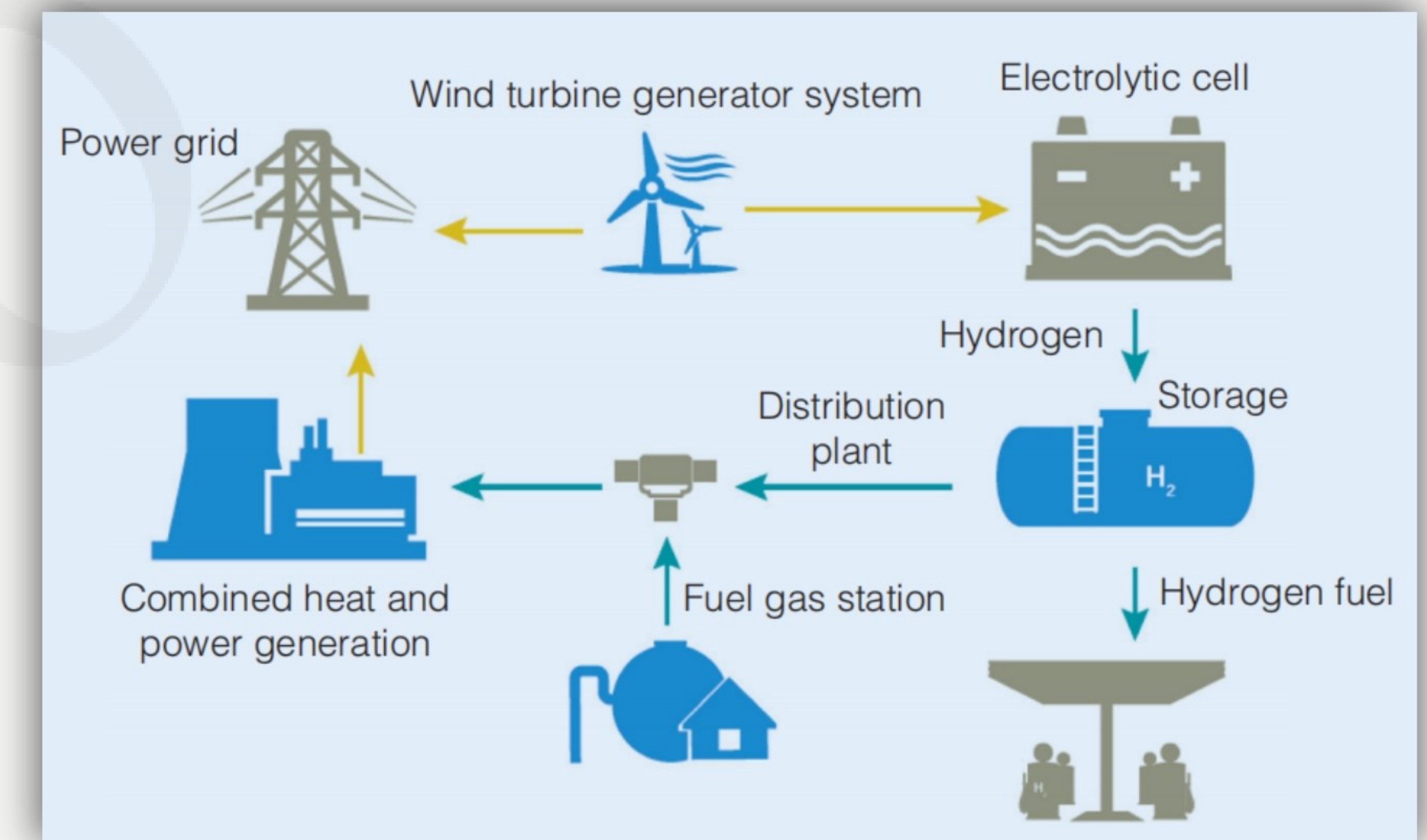
Achieve sustainable energy production and consumption with renewable energy
Impel the regeneration and recycle of production materials through electrosynthesis of fuels and raw materials
Stimulate the development of a resource-saving society through efficient application of electricity



Ease marine pollution through reducing oil and gas spills
Mitigate ocean acidification through clean development of energy system
Catalyze maritime cooperation through jointly developing marine clean energy



Reduce land destruction through alleviating energy exploitation
Protect forests and biodiversity through climate and environmental management
Boost desertification control through developing desert solar power



Clean Electrohydrogen Production and Its Comprehensive Utilization



A "Desertification Control via PV Technology" project in Kubuqi desert in Inner Mongolia China

(3) Supportive and Synergistic role



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Improve living conditions through popularizing household appliances
Develop poverty-alleviation industries through developing processing and manufacturing industries
Increase the income of the poor through developing distributed power generation



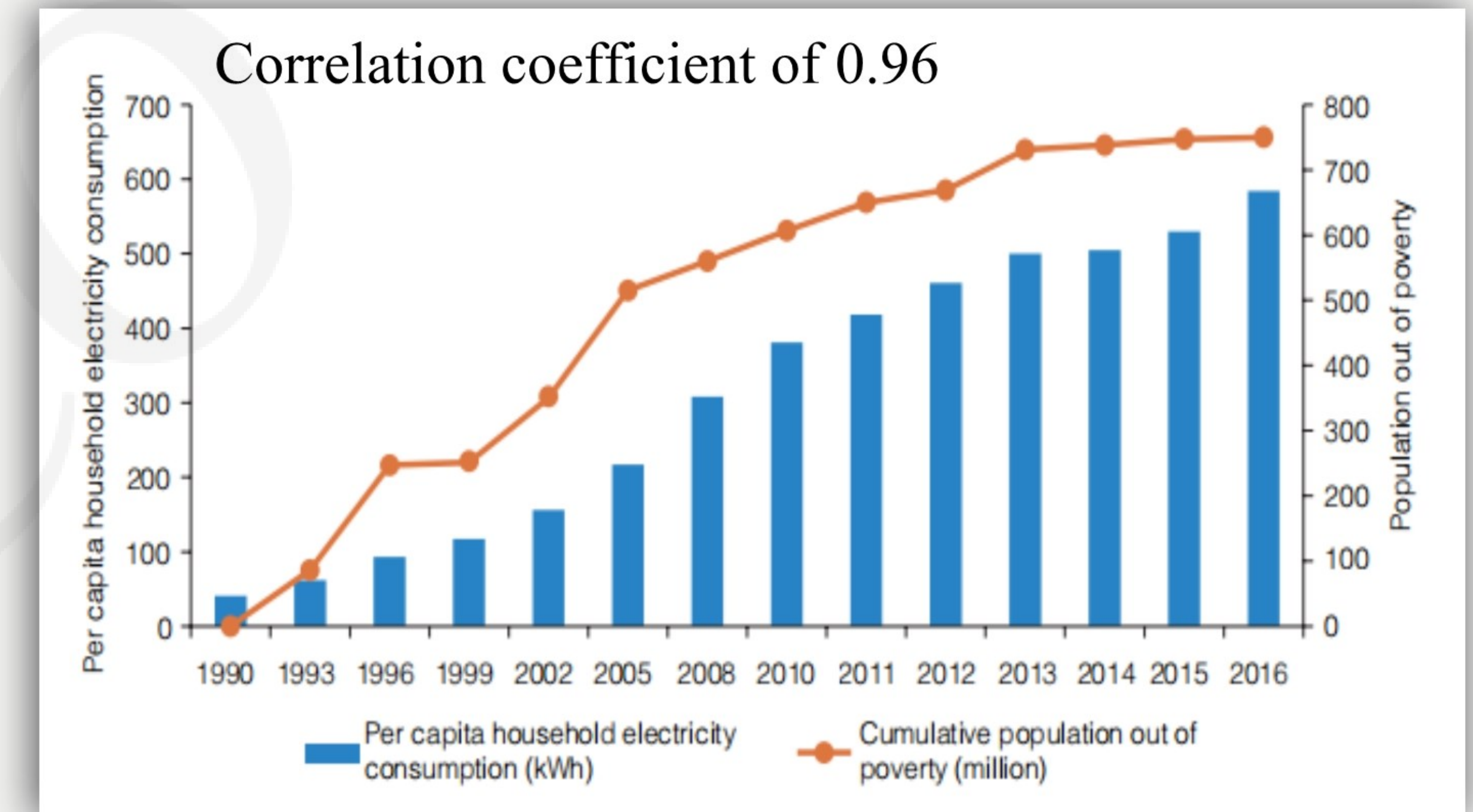
Make agriculture more resilient to disasters through curbing climate change
Improve agricultural production efficiency through popularizing electric machinery and tools
Develop intelligent agriculture through the application of intelligent equipment



Increase the educational attainment rate through alleviating poverty and increasing incomes
Improve teaching conditions through providing stable electricity supply
Realize equal access to education by promoting online education



Reduce the housework burden on women through accelerating household electrification
Increase employment opportunities for women through reducing physical demands on positions
Improve women's social status through increasing employment and income



China's Per Capita Household Electricity Consumption and Population out of Poverty from 1990 to 2016



GEIDCO's Assistance to the Abay Silto School in Ethiopia 15

(3) Supportive and Synergistic role



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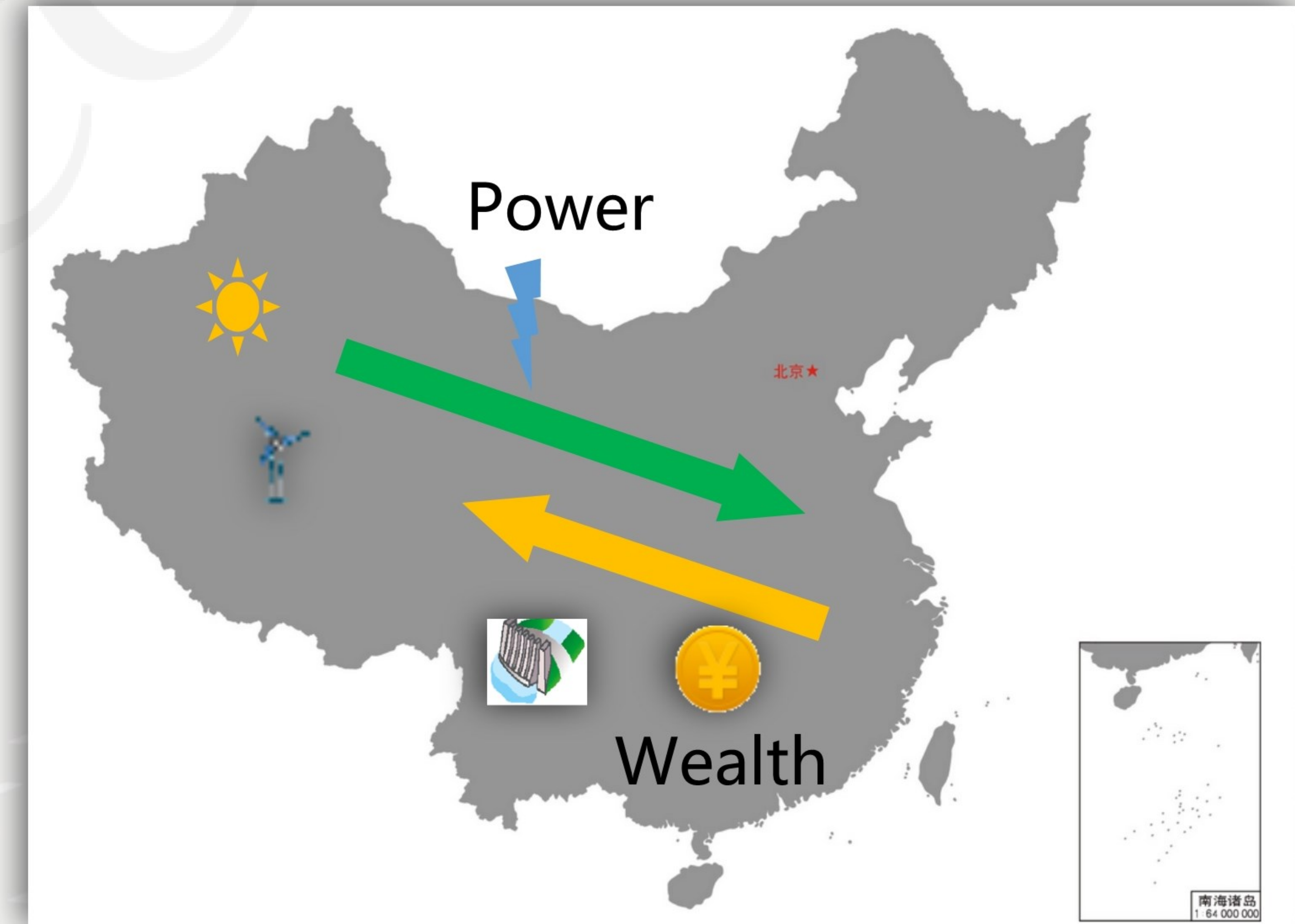
Promote the complementarity of resource markets through global allocation of clean energy
Promote the circulation of production factors through transnational energy cooperation
Enhance the capacity for development through a new model of integrated development



Resolve disputes over energy through clean energy development
Enhance political mutual trust through transnational interconnection
Promote the reform of governance system through building an energy community



Promote policy alignment among countries through planning and developing transnational interconnection
Strengthen global economic and trade cooperation with the international power market as a platform
Drive global technical cooperation based on transnational engineering projects



China Energy Interconnection Promote Balanced Development between Regions



3. GEI Actions and Mechanisms to promote the implementation of the 2030 Agenda

3.1 Ten Actions of GEI to Implement the 2030 Agenda



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"Ten Actions" of GEI:

Six constructive actions: clean development, power grid interconnection, universal access to electricity, electricity replacement, smart grid, and energy efficiency enhancement.

Four supportive actions: innovation driven, capacity building, policy support and concept promotion.

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

Power grid interconnection

- Strengthen the interconnection of domestic, transnational and transcontinental power grids, and build safe, inclusive and efficient power grid infrastructure

Universal access to electricity

- Reduce and minimize the population without access to electricity and make modern energy sources affordable and sustainable for all

Global Clean Energy Bases and Development Scale

Project	Large Solar Power Bases	Large Wind Power Bases	Large Hydropower Bases
Number	9	16	15
Exploitation scale by 2035 (100 GW)	17.1	9	8.8
Exploitation scale by 2050 (100 GW)	38.2	14.9	13

3.1 Ten Actions of GEI to Implement the 2030 Agenda



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Electricity replacement

- Replace coal, oil, gas and firewood with electricity in industry, transportation, commerce and living, significantly increasing the proportion of electricity in the final energy consumption

Smart 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

Energy efficiency enhancement

- Reduce energy intensity and establish an efficient and sustainable approach of energy development by technological advances, management innovation, and shifts in energy production and consumption patterns

Electric vehicles



Electric heating



3.1 Ten Actions of GEI to Implement the 2030 Agenda



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Innovation driven

- Provide technical and financial guarantee for the smooth implementation of engineering projects while focusing on innovation of technology, finance and development modes

Capacity building

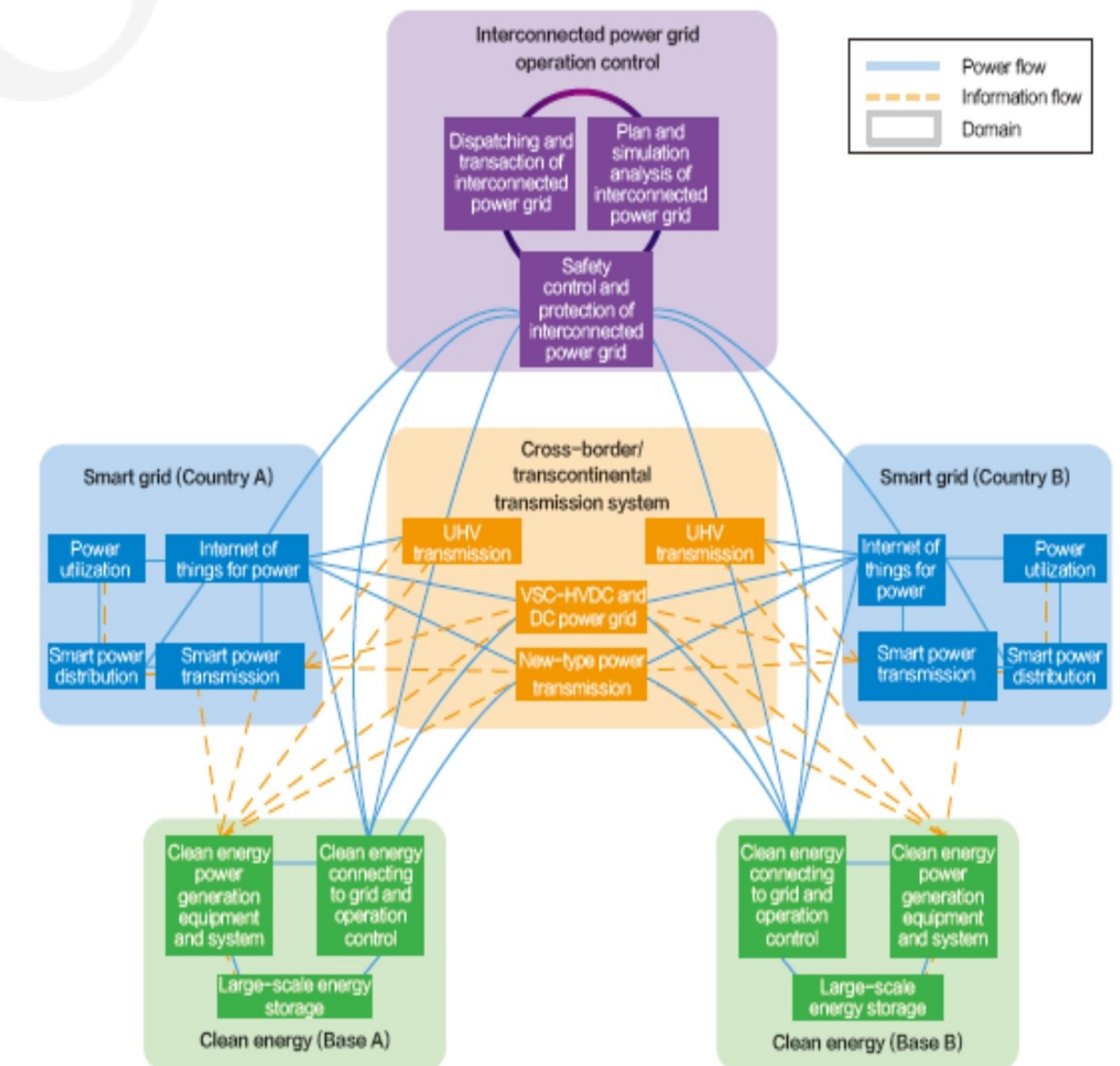
- Pool strengthen of all parties to help developing countries accelerate the enhancement of their development capacities, scientific and technological capabilities and research capabilities through international assistance and cooperation and exchanges

Policy support

- Propel the formulation of government policies, plans and measures to promote the development of GEI, and bring into play the guiding and coordinating role of international organizations, thereby enhancing policy compatibility and synergies among countries

Concept promotion

- Mobilize forces from all sectors of society to enhance the concept promotion, and consolidate the ideological foundation for jointly promoting the development of GEI, thus creating a favorable atmosphere for all parties to make concerted efforts

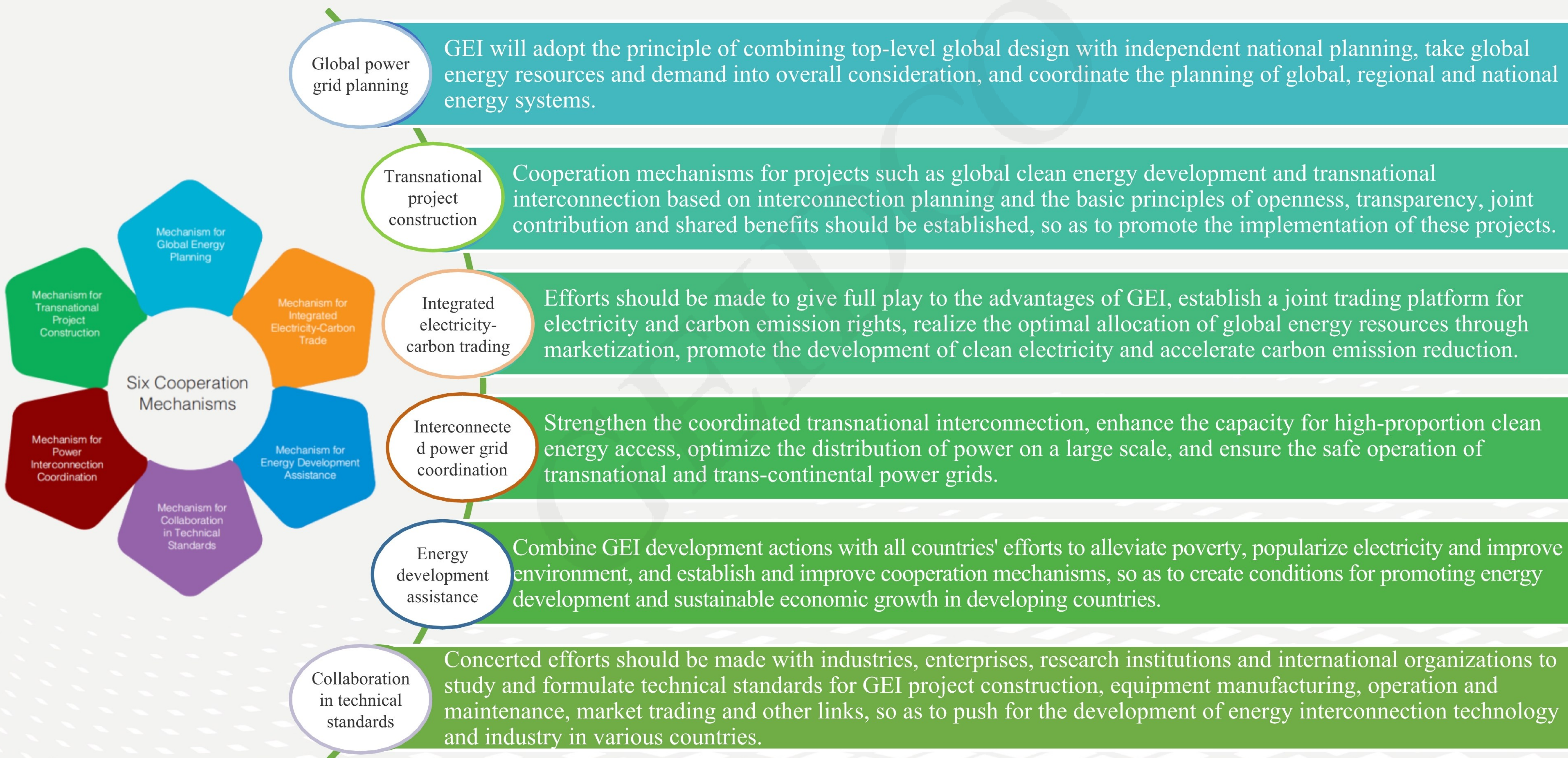


Key Technological Innovation of GEI

3.2 Cooperation Mechanisms of GEI



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GEI is a great undertaking that will benefit millions of households for generations to come. It will promote the sustainable development of energy, economy, society, and environment, creating a better future for humankind.

