# Development Progress of the Global Energy Interconnection



## Overview

Energy Transition Index 2026 | World Economic ForumDespite record global energy investment reaching $3.3 trillion, energy transition progress is fragmentin.

## Key Takeaways

Global Energy Interconnection (GEI) is advancing through large-scale renewable integration, ultra-high voltage transmission, and smart grid deployment, though progress remains uneven across regions.

### Overview of GEI

Global Energy Interconnection (GEI) is a concept aimed at linking power grids across countries and continents to optimize renewable energy resources, enhance energy security, and provide clean, affordable electricity worldwide. The initiative focuses on large-scale renewable energy deployment, ultra-high voltage (UHV) transmission, and smart grid technologies to overcome geographic and temporal mismatches in energy supply and demand.

### Recent Progress

Investment and Capacity Growth: Global clean energy investments reached $2 trillion in 2024, with renewables now rivaling fossil fuels in installed capacity. China contributed nearly 20% of global growth in clean energy, emerging as a leader in the transition. Grid Development: Over 2,500 GW of renewable and storage projects are currently stalled in grid queues worldwide.

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Efforts to accelerate grid expansion include regulatory reforms, advanced grid-enhancing technologies, and conditional non-firm connection agreements, which could unlock 1,200–1,600 GW of stalled projects. Technological Advancements: GEI leverages UHV AC/DC transmission, flexible AC/DC systems, and wide-area monitoring and control (WAMPAC) to improve reliability and efficiency. Smart grids and energy management systems are being deployed to integrate variable renewable energy sources effectively.

Global Cooperation: The 2025 GEI Conference emphasized international collaboration to triple renewable energy capacity and double energy efficiency by 2030, aligning with the UN Decade of Sustainable Energy for All.

## Challenges

Uneven Progress: Many regions, particularly in the Global South, remain underrepresented in clean energy deployment. Africa, for example, has 60% of the world's solar potential but only 1% of installed solar PV. Infrastructure Gaps: Transmission and distribution networks need to double by 2050, with two-thirds of existing grids requiring replacement due to aging infrastructure.

Critical Minerals and Supply Chains: Rising demand for lithium, cobalt, nickel, and copper is essential for renewable technologies, but supply must grow responsibly to avoid environmental and social risks. Policy and Financing: Achieving GEI goals requires coordinated policies, investment in grid modernization, and equitable access to finance, particularly in emerging markets.

## Future Outlook

Integration of Emerging Technologies: Continued adoption of energy storage, AI-driven grid management, and next-generation renewable technologies will enhance GEI efficiency. Regional Leadership: China, India, and Europe are expected to lead in grid interconnection and renewable deployment, while emerging economies present significant opportunities for investment. Decarbonization and Resilience: GEI is positioned as a key solution for decarbonizing the power sector, improving resilience against climate impacts, and supporting global energy equity.

In summary, GEI is making measurable progress through technological innovation, international collaboration, and investment in clean energy infrastructure. However, achieving its full potential will require addressing regional disparities, accelerating grid expansion, and ensuring sustainable supply chains for critical materials.

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Despite challenges, we see remarkable progress. Clean energy investments reached a record high of $2 trillion in 2024, and renewables now rival fossil fuels in global installed capacity.

Energy Transition: Where Are We Headed in 2026?

Renewable energy deployment is accelerating, integration challenges are becoming central, and collaboration across governments, utilities, and industry is deepening. But how far has

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Global Energy Interconnection: an innovative solution for

Against the background of energy consumption transformation and climate governance, Global Energy Interconnection (GEI), which features an innovative combination of advanced

Global electricity development and transition: Progress and

The Global Electricity Development and Transition Report 2025 (GEIDCO, 2025a), recently released by Global Energy Interconnection Development and Cooperation Organization

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Global energy interconnection

Executive summary Global energy interconnection (GEI) represents the ultimate evolution of the trend towards greater interconnection of power systems. It embodies high-level integration of the flow of

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