



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



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Global Electricity Development Index

2026

Global Energy Interconnection Development and Cooperation Organization

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Preface

Addressing climate change and advancing a green, low-carbon energy transition have become a broad global consensus. Against the backdrop of a profound restructuring of the global energy system, the pattern of energy allocation continues to be optimized, the supply mix is being adjusted at an accelerating pace, modes of utilization are being continuously upgraded, and technological innovation and the industrial ecosystem are evolving rapidly. The features of energy development — cleaner, more electrified, more networked, and more digital and intelligent — are becoming ever more pronounced. As the key carrier linking energy production and consumption, electricity is the core form for delivering safe, affordable, green, and inclusive energy services, and it is a foundational and pioneering industry underpinning economic and social development. As the global goals of “carbon peaking and carbon neutrality” continue to be pursued, the role of electricity in leading the energy transition, safeguarding energy security, and promoting green development has become even more prominent.

In recent years, amid global efforts to reach net-zero emissions, power is taking on greater importance in driving the energy transition, bolstering global energy security and advancing sustainable growth. On the one hand, the large-scale development of renewable energy and the acceleration of electrification have driven a sustained rise in the share of electricity in final energy consumption. On the other hand, the operating environment of power systems has become more complex: frequent extreme-weather events, energy-price volatility, and supply-chain security place higher demands on the safe and stable operation of power systems. At the same time, new-generation information technologies such as digital technologies and artificial intelligence are being integrated into power systems at an accelerating pace, driving profound changes in the modes of electricity production, transmission, distribution, and consumption. Against this background, building a scientific, systematic, and dynamic global evaluation system for electricity development is of great significance for comprehensively grasping electricity-development trends and promoting international exchange and cooperation.

The level of electricity development is shaped by the combined influence of multiple factors, including the stage of economic and social development, industrial-structure characteristics, resource endowments, the level of the technological system, and policy and market mechanisms. The Global Electricity Development Index is designed to provide a multidimensional, systematic assessment of the level of electricity development and the progress of the transition across the world's regions and countries, offering quantitative support for government decision-making, corporate investment, and industry research. In response to the new requirements that the global energy transition places on secure electricity supply, green and low-carbon development, economic efficiency, and innovation-driven growth, the Global Energy Interconnection Development and Cooperation Organization (GEIDCO) has carried out research on the Global Electricity Development Index continuously since 2024.

In 2024, the first edition of the Research Report on the Global Electricity Development Index was officially released at the United Nations High-Level Political Forum. It systematically presented the level of global electricity development and regional disparities, attracted wide attention and positive responses from international organizations, national governments, and the energy industry, and effectively enhanced the international influence and policy-reference value of the index research. Building on this foundation, continuing to advance the index research and dynamically tracking the progress of global electricity development carry important practical significance for deepening international exchange and cooperation and for supporting the global energy transition.

Compared with the 2024 edition, this report achieves important upgrades in its data foundation and indicator system. First, the timeliness of the data has been markedly improved: the research baseline has been updated from 2022 to 2025, fully reflecting the latest developments. This report draws on GEIDCO's electricity database (the GEI database) as its core data source, systematically integrating multi-source data resources to improve data consistency and authority; for certain annual data not yet released, reasonable estimates are made on the basis of historical trends and will be dynamically revised in subsequent editions. Second, the indicator system has been systematically optimized: the original qualitative indicators have been fully converted into structured quantitative indicators, building a data-driven evaluation system at its core and significantly improving the objectivity and comparability of the index. Third, the methodology continues to innovate: new methods such as large-language-model-assisted scoring have been introduced to carry out quantitative evaluation of complex indicators such as the level of technology application and the development of electricity and carbon markets, strengthening the index's ability to characterize new business forms and new models.

This report comprises six chapters:

Chapter 1 sets out the research background, analyzes the new situation and new challenges facing global electricity development, and explains the update of the indicator system and the scope of the research;

Chapter 2 introduces the indicator system of the Electricity Development Index, systematically explaining the overall framework design and the meaning of the indicators;

Chapter 3 sets out the index calculation methodology, including the calculation process, data collection and processing, standardization methods, and weight design;

Chapter 4 calculates and analyzes the Electricity Development Index for the world and each continent, revealing development levels and regional disparities from multiple dimensions;

Chapter 5 introduces the methods for applying the index for three different reader groups: policymakers, electricity investors, and practitioners in the energy and power industry;

Chapter 6 concludes the research.

Electricity is the core link in building a clean, low-carbon, safe, and efficient energy system, and an important support for achieving sustainable energy development and addressing climate change. Continuing to carry out research on the Global Electricity Development Index is both an important tool for serving global energy governance and an important support for advancing the electricity-transition practices of all countries. By building a scientific, transparent, and comparable evaluation system, the research promotes exchange, cooperation, and mutual learning among countries in the energy and power sector, advances the goal of sustainable and affordable electricity for all, and helps build a community with a shared future for humankind.

This report can serve as a reference for government departments, international organizations, energy enterprises, financial institutions, research institutes, and universities in policymaking, strategic research, and international cooperation. Limited by data availability and the research cycle, the report still has shortcomings, and comments and corrections from all sectors are welcome.

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Research Background

1.1 New Situation and New Challenges

At present, global electricity development is at a critical window of historic and profound transformation. On the one hand, clean energy continues to expand rapidly, the share of renewable generation has exceeded 42%, electricity demand maintains strong growth, and electrification is accelerating across the board. On the other hand, intensifying geopolitical conflicts, frequent extreme weather events, and rising risks in energy supply chains mean that the safeguarding of electricity security faces multiple, overlapping pressures. Overall, global electricity development is moving from accelerated transition toward a new stage of consolidating the transition and developing in a balanced way, and there is an urgent need to build a more scientific, systematic, and dynamic evaluation system to objectively characterize and rationally assess the progress of the global electricity transition.

(1) Clean energy is expanding at an accelerating pace, and the structural transformation of the power system continues to deepen

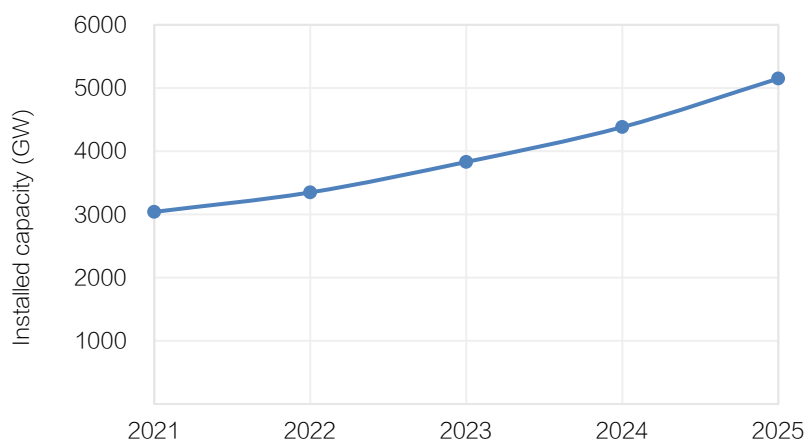
As the global agenda of climate neutrality and decarbonization moves forward, the scale of new-energy installed capacity has achieved a leap-forward expansion with far-reaching effects. According to the latest statistics from the International Renewable Energy Agency (IRENA), global newly added renewable-energy installed capacity reached about 690 GW in 2025, a record high and more than seven times the level of 2015.¹ By the end of 2025, the world's total renewable installed capacity (including hydropower) had reached 5,150 GW, approaching half of global power generation capacity. Of this, newly added solar capacity was 510 GW, accounting for 75% of new renewable capacity, while newly added wind capacity was 160 GW, up 14% year on year, continuing its steady expansion.²

¹ IRENA, Renewable Capacity Highlights 2026. <https://www.irena.org>

² IRENA, Renewable Capacity Highlights 2026. <https://www.irena.org>



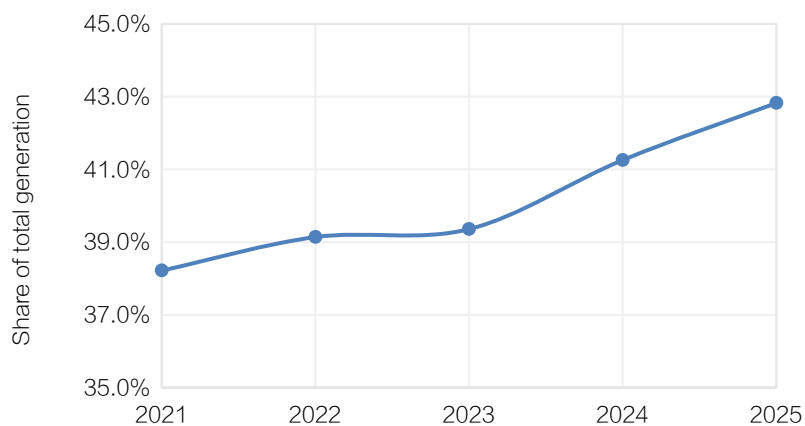
Figure 1-1 Growth in Global Renewable Energy Installed Capacity, 2021 - 2025



In terms of the generation mix, the share of global clean-energy generation (including nuclear power) rose from about 38% in 2021 to nearly 43% in 2025, with the combined share of wind and solar generation exceeding 16%. China's new energy development has been the most striking: in 2025 the combined share of solar and wind generation reached 23.7%, up 4.4 percentage points year on year. In Europe, the share of wind and solar generation is expected to exceed 30%, consolidating the region's leading position in the energy transition. At the same time, nuclear power is recovering: several developed economies have announced extensions of the operating lifetimes of nuclear plants or the restart of nuclear projects, and nuclear power is gradually becoming an important strategic option for the low-carbon transition in a number of countries.



Figure 1-2 Change in the Share of Global Clean Energy Generation, 2021 - 2025



(2) Electrification is advancing in depth, and the drivers of electricity demand growth are increasingly diverse

In 2025, total global electricity demand reached about 29.6 trillion kWh, up roughly 4% year on year — markedly higher than the average growth rate of the past decade since 2015 (excluding the pandemic years). The core drivers of demand growth come mainly from three emerging areas. First, the electrification of transport, represented by electric vehicles, is accelerating: in 2025 the global Electric Vehicles (EVs) fleet reached about 60 million units, with annual electricity use exceeding 200 TWh, and the IEA projects that the related electricity demand will reach 780 TWh by 2030.³ Second, data centers and artificial intelligence are developing rapidly: in 2025 global data center electricity use was close to 500 TWh,⁴ and, driven by the demands of large language Model (LLM) training and inference, the growth rate of electricity use has remained in double digits and is projected to rise to 945 TWh by 2030.⁵ Third, emerging electricity-use scenarios such as electrolytic hydrogen production and electric heating are expanding rapidly, driving electricity demand to penetrate continuously into fields traditionally difficult to electrify, such as industrial heating and chemical production.

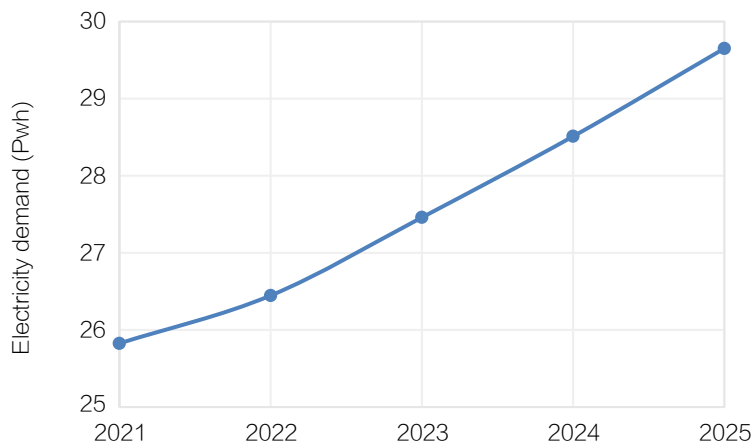


Figure 1-3 Growth in Global Electricity Demand, 2021 - 2025

In terms of the depth of electrification, the share of electricity in global final energy consumption has remained above 22% for three consecutive years, but regional disparities remain significant. Asia's overall level of electrification has exceeded 25%, and that of Northern Europe exceeds 30%; by contrast, Africa's electrification rate is only 12.6%, slightly more than half of the global average— fully reflecting the marked divergence in electrification across different stages of development. Against this background, the processes of replacing coal and oil with electricity continue to accelerate, steadily expanding the long-term growth space for electricity demand.

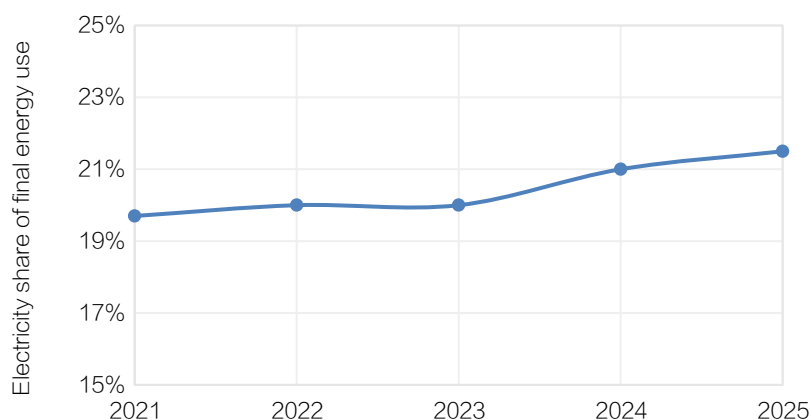
³ IEA, Global EV Outlook 2025. <https://www.iea.org/reports/global-ev-outlook-2025>

⁴ IEA, Data centre electricity use surged in 2025 (2025). <https://www.iea.org>

⁵ IEA, Energy and AI — Energy demand from AI. <https://www.iea.org/reports/energy-and-ai>



Figure 1-4 Change in the Global Level of Electrification, 2021 - 2025



(3) Multiple types of risks are intensifying the pressure on electricity security

In recent years, the safeguarding of electricity security has faced complex challenges arising from the superposition of multiple factors — climate, geopolitics, and system operation. First, as the share of new energy dominated by wind and solar rises rapidly, the problem of insufficient system regulating capacity has become increasingly prominent; integration constraints, frequency regulation pressure, and shortages of flexibility resources already exhibit structural features in some regions. Second, extreme weather events continue to intensify and have a direct impact on power systems. Since 2024, many parts of the world have experienced overlapping heat waves and extreme weather; the power grids of the southern and western United States repeatedly approached a tight supply-demand balance during the summer peak, and the resilience of power systems faced a severe test. In 2024, some South American countries saw hydropower output decline markedly under the impact of drought, tightening regional electricity supply. Third, geopolitical conflicts and energy market volatility continue to transmit through the system. In 2024 - 2025, international natural gas prices fluctuated at high levels, exerting a continued impact on the electricity costs and supply stability of European countries with a high share of gas-fired generation, and many countries still had to stabilize electricity prices and safeguard supply through policy intervention and market regulation.

At the same time, carbon emissions from the global power sector remain at a high level and continue to be under pressure. According to IEA data, in 2025 global power sector carbon dioxide emissions reached about 13.9 Gt, still the highest share of total energy-related carbon emissions; the power sector remains the largest single source of emissions.⁶ Global carbon emission

⁶ IEA, Electricity 2026. <https://www.iea.org/reports/electricity-2026>



intensity per unit of electricity used has fallen from 530 gCO₂/kwh in 2019 to about 435 gCO₂/kwh in 2025, a decline of roughly 18%, but it still deviates markedly from the emission reduction pathway required to meet climate goals.⁷ Against this background, accelerating the reduction of carbon intensity per unit of electricity used to a near-zero-emission level has become the most widely agreed core task of the global power industry.

(4) Digital technologies are providing deep empowerment, and the form of the power system is being reshaped at an accelerating pace

The intensive empowerment of digital and intelligent technologies is profoundly reshaping the design philosophy, operating modes, and optimization frameworks of power systems. Artificial intelligence (AI) has been widely applied in key areas such as power flow analysis, load forecasting, fault self-healing, and demand response, and is gradually becoming an important support for the efficient operation of systems. AI-based grid dispatch systems can compress the real-time dispatch optimization cycle under high share new energy conditions, markedly improving the precision and response speed of system control. At the same time, the fault monitoring and identification capabilities supported by big-data platforms continue to improve, with fault detection accuracy at key nodes exceeding 99.5%, driving a leap-forward improvement in grid operation and control — from experience-driven to data-driven.

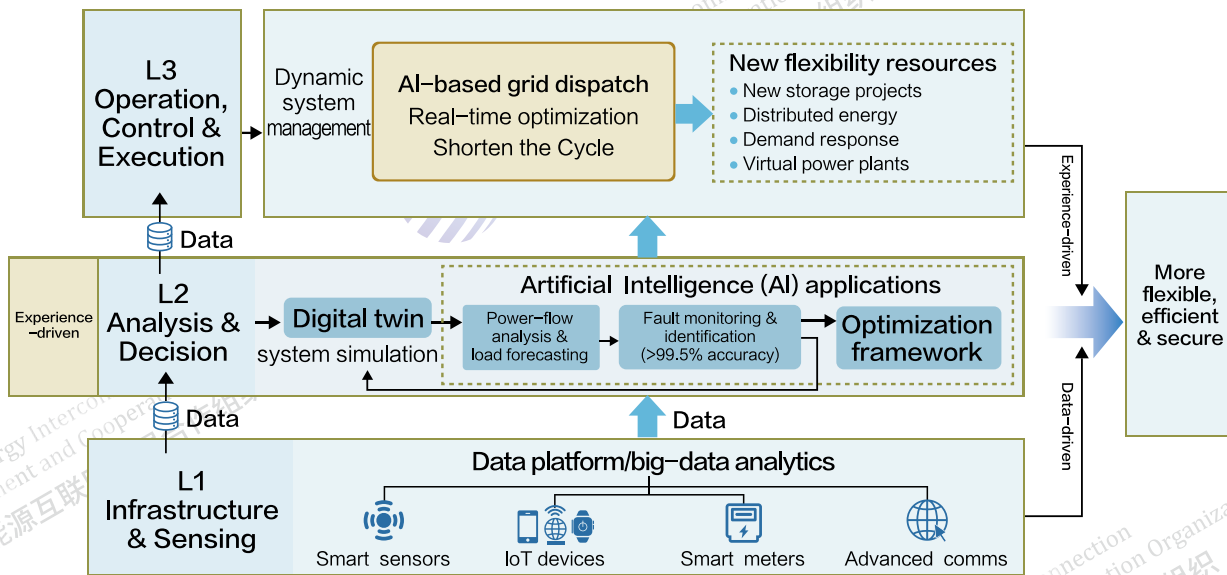


Figure 1-5 Tiers and Key Application Scenarios of Power Sector Digitalization and Intelligence

⁶ IEA, Electricity 2026. <https://www.iea.org/reports/electricity-2026>

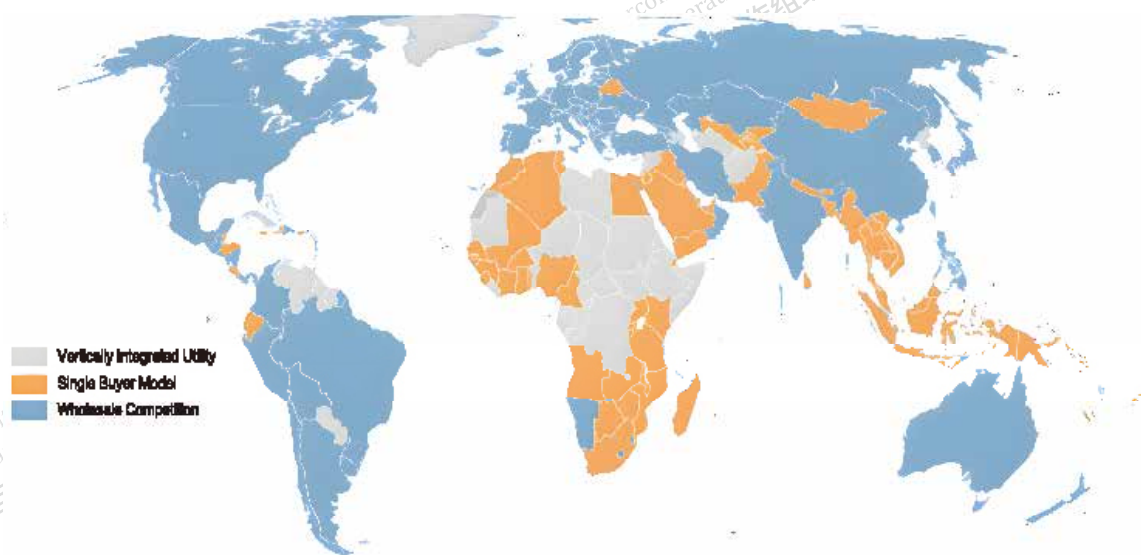
⁷ IEA, Electricity 2026 — Emissions. <https://www.iea.org/reports/electricity-2026/emissions>



The construction of new-type power systems is accelerating. New regulating resources such as energy storage, demand response, virtual power plants, and distributed energy are developing rapidly. By the end of 2025, the total installed capacity of global new-type energy storage projects was close to 270 GW, more than eight times the 2019 level.⁸ New technologies such as digital twins, smart meters, and minute-level demand-side management are being deployed at an accelerating pace, driving power systems to evolve toward greater flexibility, efficiency, and security.

(5) Policy and markets are working in concert, and the institutional system continues to improve and evolve

Against the backdrop of the global energy transition, the pace of electricity-market reform has clearly accelerated. By 2025, nearly 70 national or regional spot electricity markets worldwide were either in operation or at a key stage of market construction.⁹ The third reform of the EU internal electricity market is being advanced at an accelerating pace, driving competitive-bidding mechanisms and transparent pricing toward deeper market-based, real-time reform. China's national spot electricity market has come fully online, the share of market-traded electricity in total electricity consumption continues to rise, and the linkage mechanism between medium- and long-term and spot trading is steadily improving. In the United States, the dispatch mechanisms of the major regional electricity markets continue to be optimized, and forward-looking capacity market reform has set a new benchmark for market institutional design.



(a) Coverage of Global Electricity Markets¹⁰

⁸ Wood Mackenzie, Global energy storage market surpasses 100 GW annual installation milestone in 2025. <https://www.woodmac.com>

⁹ World Bank, Global power-market development (2024). <https://documents.worldbank.org>

¹⁰ Source: World Bank (BIRD 48442, October 2024).

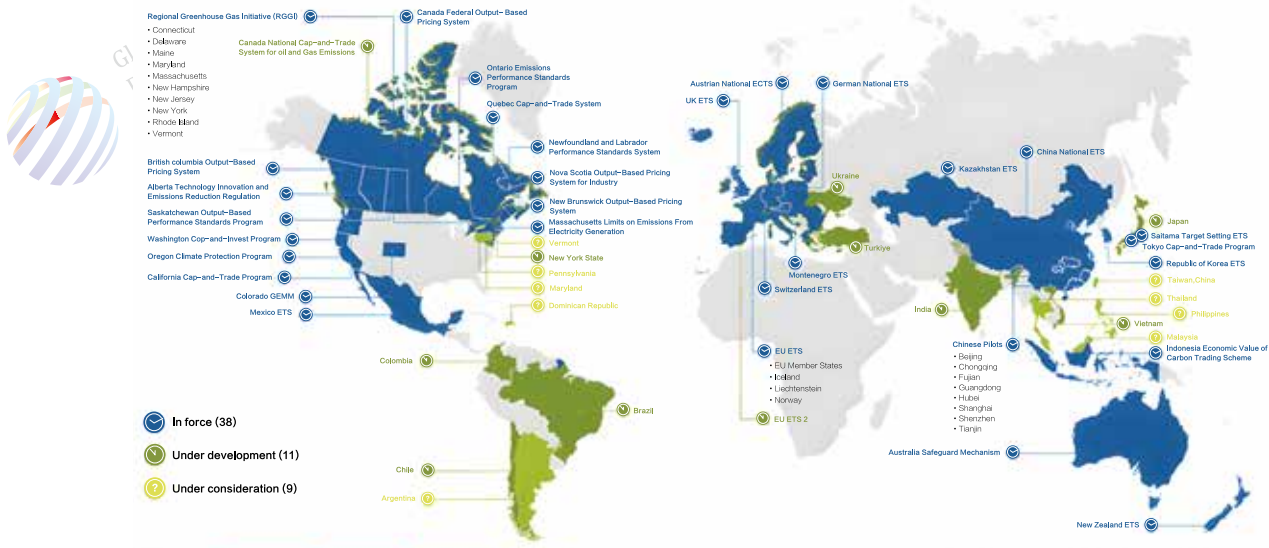
(b) Coverage of Global Carbon Markets¹¹

Figure 1-6 Coverage of Global Electricity and Carbon Markets

The scope of carbon market application continues to expand. The carbon price of the EU Emissions Trading System (EU ETS) once exceeded € 100/t in 2023, and the average auction price in 2025 was about € 73.4/t; it remains the world's most mature and most liquid carbon market.¹² The coverage of China's national unified carbon market (ETS) continues to expand, newly incorporating sectors such as steel, cement, and aluminium smelting in 2025, and increasingly strengthening incentives for enterprises to lower their average carbon intensity. At present, the share of emissions covered by the various carbon-pricing mechanisms worldwide has risen to about 28%, and market mechanisms are becoming an important policy tool for driving carbon-emission reduction.¹³

(6) Regional development disparities remain prominent, and inclusive, affordable electricity has a long way to go

Global electricity development still shows a markedly unbalanced and divergent pattern. According to the latest IEA statistics, as of 2025 there were still 730 million people worldwide without electricity, and more than 600 million more with an unstable power supply.¹⁴ Less developed regions such as Africa and South Asia still face multiple challenges, including insufficient grid coverage, weak power supply capacity, and limited capacity for independent power sources; the problem of electricity access remains prominent, becoming an important constraint on the progress of global energy equity and sustainable development.

¹¹ Source: ICAP, Emissions Trading Worldwide — Status Report 2025. <https://icapcarbonaction.com>.

¹² W ICAP, EU Emissions Trading System (EU ETS). <https://icapcarbonaction.com/en/ets/eu-emissions-trading-system-eu-ets>

¹³ World Bank, State and Trends of Carbon Pricing. <https://www.worldbank.org>

¹⁴ IEA, Access to electricity stagnates, leaving 730 million in the dark (2024). <https://www.iea.org>

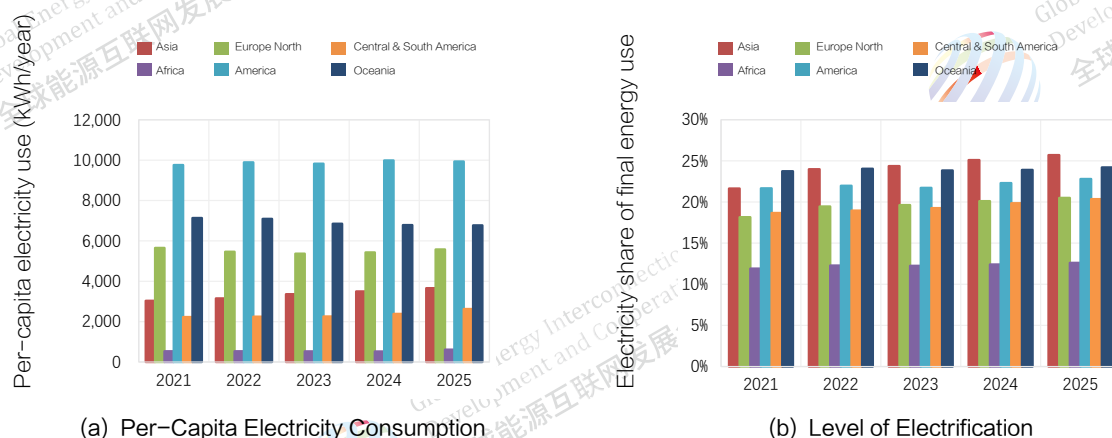


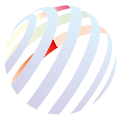
Figure 1-7 Comparison of Electricity Levels across the Six Continents

Taking per-capita electricity consumption as an example, global disparities remain extremely wide. Iceland's per-capita electricity consumption exceeds 52,000 kWh per year, whereas Uganda's is only 120 kWh per year — a difference of more than 400 times. Africa's overall electricity-access rate is still below 60%, whereas developed economies long ago achieved 100% access to electricity. Against the backdrop of accelerating global new-energy development, how to place inclusive provision in a more prominent position, continuously improve electricity accessibility and affordability, and thereby advance the achievement of UN Sustainable Development Goal 7— “affordable, reliable, sustainable and modern energy for all” by 2030— remains a core issue and shared mission facing the global energy governance system.

Taken together, in light of the six new developments described above, the global electricity transition is at a critical stage in which strategic opportunities and risk challenges are intertwined. Evaluation approaches that rely only on partial indicators to interpret overall trends, or that use static data to characterize dynamic evolution, can no longer accurately reflect the deep transformation of global electricity development. This is precisely the significance of GEIDCO's continued advancement of research on the Global Electricity Development Index— to build a global electricity-development evaluation system with a holistic perspective, data-driven capabilities, and dynamic updating, providing governments, international organizations, and the energy industry with an authoritative and comparable quantitative reference.

1.2 Indicator System

Focusing on the new situation of the global energy transition and the changing stage-specific characteristics of electricity development, and building systematically on the experience of the 2024 edition of the index research, this report has carried out a systematic iterative optimization of the indicator system



of the Global Electricity Development Index. This round of updates adheres to the overall principles of “strengthening the quantitative orientation, optimizing structural expression, enhancing international comparability, and serving decision-making applications,” achieving comprehensive upgrades in indicator composition, definitions, data foundations, and evaluation methods, and further polishing the “structured evaluation system led by quantitative analysis.”

(1) Strengthening the quantitative orientation and improving a fully quantified indicator system

Adhering to a foundation of objective data, the quantifiability of the indicator system has been comprehensively improved. For the qualitative indicators in the 2024 edition that relied in part on expert judgment or textual information, this update achieves quantitative expression of all indicators through indicator reconstruction, method optimization, and data substitution, building an evaluation system fully supported by observable data.

First, systematically advancing the conversion of qualitative indicators into quantitative ones. Around key areas such as power-supply stability, the level of new-technology application, the development of electricity markets, and the development of carbon markets, a multi-tier indicator system has been built, decomposing the original single scoring-type indicators into multiple quantifiable third- or fourth-level sub-indicators. For example, power-supply stability has been refined into multiple dimensions— generation adequacy, grid support capability, external dependence of electricity supply, fuel-supply security, and seasonal regulating capacity— characterizing system stability more comprehensively through a structured combination.

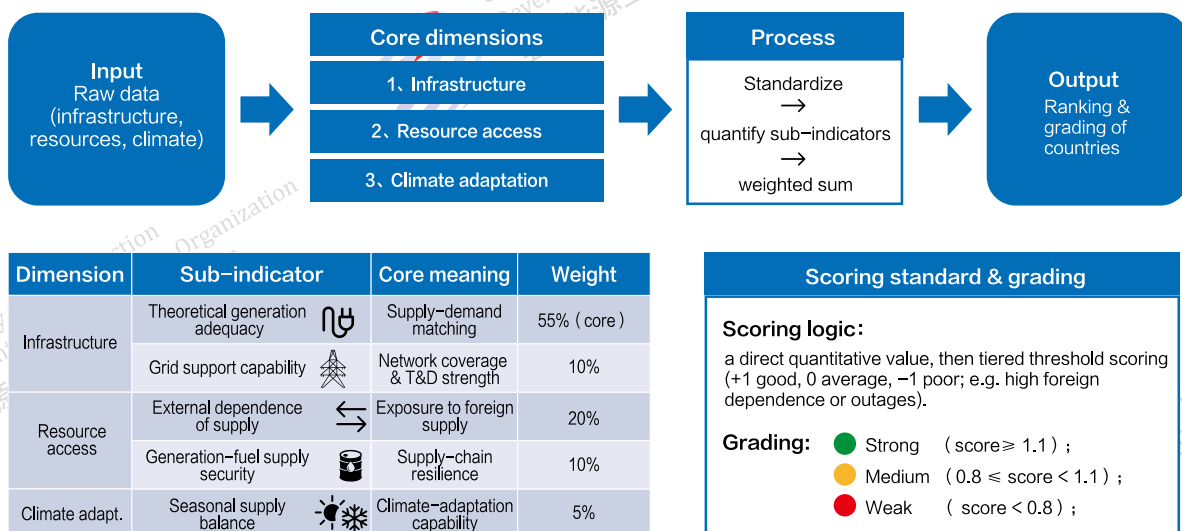


Figure 1-8 Assessment Process for Power-Supply Stability

Second, introducing structured evaluation methods to replace subjective judgment. For indicators that previously relied heavily on expert experience, standardized statistical data, objective measurement indicators, and comparable parameters are widely used as substitutes, effectively reducing the influence of expert judgment on evaluation results and improving the objectivity, stability, and reproducibility of the index results.

Third, unifying the form of indicator–data expression. All indicators adopt a standardized numerical form of expression, ensuring consistency and comparability across countries and regions and laying a solid data foundation for subsequent index calculation and trend analysis.

(2) Optimizing the indicator structure and improving the logical consistency of the system

Focusing on the inherent logic of power system development, the structure of the indicator system has been systematically optimized to further strengthen the hierarchical relationships and intrinsic connections among indicators.

First, keeping the overall framework of the four major dimensions stable. The four first-level dimensions — supply security, consumption service, green and low-carbon development, and technology innovation — continue to be used, ensuring that the index system remains consistent with the core goals of global electricity development, while strengthening framework stability and taking into account historical continuity and international comparability.

Second, optimizing the setting and definitions of the second-level indicators. Under each dimension, the original indicators have been systematically reviewed: indicators that were highly repetitive, had weak explanatory power, or had poor data sustainability were removed, and key indicators capable of reflecting development dynamics and structural change were added. For example, indicators such as the growth rate of installed generation capacity and the growth rate of transmission and distribution lines were added to the supply–security dimension, while the indicator on the formulation and completion of green and low-carbon policies was removed from the green and low-carbon dimension, making the indicator structure more streamlined, efficient, and explanatory.

Third, strengthening the dynamic–expression capability of the indicator system. Indicator design has further shifted from a “stock orientation” toward “equal emphasis on stock and increment.” By introducing dynamic indicators such as growth rates and rates of change, it strengthens the characterization of electricity–development trends and stage-specific features, more comprehensively reflecting the combined level of “speed and quality” of each country's electricity development.

(3) Enriching the meaning of indicators and enhancing the ability to characterize development features

Closely combining the new trends and new requirements of the global

electricity transition, the meaning of the indicators has been systematically deepened and expanded to further enhance the index's ability to identify and characterize key issues.

First, highlighting the security and resilience of the power system.

In response to the new situation of frequent extreme weather events and tightening energy security constraints, the comprehensive evaluation of the security, reliability, and resilience of the power system has been systematically strengthened, reflecting the system's risk resistance and recovery capabilities through the coordination of a multidimensional indicator system.

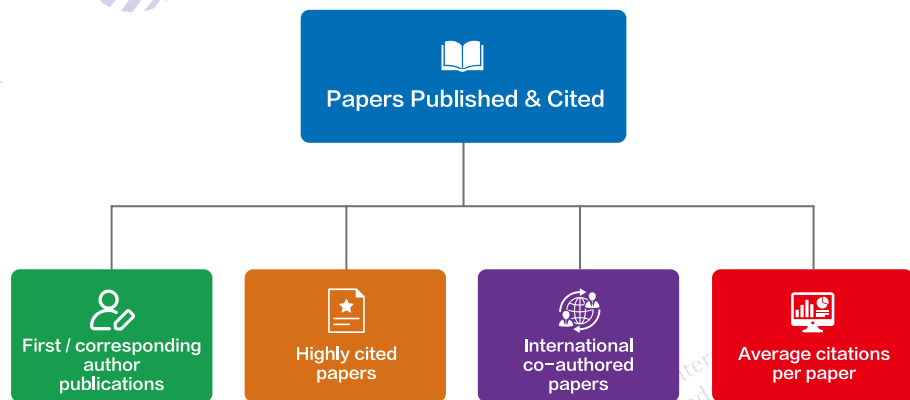
Second, strengthening the evaluation of electricity-service quality. Building on the optimization of the original “average outage time per household” indicator, a comprehensive supply-reliability evaluation system based on System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI) has been constructed, characterizing the level of end-use electricity service and supply quality more comprehensively and precisely.

Third, expanding the green and low-carbon evaluation dimension.

Building on the continued attention to the share of clean-energy generation, indicators such as the growth rate of clean-energy installed capacity, electricity carbon-emission intensity, and the level of carbon-market development have been introduced, strengthening the systematic characterization of the power system's low-carbon transition.

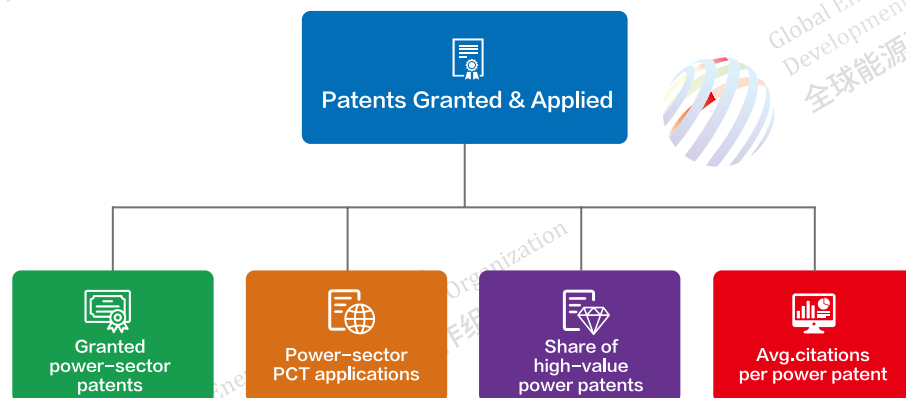
Fourth, deepening the technology-innovation evaluation system.

Around the directions of digitalization, electrification, and new-type power-system construction, quantitative indicators such as paper publication and citation and patent output and application have been added, reflecting technology-innovation capability and the level of actual conversion across the full “input - output - application” chain.



(a) Assessment System for Paper Publication and Citation

Figure 1-9 Assessment Systems for Paper Publication & Citation and Patent Output & Application



(b) Assessment System for Patent Output and Application

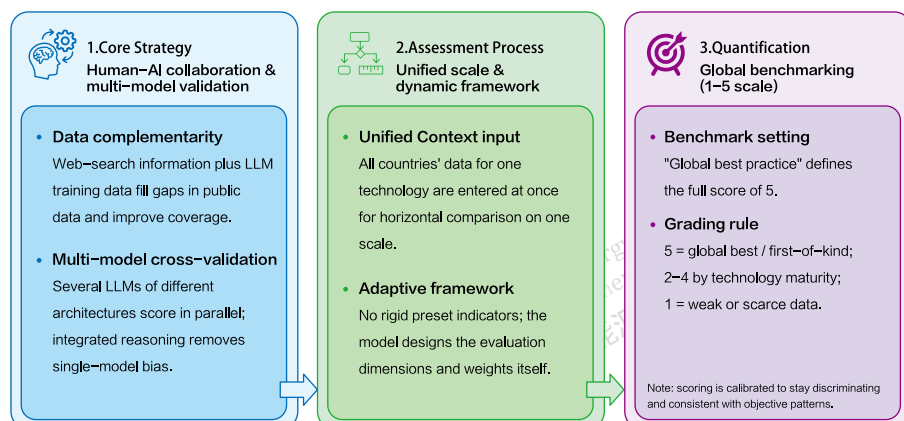
(4) Innovating evaluation methods and advancing the application of multi-source data and intelligent technologies

Building on the optimization of the indicator system, the evaluation methods have been further innovated to improve the scientific rigor and forward-looking nature of index calculation.

First, building a multi-source data-fusion system. Multidimensional information sources — international-organization databases, official national statistics, industry databases, and scientific literature — are widely integrated to form a multi-source data system covering all areas of electricity development, improving completeness, consistency, and reliability at the level of data sources.

Second, introducing large-language-model-assisted quantification methods. For areas that are difficult to quantify directly— such as new-technology application, electricity-market development, and carbon-market evolution—the report explores the use of AI large language models to carry out structured parsing and quantitative evaluation of multi-source unstructured information, and improves the objectivity and robustness of evaluation results through cross-validation among multiple models and data-complementarity mechanisms.

Figure 1-10 AI-Assisted Scoring Mechanism for the New-Technology Application Indicator





Third, improving the system of indicator-calculation methods. For certain key indicators, the conversion from a single indicator to a composite index is achieved through algorithm optimization and model reconstruction — for example, for indicators such as electricity carbon-emission intensity and power-supply stability— further enhancing the explanatory power and comprehensive reflection of the indicators.

(5) Improving data timeliness and enhancing the index's ability to reflect reality

Adhering to the use of the latest data to reflect the current level of development, the timeliness of the index has been significantly improved.

First, comprehensively updating the underlying data to 2025. In principle, economic, social, and energy- and electricity-related data uniformly use the latest 2025 data; for certain electricity data not yet publicly released, 2024 data are used and reasonably connected and verified in combination with historical trends, ensuring the continuity and completeness of the overall data system.

Second, strengthening the dynamic data-updating mechanism. A mechanism for rolling data updates and version iteration has been established, forming an institutional arrangement for sustainable updating that supports the long-term release and continuous optimization of the index.

Third, balancing timeliness and comparability. During the data-updating process, the calibre of core indicators is kept continuous and stable, ensuring the comparability and consistency of index results across the time-series dimension.

(6) Strengthening international comparability and enhancing the value of policy application

From a global perspective, the international applicability and policy-support capability of the index system have been further enhanced.

First, unifying indicator calibres and the standard system. Relevant data from various countries are processed with a unified calibre and standardized conversion, systematically eliminating the effects of statistical differences and improving the scientific rigor and consistency of cross-country comparison.

Second, strengthening support for regional analysis. Around the six major regions — Asia, Europe, Africa, and others — a regional benchmarking and comparison framework under a unified indicator system has been built, providing strong support for in-depth analysis of regional electricity-development disparities and their evolutionary features.

Third, enhancing the index's capacity to support decision-making. By strengthening the indicator system's ability to identify key issues and core trends in electricity development, the index provides a more precise quantitative reference for countries to formulate electricity-development

strategies, optimize energy policies, and advance the energy transition.

Overall, the 2026 edition of the indicator system of the Global Electricity Development Index further strengthens the orientation toward data-driven analysis, structured quantification, and dynamic analysis. Its design is more scientific and rigorous, its evaluation methods are more objective and transparent, and its results are expressed in a more intuitive and comparable way, providing a more solid technical foundation for systematically characterizing the level of global electricity development and the progress of the transition.

1.3 Scope of Evaluation

Building on the overall framework of research objects in the 2024 edition, and in combination with the principles of data availability and representativeness, this report selects 100 representative countries across the world's six continents for the calculation and comparative analysis of the Electricity Development Index. The selected countries are highly representative of regional electricity development, account for a high share of electricity consumption and installed capacity within each continent, and cover more than 97% of total global electricity demand, enabling a relatively comprehensive reflection of the overall level and structural features of global and regional electricity development. A few countries with a small scale of electricity development or for which key data are difficult to obtain were not included in this research.

By region:

Asia selects 34 countries, including China, Japan, the Republic of Korea, and Mongolia. In 2025, the selected countries accounted for more than 95% of Asia's total electricity consumption and more than 96% of its installed capacity, essentially covering Asia's main electricity producers and consumers and well reflecting the overall pattern of regional electricity development.

Europe selects 30 countries, including the United Kingdom, Germany, Norway, and Sweden. In 2025, the selected countries accounted for more than 92% of Europe's total electricity consumption and more than 93% of its installed capacity, covering the major EU member states and some non-EU countries, and are highly representative.

Africa selects 17 countries, including South Africa, Egypt, Algeria, and Morocco. In 2025, the selected countries accounted for more than 78% of Africa's total electricity consumption and more than 75% of its installed capacity, essentially covering the countries with relatively high electricity-development levels and typical characteristics in the region.

Central and South America (including South America and the Caribbean) selects 14 countries, including Brazil, Chile, Argentina, and the Dominican Republic. In 2025, the selected countries accounted for more than 88% of the region's total electricity consumption and more than 90%

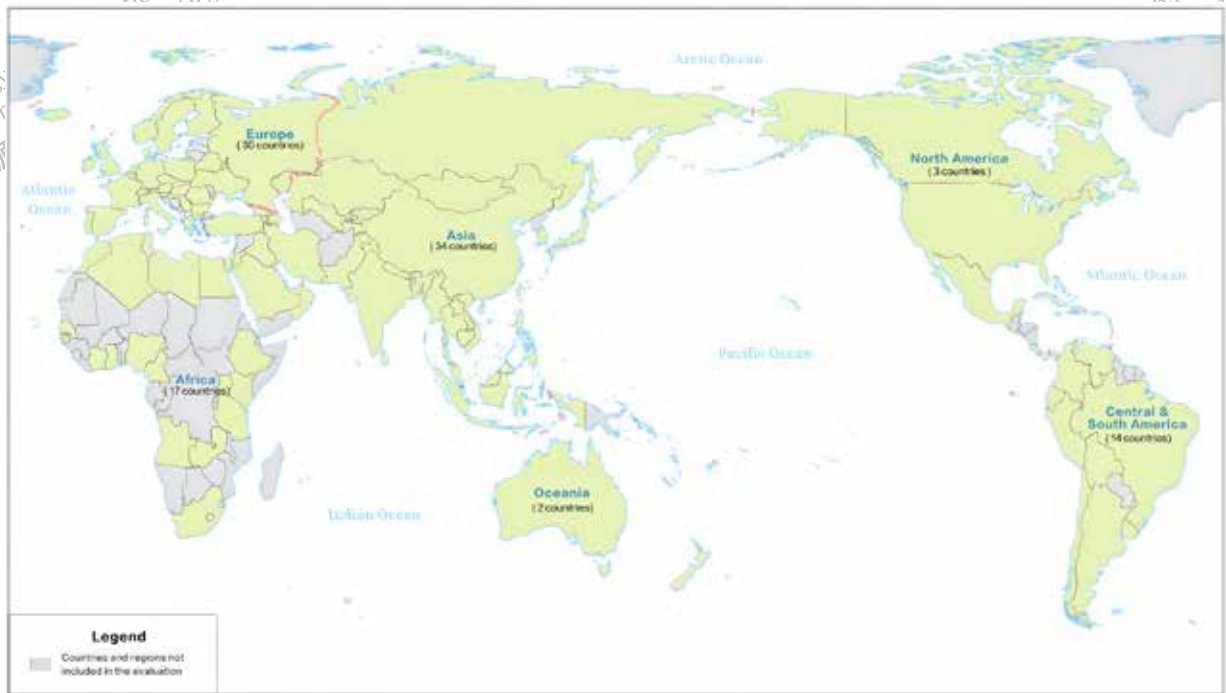


of its installed capacity, reflecting the structure and disparities of electricity development in the region.

North America includes 3 countries— Canada, the United States, and Mexico— all included in the research.

Oceania selects 2 countries — Australia and New Zealand. In 2025, the selected countries accounted for more than 95% of Oceania's total electricity consumption and more than 96% of its installed capacity, relatively completely reflecting the main features of regional electricity development.

Overall, the 100 countries selected for this report have a solid foundation in terms of scale coverage and structural representativeness, and can support a systematic assessment and horizontal comparison of the level of global electricity development.



* The regional labels in this map only indicate the scope of specific academic research, not geographic boundaries.

Figure 1-11 Evaluation Coverage

2

Indicator System of the Electricity Development Index

2.1 Overall Framework Design

The indicator system of the Global Electricity Development Index is rooted in the concept of sustainable electricity development and built on the principles of objective and comparable, systematic and comprehensive, dynamic and forward-looking, and decision-oriented. It adopts a three-tier architecture of “target layer— criterion layer— indicator layer,” forming a three-level calculation system of “Electricity Development Index— thematic indices— sub-indicators” (Figure 2-1). The system focuses on four core dimensions — supply security, consumption service, green and low-carbon development, and technology innovation — spanning the entire chain of electricity production and supply, transmission and distribution networks, end-use consumption, the low-carbon transition, and technological innovation. It systematically evaluates the level of electricity development across countries, achieving a comprehensive characterization of the “speed and quality,” “current status and trends,” and “scale and structure” of electricity development.

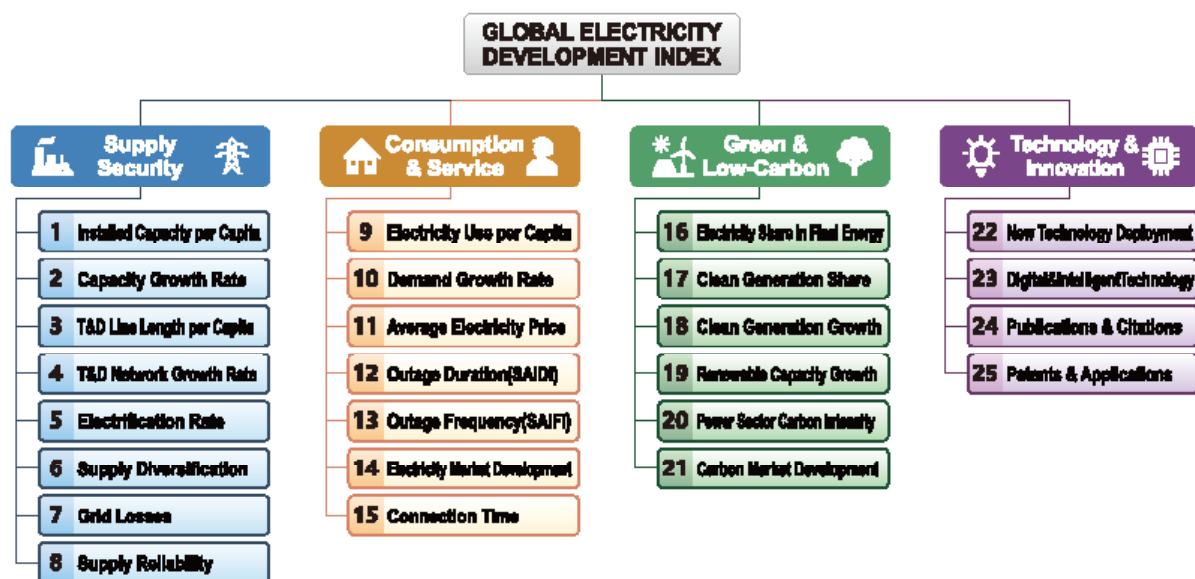


Figure 2-1 Overall Framework and Evaluation System of the Global Electricity Development Index

(1) Principles for constructing the indicator system

Principle of objectivity and comparability: Adhering to a foundation of quantifiable and verifiable objective statistical data, data-driven evaluation comprehensively replaces expert-led subjective scoring, achieving consistency and comparability in cross-country and cross-regional comparison. Data sources and statistical calibres across countries are unified to systematically eliminate the effects of statistical differences and ensure international comparability and methodological consistency of the results.

Principle of systematic comprehensiveness: The indicator system covers the key links of the entire power-system chain, taking into account both the “current level” (existed indicators) and the “development momentum” (increment and growth-rate indicators) of electricity development, and characterizes the comprehensive state of each country's electricity development in a multidimensional, three-dimensional way, avoiding biased judgments caused by a single indicator.

Principle of dynamic foresight: By introducing dynamic indicators such as the growth rates of installed capacity, electricity consumption, and clean energy, the system strengthens its ability to identify and capture electricity-development trends; at the same time, forward-looking evaluation dimensions are built for emerging areas such as electricity and carbon markets, enabling the index to better reflect the frontier dynamics and structural changes of the energy transition.

Principle of decision orientation: Indicator design closely centers on the core issues of concern to governments, international organizations, and the energy industry — including electricity security, service quality, the green transition, and technological innovation — ensuring that the results have clear policy relevance and application value; the system also supports dimension-by-dimension decomposition, providing quantitative support for identifying key weaknesses and relative strengths.

(2) Overview of the indicator system

The Global Electricity Development Index comprises 4 first-level indicators (thematic indices) and 25 second-level indicators. The name, dimension, and main 2026 adjustment of each indicator are shown in the table below.

Table 2-1 Overview of the 2026 Indicator System of the Global Electricity Development Index

First-level dimension	No.	Second-level indicator	Attribute
Supply Security (8 indicators)	1	Per-capita generation capacity (kW)	Positive
	2	Generation capacity growth rate (%)	Positive
	3	Per-capita T&D line length (m)	Positive
	4	T&D line growth rate (%)	Positive
	5	Electricity access rate (%)	Positive
	6	Supply diversification	Positive
	7	Grid losses (%)	Negative
	8	Power-supply stability	Positive
Consumption Service (7 indicators)	9	Per-capita electricity consumption (kWh/yr)	Positive
	10	Electricity consumption growth rate (%)	Positive
	11	Average electricity price (US cents/kWh)	Negative
	12	SAIDI (minutes)	Negative
	13	SAIFI (times)	Negative
	14	Electricity market development	Positive
	15	Connection time (days)	Negative
Green & Low-Carbon (6 indicators)	16	Electricity share of final energy consumption (%)	Positive
	17	Clean energy generation share (%)	Positive
	18	Clean energy generation growth rate (%)	Positive
	19	New energy capacity growth rate (%)	Positive
	20	Power carbon emission intensity (kg/kWh)	Negative
	21	Carbon market development	Positive
Technology Innovation (4 indicators)	22	New technology application	Positive
	23	Digital & intelligent technology	Positive
	24	Paper publication & citation	Positive
	25	Patent output & application	Positive

2.2 Definitions of the Indicators

(1) Supply–security dimension

The supply–security dimension focuses on measuring the basic supply capability, breadth of network coverage, and operational stability of a country's power system, with the core aim of evaluating whether a country has the electricity–supply foundation needed to support the normal functioning of the economy and society. This dimension has eight second–level indicators, systematically characterizing supply–security capability across six aspects: installed capacity, network coverage, access to electricity, structural diversity, operating efficiency, and overall stability.

Table 2–2 Meaning and Calculation Method of the Supply–Security Second–Level Indicators

First-level	Second-level indicator	Meaning	Calculation method / calibre
Supply Security	Per-capita generation capacity (kW)	Electricity–production capability	Total installed capacity / total population
	Generation capacity growth rate (%)	Expansion momentum of supply	Average annual growth of total capacity over the past 5 years
	Per-capita T&D line length (m)	Grid–infrastructure coverage	Total T&D line length / total population
	T&D line growth rate (%)	Grid–expansion investment intensity	Average annual growth of T&D lines over the past 5 years
	Electricity access rate (%)	Basic electricity accessibility	Population with electricity / total population
	Supply diversification	Balance of the generation mix	$1 - \sum(\text{share of each source}^2)$, i.e. the HHI complement
	Grid losses (%)	Grid operating efficiency	T&D losses / electricity supplied
	Power supply stability capacity	Comprehensive supply stability	Weighted sum of five quantitative scores: generation adequacy (55%) + grid support (10%) + external dependence (20%) + fuel–supply security (10%) + seasonal balance (5%)

Per-capita generation capacity (kW): calculated as total installed capacity divided by total population, this reflects the generation capability available per person and is a core indicator of a country's electricity-supply foundation. The indicator varies enormously across countries— Norway exceeds 7 kW per capita, whereas some African countries such as Nigeria are below 0.1 kW.

Generation capacity growth rate (%): characterized by the average annual growth of total installed capacity over the past five years, this reflects the expansion momentum of a country's generation capability, its ability to respond to future demand growth, and the level of investment activity.

Per-capita Transmission and Distribution (T&D) line length (m): calculated as total T&D line length divided by total population, this measures the per-capita coverage of grid infrastructure and distribution capability. Finland exceeds 70 m per capita, whereas some African countries are below 1 m per capita — an extremely wide gap.

T&D line growth rate (%): characterized by the average annual growth of T&D line length over the past five years, this reflects the level of activity in grid-infrastructure construction and a country's sustained investment in improving electricity access and network coverage.

Electricity access rate (%): calculated as the share of the population with electricity in the total population, this measures the basic accessibility of electricity supply and is a key indicator of energy equity. As of 2025, about 700 million people worldwide still lacked electricity, concentrated mainly in sub-Saharan Africa and South Asia.

Supply diversification: calculated as “one minus the sum of the squares of the generation shares of each source” (the complement of the Herfindahl - Hirschman Index), this measures the diversity of the generation mix. A higher value indicates a more balanced mix and a more diversified supply structure, with stronger overall supply resilience and risk resistance; a value approaching 0 indicates heavy dependence on a single source and a significant concentration risk.

Grid losses (%): calculated as the share of T&D line losses in electricity supplied, this measures grid operating efficiency and the level of energy utilization. The grid loss rate of the world's major developed economies is about 5% - 9%, whereas it exceeds 20% or even 30% in some African and South Asian countries; high losses represent both energy waste and the ageing of grid infrastructure.

Power supply stability capacity: calculated as a multidimensional structured quantitative evaluation. The system comprises five third-level indicators: ① theoretical generation adequacy (weight 55%), measuring generation-side adequacy on the basis of reserve margin and load factor; ② grid support capability (weight 10%), evaluated by integrating coverage density and T&D network strength; ③ external dependence of electricity supply (weight 20%), measuring the risk exposure to foreign energy supply; ④ generation fuel



supply security (weight 10%), assessing the supply stability and diversification of major fuels; and ⑤ seasonal supply balance (weight 5%), evaluating the system's seasonal balancing capability on the basis of climate-adaptation capacity and the peak-valley difference. The five indicators are weighted and summed to output a three-tier conclusion: strong (Score ≥ 1.1), medium ($0.8 \leq \text{Score} < 1.1$), and weak (Score < 0.8).

(2) Consumption-service dimension

The consumption-service dimension focuses on measuring the level of electricity service that a country provides to end-use customers — including the scale and growth potential of consumption, supply reliability, electricity affordability, ease of connection, and the depth of market-oriented reform — to comprehensively evaluate the quality and fairness of each country's electricity service. This dimension has seven second-level indicators.

Table 2-3 Meaning and Calculation Method of the Consumption-Service Second-Level Indicators

First-level	Second-level indicator	Meaning	Calculation method / calibre
Consumption Service	Per-capita electricity consumption (kWh/yr)	Scale of consumption & stage of development	Total electricity consumption / total population
	Electricity consumption growth rate (%)	Momentum of demand growth	Average annual growth of consumption over the past 5 years
	Average electricity price (¢ /kWh)	Electricity affordability	Weighted average end-use price (industrial, commercial and residential)
	Outage duration (SAIDI, minutes)	Supply reliability — duration	Total outage time of all users / total number of users
	Outage frequency (SAIFI, times)	Supply reliability — frequency	Sum of outage occurrences for all users / total number of users
	Electricity market development	Depth of market-oriented reform	Weighted rating across four dimensions — competition scope, pricing mechanism, institutional structure, trading system — each scored 1-5
	Connection time (day)	Service efficiency & business environment	Average working days from application to connection

Per-capita electricity consumption (kWh/yr): calculated as total electricity consumption divided by total population, this is a core indicator of a country's level of electricity consumption and stage of economic development. It varies enormously across the world — Iceland exceeds 50,000 kWh/yr, whereas sub-Saharan African countries are generally below 500 kWh/yr.

Electricity consumption growth rate: characterized by the average annual growth of consumption over the past five years, this reflects the momentum of demand growth and economic vitality, as well as a country's electricity-consumption potential at its stage of industrialization and urbanization.

Average electricity price (¢ /kWh): taking the weighted average of each country's industrial, commercial, and residential prices, this reflects the affordability of end-use electricity. Prices that are too high suppress demand and economic competitiveness, while prices that are too low may cause resource misallocation and fiscal pressure; the indicator comprehensively reflects the balance between economic efficiency and sustainability.

SAIDI (minutes): calculated as the total outage time of all customers divided by the total number of customers, this is an internationally accepted indicator of supply reliability. Developed economies generally have a SAIDI below 30 minutes, whereas some African and South Asian countries exceed a thousand or even several thousand minutes.

SAIFI (times): calculated as the sum of customer outage occurrences divided by the total number of customers; together with SAIDI it forms a complete supply-reliability evaluation system. SAIFI reflects how frequently outages occur, while SAIDI reflects how severe they are; combining the two more comprehensively identifies reliability weaknesses.

Electricity market development: calculated as a structured quantitative rating framework, scoring item by item across four dimensions — competition scope and access, pricing mechanism, institutional structure, and trading system and products— with each dimension rated on a standardized 1 - 5 scale (1 = fully regulated, 5 = fully market-based), and the four scores weighted and averaged into a composite score. For example, China's composite score is 3.75 (competition scope 4, pricing mechanism 4, institutional structure 3, trading system 4), and Australia's is 4.75 (5, 5, 4, 5).

Connection time (day): measuring the average number of working days from submitting an electricity application to formal connection, this reflects service efficiency and the quality of the business environment, and is one of the core indicators of the World Bank's business-environment assessment. Leading countries have connection times of under 10 days, whereas some African and South Asian countries exceed 100 days.

Table 2-4 Structured Scoring Reference for Electricity-Market Development

Score	Competition scope & access	Pricing mechanism	Institutional structure	Trading system & products
1	No substantive competition; single-buyer monopoly	Government or administrative pricing	Vertically integrated	No market-based trading products
2	Partial competition only on the generation side	Pricing based on PPAs or government-guided catalogue/benchmark tariffs	Independent internal accounting / functional separation	Only a single medium-/long-term energy trade
3	Full competition in generation feed-in	Initial spot market established; marginal-cost pricing attempted	Legal separation of generation, transmission, distribution and retail	Energy-market system of medium-/long-term plus spot
4	Retail side opened to specific groups (e.g. large industry)	Spot and medium-/long-term markets operate jointly on a regular basis	Establishment of an ISO or unbundling of transmission ownership	Energy market plus ancillary-services market
5	Retail side fully opened	Fully market-based pricing accurately reflecting the spatio-temporal value of electricity	Full unbundling of the grid from competitive businesses	Energy, ancillary services, capacity, financial derivatives, etc.

(3) Green and low-carbon dimension

The green and low-carbon dimension focuses on measuring the current level and pace of a country's power-system transition toward clean and low-carbon development, evaluating the depth of electrification, the scale of clean-energy development, electricity carbon-emission intensity, and the maturity of carbon-market mechanisms, to comprehensively present the progress and potential of each country's low-carbon transition. This dimension has six second-level indicators.

Table 2-5 Meaning and Calculation Method of the Green and Low-Carbon Second-Level Indicators

First-level	Second-level indicator	Meaning	Calculation method / calibre
Green & Low-Carbon	Share of electricity in final energy consumption (%)	Depth of electrification	End-use electricity consumption / total final energy consumption
	Clean energy generation share (%)	Cleanliness of the generation mix	Clean-energy generation / total generation
	Clean energy generation growth rate (%)	Speed of the green transition	Average annual growth of clean-energy generation over the past 5 years
	New energy capacity growth rate (%)	Expansion momentum of new energy	Average annual growth of wind/solar and other new-energy capacity over the past 5 years
	Power carbon emission intensity (gCO ₂ /kwh)	Comprehensive level of power decarbonization	Total CO ₂ emissions from power generation / total generation
	Carbon market development	Completeness of the carbon-pricing mechanism	Weighted rating across four dimensions — coverage, trading mechanism, financialization, international linkage — each scored 1 - 5

Share of electricity in final energy consumption (%): calculated as the share of electricity consumption in total final consumption of primary and secondary energy, this measures a country's overall depth of electrification. It is a core process indicator of the energy transition; the global average is about 22%, and Nordic countries generally exceed 30%.

Clean energy generation share (%): calculated as the share of generation from clean sources — hydro, wind, solar, nuclear, etc. — in total generation, this directly reflects the level of greening on the supply side. Countries rich in hydro resources such as Norway and Iceland approach 100%, whereas fossil-fuel-dependent countries are below 10%.

Clean energy generation growth rate (%): characterized by the average annual growth of clean-energy generation over the past five years, this reflects the pace and actual results of the green transition, and can in particular identify emerging transition economies that have a “low base but rapid growth.”

New energy capacity growth rate (%): characterized by the average annual growth of wind, solar, and other new-energy capacity over the past five years, this is a core indicator of a country's investment intensity and policy will on the main track of the energy transition, and an important forward-looking indicator of future clean-energy supply potential.

Power carbon emission intensity (gCO₂/kwh): calculated as total CO₂ emissions from power generation divided by total electricity consumption. Taking both the generation mix and use efficiency into account, this is the most direct comprehensive indicator of the level of power decarbonization. In the 2026 edition, the calculation calibre has been uniformly adjusted to emissions per unit of generation to improve cross-country comparability.

Carbon market development: building a four-dimensional 1 - 5 rating framework of “coverage and bindingness, trading mechanism and allocation, pricing and financialization, and degree of cross-region interconnection” to quantitatively assess the completeness of each country's carbon-pricing mechanism. For example, China's composite score is 3 (3 in all four dimensions), while Sweden (an EU ETS member state) scores 5 (5 in all four dimensions). By incorporating carbon emissions into the cost system, carbon markets provide a continuous market incentive for the clean transition of electricity.

Table 2-6 Structured Scoring Reference for Carbon-Market Development

Score	Coverage & bindingness	Trading mechanism & allocation	Pricing & financialization	Cross-region interconnection
1	No mandatory carbon-emission constraint	Only project-level voluntary credits (VCM/CDM)	Lack of an effective, unified price signal	Fully closed
2	MRV required only for some enterprises, or constraints on very few sectors	Fixed-price carbon tax, or small-scale cap pilots	Price fixed by government/industry (e.g. a fixed carbon-tax rate)	Attention to international carbon-pricing frameworks but no substantive coordination
3	Mandatory coverage of power or a few key energy-intensive sectors	National/regional unified cap-and-trade, mainly free allocation	Spot price formed by market supply and demand	Limited international/external offsets allowed against local compliance allowances
4	Broad cross-sector coverage	Mature cap-and-trade, gradually expanding allowance auctions	Standardized basic derivatives such as carbon futures introduced	Linked/mutually recognized with other ETSs
5	Deep decarbonization constraint with an absolute emission-reduction cap	Highly flexible trading mechanism with sound risk-resistance	Highly rich carbon-finance products with very high liquidity	Deeply integrated into the international carbon-pricing ecosystem

(4) Technology-innovation dimension

The technology-innovation dimension focuses on measuring a country's research and development (R&D) investment, depth of new-technology application, and output of innovation results in the electricity field, comprehensively evaluating the complete chain of “R&D foundation — application and conversion — accumulation of results” in electricity technology innovation. This dimension has four second-level indicators, all optimized in method in the 2026 edition to improve the objectivity and comparability of the evaluation.

Table 2-7 Meaning and Calculation Method of the Technology-Innovation Second-Level Indicators

First-level	Second-level indicator	Meaning	Calculation method / calibre
Technology Innovation	New technology application	Depth of frontier-technology application	AI-LLM-assisted with multi-model cross-validation; global best practice = 5; rated 1 - 5
	Digital & intelligent technology	Breadth of digital and intelligent application	AI-LLM-assisted, focusing on smart grids, digital control, user-side intelligence, etc.; rated 1 - 5
	Paper publication & citation	Basic-research capacity & international influence	First/corresponding-author publications + highly cited papers + international co-authored papers + average citations per paper; source: IEEE, Elsevier, etc.
	Patent output & application	Accumulation of innovation results & competitiveness	Patents granted in the power field + Patent Cooperation Treaty (PCT) applications + share of high-value patents + average citations per patent; source: PCT database

New technology application:calculated by an AI-LLM-assisted quantitative evaluation system. The mechanism is based on the core strategy of “human - AI collaboration and multi-model validation”: ① a data-complementarity mechanism, combining internet-search information with the vast training data of large models to fill gaps in public information; ② multi-model cross-validation, using several large models of different architectures to reason in parallel and eliminate single-model bias; ③ a unified scale and dynamic framework, in which all countries' information for a single technology is input simultaneously so that horizontal comparison is conducted on the same scale; and ④ quantification standards, taking global best practice as the full score (5) and following a normal distribution by technology maturity, with 5 representing the global best or a first-of-its-kind application and 1 representing poor performance or scarce information. The evaluation dimensions cover core areas such as new-type energy-storage technology, flexibility-regulation technology, and high-voltage transmission technology.



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Digital & intelligent technology: calculated by an AI-LLM-assisted quantitative evaluation method, focusing on the level of digitalization and intelligence in all links of the power system, with evaluation dimensions covering smart-grid infrastructure, digital control systems, user-side intelligence, and data-driven operation and maintenance. The same multi-model cross-validation mechanism as for new-technology application ensures objectivity, and each country's score reflects the comprehensive depth and sophistication of its electricity digital transformation.

Paper publication & citation: using international scientific databases such as IEEE and Elsevier to conduct a fully quantified analysis of each country's academic output in the electricity field, weighted across four sub-indicators—the number of first/corresponding-author publications, the number of highly cited papers, the number of internationally co-authored papers, and the average citations per paper. This indicator measures a country's voice in global frontier electricity research and its accumulation of basic research, reflecting the underlying capability that supports technological innovation.

Patent output & application: calculated as a fully quantified indicator with the PCT database as the core data source, weighted across four sub-indicators: patents granted in the power field, PCT applications in the power field, the share of high-value patents in the power field, and the average citations per patent, comprehensively reflecting a country's accumulation of technology-innovation results and its international competitiveness in the electricity field.



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3

Calculation Methodology of the Global Electricity Development Index

3.1 Calculation Process

Calculating the Global Electricity Development Index is a systematic undertaking, involving several key links: indicator construction, multi-source data integration, standardization, weight assignment, and comprehensive integration. This chapter systematically explains the technical route and method choices of each link to ensure that the calculation process is scientific, transparent, and reproducible.

The calculation follows a six-step systematic process: indicator construction — data collection — standardization — weight assignment — comprehensive integration — result validation, in which the links connect to one another and progress level by level, jointly safeguarding the objectivity and reliability of the final results.

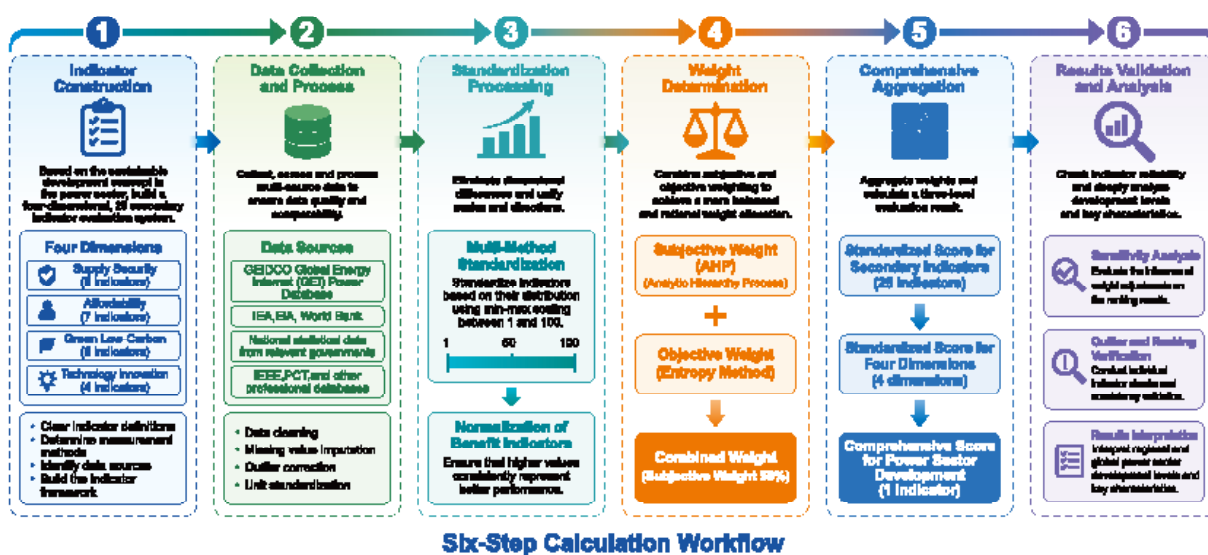
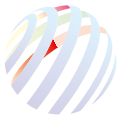


Figure 3-1 Calculation Process of the Global Electricity Development Index

Step 1— Build the indicator system: based on the concept of sustainable electricity development, and around the four core dimensions of supply security, consumption service, green and low-carbon development, and technology innovation, an evaluation system of 25 second-level indicators is built, clarifying the definition, calculation calibre, and data source of each indicator to form a structurally complete and logically consistent framework.



Step 2— Collect and process the underlying data: with GEIDCO's Global Energy Interconnection (GEI) electricity database as the core data source, the IEA, EIA, World Bank, UN, and official national statistics are systematically integrated, supplemented by professional databases such as IEEE and PCT. The collected data undergo cleaning, missing-value filling, outlier correction, and unit unification to ensure completeness, consistency, and cross-country comparability.

Step 3— Standardize the data: in view of the inconsistent dimensions and large differences in magnitude across indicators, a multi-quantile method maps each indicator, by rank, to a dimensionless 1 - 100 score range. Negative indicators are first positively oriented so that all indicator scores share the same direction (a high score always represents a better level).

Step 4— Assign weights: a subjective - objective combined weighting method is used, integrating subjective weights determined by the Analytic Hierarchy Process (AHP) with objective weights calculated by the entropy method, coupled with equal (50%/50%) weighting to obtain the final combined weights, balancing expert judgment with the structural features of the data.

Step 5— Comprehensive integration: by weighted summation, the standardized second-level indicator scores, the four thematic-index scores, and the Electricity Development Index score of each country are calculated level by level, forming a three-tier result of “indicator—dimension (sub-index) — composite.”

Step 6— Validation and analysis: a sensitivity analysis is carried out on the results to assess the impact of weight adjustments on rankings and to test the robustness of the index; abnormal rankings are reviewed case by case; and the global and regional results are interpreted in depth to reveal the patterns and features of electricity development levels and the transition.

3.2 Data Collection and Processing

(1) Data source

This research uses GEIDCO's Global Energy Interconnection (GEI) electricity database as its core data source, and on this basis systematically integrates multi-source authoritative data for supplementation and verification, forming a unified data-support system. The specific data source for each indicator is shown in the table below.

Table 3-1 Data Sources for the Global Electricity Development Index

Dimension	Second-level indicator	Main data source	Base year
Supply Security	Per-capita generation capacity / capacity growth rate	GEI annual flash report	2025
	Per-capita T&D line length / line growth rate	GEI annual flash report	2025
	Electricity-access rate	IEA, World Bank	2025
	Supply diversification	GEI annual flash report	2025
	Grid losses	GEI annual flash report	2025
	Power supply stability capacity	GEI database (multidimensional quantitative synthesis)	2025
Consumption Service	Per-capita electricity consumption / consumption growth rate	GEI annual flash report	2025
	Average electricity price	National regulators, GlobalPetrolPrices, BNEF	2025
	Outage duration (SAIDI) / outage frequency (SAIFI)	World Bank, national regulators	2023 - 2025
	Electricity market development	GEI assessment (four-dimensional structured rating)	2025
	Connection time	GEI database	2024
Green & Low-Carbon	Electricity share of final energy consumption	IEA energy balances	2023
	Clean energy generation share / generation growth rate	GEI annual flash report	2025
	New energy capacity growth rate	GEI annual flash report	2025
	Power carbon-emission intensity	GEI database	2024
	Carbon market development	GEI assessment (four-dimensional structured rating)	2025
Technology Innovation	New technology application	AI-LLM-assisted quantitative assessment	2025
	Digital & intelligent technology	AI-LLM-assisted quantitative assessment	2025
	Paper publication & citation	IEEE, Elsevier databases	2022 - 2024
	Patent output & application	PCT patent database	2022 - 2024

(2) Data timeliness

The research base year of this report is 2025, and the main indicator data are based on 2025. For certain annual data not yet publicly released, 2024 data are used as a basis and reasonably estimated in combination with the 2020 - 2024 historical trend, to be dynamically revised in future editions once the annual data are released. For five-year-growth indicators, the compound annual growth rate (CAGR) is uniformly calculated using the 2021 - 2025 data interval to ensure a consistent calibre.

(3) Data quality control

Missing-value handling: for missing data of individual countries and indicators, reasonable filling first refers to the average of nearby countries in the same region and at a similar stage of development; where the data gap is large, the values are based on estimates from authoritative international institutions or extrapolated from historical trends, with the treatment noted in the appendix tables.

Outlier handling: data points that clearly deviate from a reasonable range are verified through cross-checking across multiple data sources; outliers genuinely caused by differences in statistical calibre are adjusted to a standardized calibre.

Data consistency: all data involving energy units are uniformly converted to standard units (kWh, kW, million tonnes of CO₂-equivalent, etc.), and all data involving exchange rates uniformly use constant 2025 US dollars, ensuring cross-country comparability.

3.3 Data Standardization and Indicator Calculation

(1) Data-standardization method

1. Review of common standardization methods. When building a composite index, the dimensions, magnitudes, and distributions of the indicators differ, so the raw data cannot be directly compared or summed and must be standardized into dimensionless, comparable scores. Four types of method are common in academia and practice.

(1) Min-Max normalization. This linearly maps the raw values of each indicator to the [0, 1] or [0, 100] interval:

$$X_{\text{standardized}} = \frac{X_i - X_{\min}}{X_{\max} - X_{\min}} \times 100$$

It is intuitive and preserves the shape of the original distribution, but it is highly sensitive to extreme values: if one country's value far exceeds the others, the scores of many countries are compressed into a very low range, severely distorting the differentiation of the index.

(2) **Z-score standardization.** This converts the raw data into a standard normal distribution centered on the mean and scaled by the standard deviation:

$$Z_i = \frac{X_i - \bar{X}}{\sigma}$$

It suits approximately normally distributed data and effectively removes dimensional effects, but its results are continuous values that can be positive or negative, lacking intuitive readability; when the distribution is skewed the effect is limited, making it unsuitable for a policy-oriented composite index that must directly present rankings and score ranges.

(3) **Natural breaks (Jenks).** Using a statistical clustering algorithm, this divides the data into several class intervals with minimal within-group difference and maximal between-group difference, assigning a class score to each interval. It reflects natural clustering well, but the classification changes as the sample data are updated, giving poor year-on-year comparability, and the choice of the number of classes is somewhat subjective.

(4) **Multi-quantile rank-scoring.** Rather than relying on the absolute magnitude of the raw values, this assigns scores on the basis of each country's relative rank in the sample: all sample countries are ranked by an indicator's raw value from high to low (or low to high), the first-ranked country is given the highest score and the last the lowest, with the intermediate countries decreasing by an equal step, forming a continuous, evenly distributed series of standardized scores.

2. The standardization method used in this report. This report uses multi-quantile rank-scoring to standardize the raw data of each indicator. Among the 100 sample countries, each indicator is ranked by raw value from high to low (for positive indicators the largest value ranks first; for negative indicators the smallest value ranks first). The first-ranked country scores 100, the second 99, and so on, down to 1 for the 100th. The score can be expressed uniformly as:

$$S_i = 101 - R_i$$

where S_i is the standardized score of country i and R_i is its rank for the indicator ($R_i \in [1, 100]$). In the case of ties, the average score of the tied positions is taken so that the total of all countries' scores is unchanged.

3. Advantages of multi-quantile rank-scoring. Compared with other methods, this approach has outstanding advantages for a cross-country comparative composite index: strong resistance to extreme values (scores depend only on relative rank, not absolute magnitude, so an extreme high or low value for one country neither stretches nor compresses the distribution

of the others); an even score distribution with high differentiation (the 100 countries are evenly distributed over the integer range 1 - 100, with a constant 1-point gap between adjacent ranks); intuitive, highly readable results (a fixed range, 100 for first place and 1 for last); and good year-on-year comparability (the scoring logic is fixed and does not change with the mean, variance, or shape of the sample).

(2) Calculation examples

The following uses two indicators— per-capita electricity consumption and per-capita generation capacity— with actual data for selected countries to demonstrate the full process of multi-quantile rank-scoring.

Example 1: Per-capita electricity consumption. This is a positive indicator—the higher the value, the higher the country's level and rank, and the higher the score. Table 3-2 lists the 2024 per-capita electricity consumption of selected sample countries and the corresponding standardized scores (the full sample is 100 countries; representative countries are shown here).

Table 3–2 Example of Standardized Scores for Per-Capita Electricity Consumption (Selected Countries)

Rank	Country	Per-capita electricity (kWh/capita)	Standardized score
1	Iceland	52,337	100
2	Bahrain	23,853	99
3	Norway	22,883	98
4	Kuwait	22,719	97
5	Qatar	17,561	96
...	...	...	...
18	China	7,034	81
...	...	...	...
35	Portugal	5,157	66
...	...	...	...
52	Türkiye	3,569	49
...	...	...	...
72	Egypt	1,953	29
...	...	...	...
90	Pakistan	531	11
...	...	...	...
99	Ethiopia	168	2
100	Uganda	120	1

As Table 3–2 shows, although Iceland (52,337 kWh/capita) and second-placed Bahrain (23,853 kWh/capita) differ in raw value by about 2.3 times, under multi-quantile rank-scoring they differ by only 1 point (100 vs 99). Under Min-Max normalization, Bahrain would score about 44 and the 99 countries below Iceland would be heavily compressed into a low range, severely distorting differentiation — a problem this method effectively avoids.

Example 2: Per-capita generation capacity. Also a positive indicator — the larger the installed capacity, the higher the score.

Table 3-3 Example of Standardized Scores for Per-Capita Generation Capacity (Selected Countries)

Rank	Country	Per-capita capacity (kW/capita)	Standardized score
1	Iceland	7.75	100
2	Norway	7.35	99
3	Bahrain	6.24	98
4	Sweden	5.68	97
5	Finland	5.00	96
...	...	...	...
15	Germany	3.45	86
...	...	...	...
23	China	2.72	78
...	...	...	...
68	Cuba	0.69	33
...	...	...	...
85	Philippines	0.28	16
...	...	...	...
99	Tanzania	0.06	2
100	Uganda	0.04	1

(3) Composite-index calculation formulas

After standardizing each indicator, weighted summation is used to integrate the scores level by level. The score of each country's thematic index (first-level indicator) is calculated as:

$$F_j = \sum_{k=1}^{n_j} w_{jk} \cdot score_{jk}$$

where F_j is the score of the j -th thematic index ($j = 1, 2, 3, 4$, for supply security, consumption service, green and low-carbon development, and technology innovation, respectively), $score_{jk}$ is the standardized score of the k -th second-level indicator under thematic index j , and w_{jk} is its combined weight. The Electricity Development Index score is calculated as:

$$EDI = \sum_{j=1}^4 w_j F_j = \sum_{j=1}^4 \sum_{k=1}^{n_j} w_{jk} score_{jk}$$

where EDI is the composite-index score and w_j is the weight of the j -th thematic index (the sum of all second-level weights under it), with the thematic-index weights summing to 1. The composite score also falls in $[1, 100]$, a higher score representing a higher overall level of electricity development.

3.4 Weight Design

Indicator weights are the core parameters of the evaluation system, directly determining the contribution of each dimension and indicator to the composite score. Weight design must balance “fully reflecting the differences in information content” against “reflecting policy concerns and expert consensus.” This research uses a subjective - objective combined weighting method, establishing subjective weights via the Analytic Hierarchy Process (AHP) and objective weights via the entropy method, coupled with equal (50%) weighting to obtain the final combined weights.

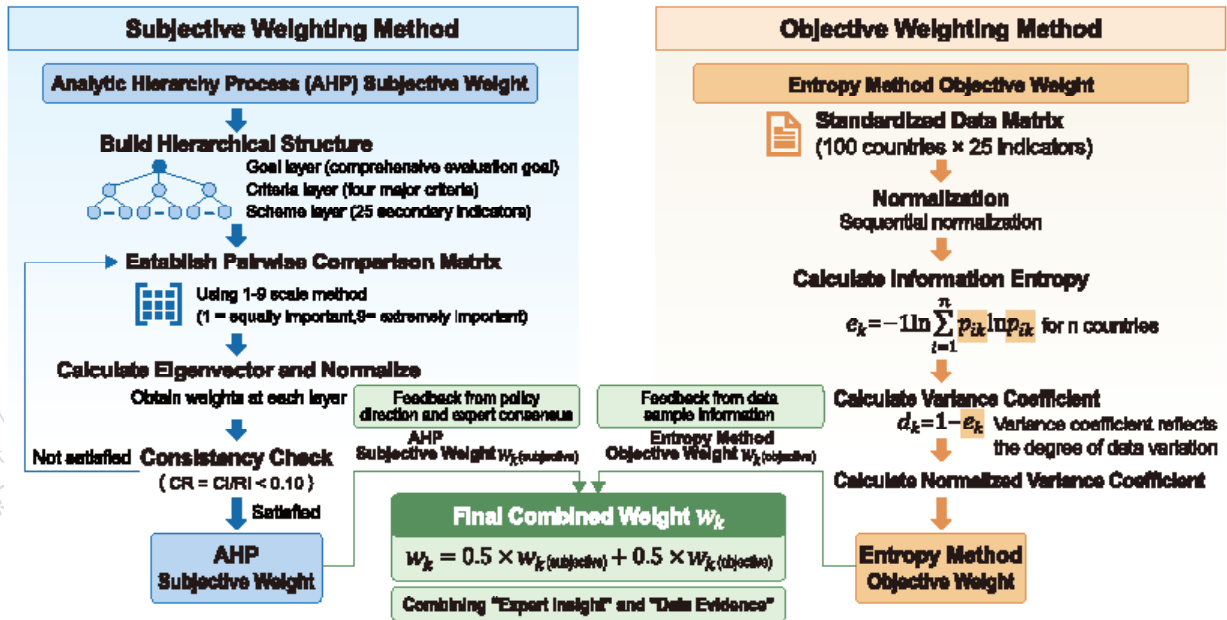


Figure 3-2 Subjective - Objective Combined Weighting Method

(1) AHP subjective weights

The AHP quantifies experts' subjective judgment of the relative importance of indicators through pairwise comparison. The steps are: build a hierarchy with the evaluation goal as the target layer, the four thematic indices as the criterion layer, and the 25 second-level indicators as the scheme layer; perform pairwise comparisons within each layer using a 1 - 9 scale (1 = equally important, 9 = absolutely important) to obtain judgment matrices; solve for the eigenvector of each matrix and normalize it into subjective weights; and compute the consistency ratio ($CR = CI/RI$), ensuring $CR < 0.10$, adjusting the matrix until the consistency test passes.

(2) Entropy-method objective weights

Based on information-entropy theory, the entropy method automatically assigns weights according to the dispersion of each indicator's data across countries — the larger the inter-country difference, the greater the contribution to differentiating electricity-development levels and the higher the weight. The steps are: normalize the standardized-score matrix of the 100 countries by column into proportions; compute the information entropy of each indicator,

$$e_k = -\frac{1}{\ln n} \sum_{i=1}^n p_{ik} \cdot \ln p_{ik}$$

where n is the number of countries and p_{ik} is the proportion of the k -th indicator for the i -th country; compute the difference coefficient $d_k = 1 - e_k$ (a larger coefficient means more pronounced inter-country divergence); and normalize the difference coefficients into objective weights.

(3) Combined-weight calculation

The final combined weight is $w_k = 0.5 \times w_k(\text{subjective}) + 0.5 \times w_k(\text{objective})$, where the subjective weight reflects policy orientation and industry consensus and the objective weight reflects the information content of the data; the equal-weight combination effectively balances “expert intent” and “letting the data speak.”

(4) Results of the indicator weight design

Based on the above combined weighting method, the final weights of the four thematic indices and the 25 second-level indicators are shown in the table below.

Table 3-4 Indicator Weights of the 2026 Global Electricity Development Index

First-level (weight)	No.	Second-level indicator	Subjective	Objective	Combined
Supply Security (30%)	1	Per-capita generation capacity	8.2%	7.9%	8.1%
	2	Generation-capacity growth rate	2.8%	3.4%	3.1%
	3	Per-capita T&D line length	5.1%	4.8%	5.0%
	4	T&D line growth rate	1.9%	2.3%	2.1%
	5	Electricity-access rate	5.3%	4.6%	5.0%
	6	Supply diversification	2.6%	3.6%	3.1%
	7	Grid losses	1.9%	2.1%	2.0%
	8	Power-supply stability	1.7%	1.9%	1.8%
Subtotal			30%	30%	30%
Consumption Service (25%)	9	Per-capita electricity consumption	6.2%	5.8%	6.0%
	10	Electricity-consumption growth rate	2.8%	3.2%	3.0%
	11	Average electricity price	3.8%	4.2%	4.0%
	12	Outage duration (SAIDI)	2.9%	3.1%	3.0%
	13	Outage frequency (SAIFI)	1.9%	2.1%	2.0%
	14	Electricity-market development	4.1%	3.9%	4.0%
	15	Connection time	2.9%	3.1%	3.0%
Subtotal			25%	25%	25.0%
Green & Low-Carbon (25%)	16	Electricity share of final energy	4.2%	3.8%	4.0%
	17	Clean-energy generation share	6.1%	5.9%	6.0%
	18	Clean-energy generation growth rate	2.8%	3.2%	3.0%
	19	New-energy capacity growth rate	3.9%	4.1%	4.0%
	20	Power carbon-emission intensity	5.1%	4.9%	5.0%
	21	Carbon-market development	2.9%	3.1%	3.0%
Subtotal			25%	25%	25.0%

First-level (weight)	No.	Second-level indicator	Subjective	Objective	Combined
Technology Innovation (20%)	22	New-technology application	5.0%	5.0%	5.0%
	23	Digital & intelligent technology	5.0%	5.0%	5.0%
	24	Paper publication & citation	4.9%	5.1%	5.0%
	25	Patent output & application	5.1%	4.9%	5.0%
Subtotal			20%	20%	20.0%
Total (25 indicators)			100%	100%	100%

In terms of the first-level weight distribution, supply security has the highest weight (30%), reflecting the priority given to basic supply security in global electricity development; consumption service (25%) and green and low-carbon development (25%) rank joint second, reflecting the equal importance of service quality and the green transition; and technology innovation has a weight of 20%, reflecting the strategic role of innovation in high-quality electricity development.

(5) Weight sensitivity analysis

To verify the robustness of the weight design, this research conducted a ± 5 -percentage-point sensitivity test on the first-level weights, calculating results under various combinations such as 35%/20%/25%/20% and 25%/25%/30%/20% for supply security, consumption service, green and low-carbon development, and technology innovation. The results show that after adjusting the weights, the composition and ranking of the global top 10 changed by no more than 3 positions, and the overlap of the global top 20 exceeded 85%, indicating that the composite-index results are highly robust. Researchers may flexibly adjust the weights according to their specific research purpose to reflect different policy emphases.

4

Analysis and Calculation of the Global Electricity Development Index

4.1 Asia

(1) Basic situation of electricity development

Asia is the world's largest continent by area, population, and economic size, an important engine of the world economy, home to the largest number of developing countries, and the region with the fastest growth in electricity demand. In 2025, Asia's total installed capacity was about 6,046 GW and total electricity consumption about 17.0 trillion kWh; over the past five years, consumption grew at an average annual rate of about 4.8% — the strongest electricity–development momentum in the world.

Table 4–1 Asia — Economic, Social and Electricity–Development Data (2025)

Economic & social data	Value	Electricity–development data	Value
Area (10,000 km ²)	3,122	Total installed capacity (GW)	6,046
Population (100 million)	46.4	Total electricity consumption (trillion kWh)	16.97
GDP (trillion USD)	43.3	Per-capita generation capacity (kW)	1.30
GDP per capita (USD)	9,334	Per-capita electricity consumption (kWh)	3,659
Electricity share of final energy	25.7%	Electricity access rate	98.6%
Clean energy generation share	36.5%	Carbon intensity (gCO ₂ /kWh)	568

From 2021 to 2025, Asia's total consumption rose from about 14.0 to 17.0 trillion kWh (4.8% per year, far above the global average of 3.5%), and installed capacity jumped from about 4,260 to 6,046 GW, a 41.8% increase over five years, with the increment coming mainly from wind and solar. In 2025, per-capita consumption was about 3,659 kWh and per-capita installed capacity about 1.30 kW — both up markedly from 2022 but still below the global average, with parts of South and Southeast Asia lagging. Asia's electricity–access rate has reached about 98.6%, with most countries achieving universal access.

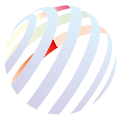
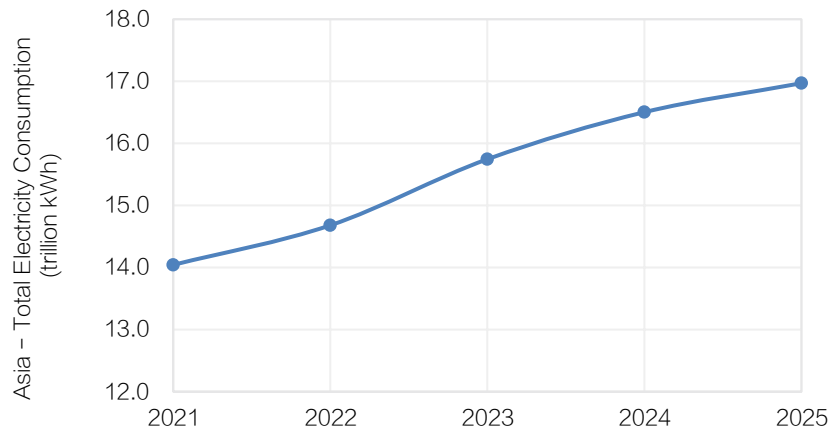
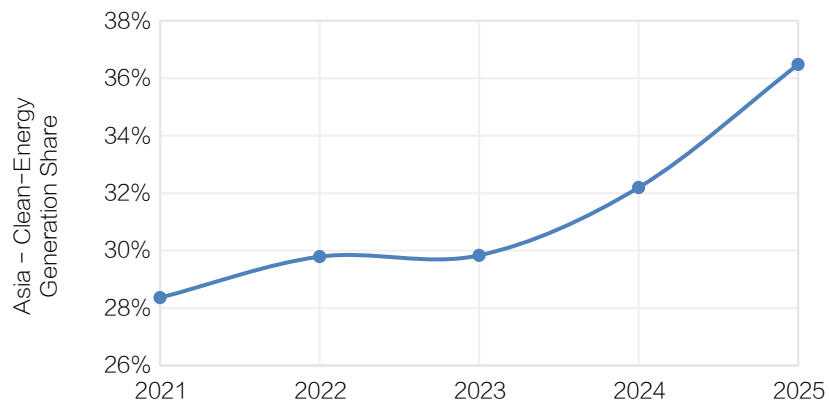


Figure 4-1 Asia — Growth in Electricity Consumption, 2021 - 2025



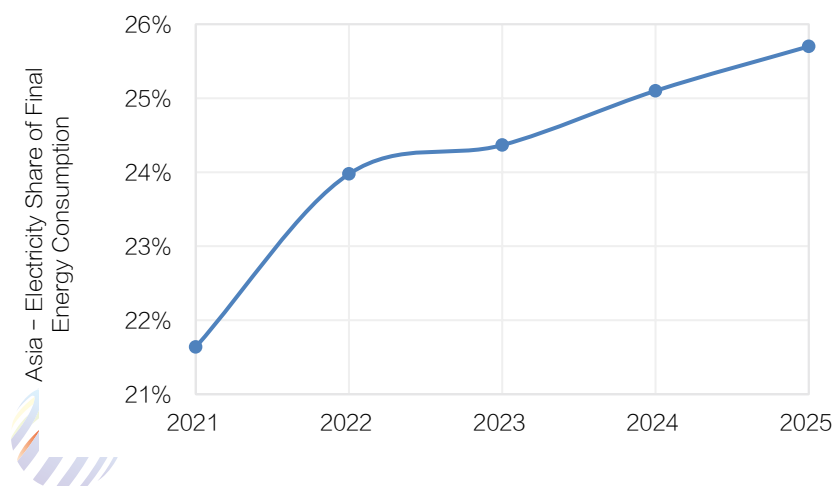
From 2021 to 2025, Asia's clean-energy generation share rose from about 28.4% to about 36.5%, an 8-percentage-point gain over five years — the fastest in the world — driven mainly by China's large-scale new-energy expansion. China's wind and solar generation share has exceeded 22%; nonetheless, thermal power still dominates Asia's generation mix, and the clean, low-carbon transition remains a formidable task.

Figure 4-2 Asia — Clean-Energy Generation Share, 2021 - 2025



From 2021 to 2025, Asia's electricity share of final energy consumption rose from 21.6% to about 25.7%, a gain of more than 4 percentage points — the fastest in the world — driven jointly by the large-scale penetration of EVs in China, accelerating industrial electrification, and continued improvement in electricity access in India and Southeast Asia. However, the high share of coal power, combined with weak grid infrastructure in some developing countries, means the cleanliness and pace of electricity substitution are not yet matched, and the overall quality of electrification needs further improvement.

Figure 4-3 Asia — Electricity Share of Final Energy Consumption, 2021 - 2025



(2) Electricity Development Index results

Asia's Electricity Development Index is 76.0, essentially level with the global average (76.5). The supply-security, consumption-service, and technology-innovation sub-indices are slightly above the global average, while green and low-carbon development is below it. Among the 34 Asian countries assessed, the top three are China, the Republic of Korea, and Singapore.

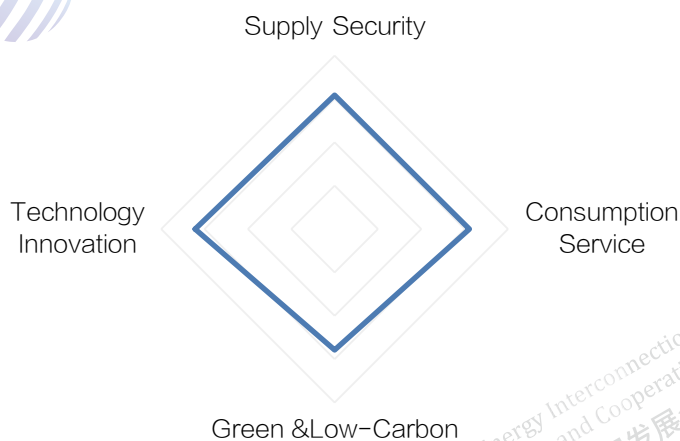


Figure 4-4 Asia— Radar of Electricity-Development Levels by Dimension

Table 4-2 Electricity Development Index Ranking and Scores of the 34 Asian Countries

Rank	Country	Score	Rank	Country	Score
1	China	88.9	18	Kazakhstan	68.8
2	Rep. of Korea	86.4	19	India	68.6
3	Singapore	84.5	20	Azerbaijan	68.5
4	Japan	83.3	21	Indonesia	68.2
5	UAE	83.2	22	Philippines	67.3
6	Israel	80.8	23	Kyrgyzstan	67.0
7	Saudi Arabia	79.0	24	Uzbekistan	66.0
8	Bahrain	78.9	25	Tajikistan	65.8
9	Qatar	78.4	26	Iran	65.8
10	Malaysia	76.6	27	Nepal	65.8
11	Oman	76.2	28	Sri Lanka	63.5
12	Vietnam	76.0	29	Cambodia	63.3
13	Kuwait	75.5	30	Bangladesh	61.0
14	Laos	74.2	31	Mongolia	60.4
15	Georgia	73.1	32	Pakistan	59.7
16	Jordan	72.3	33	Myanmar	57.7
17	Thailand	72.1	34	Iraq	54.6

(3) Analysis of fast-progressing countries in Asia

The fast progressing countries in Asia are Malaysia and Nepal. Relying on large-scale new-energy deployment, continued demand growth, and accelerating application of new technologies, both raised their index markedly, rising 13 and 8 places respectively among the 100 countries compared with the 2024 edition.

1. Malaysia. In recent years, Malaysia has improved markedly in supply security, consumption service, and technology innovation, ranking among the leaders in Southeast Asia. In supply security, it scores 75.9 (41st globally), with a grid-loss rate of 2.7% (31st) and good T&D efficiency; per-capita installed capacity of 1.28 kW still leaves room to grow. In consumption service, its connection time of just 24 days (5th globally) leads Southeast Asia, per-capita

consumption reaches 6,664 kWh (22nd), the average electricity price is about USD 0.097/kWh (39th), reliability is strong (SAIDI 53.35 min/yr, 18th), and access is 100%. Technology innovation scores 66.0, leading Southeast Asia.

However, green and low-carbon development remains Malaysia's core weakness: the clean-energy share is only 21.3% (69th) and carbon intensity is as high as 615.4 gCO₂/kWh (89th of 100), with gas and coal exceeding 75% of the mix. Overall, Malaysia shows a profile of “leading consumption service, steady supply security, and an urgent need for a green breakthrough.”

From 2022 to 2025, guided by its National Energy Transition Roadmap and driven by large-scale solar deployment and green-power market innovation, Malaysia has accelerated its energy-mix transition. Its Renewable Energy Roadmap (MyRER) targets a 31% renewable share of installed capacity by 2025, power-sector decarbonization by 2035, and a 70% renewable share by 2050. In 2023 the government released the National Energy Transition Roadmap (NETR), proposing to raise solar's share from about 4% to 58% by 2050, with solar parks, hybrid floating PV, and rooftop-PV virtual aggregation as three flagship projects. The Corporate Green Power Programme (CGPP, August 2022) and the Corporate Renewable Energy Supply Scheme (CRESS, July 2024) allow third parties to buy and sell green power via open grid access from September 2024, a key step toward a market-based green-power mechanism. In October 2023 parliament passed the Energy Efficiency and Conservation Act, extending energy-consumption norms from industry to the residential sector. The fifth solar tender concluded in January 2024 (cap of 500 MW per independent power producer), putting Malaysia's solar industry on a high-growth track.¹⁵

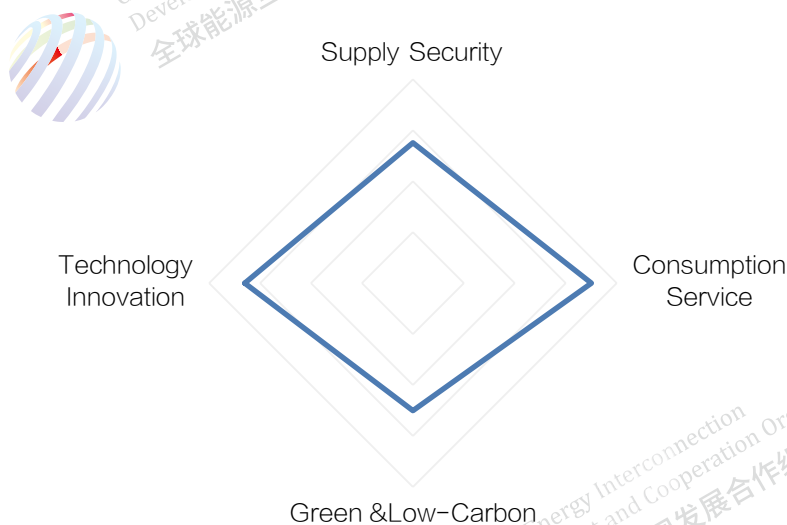


Figure 4-5 Malaysia—Radar of Electricity-Development Levels

¹⁵ National Energy Administration of China (nea.gov.cn), 2025.



2. Nepal. Nepal's most striking strength is green and low-carbon development: with a nearly all-clean mix (clean energy share of 100%) and near-zero carbon intensity (0 gCO₂/kWh), it ranks 1st of the 100 countries on both; meanwhile new-energy capacity growth of 26.8% (20th) and clean-energy generation growth of 16.8% (16th) show strong transition momentum. In supply security, generation-capacity growth of 17.4% ranks 6th globally, with construction visibly accelerating. In consumption service, 2025 consumption growth of 9.4% ranks 12th, the average price is about USD 0.05/kWh (16th, very affordable), and access has reached 94%.

However, Nepal's electricity development base remains weak: per-capita installed capacity of just 0.14 kW (92nd), per-capita consumption of just 429 kWh (92nd), and an electricity share of final energy of only 6.9% (94th) indicate a low level of electrification; supply diversification is also insufficient (96th), with heavy reliance on a single hydropower resource. Overall, Nepal shows a stage-specific profile of “a clear green base, strong growth momentum, and a small base scale,” with broad room for future improvement.

Centered on universal electrification, expanding power exports, and accelerating hydropower development, the Nepali government has stepped up policy guidance and institutional investment. From 2022 to 2025, the Nepal Electricity Authority built new transmission lines, raised distribution capacity, reduced technical and non-technical losses, promoted electric-stove substitution, distributed free meters to settlements and low-income groups, expanded smart street lighting, and encouraged EV adoption.¹⁶

In FY2022 - 23, new transmission lines reached a record 765 km and cumulative substation capacity rose to 8,867 MVA. In November 2022, eight hydropower stations totaling 403 MW began exporting power to India via a bidding mechanism, marking Nepal's shift from net importer to net exporter.¹⁷ In April 2024, the authority tendered for 800 MW of solar power over two years, attracting 134 firms.¹⁸ In January 2025, the government approved an Energy Development Roadmap targeting 28,500 MW of capacity by 2035 (13,000 MW domestic, 15,000 MW for export) with a planned USD 46.5 billion of investment.¹⁹ In May 2025, new-fiscal-year policy further emphasized developing hydropower based on domestic resources, mobilizing domestic capital and the diaspora, and advancing river regulation and reservoir construction to strengthen peak-period supply.²⁰

Looking ahead, the core paths for raising Asia's electricity-development level are threefold: continue large scale clean energy development — led by China, India, and Vietnam — and accelerate the orderly exit of coal power;

¹⁶ Ministry of Commerce of China (mofcom.gov.cn), Nepal country guide.

¹⁷ GoalFore project database (project.goalfore.cn), 2024.

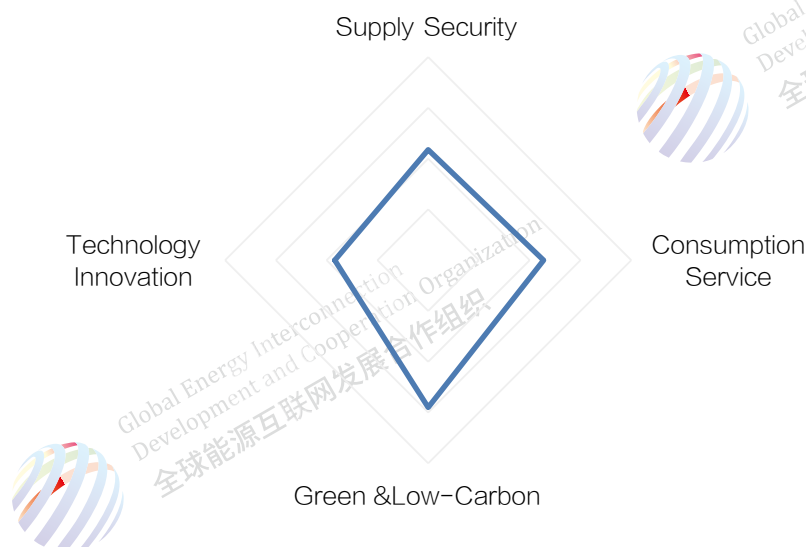
¹⁸ In-En Energy (in-en.com), Nepal electricity, 2024.

¹⁹ China International Development Cooperation Agency (cidca.gov.cn), 2025.

²⁰ Ministry of Commerce of China (mofcom.gov.cn), Nepal country guide.



Figure 4-6 Nepal — Radar of Electricity-Development Levels



accelerate cross-border power interconnection to optimize the allocation of clean energy resources within the region; and leverage digital and intelligent technologies to enhance system regulating capability and resilience under extreme-weather shocks and high-share new-energy integration.

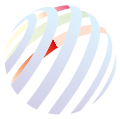
4.2 Europe

(1) Basic situation of electricity development

Europe is a highly developed economy and a leader of the global energy transition, the first to set a 2050 climate-neutrality goal and to advance deep decarbonization of the power system. In 2025 Europe's total installed capacity was about 1,931 GW and the clean-energy generation share approached 60%, far above the global average (about 42.8%). Affected by the energy-security crisis triggered by the Russia - Ukraine conflict and long-term efficiency gains, Europe's total consumption has stabilized after a slight contraction, while new-energy capacity continues to expand rapidly.

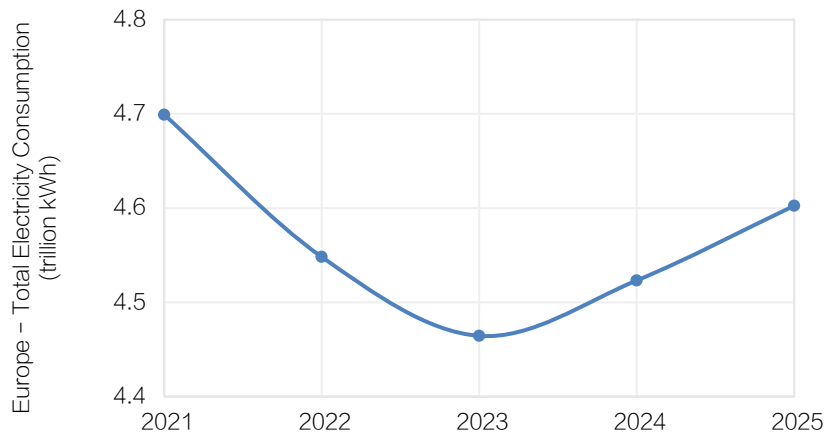
Table 4-3. Europe — Economic, Social and Electricity-Development Data (2025)

Economic & social data	Value	Electricity-development data	Value
Area (10,000 km ²)	2,379	Total installed capacity (GW)	1,931
Population (100 million)	8.3	Total electricity consumption (trillion kWh)	4.60
GDP (trillion USD)	33.1	Per-capita generation capacity (kW)	2.34
GDP per capita (USD)	40,042	Per-capita electricity consumption (kWh)	5,575
Electricity share of final energy	19.6%	Electricity access rate	100%
Clean-energy generation share	57.6%	Carbon intensity (gCO ₂ /kWh)	244



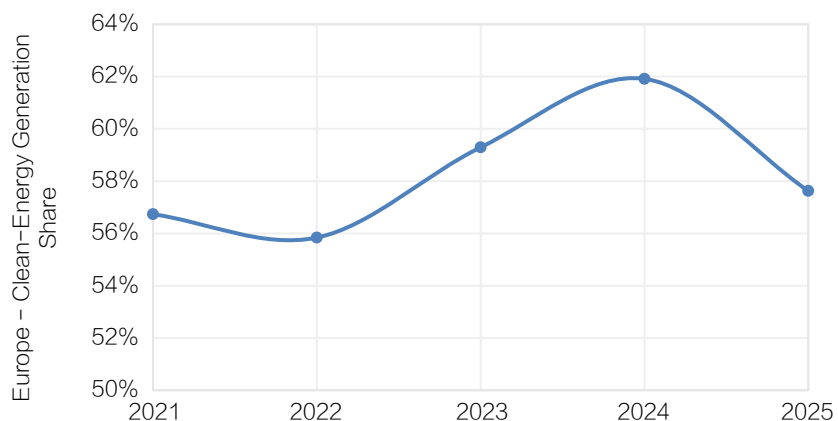
From 2021 to 2025, Europe's total consumption stayed in the 4.4 - 4.7 trillion kWh range, while capacity rose from about 1,690 to 1,890 GW, with the increment almost entirely from wind and solar. In 2025 per-capita consumption was about 5,575 kWh and per-capita installed capacity about 2.34 kW, both world-leading. Access is 100% region-wide, infrastructure is well developed, and the cross-border interconnected grid (ENTSO-E) has wide coverage.

Figure 4-7 Europe — Growth in Electricity Consumption, 2021 - 2025



Europe's clean-energy share rose from about 56.7% in 2021 to 61.9% in 2024, then fell to 57.6% in 2025, mainly because abnormal weather in parts of Europe cut hydropower output by about 11.8 - 12% and wind by about 2%. In 2025 wind and solar reached 30% of generation, surpassing fossil fuels for the first time to become Europe's largest power source. Germany, Spain, and Portugal reached renewable shares of 55.3%, 71.7%, and 73.9% respectively, leading the transition. Meanwhile several countries reassessed nuclear strategy — France is accelerating life-extensions and new builds, and Finland's Olkiluoto 3 entered commercial operation — reinforcing nuclear's role in Europe's low-carbon supply.

Figure 4-8 Europe — Clean-Energy Generation Share, 2021 - 2025



From 2021 to 2025, Europe's electricity share of final energy rose from 18.2% to about 20.5%, driven mainly by the accelerating uptake of heat pumps and EVs and the rapid climb in data-center demand. Even so, the EU's Clean Industrial Deal requires this share to rise further to 32% by 2030,²¹ implying that electrification must accelerate several-fold over the next five years. To meet this goal the EU must overcome structural obstacles such as long-stagnant industrial power demand and high electricity prices that suppress end-use substitution.²²

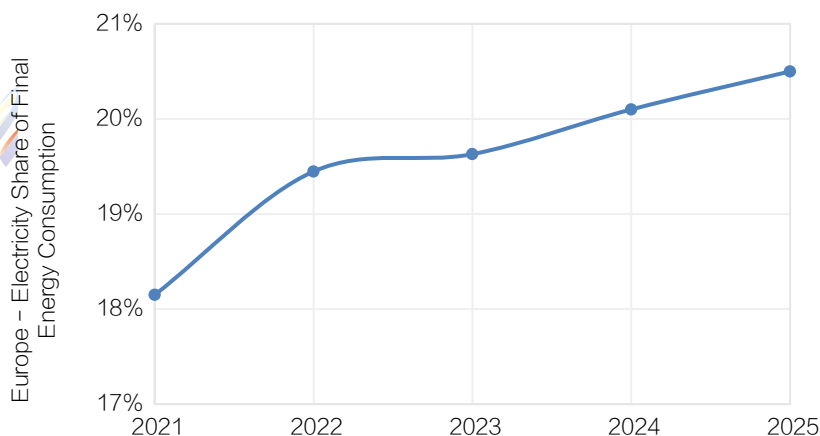


Figure 4-9 Europe—Electricity Share of Final Energy Consumption, 2021 - 2025

(2) Electricity Development Index results

Europe's Electricity Development Index is 81.3, world-leading, with supply security, consumption service, green and low-carbon development, and technology innovation all far above the global average. Among the 30 European countries assessed, the top three are Finland, Sweden, and Switzerland.

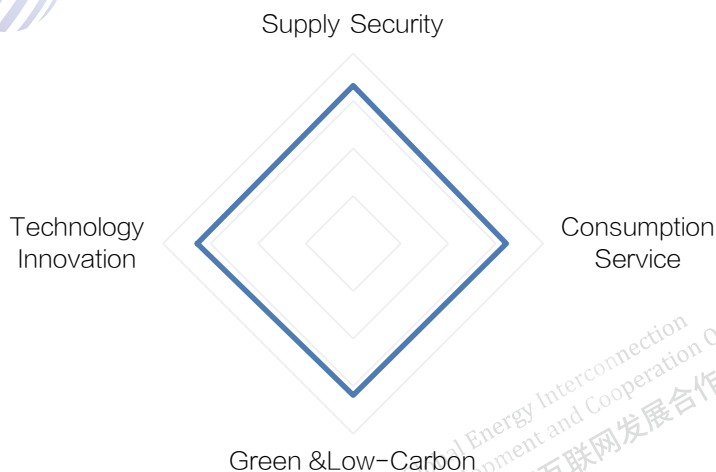


Figure 4-10 Europe—Radar of Electricity-Development Levels by Dimension

²¹ Eurelectric, Power Barometer (powerbarometer.eurelectric.org).

²² European Central Bank, Economic Bulletin (ecb.europa.eu), 2026.

Table 4-4 Electricity Development Index Ranking and Scores of the 30 European Countries

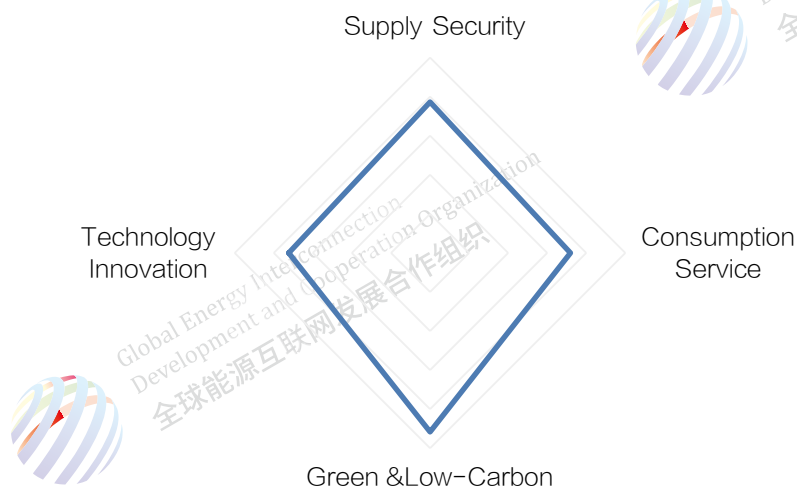
Rank	Country	Score	Rank	Country	Score
1	Finland	91.2	16	Czechia	81.5
2	Sweden	89.9	17	Bulgaria	81.3
3	Switzerland	89.1	18	Belgium	81.2
4	Norway	88.7	19	Greece	80.8
5	Austria	86.4	20	United Kingdom	80.1
6	France	86.2	21	Hungary	79.9
7	Iceland	85.9	22	Türkiye	79.4
8	Denmark	85.6	23	Poland	78.5
9	Germany	84.9	24	Slovakia	77.2
10	Netherlands	84.0	25	Croatia	76.9
11	Spain	84.0	26	Russia	75.3
12	Ireland	83.3	27	Romania	73.4
13	Slovenia	83.0	28	Belarus	72.3
14	Portugal	82.4	29	Serbia	71.8
15	Italy	82.3	30	Ukraine	66.8

(3) Analysis of fast-progressing countries in Europe

The fast-progressing countries in Europe are Finland, Slovenia, and Hungary. Relying on the coordinated advance of stable nuclear supply and rapid wind and solar expansion, all three raised their index markedly, rising 16, 14, and 14 places respectively among the 100 countries compared with the 2024 edition.

1. Finland. Finland ranks first in the world overall, showing high, balanced development across all dimensions. In supply security, per-capita installed capacity reaches 5.0 kW (5th), per-capita T&D line length ranks 2nd, and access and supply diversification both rank 1st; grid losses of just 3.5% rank 6th. In green and low-carbon development, the clean-energy share reaches 90.3% (17th), carbon intensity is just 31.3 gCO₂/kWh (10th), and the carbon-market score is full; new-energy capacity growth of 22.7% (31st) continues to release transition momentum. In consumption service, per-capita consumption is as high as 14,050 kWh (7th) with outstanding reliability (outage time 32nd); however, consumption growth of -1.8% (90th) shows a contracting demand side, and the average price of USD 0.153/kWh is mid-to-high (56th).

Figure 4-11 Finland — Radar of Electricity-Development Levels

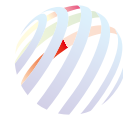


Driven by nuclear foundation, wind expansion, and digital-intelligent upgrading, the Finnish government has advanced deep decarbonization and efficient operation. In April 2023 the 1.6 GW Olkiluoto 3 reactor entered operation, raising Finland's nuclear capacity to 4.37 GW and contributing about 40% of baseload power; wind expanded in parallel — 2.43 GW added in 2022 brought the national total to 5.67 GW, rising further to 6.94 GW in 2023, with wind reaching about 25% of generation. With both nuclear and wind accelerating, Finland repeatedly had power surpluses in summer 2024, net-exporting up to 2 GW. On markets and digitalization, Finland operates a renewable-energy guarantee-of-origin (GO) system and has a highly liberalized retail market; Fingrid has deployed over 5 million smart meters for real-time monitoring and uses AI forecasting for fine-grained dispatch. In June 2024 Finland introduced an automatic frequency-restoration reserve (aFRR) energy market to further enhance grid flexibility. In heating, biomass is widely used for district heating, with cities such as Helsinki converting forestry waste into a primary heat source.

2. Slovenia. Slovenia's core strengths are concentrated in green and low-carbon development and supply security. In green and low-carbon development it scores 83.3 in 2025 (22nd), with a clean-energy share of 57.1% and carbon intensity of 179.6 gCO₂/kWh (30th); new-energy capacity growth of 32.8% ranks 11th, its strongest momentum in recent years. In supply security, access is 100% (1st), supply diversification ranks 8th, and per-capita T&D line length ranks 12th, with grid losses of about 5.1% (mid-to-upper in Europe). However, consumption service is a clear weakness: consumption growth of -1.0% (84th) shows declining demand, and the average electricity price of USD 0.224/kWh (80th) is high by European standards, constraining industrial competitiveness.



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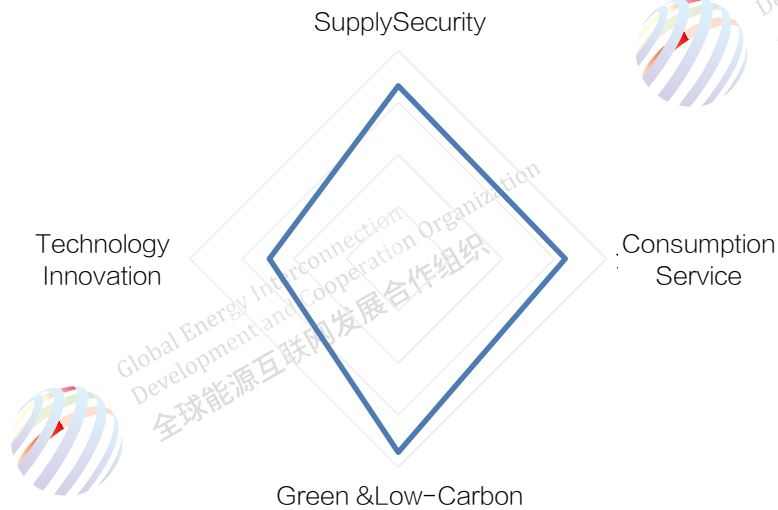


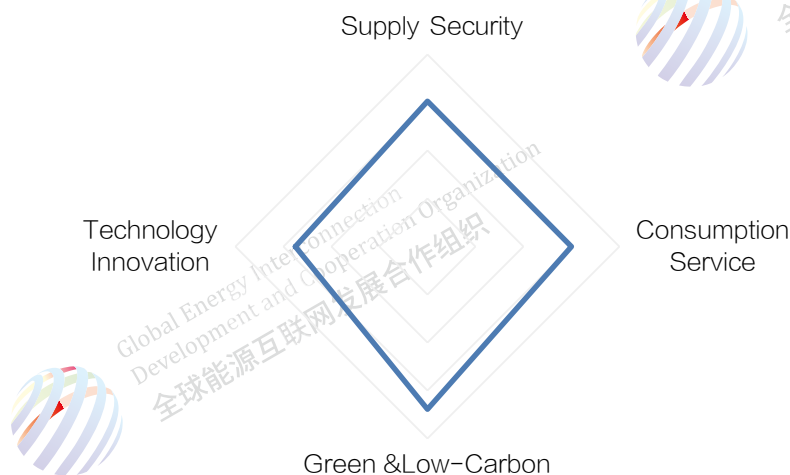
Figure 4-12 Slovenia — Radar of Electricity-Development Levels

Centered on accelerating solar expansion and simplifying renewable-permitting, the Slovenian government continues to drive a low-carbon transition. In June 2022, it announced a target of 1 GW of solar by 2025 and approved draft legislation to simplify permitting, focusing on large-scale PV. It maintains a net-metering policy that incentivizes distributed PV among households and small businesses. Slovenia is covered by the EU Modernisation Fund, used mainly for renewable production and use, efficiency, storage, and grid modernization. Its National Energy and Climate Plan (NECP) sets a 33% renewable share of final energy consumption by 2030, rising to 55% in buildings.

3. Hungary. Hungary's standout features are continued improvement in green and low-carbon development and a technology-innovation score that is strong among mid-tier European countries. In green and low-carbon development it scores 74.2 in 2025 (22nd), with a clean-energy share of 76.3% (25th), thanks mainly to nuclear baseload plus rapid PV growth; new-energy capacity growth of 30.3% ranks 13th. Technology innovation scores 55.0, upper-middle among the 100 countries. In consumption service, access is 100% with good reliability (outage time 21st), but the connection time of 257 days (98th) is one of the world's most prominent weaknesses, and the average electricity price of USD 0.22/kWh (77th) is high.

Centered on large-scale solar expansion and a “nuclear-plus-PV” dual-drive strategy, the Hungarian government has accelerated its green transition. In 2022, in line with the EU REPowerEU plan, Hungary diversified energy sources, promoted storage and wider biogas/biomethane use, and modernized the grid. According to the energy ministry, new PV installations hit a record 1.6 GW in 2023, 1.5 times the 2022 increment, bringing total solar capacity past 5.6 GW; by end-2023, PV supplied 19.5%

Figure 4-13 Hungary — Radar of Electricity-Development Levels



of national generation. In spring 2024, the installed capacity reached 6 GW, meeting the original 2030 target six years early, after which the government revised its National Energy and Climate Plan, raising the 2030 PV target to 12 GW and launching a “Solar Plus” programme that allocated HUF 230 billion to subsidize more than two-thirds of PV-and-storage installation costs for over 25,000 households. In nuclear, Hungary continues the Paks II expansion (about 2,400 MW), maintaining nuclear at about 50% of generation and building a “clean baseload plus flexible PV” structure.

Looking ahead, to raise Europe's electricity-development level: first, further scale up new-energy development to cover the supply gap left by coal exit; second, shorten connection times in some countries to improve service; and third, strengthen electricity substitution and electrification in countries with high fossil-fuel consumption.

4.3 Africa

(1) Basic situation of electricity development

Africa is the continent with the greatest development potential and also the most severe electricity-development challenges. In 2025, its total installed capacity was about 284 GW and total consumption about 890 billion kWh, with per-capita consumption of only about 610 kWh/yr — roughly one-sixth of the global average. Africa's electricity-access rate is about 60%, with 600 million people still without electricity, the situation being especially severe in sub-Saharan Africa.

Table 4-5 Africa — Economic, Social and Electricity-Development Data (2025)

Economic & social data	Value	Electricity-development data	Value
Area (10,000 km ²)	3,003	Total installed capacity (GW)	284
Population (100 million)	14.6	Total electricity consumption (trillion kWh)	0.89
GDP (trillion USD)	3.3	Per-capita generation capacity (kW)	0.19
GDP per capita (USD)	2,267	Per-capita electricity consumption (kWh)	610
Electricity share of final energy	12.2%	Electricity access rate	59.9%
Clean-energy generation share	24.8%	Carbon intensity (gCO ₂ /kWh)	528

From 2021 to 2025, Africa's total consumption rose from about 750 to 890 billion kWh (about 4.4% per year) and the installed capacity from about 250 to 284 GW (about 3.3% per year). But with rapid population growth, per-capita indicators improved slowly. South Africa, Egypt, Algeria, Nigeria, and Morocco together account for about 65% of Africa's capacity — an extremely uneven regional distribution.

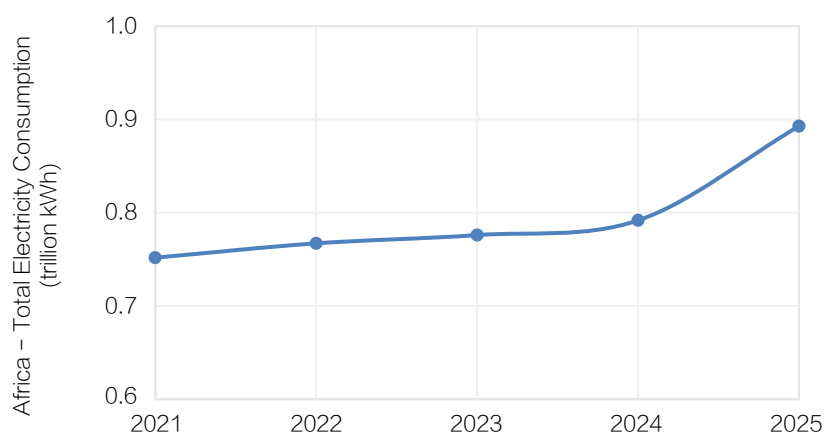
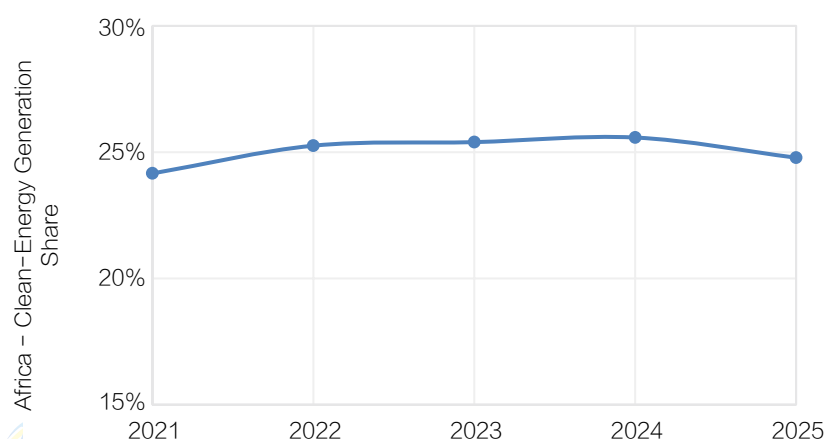


Figure 4-14 Africa — Growth in Electricity Consumption, 2021 - 2025

Africa's clean-energy share rose only slightly, from about 24.2% to about 24.8%, constrained by funding gaps, limited technical capacity, and backward grid infrastructure. Yet some countries stand out: Morocco's clean-energy share exceeds 30%, Kenya's exceeds 90% (mainly geothermal and hydro), and Ethiopia achieves near-100% clean supply on the back of the Grand Renaissance Dam.

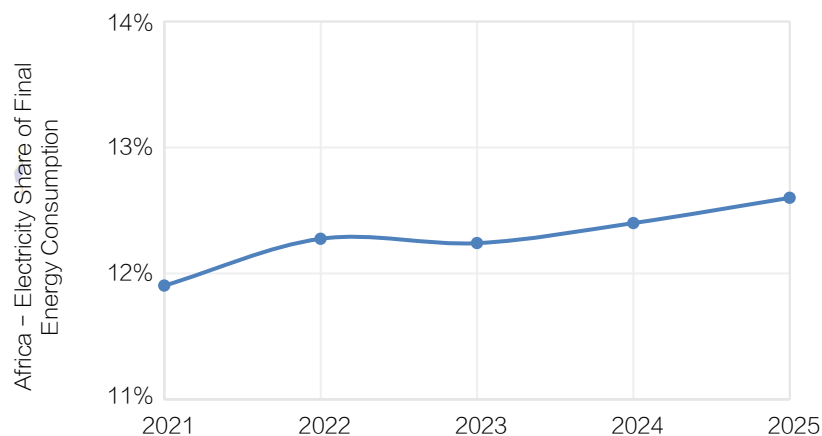


Figure 4-15 Africa — Clean-Energy Generation Share, 2021 - 2025



From 2021 to 2025, Africa's electricity share of final energy rose slowly from 11.9% to about 12.6%, a gain of less than 1 percentage point. The core constraints are threefold: severely insufficient grid coverage with very low rural connection rates; persistent funding gaps with high financing costs and limited foreign-capital channels; and a final-energy structure dominated by solid biomass (firewood, charcoal), making the shift from biomass to electricity very slow. Even so, the relatively high electrification of industry and buildings in Morocco, Egypt, and South Africa is gradually leading the region's overall improvement.

Figure 4-16 Africa— Electricity Share of Final Energy Consumption, 2021 - 2025



(2) Electricity Development Index results

Africa's Electricity Development Index is 61.9, far below the global average (76.5) and the lowest of the six continents. Scores lag in all dimensions, with consumption service (59.9) especially weak. Among the 17 countries assessed, South Africa, Morocco, and Egypt rank in the top three.

Figure 4-17 Africa — Radar of Electricity-Development Levels by Dimension

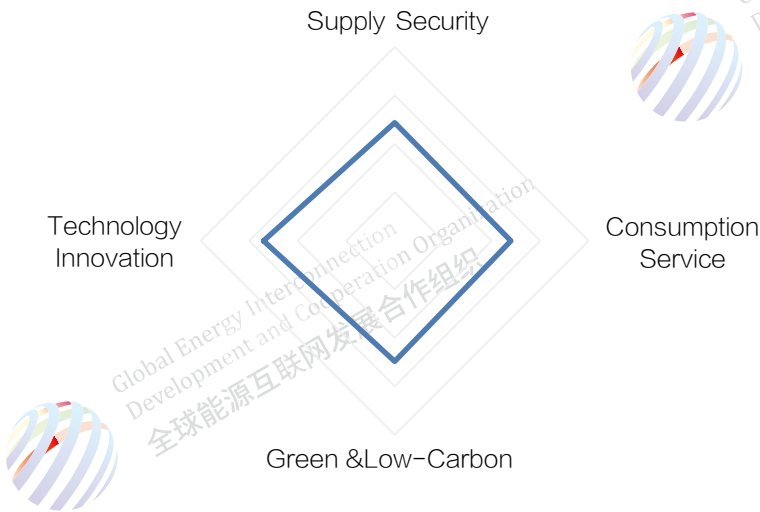


Table 4-6 Electricity Development Index Ranking and Scores of the 17 African Countries

Rank	Country	Score	Rank	Country	Score
1	South Africa	71.3	10	Ghana	59.4
2	Morocco	67.3	11	Senegal	58.3
3	Egypt	64.8	12	Libya	58.0
4	Tunisia	63.0	13	Nigeria	56.3
5	Algeria	62.1	14	Angola	54.1
6	Zambia	61.0	15	Tanzania	53.5
7	Kenya	60.9	16	Côte d'Ivoire	53.5
8	Ethiopia	60.0	17	Cameroon	51.7
9	Uganda	59.9			

(3) Analysis of fast-progressing countries in Africa

The fast-progressing countries in Africa are Ethiopia, Uganda, and Zambia. Driven by the concentrated commissioning of large hydropower projects and national electrification programmes, all three raised their index markedly — Ethiopia's Grand Renaissance Dam kept expanding and made it a major East African clean-power exporter; Uganda's Karuma hydropower plant came fully online, multiplying national capacity; and Zambia accelerated solar and storage while consolidating its hydropower base— rising 12, 12, and 9 places respectively among the 100 countries compared with the 2024 edition.

1. Ethiopia. Ethiopia is the African country with the largest improvement in this report, with a major upgrade in consumption service the core driver. Over the past five years, consumption grew at 15.4% per year (2nd globally) and the average electricity price was just USD 0.009/kWh (3rd) — one of the world's cheapest markets, benefiting from a low-cost, hydro-dominated clean structure. Green and low-carbon development is equally striking: a clean-energy share of 99.98% (2nd) and carbon intensity of just 0.1 gCO₂/kWh (2nd) make Ethiopia a benchmark for African green power; clean-energy generation growth of 14.5% (20th) keeps releasing momentum. In supply security, generation-capacity growth of 18.5% (4th) shows rapid construction. However, weaknesses are pronounced: access to electricity of only 55.4% (96th) and per-capita consumption of 167 kWh (99th) leave large rural populations off-grid, and low supply diversification (92nd) with heavy hydropower reliance creates supply risk in drought years.

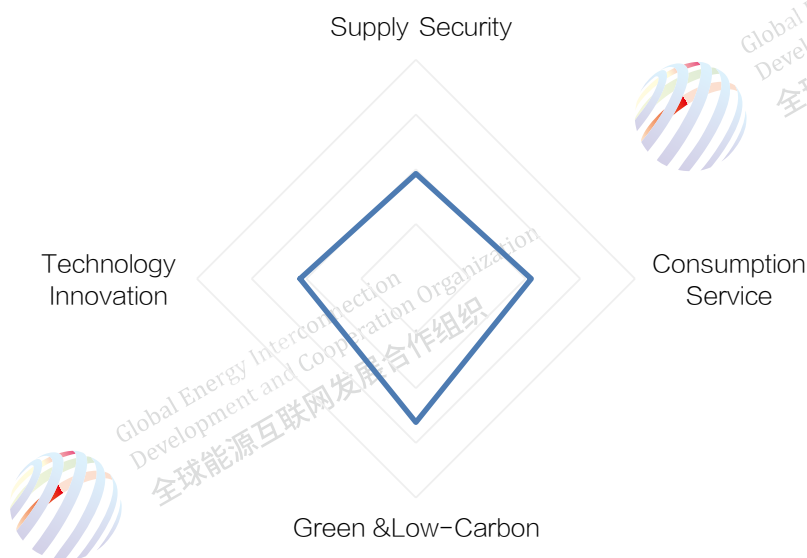


Figure 4-18 Ethiopia — Radar of Electricity-Development Levels

Centered on large hydropower, accelerated national electrification, and end-use greening, Ethiopia has achieved historic breakthroughs. In 2022 the Grand Ethiopian Renaissance Dam (GERD), Africa's largest at 6,000 MW, began generating, fundamentally easing supply shortages and marking Ethiopia's shift from net importer to exporter. In FY2023 - 24, power exports earned about USD 182 million, planned to rise to USD 400 million within a decade. In February 2024, Ethiopia banned imports of fuel vehicles — the first country to implement such a ban immediately — and aims to introduce over 150,000 EVs by 2030. On rural electrification, the government advances the National Electrification Programme (NEP) 2.0, combining grid extension and off-grid solar mini-grids toward 100% national electrification.

2. Uganda. Uganda's rise reflects steady performance in consumption growth and a green power structure. Green and low-carbon development is its clearest advantage — a clean-energy share of 98.8% (6th), with a hydro-dominated mix supplemented by bagasse cogeneration and a little PV, giving carbon intensity of just 25.4 gCO₂/kwh (8th), top-tier in sub-Saharan Africa. In consumption service, consumption growth of 9.4% (11th) shows active demand. However, constraints are pronounced: per-capita consumption of just 120 kWh (100th, the lowest of all 100 countries) and an access rate of about 45% leave more than half the population without stable power, while long-stagnant new-energy development widens the gap with fast-growing demand. Overall, Uganda shows the contradiction of “a solid green base and active demand side, but a stagnant supply side and severely lagging access.”

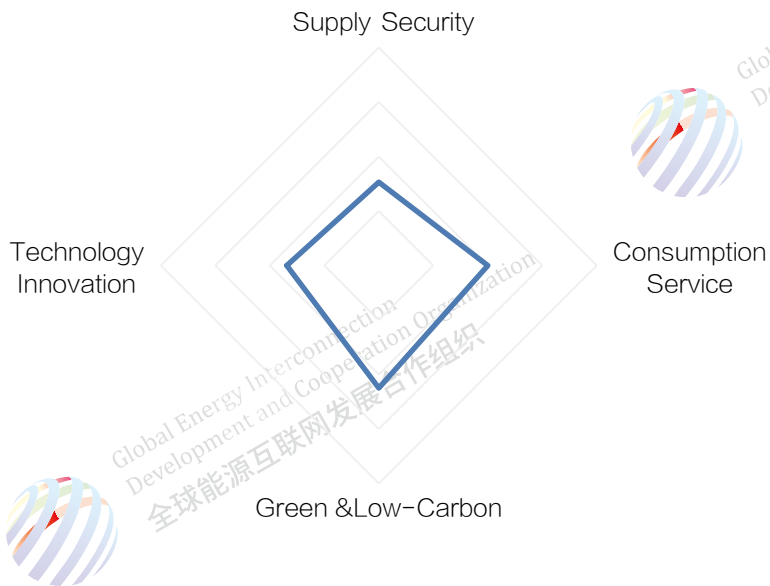


Figure 4-19 Uganda — Radar of Electricity-Development Levels

With the Karuma hydropower plant as a key milestone, Uganda has upgraded both supply capacity and its institutional system. On institutional reform, the 2022 amended Electricity Act added net-metering provisions allowing generators to sell directly to end users, breaking the traditional single-buyer model. On top-level design, the 2023 National Energy Policy sets out expanding T&D networks, improving efficiency, and promoting alternative energy. On generation, the 600 MW Karuma plant came online in batches in 2023 - 24 after years of delay, lifting national capacity past 2,000 MW. On electrification, in November 2022 parliament approved a USD 331.5 million IDA loan to connect 1.5 million more households and raise the electrification rate from 28% to 50%. On regional cooperation, in May 2024 Uganda began negotiating a long-term power-purchase agreement with Kenya, opening prospects for regional exports as Karuma's surplus is released.

3. Zambia. Relying on a clean-dominated generation mix, a marked low-price advantage, and resilient demand growth, Zambia rose against the trend even as most African countries' rankings fell. In green and low-carbon development, the clean-energy share reaches 86.6% (18th) and carbon intensity is 246.5 gCO₂/kWh (39th). In consumption service, the average price is just USD 0.032/kWh (9th) and consumption growth is 6.0% (28th). At the same time, an access rate of only 40% and per-capita consumption of 852 kWh (85th) still fall well short of its resource endowment and potential. Overall, although Zambia has green and cost advantages, its highly hydro-dependent mix leaves the system vulnerable to climate change, making diversification an urgent priority.

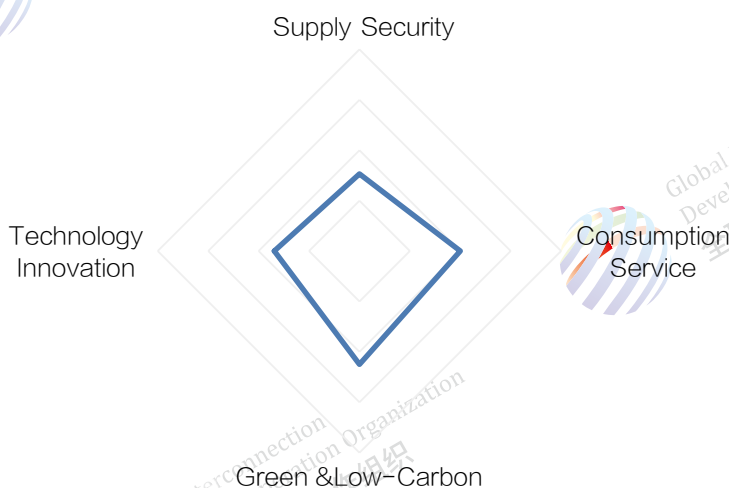


Figure 4-20 Zambia — Radar of Electricity-Development Levels

Looking ahead, to raise Africa's electricity development level the key is to accelerate power-infrastructure construction, raise access rates, speed up clean-energy development, increase electricity's share of final energy, and build a sustainable power system that underpins economic and social development.

4.4 Central and South America

(1) Basic situation of electricity development

Central and South America has the highest clean-energy generation share of any continent. Relying on abundant hydropower and rapidly expanding wind and solar, its clean-energy share has reached 71.8%, far above the global average of 42.8%. In 2025 total installed capacity was about 586 GW and total consumption about 1.39 trillion kWh; per-capita consumption of about 2,623 kWh is still below the global average, but per-capita installed capacity has risen to about 1.11 kW as the supply base continues to improve.

Table 4-7 Central and South America — Economic, Social and Electricity-Development Data (2025)

Economic & social data	Value	Electricity-development data	Value
Area (10,000 km ²)	1,858	Total installed capacity (GW)	586
Population (100 million)	5.3	Total electricity consumption (trillion kWh)	1.39
GDP (trillion USD)	5.5	Per-capita generation capacity (kW)	1.11
GDP per capita (USD)	10,402	Per-capita electricity consumption (kWh)	2,623
Electricity share of final energy	19.3%	Electricity access rate	98.1%
Clean-energy generation share	71.8%	Carbon intensity (gCO ₂ /kWh)	146

From 2021 to 2025, total consumption rose from about 1.16 to 1.39 trillion kWh (about 4.6% per year) and capacity from about 433 to 586 GW (about 7.9% per year), with wind and solar the main increment (new-energy capacity growing 20.3% per year). Brazil, Chile, Argentina, and Colombia are the region's major countries in power production, together about 80% of regional capacity.

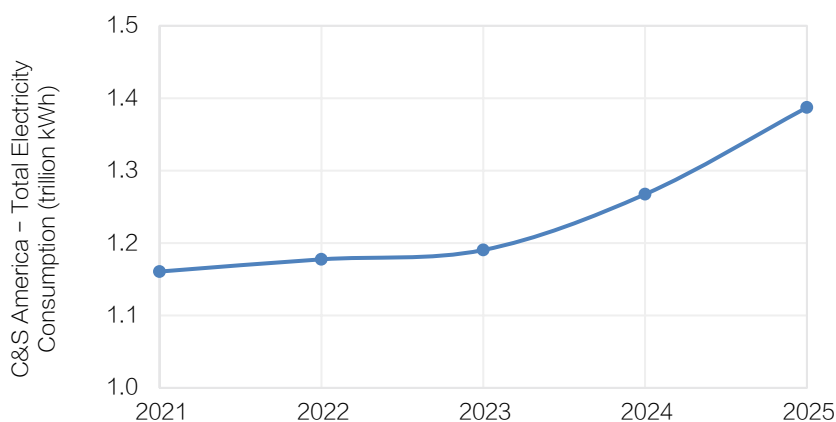
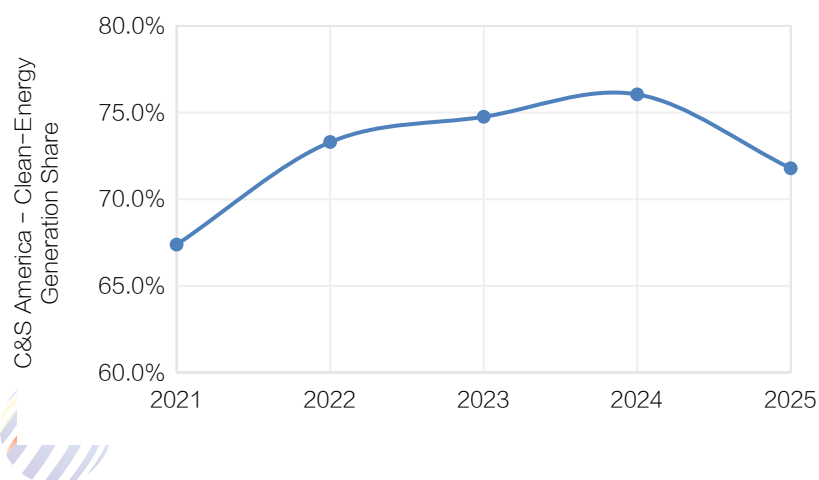


Figure 4-21 Central and South America— Growth in Electricity Consumption, 2021 - 2025

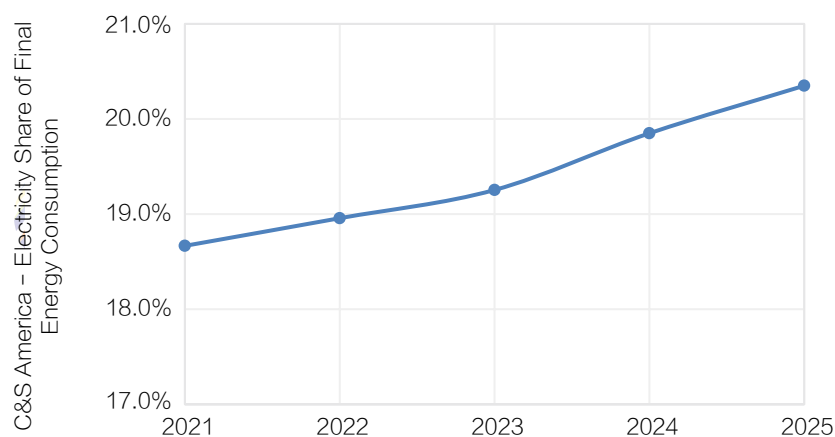
The region's clean-energy share has long stayed above 70%, first among the six continents, thanks to abundant hydro, wind, and solar in Brazil, Costa Rica, Panama, Uruguay, and others. Chile has one of the world's lowest levelized cost of electricity (LCOE) of solar power — its Atacama Desert PV projects cost below 2 US cents/kWh — leading the global drive toward renewable cost parity.

Figure 4-22 Central and South America — Clean-Energy Generation Share, 2021 – 2025



In 2025, the region's electricity share of final energy rose from 18.7% in 2021 to 20.4%, approaching the global average. The main drivers are the explosive uptake of EVs (the regional light-EV fleet grew 851% over 2022 – 2025) and accelerating electricity substitution in the sector of industry and architecture as renewable costs keep falling. Wind and solar doubled over five years, providing ample low-carbon power for electrification.

Figure 4-23 Central and South America — Electricity Share of Final Energy Consumption, 2021 – 2025



(2) Electricity Development Index results

Central and South America's Electricity Development Index is 70.6, below the global composite (76.5). Green and low-carbon development scores highest and technology innovation lowest. Among the 14 countries assessed, Chile, Uruguay, and Brazil rank in the top three.

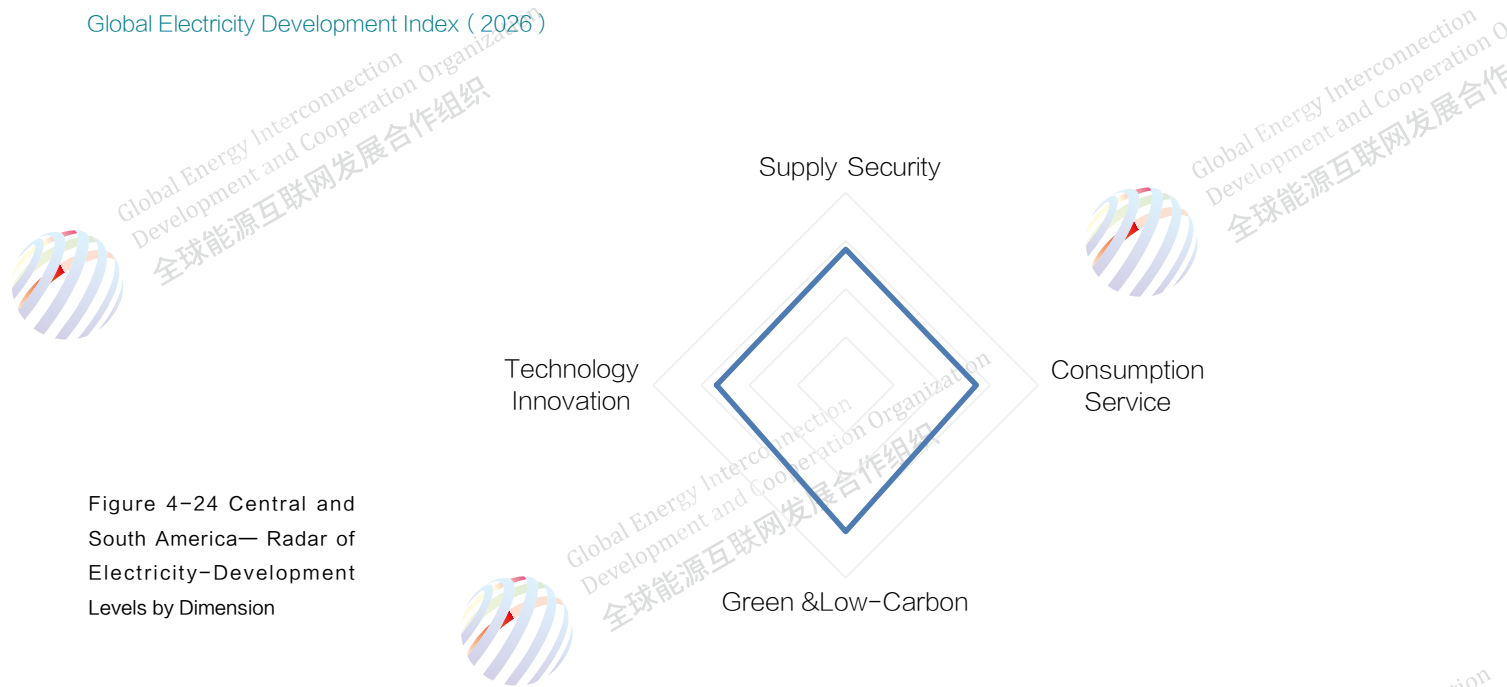


Figure 4-24 Central and South America— Radar of Electricity-Development Levels by Dimension

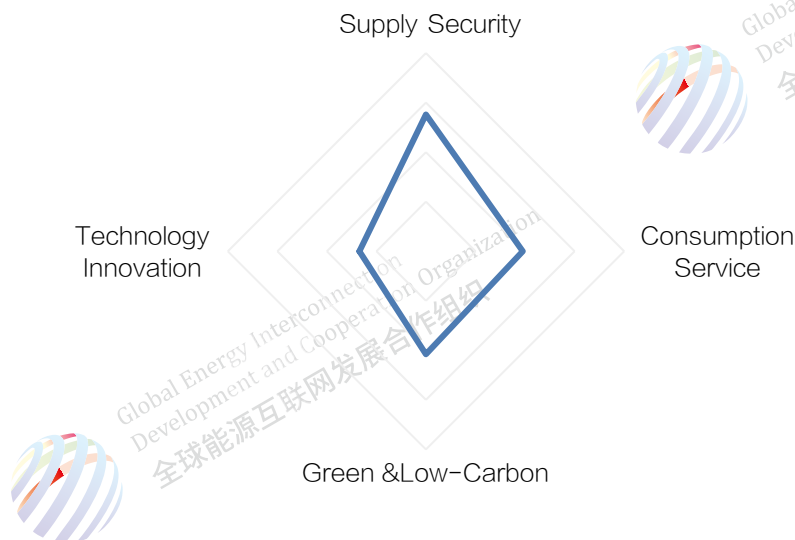
Table 4-8 Electricity Development Index Ranking and Scores of the 14 Central and South American Economies

Rank	Economy	Score	Rank	Economy	Score
1	Chile	80.6	8	Venezuela	67.7
2	Uruguay	76.7	9	Puerto Rico	67.2
3	Brazil	76.2	10	Argentina	67.0
4	Panama	74.1	11	Bolivia	66.2
5	Costa Rica	71.2	12	Dominican Rep.	66.1
6	Colombia	70.0	13	Ecuador	62.6
7	Peru	69.0	14	Cuba	52.5

(3) Analysis of the fastest-progressing country

The fastest-progressing country in Central and South America is **Bolivia**, which rose 11 places among the 100 countries compared with the 2024 edition. Even as most of the region's rankings fell, Bolivia rose against the trend thanks to improved electricity access and relatively fast demand growth. In 2024, urban household electrification reached 99.3%, rural 82.9%, and the national average 92.2%; the average price was just USD 0.074/kWh (24th, very affordable), and consumption growth of 6.7% (24th) showed steady demand. However, green and low-carbon development is mediocre: the clean-energy share is only 10.3% (90th) and clean-energy generation growth is -10.3% (91st), with gas still dominating the mix; carbon intensity of 335.1 gCO₂/kWh (53rd) shows a gap between the pace of transition and Bolivia's stated long-term clean-energy goals.

Figure 4-25 Bolivia — Radar of Electricity-Development Levels



Centered on national power self-sufficiency, faster rural electrification, and exploring the strategic value of lithium, the Bolivian government continues structural adjustment. The national utility ENDE, which runs the national interconnected system (SIN), planned about USD 330 million of investment in 2025, focused on rural grids, targeting a 95% rural-electrification rate. Bolivia continues the policy direction of Decree 2048 (2014) on clean-energy development, promoting diversified hydro, solar, and wind, and plans to prioritize clean energy by 2030. In July 2024, Bolivia discovered 1.7 trillion cubic feet of gas at the Mayaya-X1 field — its most important find since 2005 — so gas will continue to support baseload in the near term. With the world's largest lithium reserves (21 million tonnes), the government is promoting lithium industrialization and a “lithium – storage – power” path to underpin a longer-term green transition.

Looking ahead, the keys for Central and South America are: strengthen supply security and reduce over-reliance on hydropower to lower supply risk in extreme-drought years; raise technology-innovation and digitalization levels to close the gap with developed countries; and advance regional power interconnection to optimize large-scale clean-energy allocation.

4.5 North America

(1) Basic situation of electricity development

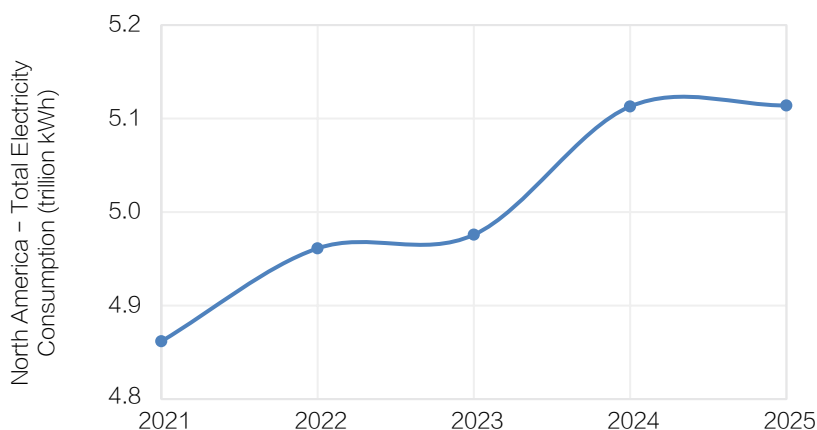
North America is one of the world's most developed regions, with electricity development among the global front-runners. In 2025, per-capita consumption was about 9,935 kWh/yr — nearly three times the global average — access to electricity was 100%, and emerging loads such as AI data centers and EVs grew strongly. Total installed capacity was about 1,566 GW, total consumption about 5.11 trillion kWh, and the clean-energy share reached 44.5%.

Table 4-9 North America — Economic, Social and Electricity-Development Data (2025)

Economic & social data	Value	Electricity-development data	Value
Area (10,000 km ²)	2,396	Total installed capacity (GW)	1,566
Population (100 million)	5.1	Total electricity consumption (trillion kWh)	5.11
GDP (trillion USD)	36.3	Per-capita generation capacity (kW)	3.04
GDP per capita (USD)	70,507	Per-capita electricity consumption (kWh)	9,935
Electricity share of final energy	21.7%	Electricity access rate	99.9%
Clean-energy generation share	44.5%	Carbon intensity (gCO ₂ /kWh)	306

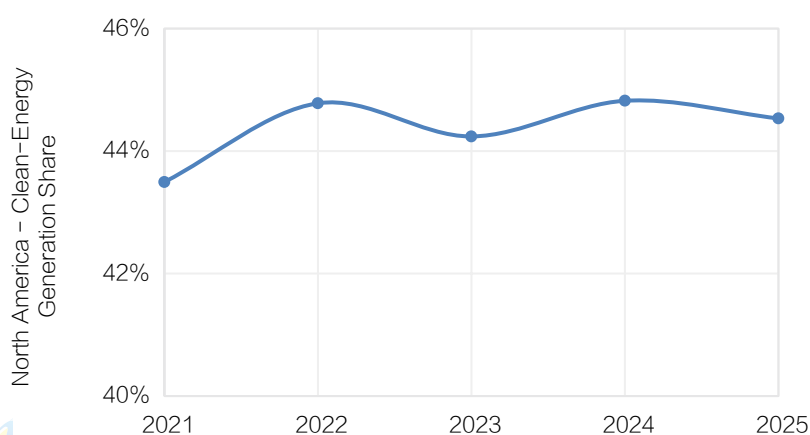
From 2021 to 2025, total consumption rose from about 4.86 to 5.11 trillion kWh (about 1.3% per year), with US growth markedly faster, driven by data centers and AI computing— US data-center consumption is projected to exceed 200 billion kWh in 2026. The total installed capacity rose from about 1,440 to 1,566 GW, mainly wind and solar, with US net solar additions exceeding 50 GW in 2024, a record.

Figure 4-26 North America
— Growth in Electricity
Consumption, 2021 - 2025



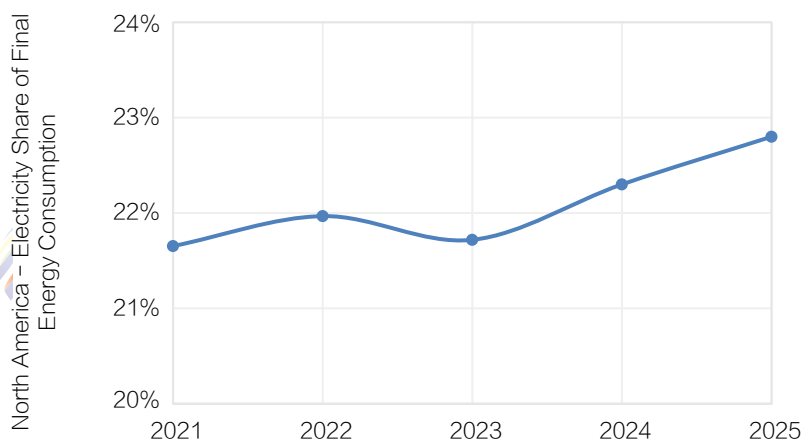
North America's clean-energy share has long stayed around 44 - 45%, lifted by Canada (about 76.7% clean, mainly hydro). The US share rose to about 42.7%; the Inflation Reduction Act (IRA) provided large tax incentives for wind, solar, and storage, markedly accelerating clean-energy expansion. Mexico's clean-energy share is about 19.3%, lagging in transition.

Figure 4-27 North America
— Clean-Energy Generation
Share, 2021 - 2025



From 2021 to 2025, North America's electricity share of final energy rose from 21.7% to 22.8%, a gain of about 1 percentage point. The core driver is the explosive expansion of data centers — in 2025, data centers accounted for about 50% of the entire US electricity-demand increment; EV sales grew 10% year on year and heat-pump sales kept double-digit growth for two years, with steady substitution in transport and buildings.

Figure 4-28 North America
— Electricity Share of Final
Energy Consumption, 2021 -
2025



(2) Electricity Development Index results

North America's Electricity Development Index is 81.1. Consumption service (81.7) and technology innovation (89.9) are both among the global front-runners, reflecting high service levels and strong innovation capacity; supply security and green and low-carbon development are relatively weaker, affected by frequent outages under extreme weather and a large fossil-fuel stock. Among the 3 countries assessed, Canada (84.1) ranks 14th globally, the United States (83.2) 19th, and Mexico (70.4) 57th.

Figure 4-29 North America
— Radar of Electricity-
Development Levels by
Dimension

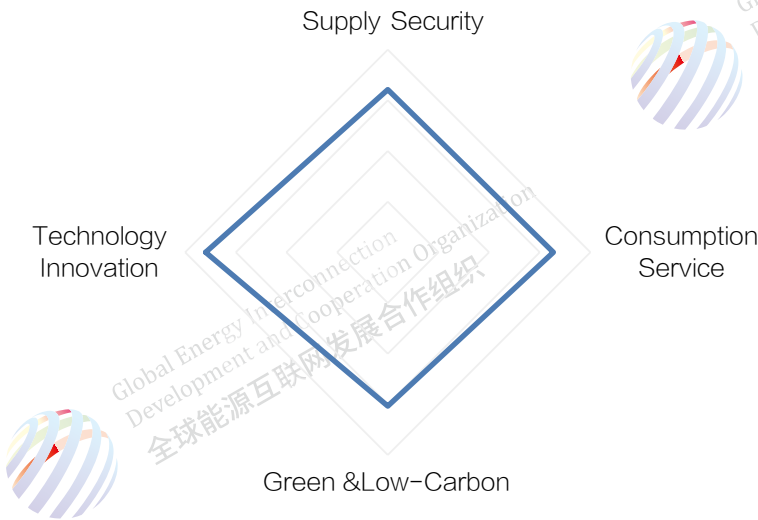


Table 4-10 Electricity Development Index Ranking and Scores of the 3 North American Countries

Rank	Country	Score	Rank	Country	Score
1	Canada	84.1	3	Mexico	70.4
2	United States	83.2			

Looking ahead, North America's core tasks of electricity development are: vigorously advance clean-energy substitution and accelerate coal phase-out—the US and Mexico in particular need to scale up new energy; modernize grid infrastructure to handle frequent extreme weather and large-scale new-energy integration; and advance regional cooperation to optimize power-resource allocation among Canada, the US, and Mexico.

4.6 Oceania

(1) Basic situation of electricity development

Oceania is dominated by two highly developed economies, Australia and New Zealand, with world-leading electricity development, while also facing the energy-access challenges of the Pacific island states. In 2025, Oceania's total installed capacity was 134 GW (Australia and New Zealand over 98%), total consumption about 310 billion kWh, per-capita consumption about 6,770 kWh, and per-capita installed capacity about 2.88 kW— all far above the global average.

Table 4-11 Oceania — Economic, Social and Electricity-Development Data (2025)

Economic & social data	Value	Electricity-development data	Value
Area (10,000 km ²)	851	Total installed capacity (GW)	134
Population (100 million)	0.46	Total electricity consumption (trillion kWh)	0.31
GDP (trillion USD)	2.3	Per-capita generation capacity (kW)	2.88
GDP per capita (USD)	49,495	Per-capita electricity consumption (kWh)	6,770
Electricity share of final energy	23.8%	Electricity access rate	81.3%
Clean-energy generation share	47.6%	Carbon intensity (gCO ₂ /kWh)	511

From 2021 to 2025, Oceania's total consumption stayed around 310 billion kWh, while capacity rose from about 110 to 134 GW (about 4.7% per year), the increment coming mainly from PV (Australia's rooftop-PV penetration exceeds 35%, the world's highest) and wind. The clean-energy share rose markedly from about 36.4% to about 47.6%, with Australia at the global frontier in rooftop PV and large-scale storage deployment.

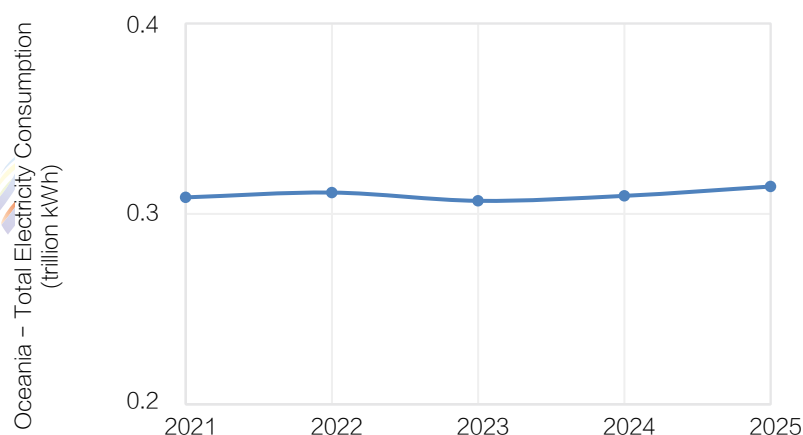
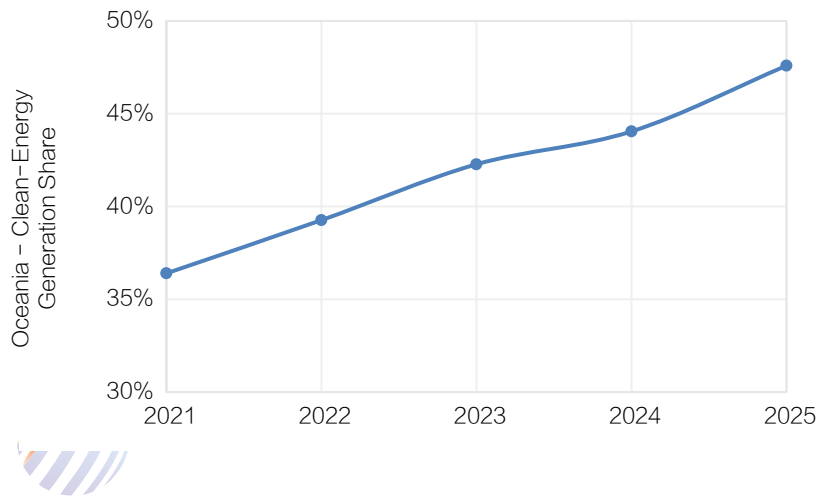


Figure 4-30 Oceania — Growth in Electricity Consumption, 2021 - 2025

Australia's clean transition is accelerating — the 2025 new energy share is about 34.5%, up about 9 points from 2020 — while New Zealand's clean-energy share is as high as 86.8% (mainly hydro and geothermal), heading toward a 100% renewable target. Large storage projects such as Australia's Waratah Super Battery have come online, markedly improving flexibility and at one point making it one of the world's most market-active spot markets.

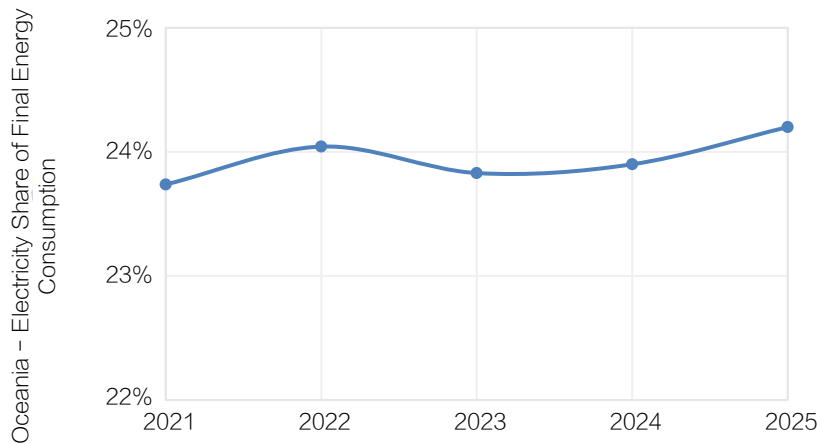


Figure 4-31 Oceania— Clean-Energy Generation Share, 2021 - 2025



Over the past three years, Oceania's electricity share of final energy has kept rising, reaching 23.8% in 2025, above the global average. The drivers are: deep penetration of distributed PV in Australia (about 40% of homes have rooftop PV, contributing nearly 15% of NEM supply in early 2025); a rapid rise in battery storage (grid-side battery discharge hit a record in Q2 2025); and accelerating industrial heat-pump adoption in New Zealand, now one of the world's most industrially electrified countries. However, electrification remains low in Pacific island states such as Papua New Guinea, below 10% in some.

Figure 4-32 Oceania— Electricity Share of Final Energy Consumption, 2021 - 2025



(2) Electricity Development Index results

Oceania's Electricity Development Index (weighted Australia + New Zealand) is about 84.3, far above the global average (76.5). The technology-innovation sub-index (88.0) is outstanding, reflecting the two countries' recent advances in new energy and storage.

Figure 4-33 Oceania — Radar of Electricity-Development Levels by Dimension

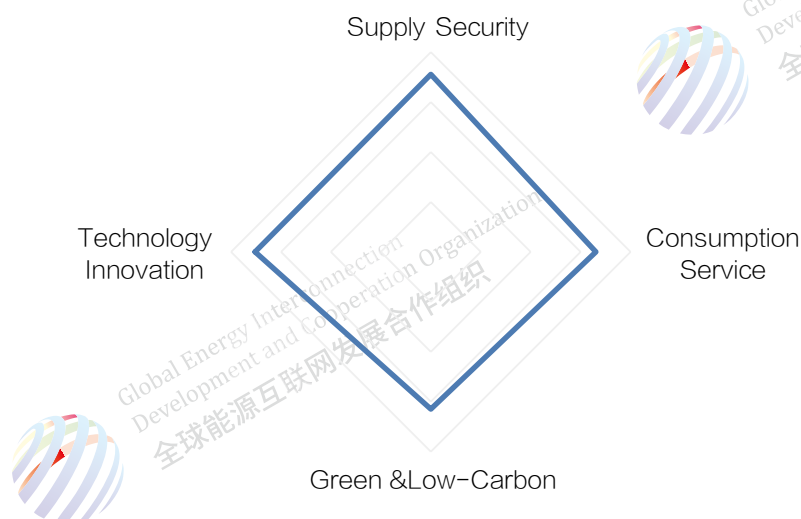


Table 4-12 Electricity Development Index Ranking and Scores of the 2 Oceanian Countries

Rank	Country	Score
1	Australia	85.0
2	New Zealand	83.2

Looking ahead, Oceania's priorities are: further strengthen storage and demand response to handle the balancing challenge of high renewable shares; lower end-use electricity costs to improve affordability; and help Pacific island states address electricity access and improve the infrastructure of small island developing states (SIDS).

4.7 Comprehensive Calculation and Analysis of the Global Electricity Development Index

(1) Global composite index

Across the 100 assessed countries, the mean Electricity Development Index is 76.5 with a standard deviation of about 10.2, showing a markedly right-skewed distribution. High-scoring countries are concentrated in Europe and North America, while low-scoring countries cluster in sub-Saharan Africa and parts of South Asia, Southeast Asia, and Latin America — a clear regional divide. The highest-scoring country is Finland (91.2) and the lowest is Cameroon (51.7).

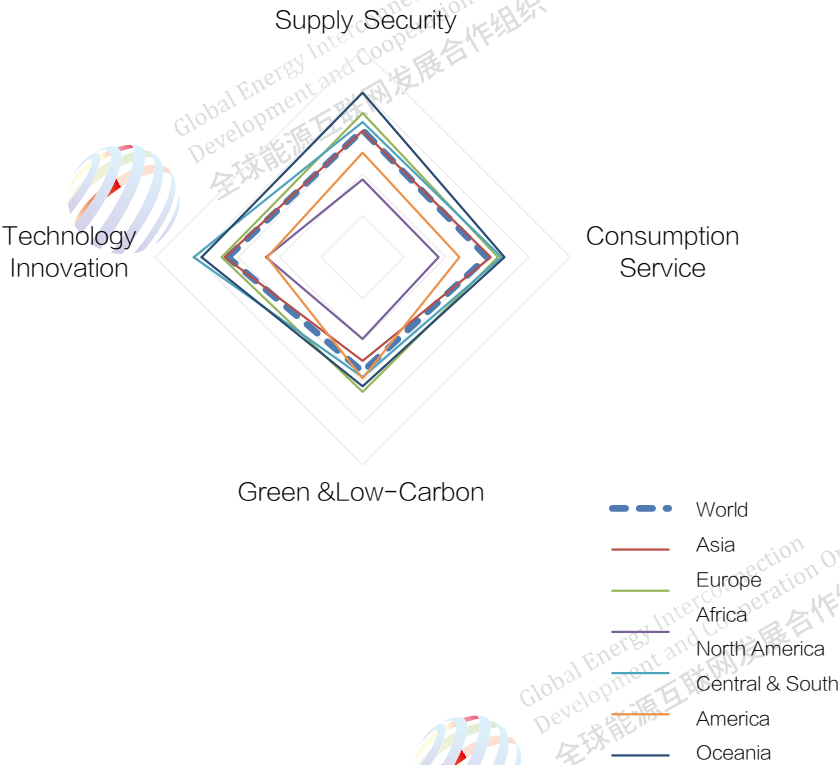
By region, Europe (81.3), North America (81.1), and Oceania (84.3) are well above the global mean (76.5), excelling especially in green and low-

carbon development and technology innovation. Overall, the regional pattern is highly correlated with the level of economic development — the correlation between GDP per capita and the composite index is about 0.72, indicating that the economic base remains an important variable for electricity development.

Compared with the 2024 edition, the balance across dimensions has improved, but green and low-carbon development remains the weakest dimension, indicating that global electricity development is shifting from expanding scale to advancing green and low carbon transformation, while the quality and pace of this transition still have considerable room for improvement.

Table 4-13 Comparison of Dimension Scores — World and Continents

Dimension	World	Asia	Europe	Africa	N. Am.	C&S Am.	Oceania
Supply Security	77.5	77.2	83.1	60.9	80.3	70.5	88.9
Consumption Service	76.6	77.7	80.5	59.9	81.7	67.8	82.6
Green & Low-Carbon	73.3	69.7	79.7	62.1	75.9	76.0	78.7
Technology Innovation	79.6	80.4	82.0	67.6	89.9	67.0	88.0
Composite index	76.5	76.0	81.3	61.9	81.1	70.6	84.3



(2) Overall ranking

The Electricity Development Index was calculated and ranked for 100 representative countries across the six continents. Among the global top 20, all are developed countries except China (4th, 88.9), with European countries taking 12 places— reflecting the strong correlation between high economic development and high electricity development.

The top-20 countries share common features: well-developed infrastructure, high per-capita capacity and consumption, world-leading reliability (SAIDI generally below 50 minutes), high market liberalization (scores generally 4 - 5), strong transition will with clear results, and continued leadership in innovation investment. China ranks 4th at 88.9, especially outstanding in technology innovation (98.1), reflecting the efficient operation of its vast power system and rapid new-energy expansion; constrained by resource endowment, however, its green and low-carbon dimension (81.5) still trails Nordic countries such as Norway and Sweden.

Countries ranked 21 - 50 come mainly from Europe (Central and Eastern), the Middle East (Gulf states), and Asia, often showing “one outstanding dimension but overall imbalance.” For example, Qatar (37th) scores 89.7 in consumption service but only 58.7 in green and low-carbon development; Uruguay (40th) scores 78.8 in green and low-carbon development but only 55.9 in technology innovation.

Countries ranked 51 - 80 are mainly emerging economies such as Indonesia, Thailand, South Africa, and Morocco— in a phase of rapid development, with expanding supply but a nascent clean transition and uneven service quality. The bottom 20 are concentrated in sub-Saharan Africa (12) and South and Southeast Asia (4), sharing low access, very low per-capita capacity and consumption, very long outage times, and almost no carbon- or power-market infrastructure — facing the most basic challenge of building electricity access “from scratch.”

Table 4-14 Global Electricity Development Index Ranking of the 100 Economies

Rank	Economy	Rank	Economy	Rank	Economy	Rank	Economy
1	Finland	26	Bulgaria	51	Belarus	76	Nepal
2	Sweden	27	Belgium	52	Jordan	77	Egypt
3	Switzerland	28	Israel	53	Thailand	78	Sri Lanka
4	China	29	Greece	54	Serbia	79	Cambodia
5	Norway	30	Chile	55	South Africa	80	Tunisia
6	Austria	31	United Kingdom	56	Costa Rica	81	Ecuador
7	Rep. of Korea	32	Hungary	57	Mexico	82	Algeria
8	France	33	Türkiye	58	Colombia	83	Bangladesh
9	Iceland	34	Saudi Arabia	59	Peru	84	Zambia
10	Denmark	35	Bahrain	60	Kazakhstan	85	Kenya
11	Australia	36	Poland	61	India	86	Mongolia
12	Germany	37	Qatar	62	Azerbaijan	87	Ethiopia
13	Singapore	38	Slovakia	63	Indonesia	88	Uganda
14	Canada	39	Croatia	64	Venezuela	89	Pakistan
15	Netherlands	40	Uruguay	65	Philippines	90	Ghana
16	Spain	41	Malaysia	66	Morocco	91	Senegal
17	Ireland	42	Oman	67	Puerto Rico	92	Libya
18	Japan	43	Brazil	68	Kyrgyzstan	93	Myanmar
19	United States	44	Vietnam	69	Argentina	94	Nigeria
20	UAE	45	Kuwait	70	Ukraine	95	Iraq
21	New Zealand	46	Russia	71	Bolivia	96	Angola
22	Slovenia	47	Laos	72	Dominican Rep.	97	Tanzania
23	Portugal	48	Panama	73	Uzbekistan	98	Côte d'Ivoire
24	Italy	49	Romania	74	Tajikistan	99	Cuba
25	Czechia	50	Georgia	75	Iran	100	Cameroon

(3) Top 10 by dimension

Analyzing the top 10 countries on each sub-index helps countries understand their strengths and weaknesses across dimensions and promotes cross-regional exchange and policy learning.

Table 4-15 Top 10 Countries by Sub-Index

Sub-index	Top 10 countries
Supply Security	Finland, Australia, Austria, Sweden, China, Switzerland, Germany, Spain, Netherlands, Rep. of Korea
Consumption Service	Singapore, UAE, Qatar, Norway, China, Bahrain, Denmark, Iceland, Sweden, Rep. of Korea
Green & Low-Carbon	Switzerland, Finland, Iceland, Norway, Sweden, Portugal, France, Tajikistan, Bulgaria, Spain
Technology Innovation	China, United States, Germany, United Kingdom, Rep. of Korea, France, Australia, Canada, Japan, Spain

Leaders in supply security are mainly developed European countries, China, and Bahrain, scoring 87 - 95, with Finland first. They share high per-capita installed capacity (Finland 5.0 kW, Sweden 5.7 kW, Austria and others above 3 kW; China combines scale with a 12.3% capacity-growth rate, 9th), 100% access to electricity, and good T&D efficiency (most grid losses below 7%).

Leaders in consumption service form two clusters: Gulf states (Qatar, UAE, Bahrain) with very high per-capita consumption, short connection times (generally under 30 days), and very low electricity prices; and Asia-Europe economies (Rep. of Korea, Singapore, China, Norway) with very high reliability (SAIDI generally below 100 min/yr), easy connection, and high market liberalization. Notably, China ranks 5th (88.7)—the only major developing country in the top 10—with per-capita consumption of 7,034 kWh/yr and consumption growth of 5.5% (31st). Norway's per-capita consumption of 22,883 kWh/yr ranks 3rd globally.

Leaders in green and low-carbon development fall into two types: countries extremely rich in hydro or nuclear generation (Iceland, Norway), with clean-energy shares above 95% and near-zero carbon intensity; and European countries advancing nuclear and renewable synergy (Finland, Switzerland, France), with clean shares generally above 80%. Tajikistan and Bulgaria enter the top 10 on abundant hydro and nuclear generation. All top 10 countries have clean energy shares above 70% and carbon intensity generally below 150 gCO₂/kWh.



In technology innovation, all top 10 countries except China are traditional developed economies. China leads the world at 98.1, with top results in paper publication and citation (3rd), and digital and intelligent technology (1st), underpinned by the world's largest new energy fleet, the most complete new-energy supply chain, and rising R&D investment. The US (94.5), Germany (92.3), and the UK (91.8) follow. The high-score threshold here is high (top-10 all above 87), with greater divergence than other dimensions, reflecting a sizeable structural gap between developed and emerging economies in power-technology innovation.

(4) OECD economy ranking

Of the 100 economies, 35 are OECD members, with electricity development in the global leading tier. Except for Costa Rica (56th), Mexico (57th), and Colombia (58th), the other 32 members are all in the global top 50, and 18 are in the top 20. Their lead stems from a long-stable economic base, relatively mature market mechanisms, and sustained large-scale infrastructure investment. Within the OECD, the top five are Finland, Sweden, Switzerland, Norway, and Austria; Costa Rica, Colombia, and Mexico are the bottom three, reflecting structural gaps in per-capita capacity, infrastructure density, and innovation capacity.

Table 4-16 Electricity Development Index Ranking within OECD Economies

Rank	Economy	Rank	Economy	Rank	Economy
1	Finland	13	Netherlands	25	Greece
2	Sweden	14	Spain	26	Chile
3	Switzerland	15	Ireland	27	United Kingdom
4	Norway	16	Japan	28	Hungary
5	Austria	17	United States	29	T ü rkiye
6	Rep. of Korea	18	New Zealand	30	Poland
7	France	19	Slovenia	31	Slovakia
8	Iceland	20	Portugal	32	Croatia
9	Denmark	21	Italy	33	Costa Rica
10	Australia	22	Czechia	34	Mexico
11	Germany	23	Belgium	35	Colombia
12	Canada	24	Israel		

(5) Developing country ranking

Under the World Bank FY2026 income classification (high-income threshold: GNI per capita > USD 13,935), 55 of the 100 countries are classified as developing. Their overall scores are relatively low, but internal differences are also large — the score gap between the top five (China, T ü rkiye, Malaysia, Brazil, Vietnam) and the bottom five exceeds 30 points, reflecting deep imbalances across stages of development and resource endowments. China ranks 4th globally and 1st among developing countries — the group's most representative benchmark. China has achieved leapfrog development of its power system on the back of an ultra-large new energy fleet, continuously improving grid infrastructure, and intensive R&D, forming a “Chinese path” that balances scale expansion with quality improvement and offers a valuable model for developing countries' energy transition.

Table 4-17 Electricity Development Index Ranking within Developing Economies

Rank	Economy	Rank	Economy	Rank	Economy
1	China	20	Venezuela	39	Zambia
2	Türkiye	21	Philippines	40	Kenya
3	Malaysia	22	Morocco	41	Mongolia
4	Brazil	23	Kyrgyzstan	42	Ethiopia
5	Vietnam	24	Argentina	43	Uganda
6	Laos	25	Ukraine	44	Pakistan
7	Georgia	26	Bolivia	45	Ghana
8	Belarus	27	Dominican Rep.	46	Senegal
9	Jordan	28	Uzbekistan	47	Libya
10	Thailand	29	Tajikistan	48	Myanmar
11	Serbia	30	Iran	49	Nigeria
12	South Africa	31	Nepal	50	Iraq
13	Mexico	32	Egypt	51	Angola
14	Colombia	33	Sri Lanka	52	Tanzania
15	Peru	34	Cambodia	53	Côte d'Ivoire
16	Kazakhstan	35	Tunisia	54	Cuba
17	India	36	Ecuador	55	Cameroon
18	Azerbaijan	37	Algeria		
19	Indonesia	38	Bangladesh		

Since GEIDCO first released the Research Report on the Global Electricity Development Index in 2024, the index — as a comprehensive quantitative tool for systematically characterizing the level and trends of electricity development across countries and regions — has been widely applied in policy research, investment analysis, and international cooperation. In 2026 GEIDCO releases the second edition, and a new edition will be published every two years thereafter. As long-term data accumulate, the index will form a cross-year comparable time series that reflects not only the current state of electricity development but also its direction and pace of change, providing more forward-looking support for all kinds of users.

Electricity is a key support for implementing the UN 2030 Agenda for Sustainable Development — especially SDG 7 (ensuring access to affordable, reliable, sustainable, and modern energy for all) — and the climate goals of the Paris Agreement. By bringing supply security, consumption service, green and low-carbon development, and technology innovation into a unified framework, the index aligns closely with the requirements of the SDGs and can serve as an international public good for measuring global energy equity and sustainable-development progress, providing a common analytical language for evidence-based multilateral cooperation.

Meanwhile, global electricity development is entering a new stage in which accelerating demand growth and the green, low-carbon transition advance in parallel. On top of expanding industrial power use, cooling demand, and transport and building electrification, the rapid growth of AI and data centers is becoming a new driver of demand, while constraints on grid interconnection, regulating capability, and clean-energy integration become increasingly prominent. Against this background, using the index scientifically to assess the situation, identify weaknesses, and seize opportunities is important for policymakers, investors, industry practitioners, and all parties to international cooperation. This chapter sets out the practical value of the index through four typical application scenarios.

5.1 Assessment Tool for Policymakers

(1) Policy analysis and assessment

Strengthening policy analysis and improving decision-making rigor: as a comprehensive indicator, the index systematically and comprehensively reflects the current state and trends of a country's or region's electricity development, providing policymakers with a reliable basis. Its sub-indicators reflect policy outcomes in different dimensions— supply-security capability, new-energy generation growth, electricity-market development, and so on — helping policymakers identify weak links and plan in a targeted way. For example, least-developed countries, small island developing states (SIDS), and African countries with low electricity access should make raising supply capability and access and eliminating energy poverty their top priorities, echoing SDG 7's principle of “leaving no one behind” ; SIDS, which also face isolated grids, high supply costs, and climate vulnerability, need to consider renewables, storage, and micro-grids together. Countries with mature systems should make a just, orderly green and low-carbon transition a key goal, aligned with their Nationally Determined Contributions under the Paris Agreement.

Optimizing policy adjustment and consolidating the development foundation: the index provides a quantitative basis for dynamic policy adjustment. By analyzing trends in the index and its sub-indicators, policymakers can assess the effects of existing policies fairly precisely and adjust them in time. For example, some countries have formulated green and low-carbon policies but, constrained by grid infrastructure, find new-energy projects hard to deploy, with slowing or even negative generation growth and a falling green and low-carbon sub-index— a signal to optimize policy and increase grid investment. With the biennial editions, policymakers can compare two editions to identify problems and adjust policy accordingly, and can use the report's models and tools to compute historical indices from their own data to evaluate policy effects.

(2) Formulating future electricity-development strategies

Forward-looking strategic layout and clear direction: the index offers a holistic perspective for medium- and long-term strategy, helping decision-makers grasp the current state and potential of the power system. By jointly considering supply security, consumption service, green and low-carbon development, and technology innovation, it can guide countries to formulate strategies that serve long-term interests. For example, some emerging-market economies, finding through the index that their main weaknesses are ageing infrastructure and low new-energy utilization efficiency, prioritize grid upgrading and renewable development in their future strategies.

Seizing opportunities and adapting to global trends: the green, low-carbon transition is the overarching trend of the global energy system, and electricity's decarbonization is critical to the overall transition. As global demand keeps rising and carbon and supply pressures increase together, countries must balance expanding clean supply with safeguarding system security. The index provides a scientific quantitative method to support transition goals aligned with Nationally Determined Contributions (NDCs), plan innovation investment, and ensure fairness and inclusiveness in the process.

Scientifically assessing options to ensure implementation: the index can also assess the feasibility and effectiveness of different strategic options. In medium- and long-term planning, countries can analyze the index's historical data and future trends to set specific targets — the electricity share of final energy, power carbon intensity, the clean-energy generation share — and design supporting policies and measures, providing strong support for the sustainable development of the global power industry.

5.2 Electricity–Market Analysis Tool for Investors

(1) Investment–risk assessment and precaution

Accurately identifying risks and avoiding investment blind spots: by quantifying key indicators, the index provides a reliable basis for assessing investment risk. Investors can judge whether a country's power system has stable supply security, a sound market environment, and reasonable policy support, thereby avoiding blind investment. In markets with a low index, where infrastructure is weak and policy unstable, investors should enter cautiously and adopt appropriate hedging strategies.

Dynamically monitoring indicators and adjusting strategy in time: changes in the index reflect the dynamic evolution of the market environment. Using the report's evaluation model, investors can regularly monitor a target region's index, detect potential market volatility or policy shifts in time, and optimize strategy. A sustained rise in a country's index usually means an improving market environment, where investors may consider increasing investment to gain greater market share.

(2) Market–prospect analysis and forecasting

Scientifically analyzing data and forecasting market trends: the index provides rich data support for understanding global, regional, and national electricity–development situations and for analyzing and forecasting future market trends. Investors can use the report's models to analyze historical trends in sub-indicators, or conduct finer-grained studies, to identify cyclical

fluctuations, the impact of technological change, and shifts in policy direction. A sustained rise in a region's green and low-carbon sub-index, for instance, signals broad market prospects and the value of an early presence.

Forward-looking investment and seizing growth opportunities: the index is not only a tool for assessing the present but also an important basis for judging future market potential. Some emerging economies have a currently low index but, with policy support and accelerating infrastructure, may become important future growth points; meanwhile, grid expansion and interconnection, storage, and power-system digitalization are becoming new investment hotspots. Such forward-looking investment helps investors seize opportunities and helps bridge the clean-energy investment gap in developing countries — especially least developed countries (LDCs) and SIDS — channeling more funds to where sustainable development is most needed.

5.3 Strategic and Operational Decision Support for Power Utilities

(1) Optimizing corporate strategic layout

Taking a holistic view to formulate development strategy: the index provides data support for corporate strategic planning, helping firms accurately assess the current state and future trends of electricity markets. Firms can analyze the development level and market potential of regions or countries to clarify priority markets and fields. For markets with a high index, firms should accelerate entry to gain first-mover advantage; for markets with a low index but large growth potential, they should make forward-looking investments to capture future share.

Laying out in advance to respond to environmental change: the index can also provide early warning for long-term development. Through in-depth analysis of the composite index and sub-indicators, firms can anticipate future policy or market changes and adjust their layout in advance. Where a market's clean-energy share or new-technology application is trending upward year by year, firms should increase investment in that field to align with the global transition.

(2) Promoting resource allocation and enhancing operational efficiency

Optimizing resource allocation for maximum benefit: the index provides a decision reference for rational resource allocation. Firms can assess the development level of different regions or markets and allocate capital, manpower, and technology accordingly to ensure efficient use. In

markets with a high index, firms can increase investment and accelerate the deployment of high-end technologies and services to raise share and margins.

Improving operational efficiency and strengthening competitiveness: through continuous monitoring of the index, firms can dynamically adjust operating strategy and optimize internal processes. They can adjust supply chains and production plans to respond to demand fluctuations and policy changes; in markets with rising renewable shares and load volatility, they can proactively strengthen flexibility resources and digital-operations capability, improving overall efficiency and competitiveness.

5.4 A Catalyst for International Electricity Cooperation

(1) Promoting international energy cooperation and building win-win mechanisms

Strengthening cooperation and exchange and expanding new areas: international cooperation is an important means of implementing SDG 17 and pooling global resources for the energy transition. Using the index, countries and international organizations can clearly understand their own and partners' electricity-development situations, find entry points for cooperation, and design mutually beneficial schemes within an open, inclusive multilateral framework — identifying partners' needs and strengths, advancing joint infrastructure development, and promoting cross-regional investment and capacity cooperation.

Deepening multilateral cooperation and improving regional interconnection: the index provides data support for building regional electricity markets, enabling countries to strengthen interconnection cooperation, optimize resource allocation, and improve the reliability and economy of supply. Based on the supply-security and consumption-service sub-indices, countries can advance cross-border and cross-regional interconnected grids and promote the sharing and optimal allocation of power resources.

(2) Promoting technology sharing to improve global system efficiency

Encouraging technology exchange and sharing advanced technologies: technology transfer and capacity building are important means of implementing sustainable development. The index provides a scientific basis for exchange and cooperation, especially in clean energy and grid digitalization. Leading countries can, on mutually agreed terms and through South-South and triangular cooperation, share advanced experience with developing countries — especially LDCs and SIDS — and strengthen capacity building, improving the overall efficiency of the global power system.



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Promoting technology transfer to support the global energy transition: the index can help countries identify and advance technology-transfer projects, especially in low-carbon technologies and renewables, giving clear direction to international cooperation projects. Based on the technology-innovation sub-index, leading countries can, on a mutually beneficial basis, export advanced technologies such as PV, storage, and flexible HVDC transmission to support other countries' energy-mix adjustment and low-carbon transition according to their own priorities.

(3) Supporting International Electricity Rulemaking and Strengthening Global Electricity Governance

Setting unified standards to regulate market operation: the index provides data support for the standardized development of international electricity markets. Through index analysis, countries can jointly formulate operating standards and rules, avoiding unfair competition and resource waste — for example, building consensus on carbon-market mechanisms and electricity markets.

Strengthening global governance and improving cooperation quality: through the index, international organizations can better coordinate global electricity cooperation and improve its quality and efficiency, helping countries identify problems and challenges and steering cooperation toward greater fairness, transparency, and sustainability. As an open, shared international public good, the index helps build a more just and inclusive system of electricity cooperation and governance, providing a solid data foundation for jointly advancing sustainable energy development.



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6

Conclusion

This report systematically presents the findings of the Global Electricity Development Index (2026). On the basis of a comprehensively updated data foundation and a systematically optimized indicator system and methodology, it provides a scientific, objective, and comparable assessment of the electricity-development level of 100 countries. The main findings are summarized along five dimensions below, followed by an outlook for future research and cooperation.

1. The global power transition is accelerating, and the leading role of clean energy is established: in 2025 global new-energy installed capacity exceeded 3,950 GW, approaching 40% of total power capacity. Over the past decade, the levelized costs of solar and wind have each fallen by more than 90%, making them the most competitive new generation types in most regions, and new-energy capacity is expanding at the fastest pace in history. Meanwhile, the global clean-energy generation share has exceeded 42%, further strengthening the decarbonization of power production. Nuclear is also recovering strategically, with several developed economies extending plant lifetimes or launching new builds, and small modular reactors (SMRs) likely to become an important low-carbon, stable supply after 2030. Overall, the shift of global power production toward cleaner, low-carbon development is essentially established, with a clearly long-term and irreversible character.

2. Regional imbalance remains prominent, and inclusive supply is still the top priority: Europe (81.3) and Oceania (84.3) lead by a wide margin while Africa (61.9) is last, with a gap of more than 20 points between highest and lowest — the global “North-South divide” in electricity development remains deep. As of 2025, about 730 million people worldwide still lacked electricity, and about 43% of Africa's population had no or unstable supply. Developing countries face the triple constraint of insufficient funding, limited technical capacity, and weak infrastructure. Achieving SDG 7 still requires sustained, coordinated effort by governments, international organizations, and multilateral financial institutions.

3. Technology innovation and digitalization application form a new competitive divide: the new fully quantified paper and patent indicators reveal that the United States, China, and Germany are the most prominent global leaders in power-technology innovation. Technologies such as AI, digital

twins, and virtual power plants are moving from demonstration to large-scale application, and the level of power-system intelligence is becoming a new yardstick distinguishing advanced economies. Developing countries generally face low digital-intelligence levels—Africa's and Central and South America's technology-innovation sub-indices are only 67.6 and 67.0, more than 20 points below North America's 89.9—and an unbridged technology gap would further widen the North-South divide.

4. Electricity and carbon markets are the institutional cornerstone of the transition: the 2026 edition adds electricity-market and carbon-market development indicators, and the results show that the depth of market-oriented reform is highly positively correlated with index rankings. Europe leads the world on both (4 - 5 points), while Africa and Asia score only around 1 - 3, and the maturity of market mechanisms profoundly affects a country's ability to attract clean-energy investment and drive the low-carbon transition. Accelerating electricity-market reform and expanding carbon-pricing coverage are key institutional paths for developing economies to improve the quality of electricity development.

Looking ahead, GEIDCO will continue to deepen its research on the Global Electricity Development Index along four main directions: first, further expanding country coverage, striving to include some currently uncovered small island states and LDCs so that the assessment is more

globally representative; second, exploring new dimensions such as power-security resilience and extreme-climate adaptation so the index better reflects the new challenges facing power systems under climate change; third, accelerating the international promotion and application of the index, aiming for inclusion in UN sustainable-development reporting and greater authority and influence in global energy governance; and fourth, opening the index methodology, encouraging research institutions, governments, and international organizations to adjust weights flexibly to suit their needs, forming diversified policy-application scenarios.

The Global Electricity Development Index is a bridge connecting data and decision-making, a scientific tool for quantitatively assessing the power transition, and an important platform for building international consensus and advancing global electricity cooperation. GEIDCO stands ready to deepen cooperation with governments, international organizations, energy enterprises, and research institutions to jointly record this historic transformation and contribute to the shared vision of “sustainable and affordable electricity for all.”

Appendix Tables

Appendix Table 1 List of Economies Assessed in the Global Electricity Development Index

Continent	Economies
Asia	China, Japan, Rep. of Korea, Mongolia, Cambodia, Laos, Myanmar, Thailand, Vietnam, Indonesia, Philippines, Malaysia, Singapore, India, Bangladesh, Nepal, Sri Lanka, Pakistan, Uzbekistan, Kyrgyzstan, Kazakhstan, Iran, Israel, Jordan, Iraq, Kuwait, Saudi Arabia, Oman, UAE, Qatar, Bahrain, Azerbaijan, Georgia, Tajikistan
Europe	United Kingdom, Ireland, Norway, Sweden, Finland, Denmark, Iceland, France, Netherlands, Belgium, Spain, Portugal, Germany, Austria, Switzerland, Italy, Slovenia, Serbia, Greece, Croatia, Poland, Czechia, Slovakia, Hungary, Romania, Bulgaria, Türkiye, Russia, Belarus, Ukraine
Africa	South Africa, Egypt, Algeria, Morocco, Libya, Nigeria, Ghana, Tunisia, Angola, Zambia, Ethiopia, Kenya, Côte d'Ivoire, Tanzania, Cameroon, Senegal, Uganda
North America	Canada, United States, Mexico
Central & South America	Brazil, Chile, Argentina, Dominican Republic, Uruguay, Venezuela, Colombia, Ecuador, Peru, Costa Rica, Panama, Bolivia, Cuba, Puerto Rico
Oceania	Australia, New Zealand

Appendix Table 2 Global Electricity Development Index Results

Rank	Economy	Total	Supply Sec.	Consum. Svc.	Green & LC	Tech. Innov.
1	Finland	91.2	94.4	86.9	95.7	85.1
2	Sweden	89.9	90.8	87.0	94.7	85.3
3	Switzerland	89.1	90.0	85.0	96.0	83.2
4	China	88.9	90.1	88.7	81.5	98.1
5	Norway	88.7	84.9	89.0	94.9	84.7
6	Austria	86.4	92.1	84.1	85.3	80.6
7	Rep. of Korea	86.4	87.7	86.9	80.8	91.3
8	France	86.2	83.4	82.3	91.1	90.9
9	Iceland	85.9	87.1	87.2	95.6	60.3
10	Denmark	85.6	83.1	87.2	86.3	86.1
11	Australia	85.0	92.1	82.1	75.6	90.6
12	Germany	84.9	89.6	83.7	75.3	92.3
13	Singapore	84.5	83.0	92.4	76.9	83.2
14	Canada	84.1	82.9	84.1	82.1	89.7
15	Netherlands	84.0	88.5	82.1	78.8	87.2
16	Spain	84.0	89.0	72.6	88.0	87.9
17	Ireland	83.3	85.2	84.6	82.0	78.6
18	Japan	83.3	85.3	82.8	77.5	89.3
19	United States	83.2	84.2	82.9	74.9	94.5
20	UAE	83.2	86.1	90.8	70.4	81.1
21	New Zealand	83.2	80.7	83.9	86.4	81.4
22	Slovenia	83.0	85.6	83.5	86.3	70.4
23	Portugal	82.4	79.7	74.9	92.7	84.1
24	Italy	82.3	82.3	81.2	80.3	87.6
25	Czechia	81.5	84.1	84.0	76.7	79.2
26	Bulgaria	81.3	85.7	75.5	89.1	68.7

Rank	Economy	Total	Supply Sec.	Consum. Svc.	Green & LC	Tech. Innov.
27	Belgium	81.2	82.2	82.0	77.3	83.8
28	Israel	80.8	82.6	80.8	79.2	79.7
29	Greece	80.8	80.2	78.1	86.8	76.6
30	Chile	80.6	86.4	75.6	82.8	74.7
31	United Kingdom	80.1	76.1	78.0	79.6	91.8
32	Hungary	79.9	79.9	80.6	82.3	74.2
33	Türkiye	79.4	84.2	79.5	71.9	81.5
34	Saudi Arabia	79.0	85.7	85.0	55.7	85.6
35	Bahrain	78.9	82.4	88.5	72.9	58.2
36	Poland	78.5	85.0	76.9	69.8	81.8
37	Qatar	78.4	83.4	89.7	58.7	72.4
38	Slovakia	77.2	76.4	75.9	82.4	72.5
39	Croatia	76.9	74.7	79.1	83.6	64.1
40	Uruguay	76.7	83.5	76.8	78.8	55.9
41	Malaysia	76.6	75.9	80.4	69.6	81.2
42	Oman	76.2	84.2	86.2	56.3	66.4
43	Brazil	76.2	74.0	71.7	80.3	81.6
44	Vietnam	76.0	73.9	75.4	79.7	74.9
45	Kuwait	75.5	76.7	85.9	66.8	63.7
46	Russia	75.3	77.0	84.3	56.7	80.0
47	Laos	74.2	77.5	69.8	83.0	58.6
48	Panama	74.1	75.9	77.2	75.8	60.1
49	Romania	73.4	79.8	66.2	74.7	71.3
50	Georgia	73.1	70.2	76.1	80.8	57.4
51	Belarus	72.3	83.5	72.4	64.7	58.8
52	Jordan	72.3	73.2	70.5	76.2	67.2
53	Thailand	72.1	76.9	74.2	59.8	76.4

Rank	Economy	Total	Supply Sec.	Consum. Svc.	Green & LC	Tech. Innov.
54	Serbia	71.8	70.5	76.3	71.5	65.2
55	South Africa	71.3	68.5	68.0	73.3	79.5
56	Costa Rica	71.2	72.2	64.8	83.2	58.1
57	Mexico	70.4	63.5	74.3	71.2	74.1
58	Colombia	70.0	65.9	70.6	76.3	65.6
59	Peru	69.0	66.3	69.6	74.5	63.6
60	Kazakhstan	68.8	68.0	77.3	57.9	68.6
61	India	68.6	66.3	69.2	61.7	81.5
62	Azerbaijan	68.5	75.5	68.8	57.3	70.6
63	Indonesia	68.2	68.4	66.2	67.7	72.6
64	Venezuela	67.7	67.2	54.8	87.0	53.8
65	Philippines	67.3	70.0	68.3	63.9	65.4
66	Morocco	67.3	67.8	66.4	61.7	76.4
67	Puerto Rico	67.2	69.9	68.8	67.5	57.7
68	Kyrgyzstan	67.0	54.5	65.7	86.3	54.6
69	Argentina	67.0	66.5	64.1	70.5	67.7
70	Ukraine	66.8	63.8	61.9	72.6	72.2
71	Bolivia	66.2	72.4	68.2	58.0	61.9
72	Dominican Rep.	66.1	69.8	66.4	67.5	54.6
73	Uzbekistan	66.0	70.5	68.5	55.8	67.0
74	Tajikistan	65.8	63.6	48.0	89.6	52.7
75	Iran	65.8	66.9	73.4	44.4	76.3
76	Nepal	65.8	63.3	60.3	76.9	60.7
77	Egypt	64.8	62.5	63.8	62.0	75.1
78	Sri Lanka	63.5	70.8	52.6	65.1	65.2
79	Cambodia	63.3	65.4	61.6	64.9	59.4
80	Tunisia	63.0	58.9	67.7	62.2	62.8

Rank	Economy	Total	Supply Sec.	Consum. Svc.	Green & LC	Tech. Innov.
81	Ecuador	62.6	55.6	64.5	69.2	60.8
82	Algeria	62.1	65.6	67.4	46.6	66.2
83	Bangladesh	61.0	52.8	61.4	67.2	64.6
84	Zambia	61.0	56.6	58.3	70.1	58.1
85	Kenya	60.9	56.1	55.7	69.0	65.3
86	Mongolia	60.4	57.7	73.1	47.5	56.4
87	Ethiopia	60.0	59.3	45.5	71.8	65.1
88	Uganda	59.9	52.9	56.8	71.7	57.2
89	Pakistan	59.7	57.9	48.9	64.2	73.1
90	Ghana	59.4	55.5	56.4	66.1	60.9
91	Senegal	58.3	58.9	56.9	59.5	58.1
92	Libya	58.0	57.6	60.2	55.9	57.8
93	Myanmar	57.7	58.2	57.0	59.3	55.4
94	Nigeria	56.3	57.5	48.2	53.2	71.8
95	Iraq	54.6	53.3	55.1	46.0	67.5
96	Angola	54.1	53.6	45.7	62.7	55.1
97	Tanzania	53.5	55.8	50.5	52.6	56.2
98	Côte d' Ivoire	53.5	59.0	48.6	52.1	53.5
99	Cuba	52.5	50.6	41.9	64.7	52.6
100	Cameroon	51.7	43.9	42.2	63.1	61.3



Basic Information Table for Selected Countries of Each Continent



China

Global No. 4 / 100

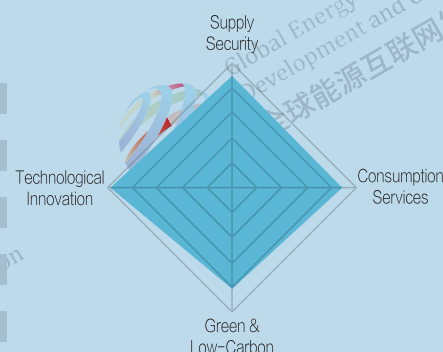
Composite Score 88.9

Supply Security 90.1

Consumption Services 88.7

Green & Low-Carbon 81.5

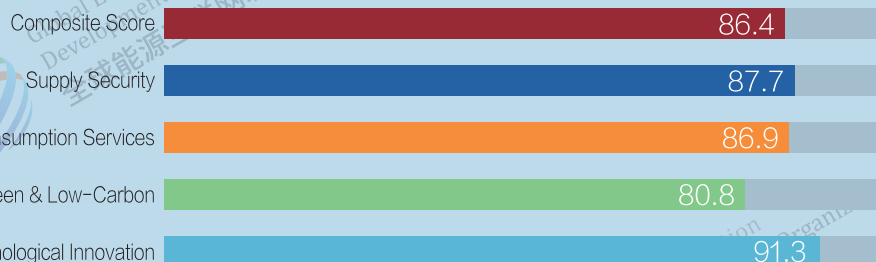
Technological Innovation 98.1



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	2.72	0.04~7.75	23
	Growth rate of installed generation capacity	12.35%	-6.31%~53.14%	9
	T&D line length per capita (m)	6.07	0.97~83.12	74
	Growth rate of T&D line length	4.55%	-0.68%~16.00%	14
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	58.34%	0.07%~79.81%	33
	Grid losses	3.43%	0.29%~55.10%	5
	Power supply stability capacity	1.23	0.56~1.59	5
Consumption Services	Electricity consumption per capita (kWh)	7034	120~52337	18
	Growth rate of electricity consumption	5.49%	-11.15%~15.54%	31
	Average electricity price level	0.095	0.002~0.438	36
	SAIDI (min)	95	0.31~12000	28
	SAIFI	1.58	0.01~200	28
	Electricity market development level	3.75	1~5	40
	Time to obtain electricity connection (day)	32	7~267	12
Green & Low-Carbon	Share of electricity in final energy consumption	28.7%	2.12%~51.31%	12
	Share of clean energy in power generation	45.6%	0.04%~100.00%	48
	Growth rate of clean energy generation	14.33%	-31.48%~144.28%	21
	Growth rate of new energy installed capacity	26.67%	-10.78%~379.86%	22
	Carbon emission intensity of electricity (gCO ₂ /kWh)	560.6	0~1096.6	80
	Carbon market development level	3	1~5	30
Technological Innovation	New technology application level	4.76	1.85~4.76	1
	Digital & intelligent technology level	4.88	1.28~4.88	1
	Research paper publication & citation	95.2	7.2~97.6	3
	Patent publication & application	84.8	36.8~92.2	7

Rep. of Korea

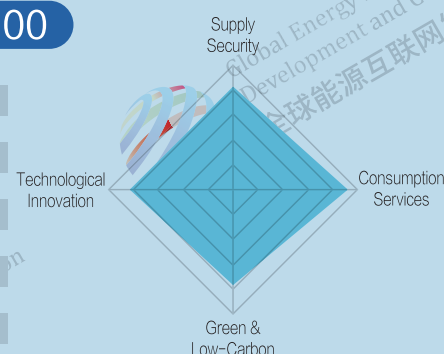
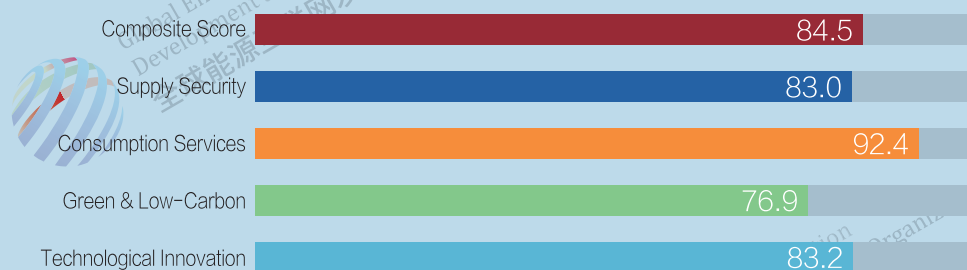
Global No. 7 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	3.26	0.04~7.75	17
	Growth rate of installed generation capacity	3.74%	-6.31%~53.14%	59
	T&D line length per capita (m)	11.33	0.97~83.12	52
	Growth rate of T&D line length	1.62%	-0.68%~16.00%	48
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	55.44%	0.07%~79.81%	37
	Grid losses	3.37%	0.29%~55.10%	4
	Power supply stability capacity	1.14	0.56~1.59	16
Consumption Services	Electricity consumption per capita (kWh)	11613	120~52337	12
	Growth rate of electricity consumption	0.81%	-11.15%~15.54%	65
	Average electricity price level	0.124	0.002~0.438	45
	SAIDI (min)	8.73	0.31~12000	5
	SAIFI	0.15	0.01~200	5
	Electricity market development level	3.25	1~5	48
	Time to obtain electricity connection (day)	13	7~267	2
Green & Low-Carbon	Share of electricity in final energy consumption	26.4%	2.12%~51.31%	17
	Share of clean energy in power generation	47.0%	0.04%~100.00%	47
	Growth rate of clean energy generation	14.74%	-31.48%~144.28%	18
	Growth rate of new energy installed capacity	14.22%	-10.78%~379.86%	53
	Carbon emission intensity of electricity (gCO ₂ /kWh)	431	0~1096.6	68
	Carbon market development level	3.75	1~5	28
Technological Innovation	New technology application level	3.28	1.85~4.76	10
	Digital & intelligent technology level	3.58	1.28~4.88	10
	Research paper publication & citation	88.8	7.2~97.6	7
	Patent publication & application	86.6	36.8~92.2	3

Singapore

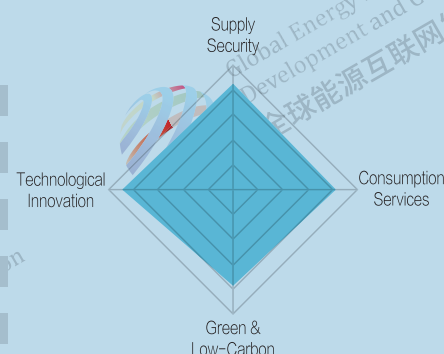
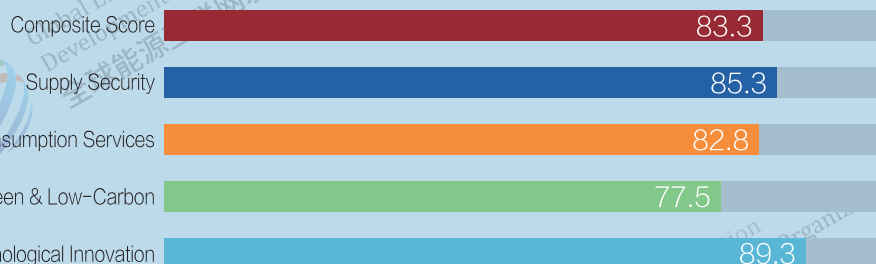
Global No. 13 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	2.16	0.04~7.75	35
	Growth rate of installed generation capacity	1.04%	-6.31%~53.14%	85
	T&D line length per capita (m)	9.14	0.97~83.12	60
	Growth rate of T&D line length	6.72%	-0.68%~16.00%	5
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	10.14%	0.07%~79.81%	87
	Grid losses	0.29%	0.29%~55.10%	1
Consumption Services	Power supply stability capacity	1.16	0.56~1.59	10
	Electricity consumption per capita (kWh)	9881	120~52337	14
	Growth rate of electricity consumption	2.02%	-11.15%~15.54%	54
	Average electricity price level	0.2305	0.002~0.438	82
	SAIDI (min)	0.306	0.31~12000	1
	SAIFI	0.01	0.01~200	1
	Electricity market development level	5	1~5	1
Green & Low-Carbon	Time to obtain electricity connection (day)	26	7~267	6
	Share of electricity in final energy consumption	26.3%	2.12%~51.31%	18
	Share of clean energy in power generation	8.9%	0.04%~100.00%	85
	Growth rate of clean energy generation	27.22%	-31.48%~144.28%	9
	Growth rate of new energy installed capacity	26.83%	-10.78%~379.86%	21
	Carbon emission intensity of electricity (gCO ₂ /kWh)	365.7	0~1096.6	59
	Carbon market development level	2.75	1~5	34
Technological Innovation	New technology application level	2.57	1.85~4.76	44
	Digital & intelligent technology level	2.69	1.28~4.88	44
	Research paper publication & citation	86.8	7.2~97.6	10
	Patent publication & application	68	36.8~92.2	36

Japan

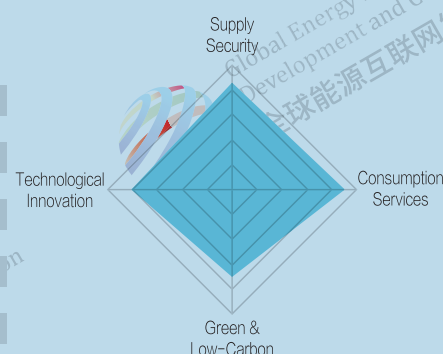
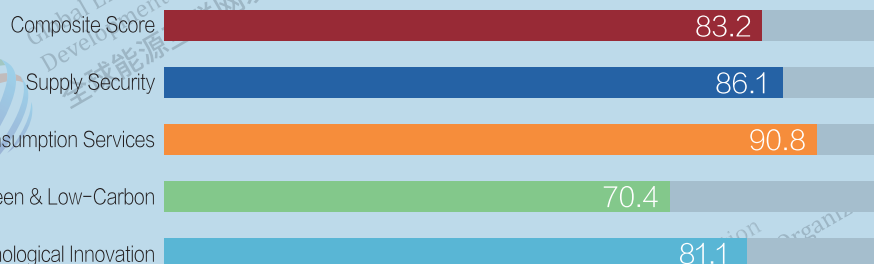
Global No. 18 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	2.87	0.04~7.75	21
	Growth rate of installed generation capacity	0.80%	-6.31%~53.14%	89
	T&D line length per capita (m)	34.97	0.97~83.12	10
	Growth rate of T&D line length	0.16%	-0.68%~16.00%	96
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	52.92%	0.07%~79.81%	43
	Grid losses	4.36%	0.29%~55.10%	10
	Power supply stability capacity	1.13	0.56~1.59	18
Consumption Services	Electricity consumption per capita (kWh)	6983	120~52337	20
	Growth rate of electricity consumption	-2.58%	-11.15%~15.54%	96
	Average electricity price level	0.209	0.002~0.438	74
	SAIDI (min)	29.48	0.31~12000	10
	SAIFI	0.49	0.01~200	10
	Electricity market development level	4.25	1~5	28
	Time to obtain electricity connection (day)	81	7~267	62
Green & Low-Carbon	Share of electricity in final energy consumption	30.3%	2.12%~51.31%	9
	Share of clean energy in power generation	44.7%	0.04%~100.00%	51
	Growth rate of clean energy generation	11.00%	-31.48%~144.28%	27
	Growth rate of new energy installed capacity	6.62%	-10.78%~379.86%	82
	Carbon emission intensity of electricity (gCO ₂ /kWh)	443.6	0~1096.6	69
	Carbon market development level	2.5	1~5	36
Technological Innovation	New technology application level	3.37	1.85~4.76	8
	Digital & intelligent technology level	3.60	1.28~4.88	8
	Research paper publication & citation	83.6	7.2~97.6	15
	Patent publication & application	85.4	36.8~92.2	5

UAE

Global No. 20 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	4.03	0.04~7.75	8
	Growth rate of installed generation capacity	4.03%	-6.31%~53.14%	55
	T&D line length per capita (m)	13.96	0.97~83.12	47
	Growth rate of T&D line length	4.06%	-0.68%~16.00%	16
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	43.22%	0.07%~79.81%	54
	Grid losses	4.91%	0.29%~55.10%	19
	Power supply stability capacity	1.03	0.56~1.59	49
Consumption Services	Electricity consumption per capita (kWh)	16843	120~52337	6
	Growth rate of electricity consumption	7.59%	-11.15%~15.54%	19
	Average electricity price level	0.095	0.002~0.438	36
	SAIDI (min)	2	0.31~12000	2
	SAIFI	0.03	0.01~200	2
	Electricity market development level	2.25	1~5	59
	Time to obtain electricity connection (day)	7	7~267	1
Green & Low-Carbon	Share of electricity in final energy consumption	20.0%	2.12%~51.31%	53
	Share of clean energy in power generation	50.6%	0.04%~100.00%	44
	Growth rate of clean energy generation	62.47%	-31.48%~144.28%	2
	Growth rate of new energy installed capacity	27.38%	-10.78%~379.86%	18
	Carbon emission intensity of electricity (gCO ₂ /kWh)	358.2	0~1096.6	55
	Carbon market development level	1.25	1~5	55
Technological Innovation	New technology application level	3.10	1.85~4.76	17
	Digital & intelligent technology level	3.37	1.28~4.88	17
	Research paper publication & citation	75.6	7.2~97.6	22
	Patent publication & application	63.4	36.8~92.2	46

Finland

Global No. 1 / 100

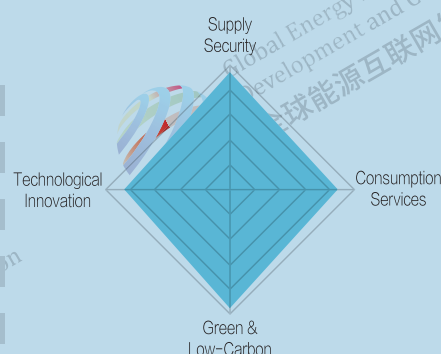
Composite Score 91.2

Supply Security 94.4

Consumption Services 86.9

Green & Low-Carbon 95.7

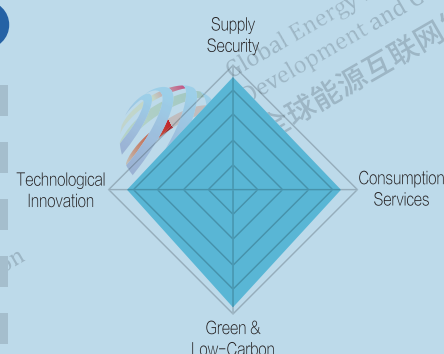
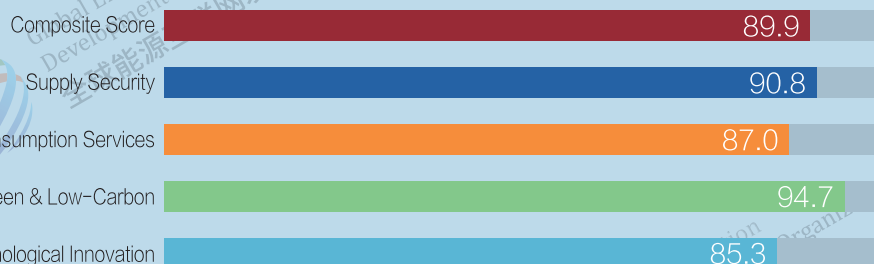
Technological Innovation 85.1



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	5.00	0.04~7.75	5
	Growth rate of installed generation capacity	8.17%	-6.31%~53.14%	21
	T&D line length per capita (m)	77.35	0.97~83.12	2
	Growth rate of T&D line length	0.69%	-0.68%~16.00%	79
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	73.45%	0.07%~79.81%	6
	Grid losses	3.48%	0.29%~55.10%	6
	Power supply stability capacity	1.12	0.56~1.59	23
Consumption Services	Electricity consumption per capita (kWh)	14050	120~52337	7
	Growth rate of electricity consumption	-1.84%	-11.15%~15.54%	90
	Average electricity price level	0.1525	0.002~0.438	56
	SAIDI (min)	112.7	0.31~12000	32
	SAIFI	1.88	0.01~200	32
	Electricity market development level	5	1~5	1
	Time to obtain electricity connection (day)	42	7~267	26
Green & Low-Carbon	Share of electricity in final energy consumption	28.2%	2.12%~51.31%	13
	Share of clean energy in power generation	90.3%	0.04%~100.00%	17
	Growth rate of clean energy generation	3.96%	-31.48%~144.28%	55
	Growth rate of new energy installed capacity	22.69%	-10.78%~379.86%	31
	Carbon emission intensity of electricity (gCO ₂ /kWh)	31.3	0~1096.6	10
	Carbon market development level	5	1~5	1
Technological Innovation	New technology application level	2.95	1.85~4.76	22
	Digital & intelligent technology level	3.32	1.28~4.88	22
	Research paper publication & citation	74.2	7.2~97.6	24
	Patent publication & application	74.6	36.8~92.2	17

Sweden

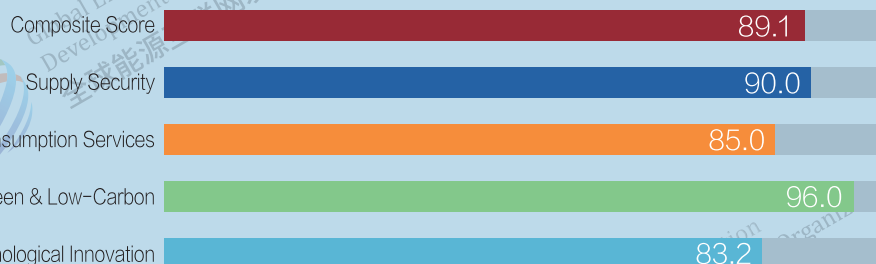
Global No. 2 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	5.68	0.04~7.75	4
	Growth rate of installed generation capacity	5.20%	-6.31%~53.14%	39
	T&D line length per capita (m)	56.44	0.97~83.12	5
	Growth rate of T&D line length	0.70%	-0.68%~16.00%	77
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	70.94%	0.07%~79.81%	10
	Grid losses	5.57%	0.29%~55.10%	27
	Power supply stability capacity	1.08	0.56~1.59	32
Consumption Services	Electricity consumption per capita (kWh)	11943	120~52337	11
	Growth rate of electricity consumption	-0.74%	-11.15%~15.54%	80
	Average electricity price level	0.184	0.002~0.438	65
	SAIDI (min)	53.9	0.31~12000	19
	SAIFI	0.90	0.01~200	19
	Electricity market development level	5	1~5	1
	Time to obtain electricity connection (day)	52	7~267	35
Green & Low-Carbon	Share of electricity in final energy consumption	32.6%	2.12%~51.31%	7
	Share of clean energy in power generation	95.2%	0.04%~100.00%	7
	Growth rate of clean energy generation	-0.61%	-31.48%~144.28%	71
	Growth rate of new energy installed capacity	13.39%	-10.78%~379.86%	54
	Carbon emission intensity of electricity (gCO ₂ /kWh)	10	0~1096.6	6
	Carbon market development level	5	1~5	1
Technological Innovation	New technology application level	3.30	1.85~4.76	9
	Digital & intelligent technology level	3.58	1.28~4.88	9
	Research paper publication & citation	74.6	7.2~97.6	23
	Patent publication & application	72.4	36.8~92.2	25

Switzerland

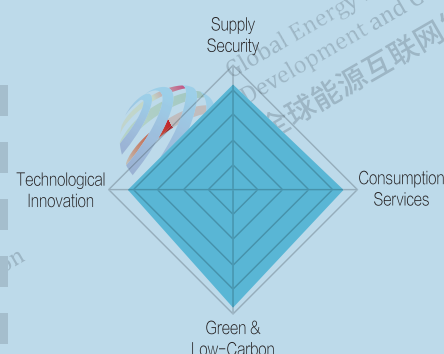
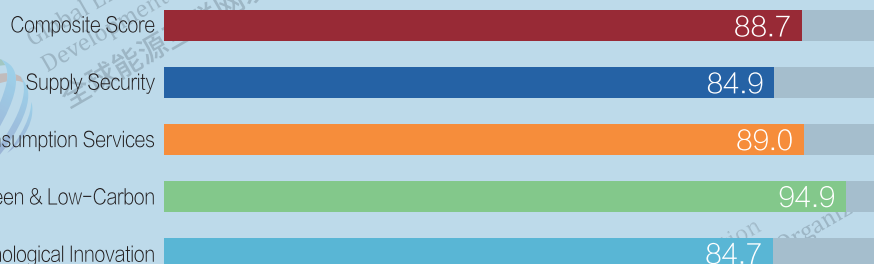
Global No. 3 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	3.17	0.04~7.75	18
	Growth rate of installed generation capacity	5.27%	-6.31%~53.14%	38
	T&D line length per capita (m)	24.06	0.97~83.12	23
	Growth rate of T&D line length	1.16%	-0.68%~16.00%	62
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	54.06%	0.07%~79.81%	41
	Grid losses	7.04%	0.29%~55.10%	32
	Power supply stability capacity	1.19	0.56~1.59	7
Consumption Services	Electricity consumption per capita (kWh)	6375	120~52337	24
	Growth rate of electricity consumption	-0.20%	-11.15%~15.54%	77
	Average electricity price level	0.346	0.002~0.438	96
	SAIDI (min)	8.16	0.31~12000	4
	SAIFI	0.14	0.01~200	4
	Electricity market development level	4.5	1~5	19
	Time to obtain electricity connection (day)	39	7~267	22
Green & Low-Carbon	Share of electricity in final energy consumption	29.2%	2.12%~51.31%	10
	Share of clean energy in power generation	79.8%	0.04%~100.00%	22
	Growth rate of clean energy generation	-0.19%	-31.48%~144.28%	70
	Growth rate of new energy installed capacity	25.21%	-10.78%~379.86%	28
	Carbon emission intensity of electricity (gCO ₂ /kWh)	17.6	0~1096.6	7
	Carbon market development level	5	1~5	1
Technological Innovation	New technology application level	3.09	1.85~4.76	18
	Digital & intelligent technology level	3.36	1.28~4.88	18
	Research paper publication & citation	61.2	7.2~97.6	38
	Patent publication & application	73.6	36.8~92.2	21

Norway

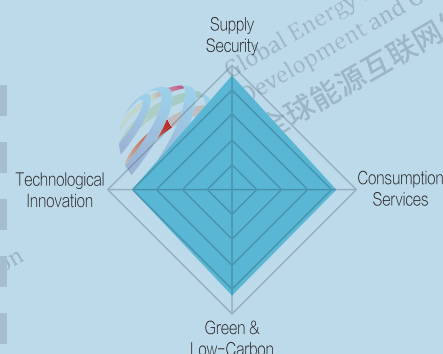
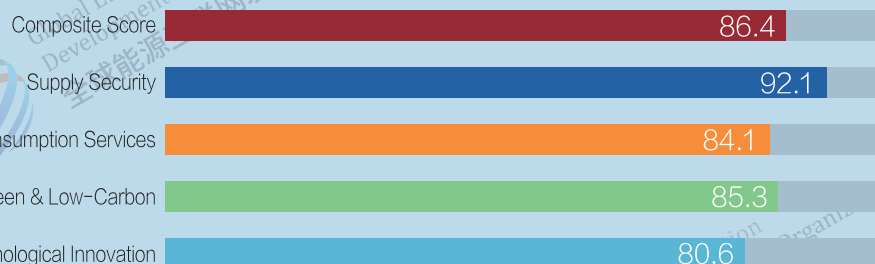
Global No. 5 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	7.35	0.04~7.75	2
	Growth rate of installed generation capacity	0.64%	-6.31%~53.14%	91
	T&D line length per capita (m)	69.91	0.97~83.12	3
	Growth rate of T&D line length	1.00%	-0.68%~16.00%	64
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	18.77%	0.07%~79.81%	81
	Grid losses	4.62%	0.29%~55.10%	13
	Power supply stability capacity	1.06	0.56~1.59	35
Consumption Services	Electricity consumption per capita (kWh)	22883	120~52337	3
	Growth rate of electricity consumption	-0.76%	-11.15%~15.54%	81
	Average electricity price level	0.138	0.002~0.438	50
	SAIDI (min)	88.2	0.31~12000	27
	SAIFI	1.47	0.01~200	27
	Electricity market development level	5	1~5	1
	Time to obtain electricity connection (day)	66	7~267	48
Green & Low-Carbon	Share of electricity in final energy consumption	47.0%	2.12%~51.31%	2
	Share of clean energy in power generation	99.3%	0.04%~100.00%	4
	Growth rate of clean energy generation	0.79%	-31.48%~144.28%	67
	Growth rate of new energy installed capacity	9.07%	-10.78%~379.86%	67
	Carbon emission intensity of electricity (gCO ₂ /kWh)	5.1	0~1096.6	4
	Carbon market development level	5	1~5	1
Technological Innovation	New technology application level	3.28	1.85~4.76	11
	Digital & intelligent technology level	3.54	1.28~4.88	11
	Research paper publication & citation	68.2	7.2~97.6	30
	Patent publication & application	75.2	36.8~92.2	15

Austria

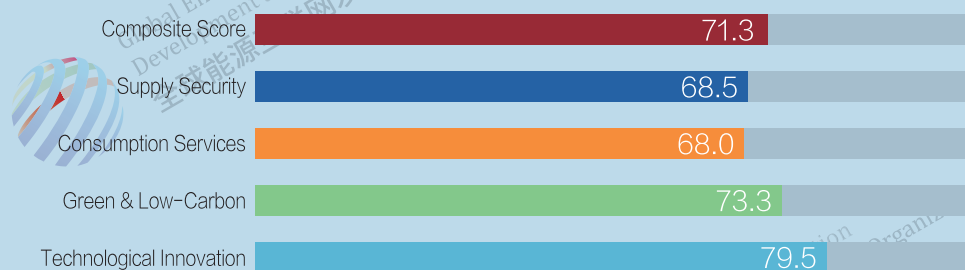
Global No. 6 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	3.79	0.04~7.75	11
	Growth rate of installed generation capacity	5.60%	-6.31%~53.14%	35
	T&D line length per capita (m)	29.63	0.97~83.12	14
	Growth rate of T&D line length	0.77%	-0.68%~16.00%	73
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	56.16%	0.07%~79.81%	35
	Grid losses	4.73%	0.29%~55.10%	17
	Power supply stability capacity	1.42	0.56~1.59	2
Consumption Services	Electricity consumption per capita (kWh)	6882	120~52337	21
	Growth rate of electricity consumption	-2.91%	-11.15%~15.54%	97
	Average electricity price level	0.3425	0.002~0.438	95
	SAIDI (min)	37.24	0.31~12000	12
	SAIFI	0.62	0.01~200	12
	Electricity market development level	4.75	1~5	9
	Time to obtain electricity connection (day)	23	7~267	4
Green & Low-Carbon	Share of electricity in final energy consumption	21.2%	2.12%~51.31%	46
	Share of clean energy in power generation	90.8%	0.04%~100.00%	15
	Growth rate of clean energy generation	5.16%	-31.48%~144.28%	50
	Growth rate of new energy installed capacity	20.59%	-10.78%~379.86%	34
	Carbon emission intensity of electricity (gCO ₂ /kWh)	92.3	0~1096.6	21
	Carbon market development level	5	1~5	1
Technological Innovation	New technology application level	3.00	1.85~4.76	19
	Digital & intelligent technology level	3.36	1.28~4.88	19
	Research paper publication & citation	65	7.2~97.6	33
	Patent publication & application	71.2	36.8~92.2	29

South Africa

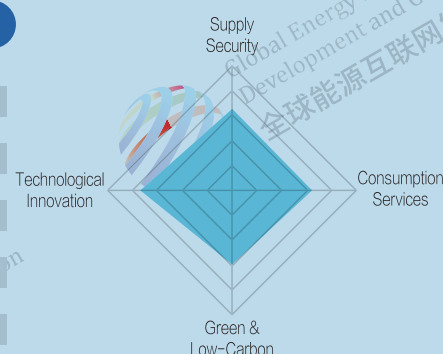
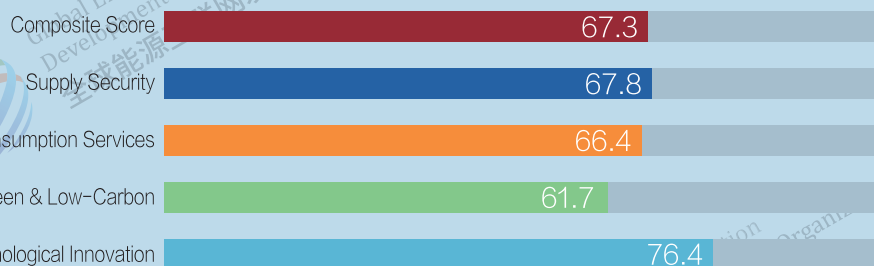
Global No. 55 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	1.01	0.04~7.75	61
	Growth rate of installed generation capacity	-0.69%	-6.31%~53.14%	97
	T&D line length per capita (m)	6.49	0.97~83.12	71
	Growth rate of T&D line length	0.96%	-0.68%~16.00%	67
	Electricity access rate	87.7%	48.3%~100.0%	88
	Supply diversification level	28.33%	0.07%~79.81%	72
	Grid losses	9.89%	0.29%~55.10%	62
	Power supply stability capacity	1.10	0.56~1.59	26
Consumption Services	Electricity consumption per capita (kWh)	3436	120~52337	54
	Growth rate of electricity consumption	0.73%	-11.15%~15.54%	67
	Average electricity price level	0.1825	0.002~0.438	64
	SAIDI (min)	270	0.31~12000	54
	SAIFI	4.50	0.01~200	54
	Electricity market development level	2.75	1~5	54
	Time to obtain electricity connection (day)	109	7~267	82
Green & Low-Carbon	Share of electricity in final energy consumption	26.3%	2.12%~51.31%	19
	Share of clean energy in power generation	19.6%	0.04%~100.00%	72
	Growth rate of clean energy generation	13.08%	-31.48%~144.28%	24
	Growth rate of new energy installed capacity	4.28%	-10.78%~379.86%	88
	Carbon emission intensity of electricity (gCO ₂ /kWh)	893.1	0~1096.6	98
	Carbon market development level	2.5	1~5	36
Technological Innovation	New technology application level	2.82	1.85~4.76	26
	Digital & intelligent technology level	3.11	1.28~4.88	26
	Research paper publication & citation	70.2	7.2~97.6	28
	Patent publication & application	70.2	36.8~92.2	31

Morocco

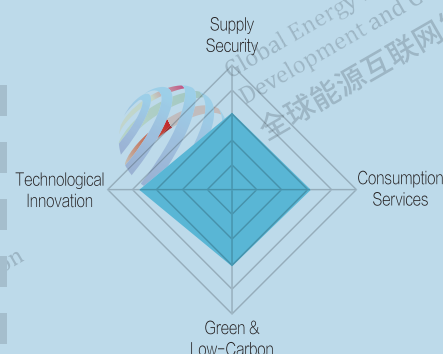
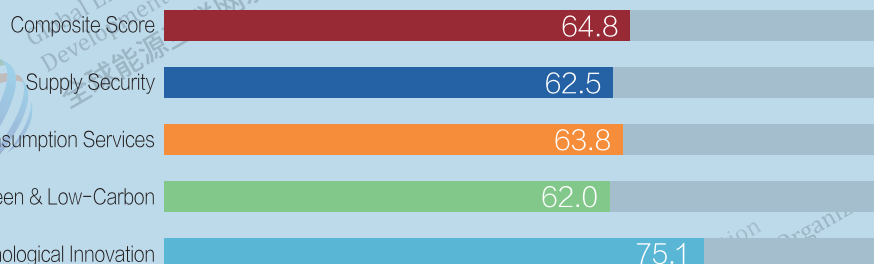
Global No. 66 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	0.43	0.04~7.75	81
	Growth rate of installed generation capacity	2.64%	-6.31%~53.14%	68
	T&D line length per capita (m)	10.25	0.97~83.12	57
	Growth rate of T&D line length	1.60%	-0.68%~16.00%	49
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	39.42%	0.07%~79.81%	59
	Grid losses	18.36%	0.29%~55.10%	88
	Power supply stability capacity	1.06	0.56~1.59	36
Consumption Services	Electricity consumption per capita (kWh)	1170	120~52337	81
	Growth rate of electricity consumption	6.32%	-11.15%~15.54%	26
	Average electricity price level	0.122	0.002~0.438	44
	SAIDI (min)	194	0.31~12000	42
	SAIFI	3.23	0.01~200	42
	Electricity market development level	2	1~5	72
	Time to obtain electricity connection (day)	31	7~267	10
Green & Low-Carbon	Share of electricity in final energy consumption	19.1%	2.12%~51.31%	60
	Share of clean energy in power generation	30.6%	0.04%~100.00%	65
	Growth rate of clean energy generation	12.66%	-31.48%~144.28%	25
	Growth rate of new energy installed capacity	8.48%	-10.78%~379.86%	72
	Carbon emission intensity of electricity (gCO ₂ /kWh)	632.8	0~1096.6	91
	Carbon market development level	1.25	1~5	55
Technological Innovation	New technology application level	2.57	1.85~4.76	43
	Digital & intelligent technology level	2.70	1.28~4.88	43
	Research paper publication & citation	59.8	7.2~97.6	40
	Patent publication & application	66.4	36.8~92.2	39

Egypt

Global No. 77 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	0.59	0.04~7.75	76
	Growth rate of installed generation capacity	1.74%	-6.31%~53.14%	78
	T&D line length per capita (m)	5.72	0.97~83.12	77
	Growth rate of T&D line length	2.48%	-0.68%~16.00%	36
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	22.70%	0.07%~79.81%	76
	Grid losses	21.40%	0.29%~55.10%	94
	Power supply stability capacity	1.03	0.56~1.59	47
Consumption Services	Electricity consumption per capita (kWh)	1953	120~52337	72
	Growth rate of electricity consumption	7.02%	-11.15%~15.54%	21
	Average electricity price level	0.032	0.002~0.438	9
	SAIDI (min)	262.5	0.31~12000	53
	SAIFI	4.38	0.01~200	53
	Electricity market development level	2.5	1~5	58
	Time to obtain electricity connection (day)	53	7~267	36
Green & Low-Carbon	Share of electricity in final energy consumption	20.6%	2.12%~51.31%	49
	Share of clean energy in power generation	9.5%	0.04%~100.00%	84
	Growth rate of clean energy generation	-0.18%	-31.48%~144.28%	69
	Growth rate of new energy installed capacity	12.23%	-10.78%~379.86%	57
	Carbon emission intensity of electricity (gCO ₂ /kWh)	400	0~1096.6	64
	Carbon market development level	1.25	1~5	55
Technological Innovation	New technology application level	2.75	1.85~4.76	30
	Digital & intelligent technology level	2.97	1.28~4.88	30
	Research paper publication & citation	84.4	7.2~97.6	14
	Patent publication & application	42.6	36.8~92.2	70

Tunisia

Global No. 80 / 100

Composite Score

63.0

Supply Security

58.9

Consumption Services

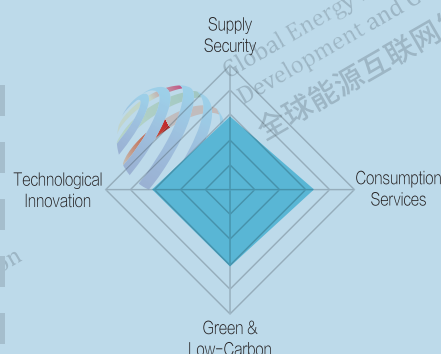
67.7

Green & Low-Carbon

62.2

Technological Innovation

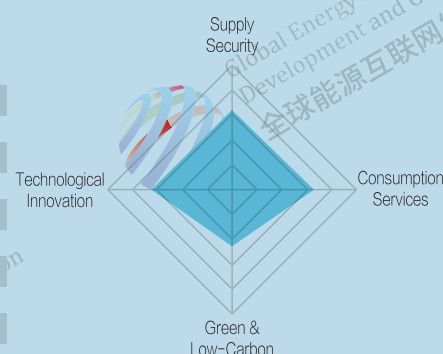
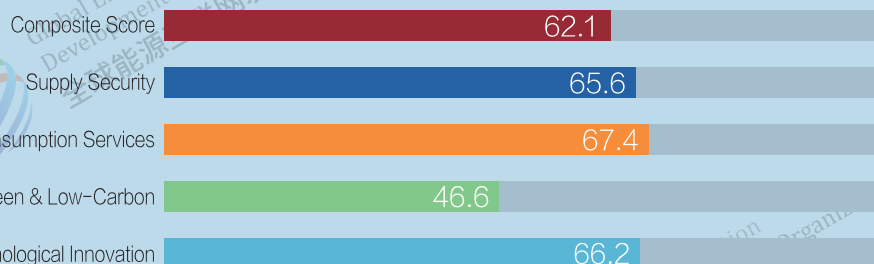
62.8



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	0.65	0.04~7.75	72
	Growth rate of installed generation capacity	5.67%	-6.31%~53.14%	33
	T&D line length per capita (m)	14.40	0.97~83.12	46
	Growth rate of T&D line length	1.50%	-0.68%~16.00%	52
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	8.20%	0.07%~79.81%	89
	Grid losses	21.75%	0.29%~55.10%	95
	Power supply stability capacity	0.79	0.56~1.59	88
Consumption Services	Electricity consumption per capita (kWh)	1833	120~52337	74
	Growth rate of electricity consumption	4.64%	-11.15%~15.54%	40
	Average electricity price level	0.0945	0.002~0.438	35
	SAIDI (min)	200	0.31~12000	44
	SAIFI	3.33	0.01~200	44
	Electricity market development level	1.75	1~5	90
	Time to obtain electricity connection (day)	65	7~267	45
Green & Low-Carbon	Share of electricity in final energy consumption	19.3%	2.12%~51.31%	57
	Share of clean energy in power generation	5.0%	0.04%~100.00%	90
	Growth rate of clean energy generation	15.29%	-31.48%~144.28%	17
	Growth rate of new energy installed capacity	31.55%	-10.78%~379.86%	12
	Carbon emission intensity of electricity (gCO ₂ /kWh)	401.4	0~1096.6	66
	Carbon market development level	1.25	1~5	55
Technological Innovation	New technology application level	2.27	1.85~4.76	66
	Digital & intelligent technology level	2.42	1.28~4.88	66
	Research paper publication & citation	42.8	7.2~97.6	60
	Patent publication & application	36.8	36.8~92.2	80

Algeria

Global No. 82 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	0.66	0.04~7.75	70
	Growth rate of installed generation capacity	8.65%	-6.31%~53.14%	19
	T&D line length per capita (m)	9.46	0.97~83.12	59
	Growth rate of T&D line length	3.33%	-0.68%~16.00%	23
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	2.13%	0.07%~79.81%	97
	Grid losses	9.63%	0.29%~55.10%	60
	Power supply stability capacity	1.04	0.56~1.59	41
Consumption Services	Electricity consumption per capita (kWh)	1961	120~52337	71
	Growth rate of electricity consumption	5.35%	-11.15%~15.54%	34
	Average electricity price level	0.04	0.002~0.438	13
	SAIDI (min)	343	0.31~12000	59
	SAIFI	5.72	0.01~200	59
	Electricity market development level	2	1~5	72
	Time to obtain electricity connection (day)	84	7~267	63
Green & Low-Carbon	Share of electricity in final energy consumption	13.4%	2.12%~51.31%	84
	Share of clean energy in power generation	0.2%	0.04%~100.00%	99
	Growth rate of clean energy generation	-31.48%	-31.48%~144.28%	100
	Growth rate of new energy installed capacity	5.84%	-10.78%~379.86%	83
	Carbon emission intensity of electricity (gCO ₂ /kWh)	500.1	0~1096.6	76
	Carbon market development level	1	1~5	78
Technological Innovation	New technology application level	2.22	1.85~4.76	70
	Digital & intelligent technology level	2.38	1.28~4.88	70
	Research paper publication & citation	53.4	7.2~97.6	49
	Patent publication & application	44.6	36.8~92.2	65

Chile

Global No. 30 / 100

Composite Score

80.6

Supply Security

86.4

Consumption Services

75.6

Green & Low-Carbon

82.8

Technological Innovation

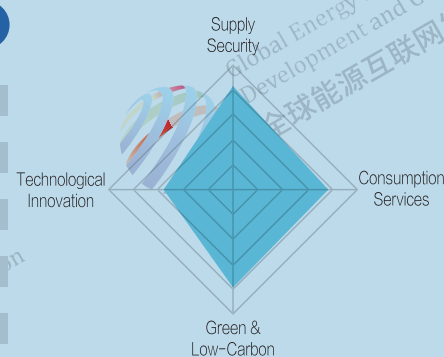
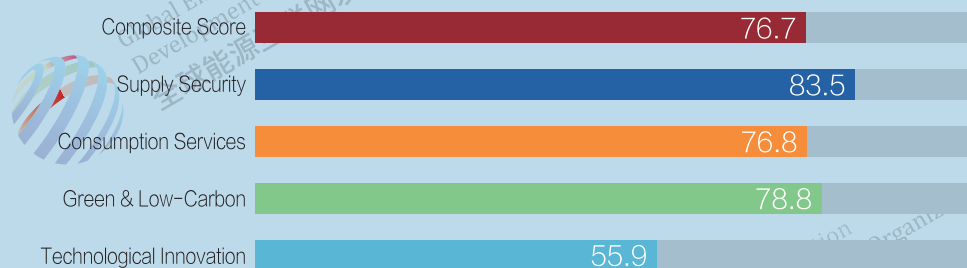
74.7

Technological
InnovationSupply
SecurityConsumption
ServicesGreen &
Low-Carbon

Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	1.89	0.04~7.75	39
	Growth rate of installed generation capacity	3.88%	-6.31%~53.14%	57
	T&D line length per capita (m)	7.15	0.97~83.12	68
	Growth rate of T&D line length	1.24%	-0.68%~16.00%	59
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	75.52%	0.07%~79.81%	3
	Grid losses	5.16%	0.29%~55.10%	23
	Power supply stability capacity	1.16	0.56~1.59	11
Consumption Services	Electricity consumption per capita (kWh)	4819	120~52337	40
	Growth rate of electricity consumption	3.80%	-11.15%~15.54%	45
	Average electricity price level	0.246	0.002~0.438	86
	SAIDI (min)	223.1	0.31~12000	48
	SAIFI	3.72	0.01~200	48
	Electricity market development level	4	1~5	31
	Time to obtain electricity connection (day)	43	7~267	27
Green & Low-Carbon	Share of electricity in final energy consumption	23.6%	2.12%~51.31%	34
	Share of clean energy in power generation	82.5%	0.04%~100.00%	19
	Growth rate of clean energy generation	20.23%	-31.48%~144.28%	13
	Growth rate of new energy installed capacity	28.46%	-10.78%~379.86%	15
	Carbon emission intensity of electricity (gCO ₂ /kWh)	189.6	0~1096.6	33
	Carbon market development level	2.5	1~5	36
Technological Innovation	New technology application level	2.98	1.85~4.76	20
	Digital & intelligent technology level	3.35	1.28~4.88	20
	Research paper publication & citation	55.4	7.2~97.6	46
	Patent publication & application	57.4	36.8~92.2	53

Uruguay

Global No. 40 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	1.73	0.04~7.75	43
	Growth rate of installed generation capacity	3.14%	-6.31%~53.14%	65
	T&D line length per capita (m)	19.16	0.97~83.12	35
	Growth rate of T&D line length	1.20%	-0.68%~16.00%	60
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	68.56%	0.07%~79.81%	15
	Grid losses	8.86%	0.29%~55.10%	55
	Power supply stability capacity	1.15	0.56~1.59	14
Consumption Services	Electricity consumption per capita (kWh)	4239	120~52337	46
	Growth rate of electricity consumption	5.41%	-11.15%~15.54%	33
	Average electricity price level	0.2025	0.002~0.438	70
	SAIDI (min)	126.1	0.31~12000	36
	SAIFI	2.10	0.01~200	36
	Electricity market development level	3.25	1~5	48
	Time to obtain electricity connection (day)	48	7~267	30
Green & Low-Carbon	Share of electricity in final energy consumption	18.9%	2.12%~51.31%	61
	Share of clean energy in power generation	94.1%	0.04%~100.00%	9
	Growth rate of clean energy generation	-0.75%	-31.48%~144.28%	72
	Growth rate of new energy installed capacity	4.25%	-10.78%~379.86%	89
	Carbon emission intensity of electricity (gCO ₂ /kWh)	5.5	0~1096.6	5
	Carbon market development level	2	1~5	40
Technological Innovation	New technology application level	2.38	1.85~4.76	58
	Digital & intelligent technology level	2.53	1.28~4.88	58
	Research paper publication & citation	13.6	7.2~97.6	97
	Patent publication & application	36.8	36.8~92.2	80

Brazil

Global No. 43 / 100

Composite Score

76.2

Supply Security

74.0

Consumption Services

71.7

Green & Low-Carbon

80.3

Technological Innovation

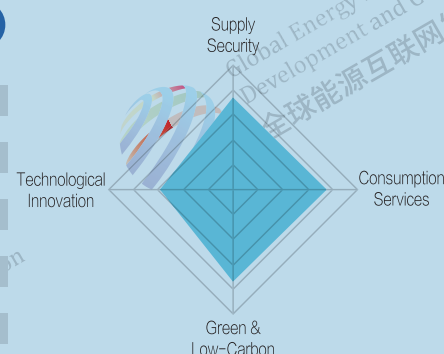
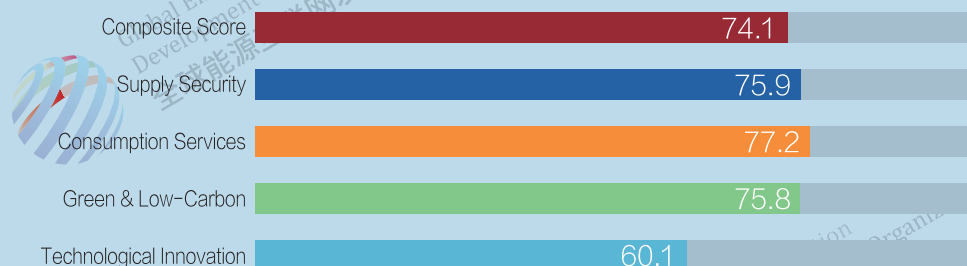
81.6

Technological
InnovationSupply
SecurityConsumption
ServicesGreen &
Low-Carbon

Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	1.24	0.04~7.75	56
	Growth rate of installed generation capacity	6.27%	-6.31%~53.14%	26
	T&D line length per capita (m)	20.52	0.97~83.12	32
	Growth rate of T&D line length	2.13%	-0.68%~16.00%	41
	Electricity access rate	99.8%	48.3%~100.0%	70
	Supply diversification level	63.33%	0.07%~79.81%	23
	Grid losses	15.25%	0.29%~55.10%	82
	Power supply stability capacity	0.85	0.56~1.59	80
Consumption Services	Electricity consumption per capita (kWh)	3149	120~52337	55
	Growth rate of electricity consumption	4.23%	-11.15%~15.54%	41
	Average electricity price level	0.1425	0.002~0.438	52
	SAIDI (min)	650	0.31~12000	74
	SAIFI	10.83	0.01~200	74
	Electricity market development level	4	1~5	31
	Time to obtain electricity connection (day)	129	7~267	91
Green & Low-Carbon	Share of electricity in final energy consumption	19.7%	2.12%~51.31%	54
	Share of clean energy in power generation	93.0%	0.04%~100.00%	12
	Growth rate of clean energy generation	9.14%	-31.48%~144.28%	35
	Growth rate of new energy installed capacity	25.91%	-10.78%~379.86%	26
	Carbon emission intensity of electricity (gCO ₂ /kWh)	68.7	0~1096.6	15
	Carbon market development level	1.5	1~5	47
Technological Innovation	New technology application level	2.81	1.85~4.76	27
	Digital & intelligent technology level	3.03	1.28~4.88	27
	Research paper publication & citation	62.8	7.2~97.6	36
	Patent publication & application	75.2	36.8~92.2	15

Panama

Global No. 48 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	1.24	0.04~7.75	57
	Growth rate of installed generation capacity	3.48%	-6.31%~53.14%	61
	T&D line length per capita (m)	7.61	0.97~83.12	65
	Growth rate of T&D line length	2.60%	-0.68%~16.00%	33
	Electricity access rate	97.0%	48.3%~100.0%	81
	Supply diversification level	60.53%	0.07%~79.81%	30
	Grid losses	7.05%	0.29%~55.10%	33
	Power supply stability capacity	1.05	0.56~1.59	39
Consumption Services	Electricity consumption per capita (kWh)	3576	120~52337	51
	Growth rate of electricity consumption	8.52%	-11.15%~15.54%	14
	Average electricity price level	0.1875	0.002~0.438	66
	SAIDI (min)	225.4	0.31~12000	50
	SAIFI	3.76	0.01~200	50
	Electricity market development level	3.5	1~5	44
	Time to obtain electricity connection (day)	35	7~267	16
Green & Low-Carbon	Share of electricity in final energy consumption	24.3%	2.12%~51.31%	31
	Share of clean energy in power generation	53.0%	0.04%~100.00%	42
	Growth rate of clean energy generation	-3.63%	-31.48%~144.28%	83
	Growth rate of new energy installed capacity	25.48%	-10.78%~379.86%	27
	Carbon emission intensity of electricity (gCO ₂ /kWh)	315.8	0~1096.6	50
	Carbon market development level	1.25	1~5	55
Technological Innovation	New technology application level	2.12	1.85~4.76	83
	Digital & intelligent technology level	2.21	1.28~4.88	83
	Research paper publication & citation	38.4	7.2~97.6	67
	Patent publication & application	36.8	36.8~92.2	80

Costa Rica

Global No. 56 / 100

Composite Score

71.2

Supply Security

72.2

Consumption Services

64.8

Green & Low-Carbon

83.2

Technological Innovation

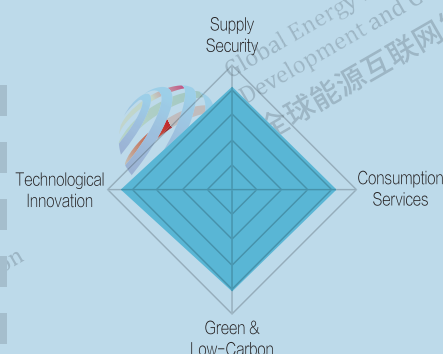
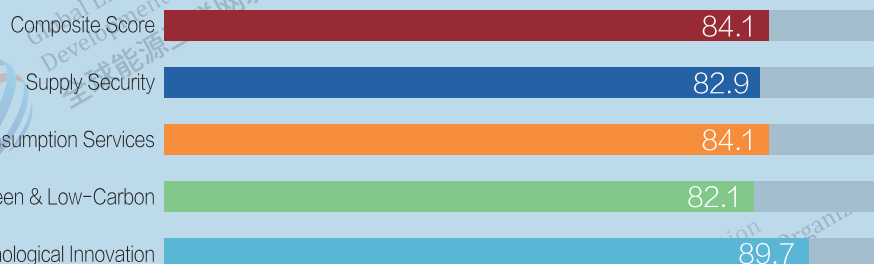
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Technological
InnovationSupply
SecurityConsumption
ServicesGreen &
Low-Carbon

Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	0.72	0.04~7.75	66
	Growth rate of installed generation capacity	-0.11%	-6.31%~53.14%	94
	T&D line length per capita (m)	5.14	0.97~83.12	79
	Growth rate of T&D line length	1.50%	-0.68%~16.00%	52
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	43.77%	0.07%~79.81%	52
	Grid losses	8.58%	0.29%~55.10%	49
	Power supply stability capacity	1.14	0.56~1.59	15
Consumption Services	Electricity consumption per capita (kWh)	2305	120~52337	66
	Growth rate of electricity consumption	2.88%	-11.15%~15.54%	51
	Average electricity price level	0.207	0.002~0.438	72
	SAIDI (min)	145.5	0.31~12000	37
	SAIFI	2.43	0.01~200	37
	Electricity market development level	2	1~5	72
	Time to obtain electricity connection (day)	39	7~267	22
Green & Low-Carbon	Share of electricity in final energy consumption	23.3%	2.12%~51.31%	37
	Share of clean energy in power generation	93.1%	0.04%~100.00%	11
	Growth rate of clean energy generation	-2.97%	-31.48%~144.28%	82
	Growth rate of new energy installed capacity	0.82%	-10.78%~379.86%	96
	Carbon emission intensity of electricity (gCO ₂ /kWh)	79.7	0~1096.6	17
	Carbon market development level	2	1~5	40
Technological Innovation	New technology application level	2.21	1.85~4.76	73
	Digital & intelligent technology level	2.34	1.28~4.88	73
	Research paper publication & citation	14.6	7.2~97.6	94
	Patent publication & application	44.8	36.8~92.2	64

Canada

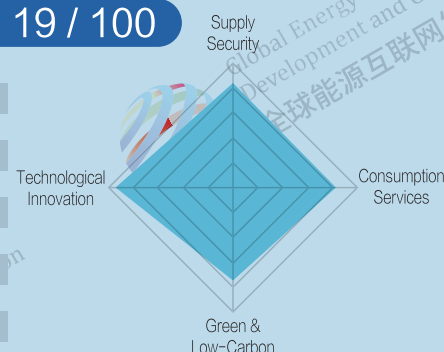
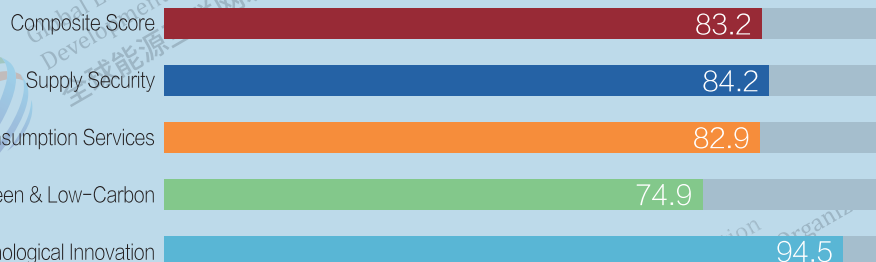
Global No. 14 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	3.90	0.04~7.75	9
	Growth rate of installed generation capacity	0.77%	-6.31%~53.14%	90
	T&D line length per capita (m)	30.04	0.97~83.12	13
	Growth rate of T&D line length	1.15%	-0.68%~16.00%	63
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	62.13%	0.07%~79.81%	26
	Grid losses	5.10%	0.29%~55.10%	21
	Power supply stability capacity	0.94	0.56~1.59	64
Consumption Services	Electricity consumption per capita (kWh)	13787	120~52337	8
	Growth rate of electricity consumption	1.82%	-11.15%~15.54%	57
	Average electricity price level	0.114	0.002~0.438	43
	SAIDI (min)	186.2	0.31~12000	39
	SAIFI	3.10	0.01~200	39
	Electricity market development level	4	1~5	31
	Time to obtain electricity connection (day)	137	7~267	92
Green & Low-Carbon	Share of electricity in final energy consumption	23.3%	2.12%~51.31%	36
	Share of clean energy in power generation	76.7%	0.04%~100.00%	23
	Growth rate of clean energy generation	-1.49%	-31.48%~144.28%	76
	Growth rate of new energy installed capacity	7.05%	-10.78%~379.86%	79
	Carbon emission intensity of electricity (gCO ₂ /kWh)	120.5	0~1096.6	24
	Carbon market development level	4	1~5	26
Technological Innovation	New technology application level	3.26	1.85~4.76	12
	Digital & intelligent technology level	3.47	1.28~4.88	12
	Research paper publication & citation	87.8	7.2~97.6	8
	Patent publication & application	85	36.8~92.2	6

United States

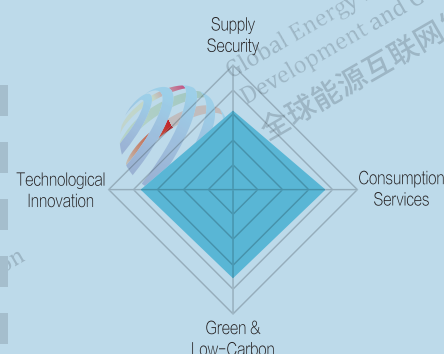
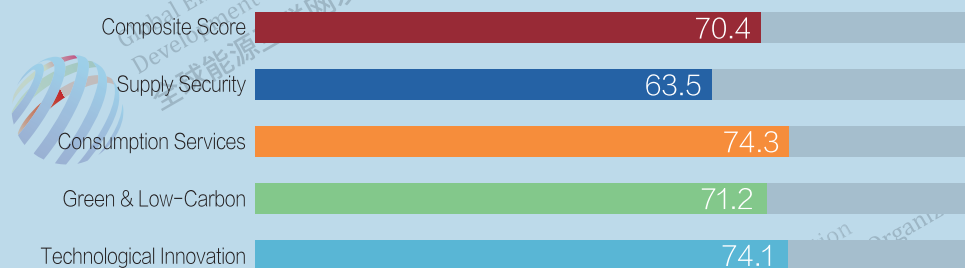
Global No. 19 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	3.73	0.04~7.75	12
	Growth rate of installed generation capacity	1.96%	-6.31%~53.14%	76
	T&D line length per capita (m)	36.37	0.97~83.12	7
	Growth rate of T&D line length	1.26%	-0.68%~16.00%	58
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	61.32%	0.07%~79.81%	27
	Grid losses	4.49%	0.29%~55.10%	11
	Power supply stability capacity	0.93	0.56~1.59	66
Consumption Services	Electricity consumption per capita (kWh)	12274	120~52337	10
	Growth rate of electricity consumption	1.24%	-11.15%~15.54%	61
	Average electricity price level	0.173	0.002~0.438	61
	SAIDI (min)	350	0.31~12000	60
	SAIFI	5.83	0.01~200	60
	Electricity market development level	4.5	1~5	19
	Time to obtain electricity connection (day)	90	7~267	69
Green & Low-Carbon	Share of electricity in final energy consumption	21.4%	2.12%~51.31%	43
	Share of clean energy in power generation	42.7%	0.04%~100.00%	55
	Growth rate of clean energy generation	5.44%	-31.48%~144.28%	48
	Growth rate of new energy installed capacity	11.74%	-10.78%~379.86%	61
	Carbon emission intensity of electricity (gCO ₂ /kWh)	321.8	0~1096.6	51
	Carbon market development level	3.75	1~5	28
Technological Innovation	New technology application level	3.91	1.85~4.76	2
	Digital & intelligent technology level	3.93	1.28~4.88	2
	Research paper publication & citation	97.6	7.2~97.6	1
	Patent publication & application	92.2	36.8~92.2	1

Mexico

Global No. 57 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	0.98	0.04~7.75	62
	Growth rate of installed generation capacity	5.48%	-6.31%~53.14%	36
	T&D line length per capita (m)	7.32	0.97~83.12	66
	Growth rate of T&D line length	0.86%	-0.68%~16.00%	71
	Electricity access rate	99.7%	48.3%~100.0%	73
	Supply diversification level	38.31%	0.07%~79.81%	62
	Grid losses	11.51%	0.29%~55.10%	72
	Power supply stability capacity	0.93	0.56~1.59	67
Consumption Services	Electricity consumption per capita (kWh)	2618	120~52337	61
	Growth rate of electricity consumption	0.80%	-11.15%~15.54%	66
	Average electricity price level	0.171	0.002~0.438	59
	SAIDI (min)	255	0.31~12000	52
	SAIFI	4.25	0.01~200	52
	Electricity market development level	4	1~5	31
	Time to obtain electricity connection (day)	100	7~267	76
Green & Low-Carbon	Share of electricity in final energy consumption	22.8%	2.12%~51.31%	38
	Share of clean energy in power generation	19.3%	0.04%~100.00%	73
	Growth rate of clean energy generation	0.10%	-31.48%~144.28%	68
	Growth rate of new energy installed capacity	7.02%	-10.78%~379.86%	81
	Carbon emission intensity of electricity (gCO ₂ /kWh)	414.4	0~1096.6	67
	Carbon market development level	3	1~5	30
Technological Innovation	New technology application level	2.75	1.85~4.76	29
	Digital & intelligent technology level	2.99	1.28~4.88	29
	Research paper publication & citation	46.6	7.2~97.6	56
	Patent publication & application	70	36.8~92.2	34

Australia

Global No. 11 / 100

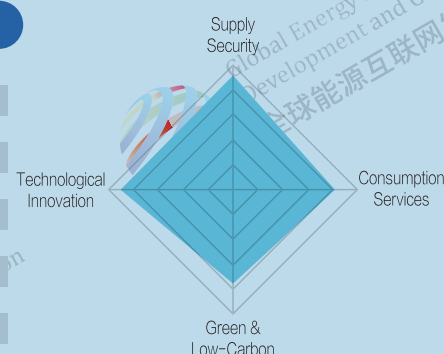
Composite Score 85.0

Supply Security 92.1

Consumption Services 82.1

Green & Low-Carbon 75.6

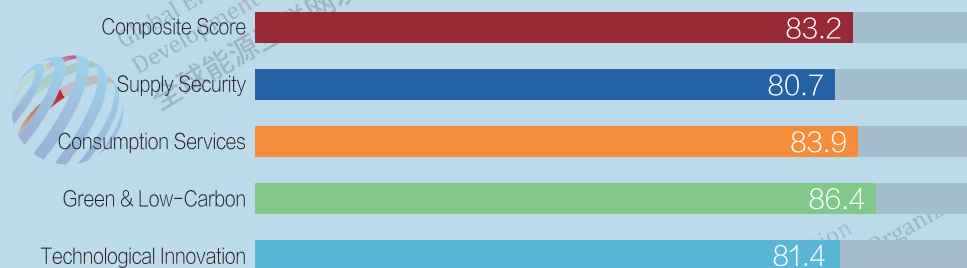
Technological Innovation 90.6



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	4.29	0.04~7.75	7
	Growth rate of installed generation capacity	4.98%	-6.31%~53.14%	42
	T&D line length per capita (m)	35.27	0.97~83.12	8
	Growth rate of T&D line length	0.53%	-0.68%~16.00%	83
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	55.67%	0.07%~79.81%	36
	Grid losses	4.90%	0.29%~55.10%	18
	Power supply stability capacity	1.16	0.56~1.59	8
Consumption Services	Electricity consumption per capita (kWh)	9384	120~52337	15
	Growth rate of electricity consumption	0.20%	-11.15%~15.54%	73
	Average electricity price level	0.2715	0.002~0.438	88
	SAIDI (min)	214	0.31~12000	47
	SAIFI	3.57	0.01~200	47
	Electricity market development level	4.75	1~5	9
	Time to obtain electricity connection (day)	75	7~267	58
Green & Low-Carbon	Share of electricity in final energy consumption	23.6%	2.12%~51.31%	32
	Share of clean energy in power generation	41.9%	0.04%~100.00%	57
	Growth rate of clean energy generation	11.13%	-31.48%~144.28%	26
	Growth rate of new energy installed capacity	15.40%	-10.78%~379.86%	44
	Carbon emission intensity of electricity (gCO ₂ /kWh)	575.4	0~1096.6	83
	Carbon market development level	3	1~5	30
Technological Innovation	New technology application level	3.25	1.85~4.76	13
	Digital & intelligent technology level	3.47	1.28~4.88	13
	Research paper publication & citation	93.2	7.2~97.6	4
	Patent publication & application	87	36.8~92.2	2

New Zealand

Global No. 21 / 100



Dimension	Indicator	Value	Range	Rank
Supply Security	Installed generation capacity per capita (kW)	2.06	0.04~7.75	37
	Growth rate of installed generation capacity	2.27%	-6.31%~53.14%	71
	T&D line length per capita (m)	33.01	0.97~83.12	11
	Growth rate of T&D line length	0.41%	-0.68%~16.00%	89
	Electricity access rate	100.0%	48.3%~100.0%	1
	Supply diversification level	64.51%	0.07%~79.81%	21
	Grid losses	7.69%	0.29%~55.10%	41
Consumption Services	Power supply stability capacity	1.04	0.56~1.59	46
	Electricity consumption per capita (kWh)	7667	120~52337	16
	Growth rate of electricity consumption	0.20%	-11.15%~15.54%	74
	Average electricity price level	0.1775	0.002~0.438	62
	SAIDI (min)	196	0.31~12000	43
	SAIFI	3.27	0.01~200	43
	Electricity market development level	5	1~5	1
Green & Low-Carbon	Time to obtain electricity connection (day)	58	7~267	42
	Share of electricity in final energy consumption	24.9%	2.12%~51.31%	27
	Share of clean energy in power generation	93.8%	0.04%~100.00%	10
	Growth rate of clean energy generation	3.77%	-31.48%~144.28%	57
	Growth rate of new energy installed capacity	9.64%	-10.78%~379.86%	65
	Carbon emission intensity of electricity (gCO ₂ /kWh)	117.7	0~1096.6	23
	Carbon market development level	4	1~5	26
Technological Innovation	New technology application level	2.70	1.85~4.76	34
	Digital & intelligent technology level	2.91	1.28~4.88	34
	Research paper publication & citation	69.2	7.2~97.6	29
	Patent publication & application	71.8	36.8~92.2	26