



Chapter 6

Case Studies: Development and Utilization of Clean Energy

- (1) Southeast's Wind & Solar Power: The Rise of Offshore Energy
- (2) Southwest's Hydropower: The Strong Pulse of River Systems
- (3) Northwest China's Photovoltaic Power: A Green Revolution in the Desert
- (4) Inner Mongolia: A Strategic Hub in China's Clean Energy Transition
- (5) MEE's Specific Arrangements for Carbon Market Expansion
- (6) Concept: Key Terms in Ecological Product Value Realization

(1) Southeast's Wind & Solar Power: The Rise of Offshore Energy

Amid the global efforts to tackle climate change and actively promote energy transition, the development and utilization of clean energy have become a key pathway for countries worldwide to achieve sustainable development. China, with its vast territory and significant regional disparities in resource endowments, faces both challenges and opportunities. These differences provide a broad stage for diversified clean energy development models. Today, China is leveraging its unique strengths to vigorously develop diverse forms of clean energy across the country according to different local conditions. This not only lays a solid foundation for the green transformation and high-quality development of the economy and society but also injects new momentum into local economic growth. Furthermore, it offers valuable insights for optimizing the national energy structure and advancing green development. Looking ahead, with continuous technological advancements and sustained policy support, China's clean energy industry is poised for even greater growth, making substantial contributions to achieving carbon peaking and carbon neutrality goals while driving global sustainable development.

The year 2025 marks the conclusion of China's 14th Five-Year Plan, during which the government has identified “coordinated efforts to reduce carbon emissions, cut pollution, expand green initiatives, and drive growth, while accelerating the comprehensive green transformation of economic and social

development” as a key task for 2025 in its government work report. Closely tied to this goal, the energy and chemical industries are witnessing new plans and heightened expectations. Notably, terms such as “offshore wind power” and “zero-carbon industrial parks” have been included in the report for the first time. China's southeastern coastal regions boast abundant marine resources. The extensive coastline and vast sea areas provide ideal conditions for the development of offshore wind power and photovoltaic (PV) industries. Lin Boqiang, Director of the China Institute for Studies in Energy Policy at Xiamen University, stated that China's long coastline and large areas of usable sea space offer favorable conditions and significant advantages for developing offshore wind power. Coupled with declining costs, offshore wind power is poised for substantial growth. In the first half of 2024, the national wind power generation reached 508.8 GWh, a year-on-year increase of 10%. Wind power has become China's second-largest source of electricity after coal power, and coastal regions are rapidly emerging as the “New Three Gorges” for wind energy. Recently, the Implementation Plan for Offshore Photovoltaic Development and Construction in Jiangsu Province (2025–2030) was officially released. The plan outlines a coordinated framework for building a 10 GW offshore PV base across the province. It proposes the development of 60 offshore PV sites with a total installed capacity of 27.25 MW.



Yancheng, Jiangsu, boasts the province's longest coastline and largest sea area, along with abundant coastal wind resources. At a height of 100 meters, the average annual wind speed exceeds 7.6 meters per second, and the region enjoys about 2,280 hours of sunshine annually, making it one of the world's most valuable offshore wind farm locations. Yancheng is home to China's first commercially operational offshore wind power project, the country's largest string-type energy storage power station, its farthest offshore wind power project, and the world's largest wind power testing platform—the Shanghai Electric Wind Power Full-Power Testing Platform. In 2024, Yancheng advanced the

construction of three offshore wind power projects with a combined capacity of 2.65 GW. The city's total installed capacity for new energy power generation reached 16.76 GW, with annual new energy power generation totaling 31.2 GWh, having remained No. 1 in Jiangsu Province for 15 consecutive years. Additionally, Yancheng completed and connected 10 energy storage power stations with a combined capacity of 1.81 GW, also leading the province in scale. Yancheng has also attracted numerous leading enterprises in wind turbine manufacturing and component production, forming an integrated wind power industrial chain that encompasses 'R&D and design—equipment

Source:

China Report | Offshore Wind Power Industry's Journey toward a “New Blue Ocean.”

<https://baijiahao.baidu.com/s?id=1821474706171761764&wfr=spider&for=pc>

manufacturing—resource development—operation and maintenance services.' The city's manufacturing capacities for wind turbines and blades account for 40% and 20% of the national total, respectively. From successfully overcoming key technological bottlenecks such as multi-megawatt turbine bearings and carbon fiber blades to launching global-first innovations like the world's first 20 MW floating wind turbine and China's first offshore large-megawatt 'carbon-neutral' turbine, Yancheng's independent innovation has propelled its wind power industry from being a 'follower' to a 'leader,' solidifying its position as a global leader in offshore wind power.

Yancheng is actively promoting the systematic, large-scale, and centralized development of green electricity resources, attracting leading renewable energy companies such as China Energy Investment Corporation (CEIC), China Huadian Corporation, and State Power Investment Corporation (SPIC). According to Sun Haishan, Director of the Yancheng Development and Reform Commission, the city plans to introduce over 10 green power-intensive projects within this year, while steadily developing wind and photovoltaic (PV) resources and implementing several wind-solar hybrid demonstration projects. Dafeng District and Sheyang County are accelerating offshore engineering construction for wind power projects to achieve full-capacity turbine grid connection as soon as

possible. Additionally, Yancheng is planning the layout of an 'Offshore Energy Island' and striving to exceed 20 GW in installed capacity for new energy projects, with invoiced sales surpassing 200 billion yuan. According to the 2025 Major Project List of Jiangsu Province and the 2025 Key Industry Projects for Private Investment in Jiangsu Province recently released by the Jiangsu Provincial Development and Reform Commission, the lists include three Yancheng-based offshore wind power projects: the Yancheng Guoxin Offshore Wind Power Project, the Yancheng Three Gorges Offshore Wind Power Project, and the Yancheng Longyuan Offshore Wind Power Project. Together, these projects have a combined installed capacity of 2.65 GW.

To better establish an active and dynamic consumption cycle and optimize the economic viability of offshore wind power, Yancheng has precisely targeted its primary consumers—enterprises and industrial chains facing the EU's Carbon Border Adjustment Mechanism (CBAM), along with their demands for green electricity and export capabilities. Through top-level planning to continuously inject market-driven momentum into the offshore wind power industry and optimize the local business environment, Yancheng is leveraging its offshore open ports to build new power system pilot industrial parks in proximity. These parks aim to gradually create scenarios for the localized 'consumption' of renewable energy generation, meeting multiple needs, including supplying

green electricity to enterprises, enabling port-based export transportation, and facilitating exports. Take Yancheng's Binhai County as an example. With its unique advantage of 'three-port linkage' (integration of port, port area, and port city), Binhai Port faces Japan and South Korea across the sea and is a national first-class open port. The county is tapping into its 'green electricity + cold energy' resources and striving to build the largest comprehensive energy supply base in the Yangtze River Delta, integrating coal, wind, solar, natural gas, hydrogen, and cooling and thermal energy.

Similarly, Rudong County in Jiangsu, located on the coast of the Southern Yellow Sea, boasts 4,555 km² of sea area and over 1 million mu of coastal mudflats. With an average annual sunlight duration of 1,754.5 hours, it has abundant solar resources and a natural advantage for developing a solar economy. Since 2002, Rudong has successively established China's first intertidal zone wind power testing site, the country's first offshore substation, and other demonstration projects. It has installed 200 wind turbines with a capacity of 4 MW each, achieving a total installed capacity of 800 MW. Rudong also became the first in Asia to adopt flexible DC (VSC-HVDC) transmission technology for offshore wind power, and has built the world's largest offshore wind power flexible DC transmission project in terms of capacity, highest voltage level, and longest transmission distance. To date, Rudong has

completed 32 offshore and onshore wind farms, with cumulative new energy grid-connected power generation reaching 75.257 TWh, enabling a net output of 'green electricity' to the grid. Rudong is now home to Asia's largest county-level offshore wind farm, with a total installed capacity of over 5.62 GW. This marks the first large-scale, contiguous offshore wind power development project in China led by a county-level government, setting a benchmark for offshore wind power projects nationwide.

Rudong County adopts three simultaneous approaches: expanding wind power and solar photovoltaic (PV) capacity, upgrading equipment, and increasing energy storage deployment. By focusing on the continuous expansion of renewable energy capacity, the improvement of comprehensive utilization efficiency, and the enhancement of stable power output capabilities, Rudong is accelerating the construction of a new energy system and striving to build a high-level national green energy pilot demonstration city. According to the implementation plan, Rudong will follow an overall strategy of being safe, reliable, eco-friendly, resource-efficient, and phased. The county plans to develop 17 offshore photovoltaic (PV) project sites, covering a total planned sea area of approximately 83.6 km². Among them, Guohua Energy Investment's Rudong Offshore PV Project, located in the Yudong Reclamation Area (a reclaimed land region in Rudong), is one of the first 'pilot and

intensively-developed' demonstration projects under the plan. It is also included in the third batch of national large-scale PV base projects. With a total installed capacity of 400 MW and an area of about 287 hectares, the project is expected to have an annual capacity factor of approximately 1,200 hours, generating an average of 468 MKh of electricity per year. As of now, the project has achieved grid connection and commenced power generation.

While Rudong's photovoltaic (PV) industry accelerates its offshore expansion, offshore wind power is witnessing new project additions. On January 27, 2025, the Jiangsu Provincial Development and Reform Commission released the *Notice on Awarding Allocations for Jiangsu Province's New Round of Offshore Wind Power Projects*. Under this notice, three offshore wind power projects in Rudong, with a combined capacity of 1.15 GW, were successfully awarded to CEIC, China Huadian Corporation, and China Three Gorges Corporation (CTG). Consequently, the newly planned combined capacity for Rudong's offshore wind and PV projects has reached 7.665 GW. Once these projects are fully commissioned and operational, Rudong's total renewable energy installed capacity will exceed 14 GW, with annual grid-connected power generation expected to exceed 20 TWh.

As the largest green power-exporting county in Jiangsu Province, Rudong has fully leveraged its resource advantage of exceeding

1 billion kilowatt-hours of monthly wind and PV power generation. Since 2022, the county has actively developed its advanced energy storage industry, making significant progress in constructing new-type energy storage facilities. To date, Rudong has completed three major energy storage stations—Fengchu Energy Storage Station, Luhen Energy Storage Station, and Shengneng Energy Storage Station—with a combined storage capacity of 550 MW. Meanwhile, a 26 MW/100 MWh gravity-based energy storage project is undergoing commissioning tests, and the Guohua Rudong 60 MW/120 MWh energy storage station is scheduled to commence construction this month. Once all five energy storage stations are operational, they will undertake critical tasks for the provincial power grid, including peak shaving and valley filling, and frequency regulation. These projects will play a pivotal role in ensuring regional power supply security, enhancing the reliability and operational economy of the power system, and advancing the green energy transition. The implementation plan also emphasizes the local consumption of renewable energy, calling for optimized power transmission channels and mandating the allocation or procurement of new energy storage facilities (or services) with 10% capacity and 2-hour duration, enabling an integrated multi-energy complementary operation system. “The implementation of this plan has given a significant boost to Rudong's integrated

wind-solar-storage development”,said Zhou Hua, Chief Engineer of the Rudong Development and Reform Commission. He noted that the coordinated 'energy

storage+renewable energy'development model will effectively support the county's goal of building a clean, low-carbon, safe, and efficient new energy system.

Sources:

www.gov.cn. Government Work Report 2025 [EB/OL]. (2025-03) [2025-04-26].

https://www.gov.cn/yaowen/liebiao/202503/content_7010289.htm.

China Energy News. Jiangsu Issued Implementation Plan for Offshore Photovoltaic Development and Construction (2025-2030) [EB/OL]. (2021-03-22) [2025-04-26]. https://paper.people.com.cn/zgnybwap/html/2021-03/22/content_2039906.htm.

Jiangsu Provincial People's Government. Implementation Plan for the Development and Construction of Offshore Photovoltaic Projects in Jiangsu Province(025—2030)[EB/OL]. (2025-02-08) [2025-04-26]. https://www.jiangsu.gov.cn/art/2025/2/8/art_60095_11487728.html.

Jiangsu Provincial People's Government. Development Status of Yancheng's Offshore Wind Power Industry [EB/OL]. (2025-03-18) [2025-04-26]. https://www.jiangsu.gov.cn/art/2025/3/18/art_33718_11518729.html.

(2) Southwest's Hydropower: The Strong Pulse of River Systems

Conventional hydropower has emerged as a rapidly growing clean energy source in recent years. It is renewable, pollution-free, features low operational costs, and is well-suited for peak load regulation, contributing to improved resource utilization and comprehensive economic and social benefits. China's southwestern region, with its complex terrain and abundant water resources, serves as a key hub for the country's clean energy development. In early 2024, the first large-scale pumped storage plant in Southwest China with a capacity exceeding 1 MW—the Qijiang Panlong Pumped Storage Plant—was fully commissioned. This marked a significant breakthrough in regulatory power sources for Chongqing and the Southwest Power Grid. Located in Zhongfeng Town, Qijiang District, Chongqing, the plant sits at the center of Chongqing's electricity load and adjacent to Sichuan's hydropower base, functioning as a relay power source on the main corridor of the national “West-to-East Power Transmission” (a national strategic project). With a total investment of 7.118 billion yuan, the plant has a 1.2 GW installed capacity, annual designed power generation of 2,004

GWh, and annual pumping power consumption of 2,672 GWh. Compared with coal-fired power generation, it saves 152,300 tons of standard coal and reduces CO₂ emissions by 398,700 tons annually. The plant's commissioning alleviates grid peak regulation pressures while providing safer, more reliable, and efficient green power support for the Southwest Power Grid and the West-to-East Transmission corridor. Not only is hydropower a new energy source with significant carbon reduction effects, but pumped storage plants also represent a green energy storage solution, valued for their mature technology, rapid response, large capacity, long discharge cycles, cost efficiency, and environmental friendliness. They are a crucial component in Chongqing's drive to build a new power system. The Qijiang Panlong Plant will enhance power supply reliability for Chongqing's role as a key strategic fulcrum for the new-era Western Development, an integrated inland opening hub, and a core part of the Chengdu-Chongqing Twin Cities Economic Circle. It will also play a vital role in national energy base development and the construction of new power and energy systems.



Guizhou Province's energy resources are primarily composed of hydropower and coal, offering advantages in coal-power integration and complementary thermal (coal)-hydropower operations. The province boasts abundant hydropower resources, with a theoretical potential of 18.75 GW (excluding small rivers with theoretical potential below 10 MW), ranking among the highest in China. Its total installed hydropower capacity reaches 22.86 MW, concentrated mainly along the Wujiang, Nanpanjiang, Beipanjiang, Qingshuijiang, and Chishui Rivers. These “four rivers and one stream” feature concentrated hydraulic head in multiple sections, with superior development conditions, and account for 80% of the province's total hydropower potential and

developable capacity. Guizhou's hydropower resources are characterized by balanced distribution, low construction costs, high power generation efficiency, and advantageous location.

Currently, Guizhou's total power installed capacity from traditional and new energy sources reaches 91 GW, with hydropower accounting for over 25%. On September 6, 2024, the completion acceptance meeting for the Silin Hydropower Station on the Wujiang River was held in Guiyang. The meeting concluded that the station has been fully constructed according to the approved design and scale, achieved its functional objectives, and met the conditions for completion acceptance, and unanimously approved the acceptance. As a result, Silin

Source:

SOHU.com | How significant is hydropower generation? How does China's hydropower generation level compare worldwide?

https://www.sohu.com/a/783807658_123710

Hydropower Station became the first million-kilowatt-level large hydropower station in Guizhou to pass overall project completion acceptance after China's power sector reform.

Located in Sinan County, Guizhou, the Silin Hydropower Station is a key provincial project and a backbone project of the “West-to-East Power Transmission”. It is the 6th cascade development station on the mainstream of the Wujiang River, with an installed capacity of 1.05 GW. Primarily for power generation, it is expected to produce over 4 GWh of electricity annually, followed by shipping, with additional functions including flood control and irrigation.

In August 2024, the Qiannan Prefecture Pumped Storage Power Station Project was launched. As one of Guizhou's first batch of pumped storage projects, it will become a vital component of the new power system. With an installed capacity of 1.5 GW—widely dubbed a 'super battery'—it stores water during low-power-demand periods and generates electricity by releasing water during peak hours, fully utilizing clean energy to regulate grid load and enhance power system stability and reliability. Upon completion, the project will improve the integration capacity of clean energy and contribute to achieving the goals of carbon peaking and carbon neutrality.

Sources;

State-owned Assets Supervision and Administration Commission of the State Council. The Qijiang Panlong Pumped Storage Power Station is put into operation. [EB/OL]. (2024) [2025-04-26].

<http://www.sasac.gov.cn/n2588025/n2588124/c30907440/content.html>.

Guizhou Provincial Investment Promotion Bureau. Overview of Hydropower Resources in Guizhou Province [EB/OL]. (2024) [2025-04-26]. <https://invest.guizhou.gov.cn/tzgz/tzgk/gzys/zrzy/>.

(3) Northwest China's Photovoltaic Power: A Green Revolution in the Desert

Amid the vast, desolate Gobi Desert, CGN's large-scale desertification control project is breathing new life into the sands. At the 500 MW photovoltaic site in Luopu County, Hotan, Xinjiang, tender alfalfa sprouts have already begun to emerge beneath the newly laid solar panels. The vibrant green of the seedlings stands in striking contrast to the distant rolling dunes. This innovative approach—combining solar energy with ecological restoration—injects new vitality into arid lands.

At the end of 2024, the Central Economic Work Conference called for an accelerated development of new energy bases in desert, Gobi, and arid

regions—collectively referred to as “sand-Gobi-arid lands.” On April 6, 2025, People's Daily spotlighted this topic again in its feature article *How to Accelerate the Construction of New Energy Bases in Arid Regions*, drawing renewed attention to photovoltaic desertification control. Earlier in May 2024, the National Energy Administration and the National Forestry and Grassland Administration jointly issued the *Notice on the Orderly Advancement of Photovoltaic Desertification Control Project Development and Construction*, covering everything from planning and design to construction, operations, and maintenance.

Province (Region)	Grid-Connected Capacity by End of 2017		Cumulative Power Generation in 2017		Utilization Hours in 2017		Curtailed Wind/Solar Power in 2017		Curtailment Rate	
	Wind	Solar	Wind	Solar	Wind	Solar	Wind	Solar	Wind	Solar
Shaanxi	322.2	516.9	50.93	51.38	1823	1335	4	7.7	7.3%	13.0%
Gansu	1277	694.9	189.36	70.36	1473	1133	91.8	18.5	32.7%	20.8%
Qinghai	192	796	17.59	112.82	1693	1515	0.0	7.5	0.0%	6.2%
Ningxia	942	588	153.05	70.35	1651	1368	7.7	4.8	4.8%	6.4%
Xinjiang	1835	908	312.69	102.34	1801	1221	132.5	28.2	29.8%	21.6%
Total	4568.2	3502.9	723.62	407.25	1670	1350	236.0	66.7	24.6%	14.1%

Note: Shaanxi data includes data from local power groups.

Source: The State Council of the People's Republic of China: Analysis of the Photovoltaic Market in Northwest China https://www.gov.cn/gongbao/2024/issue_11306/202404/content_6947725.html

According to China's *Plan for the Development and Layout of Large-Scale Wind and Solar Power Bases in Desert, Gobi, and Arid Regions*, the country aims to install 455 GW of renewable energy capacity in these areas by 2030. That's roughly 20 times the installed capacity of the Three Gorges Dam. While the natural environment in northwest China's deserts and Gobis has traditionally been harsh, these regions hold immense potential thanks to their abundant solar resources. As national focus intensifies on developing clean energy in these arid zones, a series of supportive policies have been introduced, giving a strong boost to the growing photovoltaic desertification control industry. In the first 11 months of 2024, the total installed capacity of wind and solar power across five northwestern provinces—Xinjiang, Gansu, Inner Mongolia, Qinghai, and Ningxia—reached approximately 280 GW, a year-on-year increase of 37%, forming a "photovoltaic Great Wall" across the sand-swept deserts of northwest China.

On April 10, 2025, the 500 MW photovoltaic desert control project in Yingjisha County, Xinjiang, was officially connected to the grid. Developed and financed by the Northwest Electric Power Design Institute under China Energy Engineering Corporation, this marks the country's largest single renewable energy project built under the "*Desertification Prevention and Control Model*". It also represents a major milestone in integrating ecological restoration with clean energy

development.

The project spans approximately 14,000 mu (around 9.3 sq km) and involves a total investment of 1.27 billion yuan. It follows an integrated model covering investment, construction, and operation, and includes a 500 MW solar power plant, 35 kV collection lines, a 50 MW/100 MWh energy storage system, a 220 kV booster station, 220 kV transmission lines, and upgrades to existing grid connection facilities. It is expected to generate around 760 million kWh of green electricity annually—saving about 230,000 tonnes of standard coal and cutting CO₂ by an estimated 590,000 tonnes.

Gansu Province, long and narrow in shape, is rich in both wind and solar resources. According to the Gansu Provincial Energy Bureau, the province's exploitable wind energy potential is 560 GW, while solar potential is as high as 9.5 TW—ranking fourth and fifth in China, respectively. Moreover, the province has around 197,000 sq km of unused land, accounting for 46.3% of its total area, providing a strong foundation for renewable energy development. The rapidly expanding clean energy sector is helping Gansu convert its natural and geographical advantages into economic and ecological benefits. Notable achievements include the launch of the world's first "dual-tower, single-generator" solar thermal power plant, the completion of China's first large-scale clean electricity transmission channel, and the addition of new renewable capacity during the 14th Five-Year Plan period equivalent to 1.8 times the

output of the Three Gorges Hydropower Station. Under the guidance of China's "dual carbon" goals, Gansu is turning previous constraints into opportunities and positioning the renewable energy and equipment manufacturing industries as key drivers of its modern industrial system and high-quality productivity.

According to data from State Grid Gansu Electric Power Company, by the end of 2024, Gansu's installed renewable energy capacity had reached 64.37 GW. Of that, 40.67 GW was added since the start of the 14th Five-Year Plan—equivalent to building 1.8 new Three Gorges Dams—pushing the province's total power generation capacity past the 100 GW mark. Gansu has already built a 10 GW wind base in Jiuquan, as well as six 1 GW solar power bases in cities like Lanzhou and Jiayuguan, and five 1 GW wind power bases in Baiyin, Dingxi, and other areas. In 2024 alone, Gansu transmitted more than 55 billion kWh of electricity to 26 other provinces, establishing itself as a major green power exporter in the national grid.

Take Wuwei City as an example: the Jiuduntan Photovoltaic Desertification Control Demonstration Park is one of the largest of its kind in northwest China. Covering 500,000 mu (333 sq km), the zone has a planned capacity of 15 GW and is a flagship "PV desertification control demonstration" project under Gansu's 14th Five-Year Plan. So far, 14 photovoltaic companies have settled in the zone,

launching 16 projects with a combined capacity of 8.5 GW. Of that, 1.5 GW has already been connected to the grid, generating 1.876 billion kWh of electricity in 2024. In recent years, Wuwei has aligned closely with China's long-term dual carbon goals. Following a strategy of systematic planning, modular development, long-distance energy transmission, industrial chain integration, and clean energy application, the city has made full use of its desert and Gobi resources. It has prioritized the growth of the renewable energy sector—particularly solar—and is working to build a new, robust model for clean energy development.

In recent years, while strengthening the "Three-North" Shelter belt Forest Program, Qinghai Province has also rapidly expanded its PV industry and promoted desertification control through solar development. Once barren and uninhabitable, the province's Gobi deserts are now becoming thriving hubs for renewable energy—what many call "golden lands" for solar development. A comprehensive land survey identified in Qinghai up to 100,000 sq km of desertified land suitable for solar and wind power projects. To accelerate and improve the integration of renewable energy and desert control, the provincial government issued the Zoning Report on the Utilization of Forest, Grassland, and Sandy Land for the Photovoltaic Industry at the end of 2024. The report provides a full comprehensive of desert, Gobi, and arid, classifying usable

land into three zones—development encouraged, suitable for construction, and conditionally permitted. This zoning system will guide local efforts to combine photovoltaic power generation with desertification prevention and control, contributing both to the success of the “Three-North” initiative and to China's broader goal of reaching carbon neutrality ahead of schedule.

One of the most challenging areas for sand and wind control has been Tala Beach in Hainan Prefecture, located in the Upper Yellow River and Sanjiangyuan Region. But today, walking across Talatan in Tiegai Township, Gonghe County, visitors see a striking transformation: towering molten salt solar power tower and expansive fields of blue PV panels generate sustainable energy while creating tangible ecological

benefits. Once a barren wasteland, it has now become a thriving hub for the solar industry. Since the establishment of the PV park, average wind speeds in the area have dropped by 50%, soil moisture evaporation has decreased by 30%, and vegetation coverage has reached 80%. “Solar panels block direct sunlight, which helps retain soil moisture. During regular panel cleaning, some water filters into the ground, creating favorable conditions for grass to grow,” explains He Xianglong, director of the Hainan Prefecture Natural Resources Bureau and a long-time expert in forestry and grassland management. “The key to controlling desertification is blocking wind and preserving soil. Once PV panels are installed on a large scale, they act as a wind barrier, turning barren land into pasture.”



Source: The State Council of the People's Republic of China: Analysis of the Photovoltaic Market in Northwest China
https://www.gov.cn/gongbao/2024/issue_11306/202404/content_6947725.html

land into three zones—development encouraged, suitable for construction, and conditionally permitted. This zoning system will guide local efforts to combine photovoltaic power generation with desertification prevention and control, contributing both to the success of the “Three-North” initiative and to China's broader goal of reaching carbon neutrality ahead of schedule.

One of the most challenging areas for sand and wind control has been Tala Beach in Hainan Prefecture, located in the Upper Yellow River and Sanjiangyuan Region. But today, walking across Talatan in Tiegai Township, Gonghe County, visitors see a striking transformation: towering molten salt solar power tower and expansive fields of blue PV panels generate sustainable energy while creating tangible ecological

benefits. Once a barren wasteland, it has now become a thriving hub for the solar industry. Since the establishment of the PV park, average wind speeds in the area have dropped by 50%, soil moisture evaporation has decreased by 30%, and vegetation coverage has reached 80%. “Solar panels block direct sunlight, which helps retain soil moisture. During regular panel cleaning, some water filters into the ground, creating favorable conditions for grass to grow,” explains He Xianglong, director of the Hainan Prefecture Natural Resources Bureau and a long-time expert in forestry and grassland management. “The key to controlling desertification is blocking wind and preserving soil. Once PV panels are installed on a large scale, they act as a wind barrier, turning barren land into pasture.”

Sources:

National Energy Administration. (2025, January 17). Zoning Report on the Utilization of Forest, Grassland, and Sandy Land for the Photovoltaic Industry. Retrieved April 26, 2025, from <https://www.nea.gov.cn/20250117/014939823eb448f7abd22c9a0e5c30b4/c.html>
CCTV (2024, 05 October). Ecological Photovoltaic Outcomes in Qinghai's Talatan. Retrieved from <https://news.cctv.com/2024/10/05/ARTIBO2DFR9b0zE9cMqvMUIZ241005.shtml>.

(4) Inner Mongolia: A Strategic Hub in China's Clean Energy Transition

With wind and solar resources overhead, coal reserves underground, and a robust power grid in place, Inner Mongolia exemplifies the integrated energy strengths driving China's transition toward high-quality development. The region is increasingly using clean wind power to energize cities and homes across the country. Leveraging its vast land area and rich wind resources, Inner Mongolia has made notable advances in renewable energy. In 2024 alone, it added over 41 gigawatts of new capacity, bringing its total installed renewable energy capacity to 135 GW—placing it at the forefront of the nation's energy transition across multiple categories.

To date, over 10 GW of capacity from market-based renewable projects has been connected to the grid. These projects are expected to generate 23.1 billion kWh of green electricity annually—equivalent to saving approximately 7.05 million tons of standard coal and reducing CO₂ emissions by about 20.43 million tons. This contributes significantly to China's green and low-carbon economic transformation. One exemplary project is the China General

Nuclear (CGN) 3 GW wind power project in Hinggan League. As part of the first batch of large-scale wind and solar power bases targeting desert, Gobi, and arid regions, it is currently the largest onshore wind power base in operation in China. It is also the first national renewable energy project to deliver electricity via an 800 kV ultra-high voltage direct current (UHVDC) transmission line. It features China's first 1000 MVA / 500 kV three-phase integrated main transformer specially designed for the renewable sector.

A supporting 500 kV transmission line connects to the ±800 kV Zhalute–Qingzhou UHVDC line, a major national and regional energy security initiative launched in 2022. The project has installed 701 wind turbines and generates over 10 billion kWh of clean electricity annually. It plays a crucial role in supporting China's “West-to-East Power Transmission” strategy and is expected to cut standard coal use by about 2.96 million tons and reduce CO₂ emissions by 8.02 million tons each year—marking a major step in Inner Mongolia's transition from a fossil-fuel-heavy region to a hub of clean energy.



The development of renewable energy depends heavily on robust technological support. In October 2023, the State Council issued the Opinions on Promoting the High-Quality Development of Inner Mongolia and Striving to Write a New Chapter of Chinese-style Modernization, which outlined a clear mandate: accelerate the development of the full industrial chain for new energy, including key materials, equipment, and components, and foster integrated industrial clusters for wind, solar, hydrogen, and energy storage. This top-level policy guidance has provided a strategic roadmap for China's energy transformation.

Wind power equipment manufacturing is not only part of the high-end manufacturing sector but also a strategic emerging industry that plays a vital role in driving the energy

transition. Baotou City has prioritized the development of wind power equipment manufacturing as a key initiative to foster new quality productive forces. Leveraging its unique advantages and industrial foundation, Baotou aims to become a significant national base for onshore wind power equipment manufacturing.

Currently, Baotou is the only city in the Inner Mongolia Autonomous Region with the industrial infrastructure to produce large-scale wind power components and electrical systems. Its growing industrial cluster has made it the largest wind power equipment manufacturing base in both the region and all of northwest China. In 2024, Baotou signed 13 new wind equipment manufacturing projects and included 37 enterprises in the 2024 Inner Mongolia Autonomous Region

New Energy Equipment Manufacturing Enterprises List, ranking first in the region. The city also advanced 15 major industrial projects with a total investment of 8.7 billion yuan. Once operational, many of these projects will fill existing gaps in the regional supply chain.

On December 28, 2024, the Three Gorges Energy Inner Mongolia Baotou 500 MW Wind Power Demonstration Project was successfully connected to the grid. The project includes 60 wind turbines with a single-unit capacity of 6.7 MW and 16 turbines rated at 6.25 MW, along with a 220 kV step-up substation. Once fully operational, it is expected to deliver approximately 1.8 billion kilowatt-hours of electricity annually—saving an estimated 556,000 tons of standard coal and cutting CO₂ emissions by about 1.517 million tons each year. The project represents a significant contribution to both local economic development and environmental sustainability.

Across China—from the southeast to the southwest, and from the northwest to the northeast—the rapid growth of clean energy industries is reshaping the national energy landscape. This shift is reducing reliance on traditional fossil fuels, enhancing the stability and security of energy supply, and laying a solid foundation for sustainable

economic and social development. The rise of clean energy across regions also drives the coordinated development of upstream and downstream industries, generating substantial employment opportunities, and becomes a key driver of economic transformation and regional revitalization. These efforts are effectively advancing China's regional coordination strategy while supporting its dual carbon goals—carbon peaking and carbon neutrality—and accelerating ecological civilization. At the same time, China's achievements in clean energy innovation, industrial model design, and ecological integration provide practical reference points for other countries, bolstering China's voice and influence in global clean energy governance and contributing to the building of a shared future for sustainable human development.

Looking ahead, China must continue to advance its clean energy sector with greater strategic foresight and stronger development resolve. By sustaining the momentum of high-quality growth in green industries, China will inject lasting vitality into its modernization process and global sustainability efforts—writing a new chapter in green development and sharing China's wisdom and strength with the world for a sustainable future.

Sources:

[1] People's Government of Inner Mongolia Autonomous Region. Installed Capacity of New Energy in Inner Mongolia [EB/OL]. (2025-01-03) [Accessed: 2025-04-26].

https://www.nmg.gov.cn/zfbgt/zwxx/202501/t20250103_2647490.html.

[2] Southern Daily. CGN Hinggan League Wind Power Project [EB/OL]. (2023-12-10) [Accessed: 2025-04-26].

<https://static.nfapp.southcn.com/content/202312/10/c8389110.html>.