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China's Renewable Energy Revolution:

Solar and Wind Power



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Renewable energy represents China's most transformative development in global energy management. The country stands as the world's most substantial energy consumer and carbon-producing entity yet

recognizes the critical requirement for a fossil fuel switch to renewable alternatives. China has gained leadership position in solar



and wind power manufacturing and application to advocate for both carbon emission reduction and environmentally sustainable progress.

The Chinese government allocated billions of dollars to renewable energy investments which made China lead other nations in both capacity development and renewable innovation. Chinese authorities made two nationwide clean energy targets including early emission peak achievement by 2030 alongside carbon neutral status delivery by 2060. Fast-paced innovations in solar and wind power technology resulted from these targets which enabled large-scale implementation and sustained transformation of the international energy sector.

Solar energy production in China stands as the global leader. PV solar panel production in China exceeds all other countries as it controls more than 70% of worldwide manufacturing operations. The rise of solar farm installations throughout China became possible because of its manufacturing dominance in solar photovoltaic products thus leading to their extensive development across areas receiving strong sunlight like Inner Mongolia and Xinjiang and the Gobi Desert. Shifting electricity generation from fossil fuels to renewable



sources now includes the first rank solar power projects which can be found at both Longyangxia Dam Solar Park and Tengger Desert Solar Park among the largest in their category.

The successful implementation of solar energy in China has been strongly supported by technological progress. The advancements in solar panel technologies through bifacial and perovskite solar cells brought down operation expenses while boosting the rate of energy conversion. Floating solar farms now enable optimal land utilization while the Anhui floating solar plant showcases Chinese innovation in renewable technologies production.

Information Technology advances in solar energy have occurred while the industry faces multiple hurdles related to its quick growth. The problem of energy storage remains one of the top issues in solar power generation because this technology depends on sunlight conditions. China tackles this issue through investments in two types of battery storage technology including massive flow battery and lithium-ion battery systems. The transition of solar power to integrate with the national grid demanded important improvements of transmission and distribution network infrastructure.

The renewable energy strategy of China rests strongly on wind power installations along with solar energy systems. Wind power operations across land and sea constitute the largest capacity of installed wind turbines worldwide which contributes to China's energy portfolio. The provinces of Gansu together with Inner Mongolia and Xinjiang concentrate their onshore wind farm operations because those areas have reliable wind speeds necessary for effective wind energy production. One of the biggest wind power projects worldwide known as Gansu Wind Farm demonstrates how China engages with large-scale wind energy exploitation.

The Chinese government maintains strong investments toward offshore wind energy development across the country. China has invested generously in its offshore wind farm projects because of its extensive coastline and ideal wind velocities which



led the nation to surpass European offshore wind capacity. The provincial areas of Jiangsu and Guangdong and Fujian host offshore wind development projects that use advanced turbines to produce abundant electricity. They are exploring floating wind farms as an additional method to increase offshore wind energy developments.

China has gone through rapid wind energy technology development which resulted in improved wind turbine design and increased output efficiency. The modern turbine sector presents systems with capacity levels exceeding 16 MW so it generates more power at reduced expense. Advanced electrical grids connected with artificial intelligence enabled predictive maintenance have improved the efficiency in addition to reliability of wind power systems.

The growth of Chinese wind energy installations continues to encounter various obstacles. Grid congestion stands as a significant hurdle because China primarily bases its wind farms across distant areas that do not directly connect with major municipalities. Insufficient transmission capacity leads to curtailment orders that force operators to discard parts of the generated wind energy. The government founded ultra-high-voltage (UHV) transmission lines as a solution to optimize the delivery of renewable energy from distant areas to cities.



The expansion of renewable energy in China has been greatly determined by government policies and financial support schemes. Financial assistance combined with tax benefits stimulates private enterprises as well as state-owned companies to undertake clean energy initiatives. China engages in international renewable energy cooperation by exporting solar panels alongside wind turbines along with its expertise to countries that aim to build their domestic renewable energy markets.

Renewable energy will continue to advance in China based on current trends. New advancements in hydrogen-based energy combined with advanced energy storage technologies and smart power distribution networks will boost the productivity and stability of solar and wind power systems because China continues to generate significant investments in research. By combining artificial intelligence with big data analytics systems China will enhance its capability to predict energy needs and manage its power grids and ensure steady clean energy distribution.

Renewable energy leadership from China creates both local energy transformation and substantial impacts on worldwide energy sector developments. Through its aggressive goal-setting along with major implementation efforts China shows a path towards building a renewable energy future that is clean and sustainable. A successful achievement of carbon neutrality targets by China will demonstrate to the world that economic expansion and environmental sustainability can exist together.