

Onshore and Offshore Wind Energy for Power Generation- Trends and Prospects

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Abstract:

Wind energy remains the 2nd most dominant source amongst all renewable energy for power generation after hydro energy. Its global share in 2021 is over 6.6% while hydro 15.3%, solar 3.7%, bioenergy 2.4% and other renewables 0.4%. Coal and gas remain the most dominant energy for base power generation (36.5% and 22.2%, respectively) and other fossil fuels (mainly liquid fuel) constitute roughly 3.1%. Nuclear energy's share of the total global power generation is 9.9%. The global power demand rose 3% in 2022 compared to the year 2021. Wind and solar combinedly met 77% of this demand growth, and hydro met the remaining 23% as the fossil and nuclear fuels based power generation remain constant. A record wind power generation (830 GW) was achieved in 2021, of which 43% by one country which is China. Out of 830 GW, the onshore wind power is 93% and the remaining 7% is offshore wind power. Despite enormous wind power growth over the decade, in absence of stronger policies, the growth of wind power along with other renewable power is expected to plateau in 2023. Policy uncertainties, complex permitting regulations and slow technological advancement remain to be the main hinderance for the faster growth of wind power generation worldwide. This paper highlights the current trends and prospects for onshore and offshore wind power generation. It also underscores the need for the sustained annual addition of 250 GW wind power to the global power generation pool as the wind power's share to achieve the United Nations' Net Zero Emissions target by 2050.

Keywords: Renewable energy, onshore wind, offshore wind, power generation, policy and incentives

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