

HARVESTING THE ENERGY OF SUN: UNLOCKING RENEWABLE POWER FOR A SUSTAINABLE FUTURE

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In the pursuit of a sustainable future, the focus of scientists and engineers has shifted to the sun, the most abundant and potent energy source in our solar system. Capturing the radiated energy from our celestial companion offers an unprecedented opportunity to access an almost boundless supply of renewable power. Embracing solar energy has the potential to revolutionise electricity generation, curtail carbon emissions, and lead us towards a cleaner and more environmentally friendly world. This article delves into the methods of harnessing solar energy and converting it into a driving force for a sustainable future.

Photovoltaic (PV) solar cells stand at the core of solar energy technology. These specialised cells are designed to directly convert sunlight into electrical energy through the photovoltaic effect. When sunlight hits the solar cell's surface, it stimulates electrons, resulting in the production of electricity. With continuous progress in material science and engineering, solar cells have become more efficient and affordable over time.

Nowadays, it is a familiar sight to see solar panels installed on rooftops, solar farms, and integrated into urban infrastructure. As the technology advances, the cost of solar power generation has significantly decreased, making it a financially feasible and practical solution for meeting our energy requirements.

Apart from photovoltaic cells (PV), concentrated solar power (CSP) presents an alternative method for harnessing solar energy. CSP systems focus sunlight onto a concentrated area using mirrors or lenses, generating high levels of heat that can be used to power turbines and produce electricity. Unlike PV systems, CSP has the capability to store excess heat, ensuring a consistent power output even during periods without direct sunlight.

CSP facilities are strategically located in regions with abundant solar irradiance, such as deserts, where there is ample open space. These power plants have the potential to provide energy to entire regions and decrease reliance on fossil fuels. By capitalising on solar heat, CSP contributes to a sustainable energy future and reduces our carbon footprint.

Energy storage solutions play a crucial role in overcoming one of the primary challenges of solar energy – its intermittent nature due to variations in sunlight availability. Since the sun does not shine continuously, and energy demand fluctuates throughout the day, effective energy storage becomes essential.

Various technologies, such as batteries, pumped hydro storage, and thermal storage systems, are employed to store the surplus energy generated during peak sunlight hours for later use. By doing so, these energy storage solutions help stabilise the grid and enhance the reliability and feasibility of solar power as a sustainable energy source.

The advancements in solar technology have led to its diverse applications, extending beyond conventional solar panels. Building-integrated photovoltaics (BIPV) integrate solar panels seamlessly into architectural designs, enhancing both aesthetics and energy efficiency simultaneously.

Additionally, portable solar chargers are becoming increasingly popular, allowing individuals to harness solar power for charging electronic devices while on the move. Solar textiles and wearable solar cells are also under development, enabling clothing to serve as personal solar power sources.

Transitioning to solar energy yields numerous benefits. Environmentally, solar power significantly reduces greenhouse gas emissions, thus addressing climate change and air pollution concerns. As the cost of solar technology decreases, the economic advantages become evident, as solar power systems provide energy independence, create employment opportunities in the renewable energy sector, and stimulate local economies. Harnessing the power of the sun marks a significant stride towards achieving a sustainable and environmentally friendly future. The swift evolution of solar energy technologies offers an unmatched potential to revolutionise the global energy scenario.

Embracing solar power not only diminishes our impact on the environment by lowering carbon emissions but also ensures a reliable and renewable energy supply for future generations. Realising the full potential of solar energy requires a collaborative effort from individuals, businesses, and governments, all working together to create a brighter and more sustainable world.

TRACKING SOLAR PV

Solar PV generation increased by a record 270 TWh (up 26%) in 2022, reaching almost 1 300 TWh. It demonstrated the largest absolute generation growth of all renewable technologies in 2022, surpassing wind for the first time in history. This generation growth rate matches the level envisaged from 2023 to 2030 in the Net Zero Emissions by 2050 Scenario. Continuous growth in the economic attractiveness of PV, massive development in the supply chain and increasing policy support, especially in China, the United States, the European Union and India, are expected to further accelerate capacity growth in the coming years. The tracking status of solar PV has therefore been upgraded in 2023 from “more effort needed” to “on track”.

Maintaining a generation growth rate aligned with the Net Zero Scenario will require reaching annual capacity additions that are close to three times higher than those of 2022 until 2030. Achieving this will require continuous policy ambition and effort from both public and private stakeholders, especially in the areas of grid integration and in addressing policy, regulation and financing challenges.