

Analysis of the situation of solar power generation

Does aggregation affect the intermittency of solar power generation?

The aim of this article is to address the fundamental scientific question on how the intermittency of solar power generation is affected by aggregation, which is of great interest in the wider power and energy community and would have profound impacts on the solar energy integration into the energy supply and Net-Zero Implementation.

What is the contribution of solar energy to global electricity production?

While the contribution of solar energy to global electricity production remains generally low at 3.6%, it has firmly established itself among other renewable energy technologies, comprising nearly 31% of the total installed renewable energy capacity in 2022 (IRENA, 2023).

Are solar energy uptake rates underestimated?

Historical projections of energy generation have consistently underestimated uptake rates of solar energy^{16,17}. For example, only a year after the publication of the 2020 World Energy Outlook (WEO), the IEA's "Stated policies scenario" has been revised strongly in favour of solar energy.

How environmental factors affect solar power generation?

The optimum output, energy conversion efficiency, productivity, and lifetime of the solar PV cell are all significantly impacted by environmental factors as well as cell operation and maintenance, which have an impact on the cost-effectiveness of power generation.

What is intermittency of solar energy?

It is well recognized internationally that the intermittency of solar energy is a fundamental technical/economic barrier which limits the penetration level of solar power in the energy supply.

What are the disadvantages of solar energy?

Solar energy aligns with many policy objectives (clean air, poverty alleviation, energy security⁵⁴). It also has disadvantages for some of the players involved, as it leads to rapid economic and industrial change. Solar and wind power have a low energy density compared to alternatives.

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