

Comparison of Photovoltaics and Nuclear Power Plants

By the end of 2024, the globally installed photovoltaic (PV) capacity amounted to around 2.2 TW (IEA PVPS, 2025; SolarPower Europe, 2025). The actual electricity generation depends on the capacity factor, which typically ranges between 10% and 20% worldwide for photovoltaics (IEA, 2022). Assuming a conservative average capacity factor of 15%, the globally installed PV capacity results in an annual electricity output of:

$$E_{PV} = 2.2 \text{ TW} \times 0.15 \times 8760 \text{ h/year} \approx 2,900 \text{ TWh/year}$$

For comparison, a modern nuclear power plant with a net capacity of 1 GW typically achieves very high capacity factors of around 80–90% (World Nuclear Association, 2024, 2025). Assuming an average utilization of 90%, such a plant generates:

$$E_{NPP} = 1 \text{ GW} \times 0.9 \times 8760 \text{ h/year} \approx 7.9 \text{ TWh/year}$$

To replace the annual electricity generation from the 2.2 TW of globally installed PV capacity, approximately:

$$2,900 \div 7.9 \approx 370$$

large nuclear power plants of 1 GW each would be required.

References (APA)

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