

How renewable energy is transforming the global electricity supply

September 27 2023, by Harrison Dreves

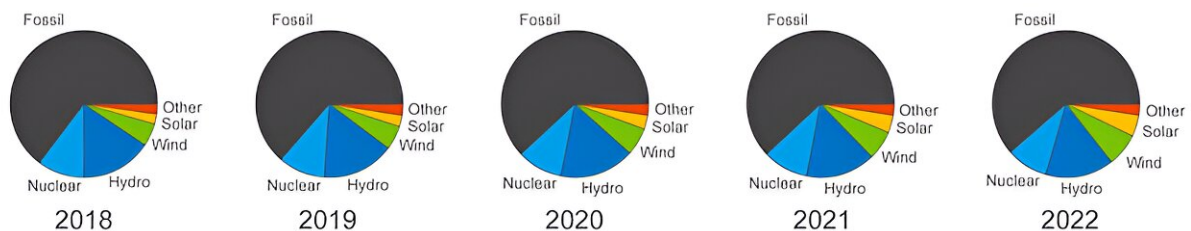


Credit: Pixabay/CC0 Public Domain

Two senior National Renewable Energy Laboratory (NREL) researchers recently published an [article](#) in the *Journal of Photovoltaics* tracking changes to the world's electricity supply over the past several years.

The authors, Nancy Haegel and Sarah Kurtz, drew upon information from various sources and presented it collectively to highlight significant trends in global electricity [generation](#). This is the third article in an annual series—Haegel and Kurtz have published their recap each year in the *Journal of Photovoltaics*, starting in 2021.

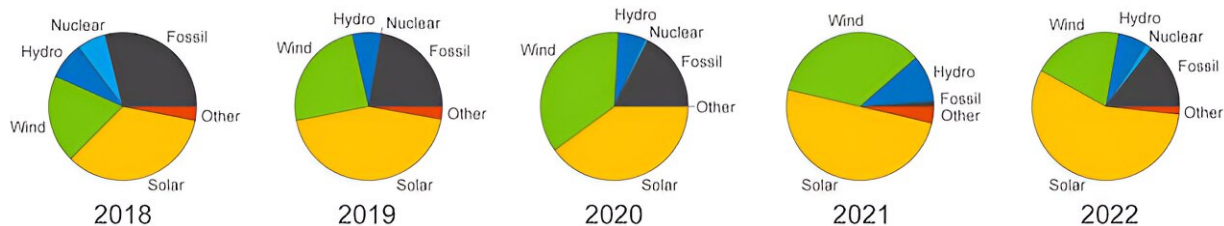
Fossil energy continues to dominate global electricity generation



Fossil generation still provides the majority of the world's total electricity generation each year. Data in these figures is drawn from several public data sets on worldwide electricity generation. Credit: National Renewable Energy Laboratory

In 2022, 38% of the world's electricity was delivered by carbon-free generation sources (nuclear, hydropower, and combined renewables), similar to 2021. The global electricity system is still mostly powered by [fossil energy](#), but it is undergoing an increasingly rapid rate of change.

Renewable energy composes the vast majority of new electricity generation capacity



Non-fossil energy sources composed 85% of new electricity generation capacity in 2022, with solar energy representing the single largest new source—56%. This continues and expands upon the trend of growing renewable energy expansions over recent years. Credit: National Renewable Energy Laboratory

Despite lingering supply chain and trade issues around the globe, this is the second year in a row that more than 50% of new electricity generating capacity has been solar [photovoltaic](#) (PV) systems. Solar PV is now the most rapidly growing generation technology—25% of total installed solar PV generation capacity was added in 2022 alone. PV's share of global electricity generation rose from around 3.6% in 2021 to around 4.5% in 2022.

Together, carbon-free generation sources (nuclear, hydropower, solar PV, wind, and other renewables) constitute more than 80% of capacity expansions over the past three years. Most of this expansion has been powered by solar PV and wind—together, these sources have contributed more than 75% of capacity expansion over the past three years.

"It's impressive to see how solar is dominating the current sales," said Sarah Kurtz, a fellow with NREL's National Center for Photovoltaics and a professor at the University of California, Merced. "We're interested to see how much fossil generation expansion there is in the 2023 data for next year's recap article. It could be that carbon-free

energy sources will be consistently supplying almost all of our new generation capacity very soon."

The energy transition is only beginning

Solar PV contributed 56% of new electricity generating capacity in 2022, yet it provided only around 5% of global electricity generation. This contrast highlights both solar PV's significant growth so far and the further growth needed to reach a sustainable energy future. Certain [electric grids](#) around the world demonstrate that much more is possible. For example, grids in California, South Australia, and Hawaii are reaching or exceeding 20% of generation from solar PV.

"We thought it could be useful to gather the data from multiple sources in one place," said Nancy Haegel, director of the National Center for Photovoltaics at NREL. "Although there are interesting minor variations among global sources, what is striking is the amazing growth of solar in new [electricity](#) generating [capacity](#) and the accelerating change in the future energy mix. We are witnessing the energy transformation."

More information: Nancy M. Haegel et al, Global Progress Toward Renewable Electricity: Tracking the Role of Solar (Version 3), *IEEE Journal of Photovoltaics* (2023). [DOI: 10.1109/JPHOTOV.2023.3309922](#)

Provided by National Renewable Energy Laboratory

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