Renewable Electricity Data Introduction

Hannah Ritchie and Max Roser, adapted by Bennett Sherry

More and more of the world's electricity is coming from renewable or low-emission sources. However, when you calculate total energy usage, the fraction from renewables is still very small.

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Introduction

During the eighteenth century, we discovered how to efficiently extract energy from fossil fuels. This innovation started the Industrial Revolution. Since then, the availability of cheap energy has been essential to technological progress. But, energy from fossil fuels has come at a cost. Fossil fuels are the main source of greenhouse gases. They are the primary driver of climate change. In 2018, 87% of global CO_2 emissions came from fossil fuels and industry. Additionally, fossil fuels are responsible for large amounts of air pollution—a health problem that leads to at least 5 million premature deaths each year. To reduce CO_2 emissions the world needs to rapidly "decarbonize": to shift towards low-carbon sources of energy like nuclear and renewable technologies. The good news is that these low-carbon sources of energy also lead to very little air pollution.

It's electric!

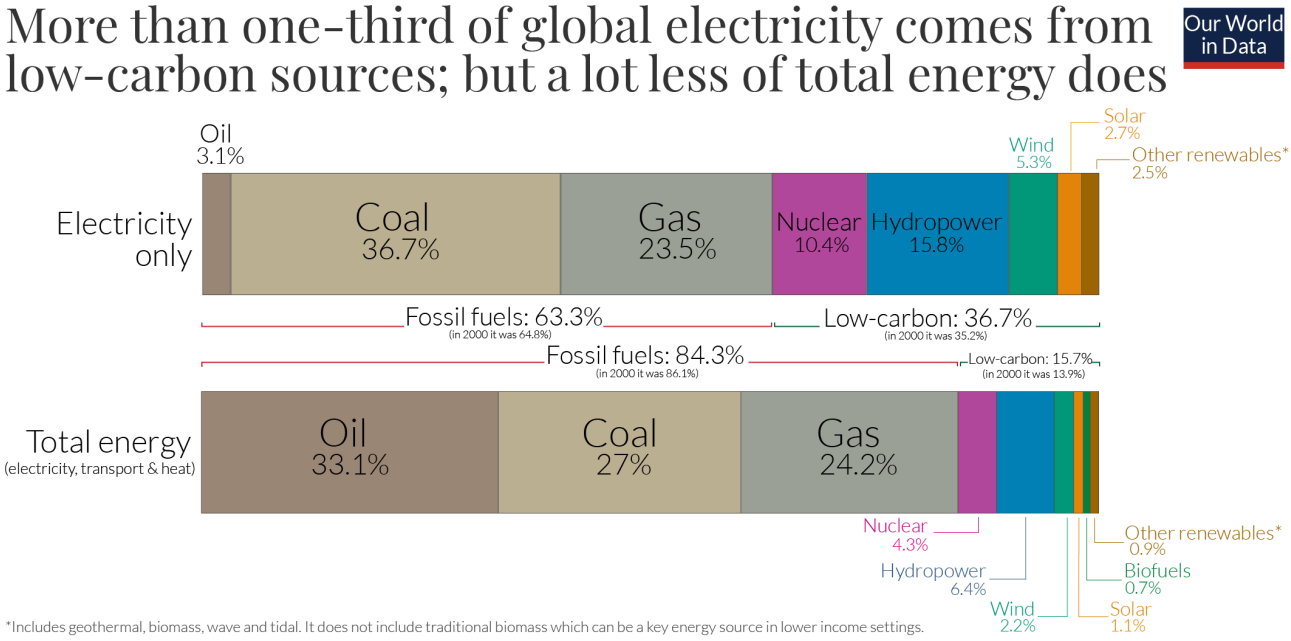
Renewable energies like solar and wind are growing quickly across the world. This is, of course, good news and it often makes the headlines. For example, here's a headline from the British newspaper *The Independent*:

> *"More UK energy is coming from clean sources than fossil fuels for the first time ever, National Grid announces."*

You might think that we're on the verge of having a fossil-free energy system, but many of these headlines are misleading. *The Independent* made the mistake of using the terms electricity and energy interchangeably.

Electricity (or 'power') is just one component of total energy consumption. The other two components are transport and heating. When we see headlines about our progress in using renewable energy, the quoted figures often refer only to electricity. Many countries are making progress on clean electricity, but progress on energy as a whole is much slower. Chart 1 shows the breakdown of the global energy and electricity mix.

Chart 1



Explore at: https://ourworldindata.org/electricity-mix#electricity-is-only-one-part-of-total-energy-decarbonizing-electricity-is-only-one-step-towards-a-low-carbon-energy-system By Our World in Data, CC BY 4.0.

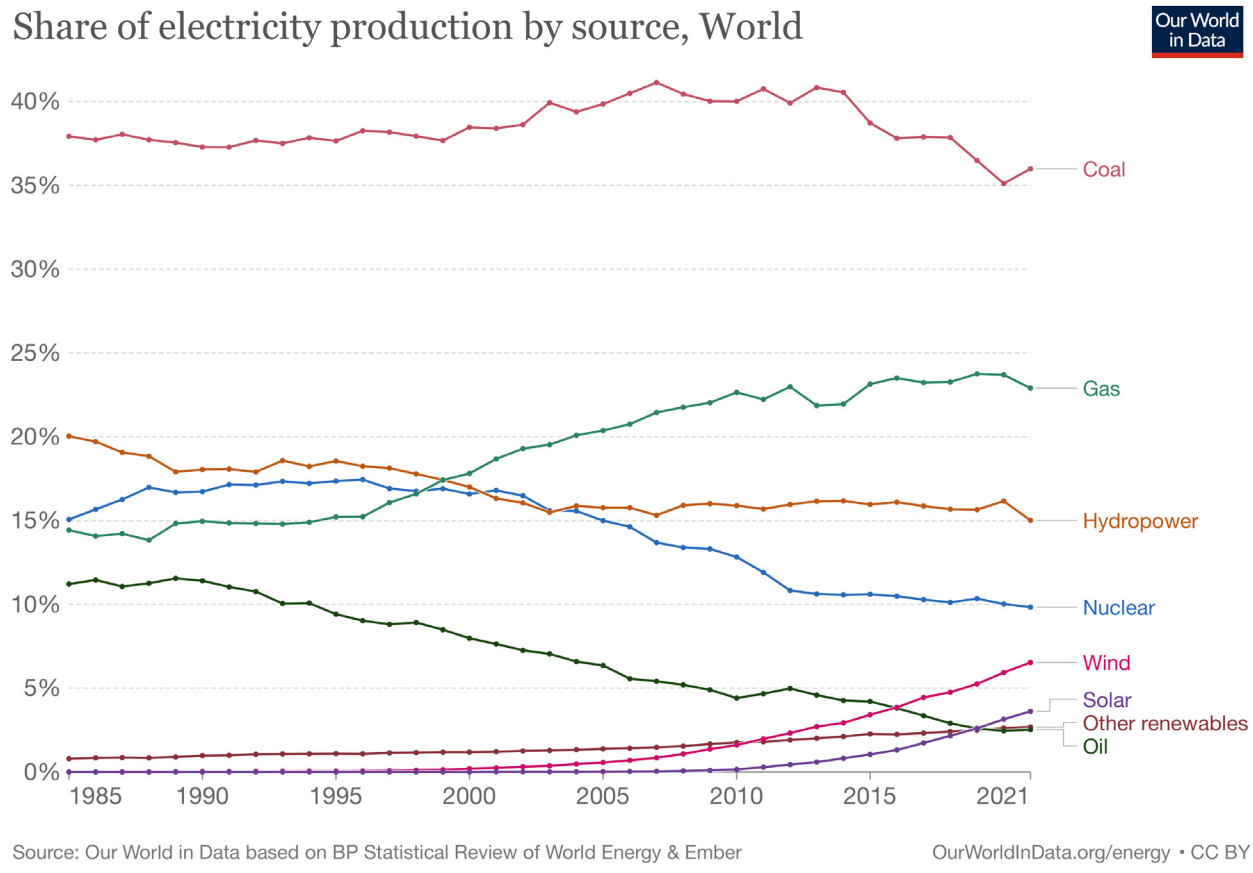
Let's talk about where our energy comes from for a moment. The right half of the chart shows that nuclear and renewables account for 36.7% of global electricity. But they account for only 15.7% of the global energy mix. This is because the other elements of the energy—transport and heating—rely much more heavily on fossil fuels.

Producing more renewable electricity should be a top priority. Many solutions to reducing greenhouse gas emissions depend on us electrifying other parts of the energy system. For example, shifting to electric vehicles would reduce emissions. But, we lose most of the benefits of electric cars if the electricity they run on is produced by burning coal.

Keeping the lights on

Fortunately, we're making more and more of our electricity with renewable sources. Chart 2 shows how this has changed over time. This chart illustrates the percentage of our electricity we have generated from each type of source since 1985. We see that coal, followed by gas, remains the largest source of electricity production. These are high-carbon forms of energy production. Of the low-carbon sources, hydropower and nuclear make the largest contribution, although wind and solar power are growing quickly.

Chart 2



Explore at: https://ourworldindata.org/grapher/share-elec-by-source?time=earliest..latest By Our World in Data, CC BY 4.0.

We can also zoom in to look at the electricity mix of individual countries (you can do this using the "Change country" button). This shows even more dramatic changes, especially in some countries. In the late 1980s, coal

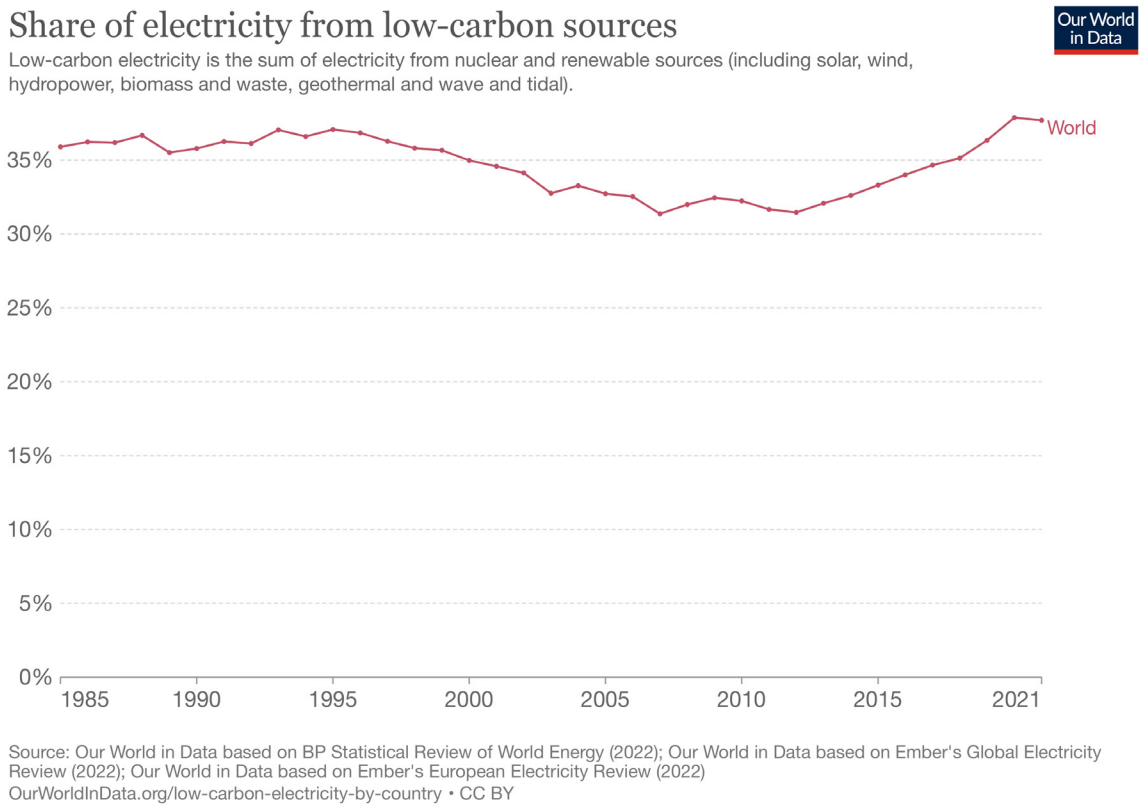
accounted for more than 60% of electricity production in the United Kingdom. By 2019, this had fallen to 2%. This change is not necessarily the same in other countries.

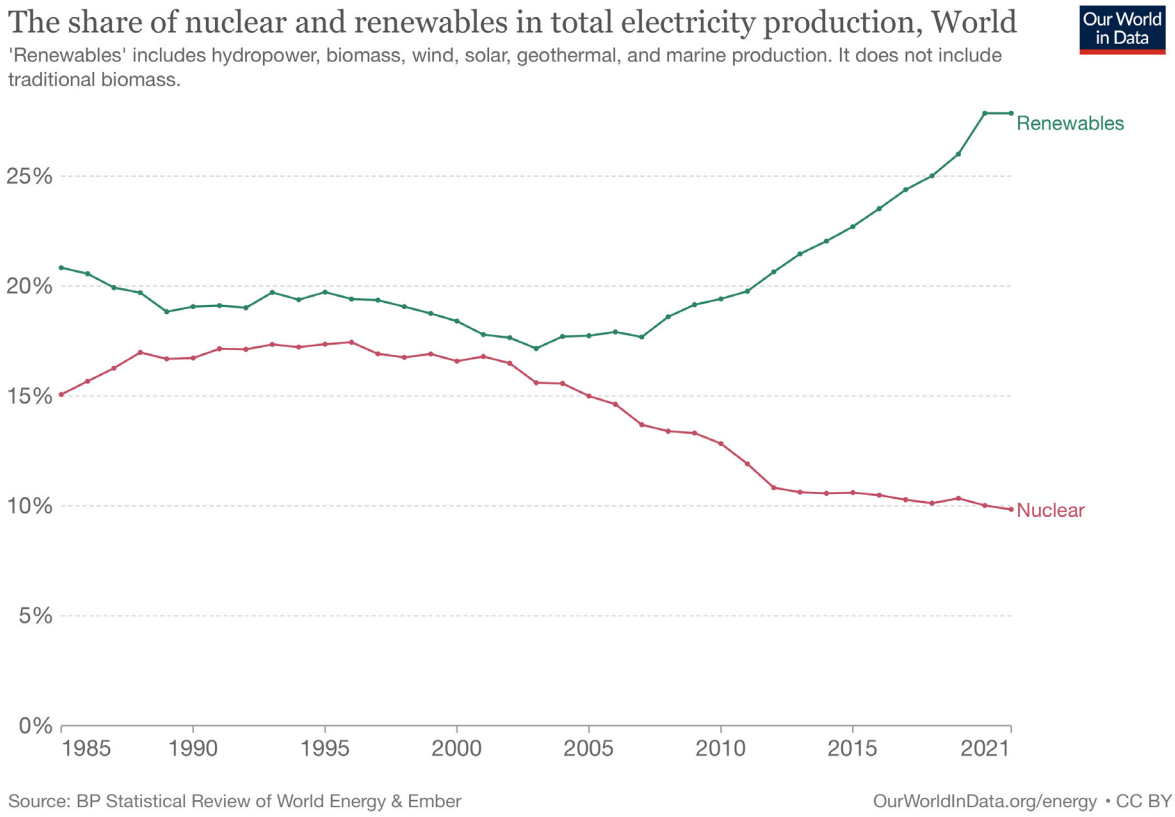
Two steps forward, two steps back

As the world attempts to transition away from fossil fuels, we have many options, but none of these options are perfect. In fact, we will need to make a lot of innovations for any one method to produce the energy we need. The world will need to use a combination of different low-carbon systems, including solar, wind, and nuclear. Unfortunately, our progress is very slow. As Chart 3 shows, the percentage of electricity that comes from low-carbon sources today is almost unchanged from the mid-1980s. Chart 4 explains why.

The total amount of electricity we generate from low-carbon sources has not changed. Even while renewables' share has been growing, nuclear's share has declined. Some of the new solar and wind installations have been replacing the electricity once generated by nuclear plants. While some countries get most of their electricity from nuclear, others are taking their nuclear plants offline. This is a result of perceptions. Some people believe that nuclear power is less safe than other forms of power. Although, the data doesn't necessarily support that position.

Charts 3 and 4





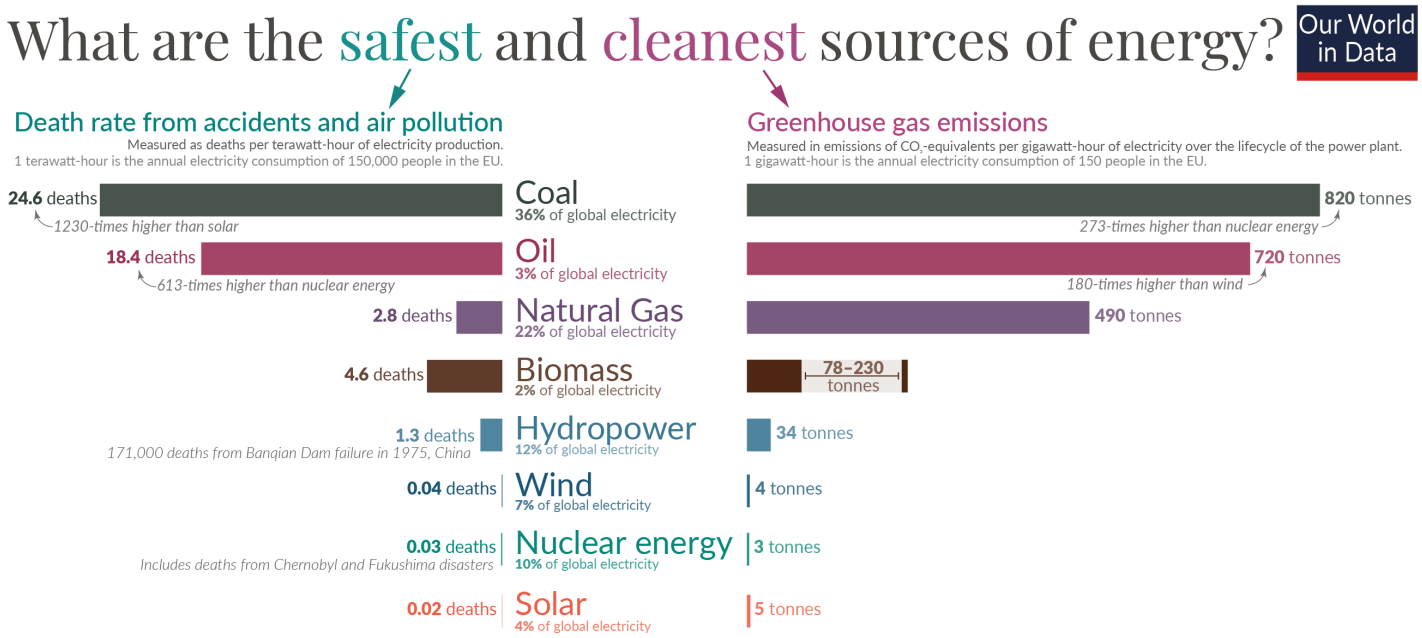
Explore Chart 3 at: https://ourworldindata.org/grapher/nuclear-renewables-electricity?time=1985..latest. By Our World in Data, CC BY 4.0. Explore Chart 4 at: https://ourworldindata.org/grapher/share-electricity-low-carbon?tab=chart&time=earliest..latest&country=~OWID_WRL By Our World in Data, CC BY 4.0.

Safe energy

Solar, wind, geothermal, hydropower, biomass, natural gas, coal, oil, nuclear. Which do you think is the most dangerous form of energy? Because of big, catastrophic accidents, a lot of people think nuclear is the most dangerous. Yet, in terms of how many people die as a result of each of these energy forms, nuclear energy is actually one of the safest ways to generate power. Fossil fuels are the dirtiest and most dangerous. Through air pollution and accidents, fossil fuels kill many more people than nuclear and modern renewable energy sources. They also emit much more greenhouse gases.

Chart 5 shows human death rates and emissions per unit of energy produced. The explanations also show the share of total energy production from each source. The chart shows that it doesn't matter that much whether we transition to nuclear or renewable energy. What matters is that we stop relying on fossil fuels.

Chart 5



Death rates from fossil fuels and biomass are based on state-of-the art plants with pollution controls in Europe, and are based on older models of the impacts of air pollution on health. This means these death rates are likely to be very conservative. For further discussion, see our article: OurWorldinData.org/safest-sources-of-energy. Electricity shares are given for 2021.
Data sources: Markandya & Wilkinson (2007); UNSCEAR (2008; 2018); Sovacool et al. (2016); IPCC AR5 (2014); Pehl et al. (2017); Ember Energy (2021).
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Conclusion

Globally, we get just over one-third of our electricity from low-carbon sources. But, some countries get much more from fossil-free sources. In Chart 6, we see this share across the world. Some countries get over 90% of their electricity from nuclear or renewables—Sweden, Norway, France, Paraguay, Iceland, and Nepal, among others. Nearly all these countries have one thing in common: they get a lot of electricity from hydropower and/or nuclear energy.

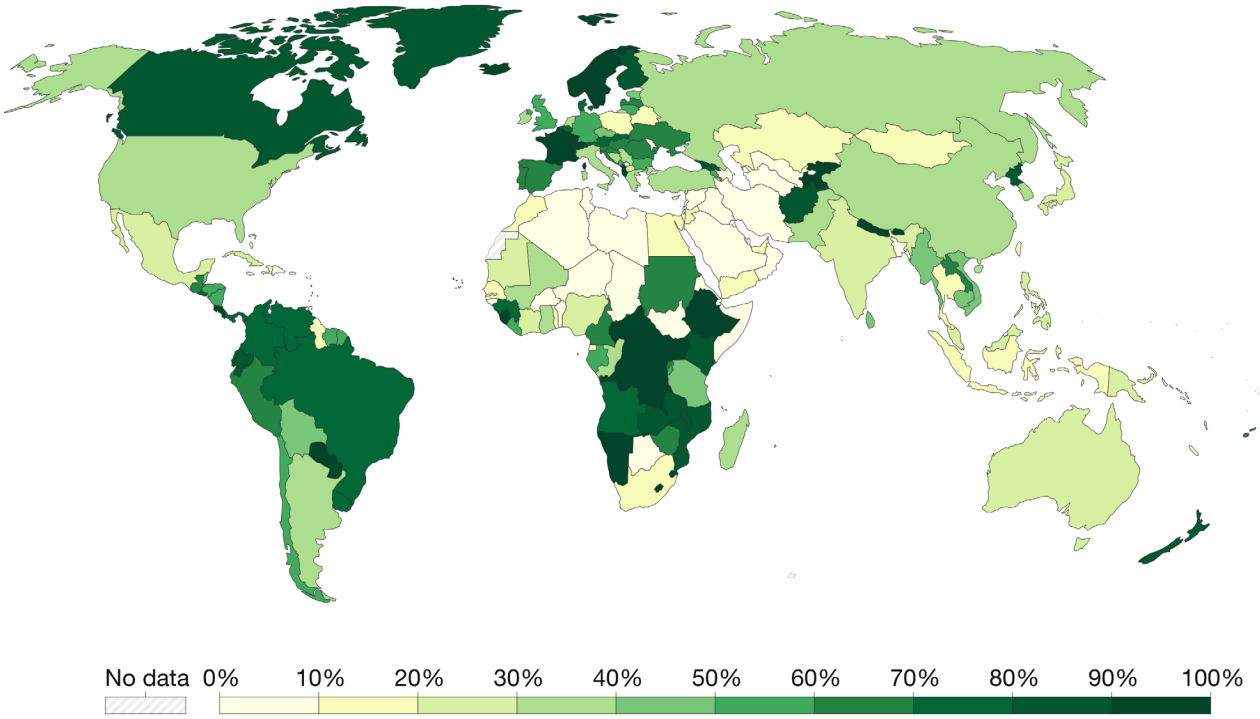
The world should probably learn from these examples. In the years to come, accelerating the transition to clean electricity will become ever-more important as we electrify other parts of the energy system. We will need to rely on low-carbon electricity, and lots of it.

Chart 6

Share of electricity from low-carbon sources, 2021

Our World in Data

Low-carbon electricity is the sum of electricity from nuclear and renewable sources (including solar, wind, hydropower, biomass and waste, geothermal and wave and tidal).



Source: Our World in Data based on BP Statistical Review of World Energy (2022); Our World in Data based on Ember's Global Electricity Review (2022); Our World in Data based on Ember's European Electricity Review (2022)
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Image credits

Cover image: Solar power stations in plain areas, wind turbines in the distance. Yancheng City, Jiangsu Province, China. © Moment / Getty Images.

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