

ENERGY TRANSITIONS

We need much more than just solar and wind to achieve a clean energy transition

The world is in a race against time to cut its reliance on fossil fuels and have a fighting chance of limiting a temperature rise to 1.5°C.

Thanks to wind and solar, the share of low-carbon energy has accelerated recently to reach 17 percent of total primary energy needs. However, this is hardly enough, as fossil fuels still make up 77 percent, just as they did 20 years ago.

The energy transition required today is like no other in history (see “Bumps in the Energy Transition,” in this issue of F&D). Energy transitions of the past were really just energy additions because the world was consuming more of different forms of energy.

Achieving net zero emissions by 2050 means not only increasing low-carbon energy rapidly but also decreasing fossil fuel use at the same time.

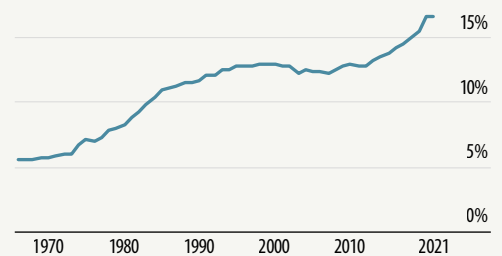
The challenge is that while per capita energy consumption has peaked in many advanced economies, it is growing in those that are still developing, and as the map below shows, it must increase in low-income countries to lift people out of poverty and raise living standards. Low-income and

developing countries are also where most of the population growth is happening.

This is why the world needs a lot more than just wind and solar for the transition. Other renewables like bioenergy and green hydrogen will be key, but so too will things like carbon capture and storage—and, as the IEA’s Fatih Birol points out, doing more with less through greater energy efficiency.

Green shoots

Low-carbon energy consumption has been accelerating.
(contributions to primary energy consumption by renewables and nuclear)

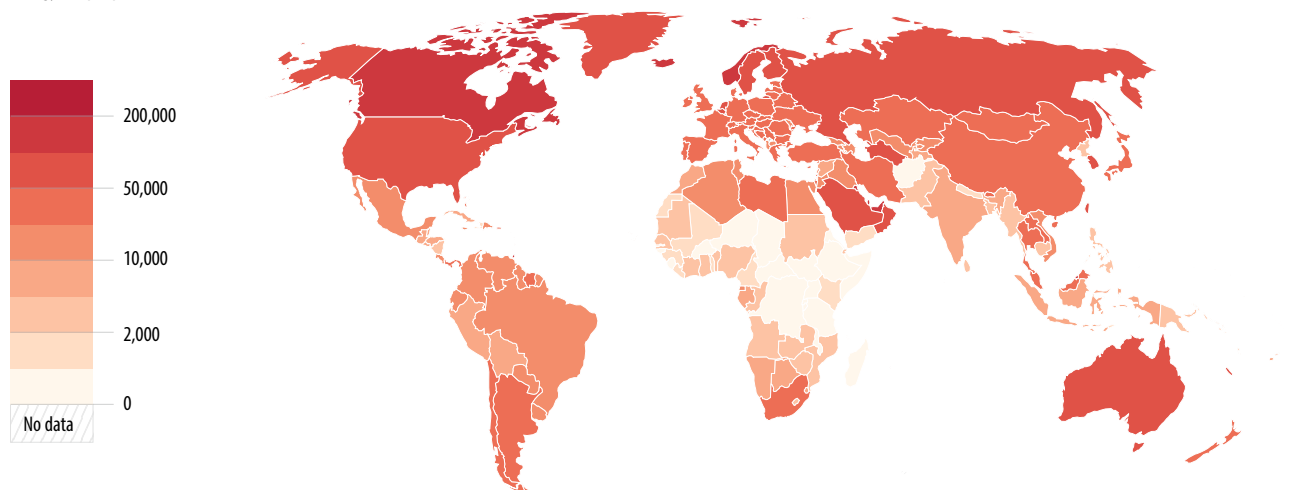


Source: Our World in Data based on Vaclav Smil (2017) and BP.

ANDREW STANLEY is on the staff of *Finance & Development*.

Powering up

Energy use varies: the average person in some countries consumes as much as 100 times more than the average person in some of the poorest countries.
(energy use per person, 2021, kilowatt-hours)

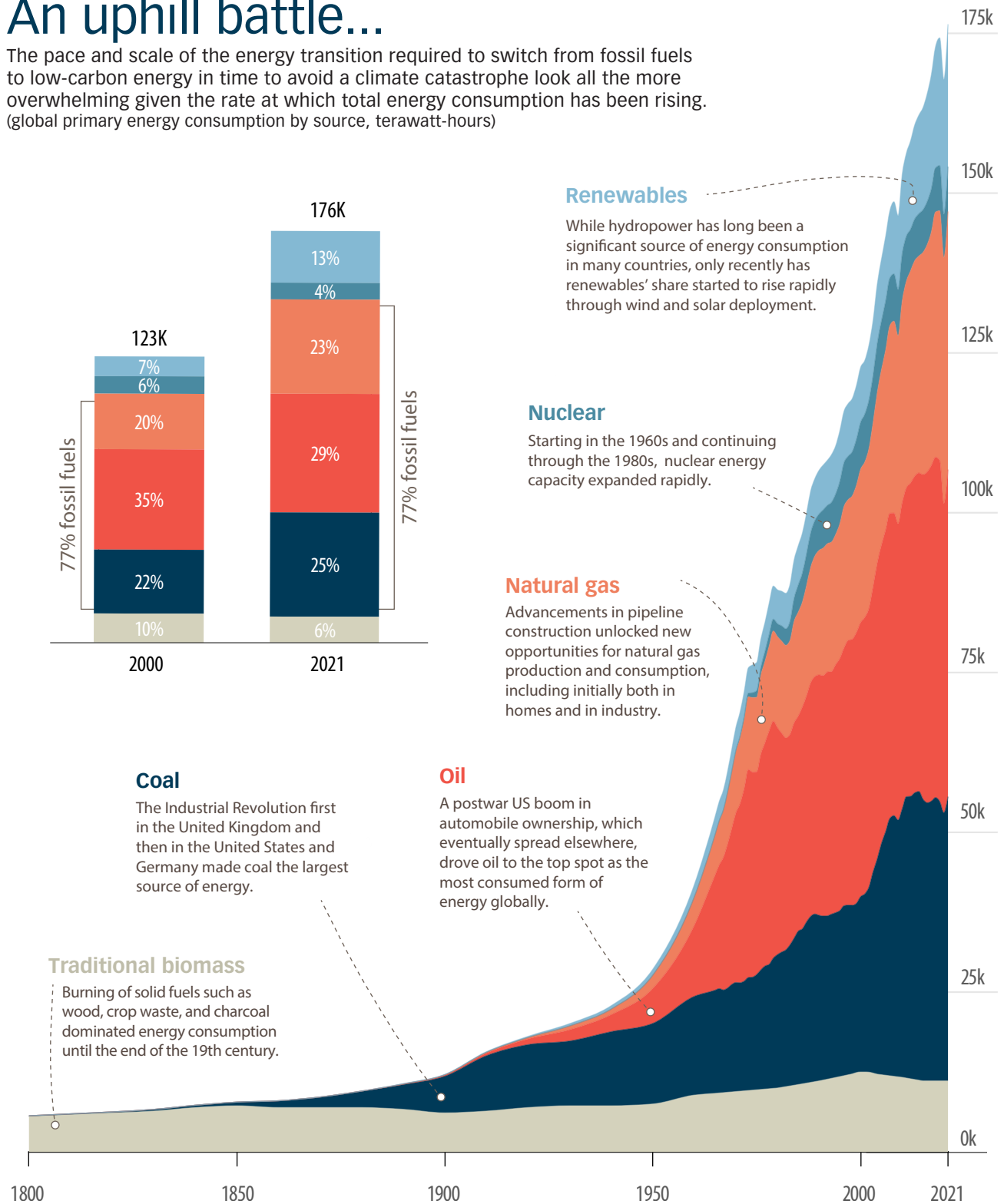


Sources: Our World in Data based on the BP *Statistical Review of World Energy*; and the Shift Project’s data portal.

Note: The map shows primary energy consumption per capita. The boundaries, colors, denominations, and any other information shown on the map do not imply, on the part of the IMF, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries.

An uphill battle...

The pace and scale of the energy transition required to switch from fossil fuels to low-carbon energy in time to avoid a climate catastrophe look all the more overwhelming given the rate at which total energy consumption has been rising. (global primary energy consumption by source, terawatt-hours)



Sources: Our World in Data based on Vaclav Smil, *Energy and Civilization: A History*; and the BP *Statistical Review of World Energy*.

Note: Primary energy is calculated according to the "substitution method," which takes account of the inefficiencies in fossil fuel production by converting nonfossil energy into the energy inputs required if they had the same conversion losses as fossil fuels.