



© ercanozay/Getty Images

SUSTAINABILITY & RESOURCE PRODUCTIVITY

Energy 2050: Insights from the ground up

How will the world satisfy its need for energy? McKinsey research offers a perspective.

Scott Nyquist

When it comes to energy, there is one matter everyone agrees on. For the near future, at least, the world will need more of it—and how it is produced and used will be a critical factor in the future of the global economy, geopolitics, and the environment. With that in mind, McKinsey took a hard look at the data, modeling energy demand from the bottom up, by country, sector, and fuel mix, with an analysis of current conditions, historical data, and country-level assessments. On this basis, McKinsey's Global Energy Insights team has put together a description of the global energy landscape to 2050.

It is important to remember that this is a business-as-usual scenario. That is, it does not anticipate big disruptions in either the production or use of energy. And, of course, predicting the future of

anything is perilous. With those caveats in mind, here are four of the most interesting insights from this research.

Global energy demand will continue to grow. But growth will be slower—an average of about 0.7 percent a year through 2050 (versus an average of more than 2 percent from 2000 to 2015). The decline in the rate of growth is due to digitization, slower population and economic growth, greater efficiency, a decline in European and North American demand, and the global economic shift toward services, which use less energy than the production of goods. For example, in India, the percentage of GDP derived from services is expected to rise from 54 to 64 percent by 2035. And efficiency is a forthright good-news story. By 2035, McKinsey research expects that it will take

Given that global energy demand will grow, it is likely that prices will continue to be volatile. Better energy efficiency, then, is an important way to reduce related risks.

almost 40 percent less fuel to propel a fossil-fueled car a mile than it does now. By 2050, global “energy intensity”—that is, how much energy is used to produce each unit of GDP—will be half what it was in 2013. That may sound optimistic, but it is based on recent history. From 1990 to 2015, global energy intensity improved by almost a third, and it is reasonable to expect the rate of progress to accelerate.

Demand for electricity will grow twice as fast as that for transport. China and India will account for 71 percent of new capacity. By 2050, electricity will account for a quarter of all energy demand, compared with 18 percent now. How will that additional power be generated? More than three-quarters of new capacity (77 percent), according to the McKinsey research, will come from wind and solar, 13 percent from natural gas, and the rest from everything else. The share of nuclear and hydro is also expected to grow, albeit modestly.

What that means is that by 2050, nonhydro renewables will account for more than a third of global power generation—a huge increase from the 2014 level of 6 percent. To put it another way, between now and 2050, wind and solar are expected to grow four to five times faster than every other source of power.

Fossil fuels will dominate energy use through 2050. This is because of the massive investments that have already been made and because of the

superior energy intensity and reliability of fossil fuels. The mix, however, will change. Gas will continue to grow quickly, but the global demand for coal will likely peak around 2025. Growth in the use of oil, which is predominantly used for transport, will slow down as vehicles get more efficient and more electric; here, peak demand could come as soon as 2030. By 2050, the research estimates that coal will be down to just 16 percent of global power generation (from 41 percent now) and fossil fuels to 38 percent (from 66 percent now). Overall, though, coal, oil, and, gas will continue to be 74 percent of primary energy demand, down from 82 percent now. After that, the rate of decline is likely to accelerate.

Energy-related greenhouse-gas emissions will rise 14 percent in the next 20 years. That is not what needs to happen to keep the planet from warming another two degrees, the goal of the 2015 Paris climate conference. Around 2035, though, emissions will flatten and then fall, for two main reasons. First, cars and trucks will be cleaner, due to more efficient engines and the deployment of electric vehicles. Second, there is the shift in the power industry toward gas and renewables discussed above. The countervailing trends are that there are likely to be some 1.5 billion more people by 2035, and global GDP will rise by about half over that period. All those people will need to eat and work, and that means more energy.

The world is full of unpredictable and sometimes wonderful surprises, so I accept that these numbers

are unlikely to be perfect. As with any forecast, they are based on assumptions—about China and India, for example—as well as about oil prices and economic growth. Other sources see different outlooks. Concerted global action to reduce greenhouse-gas emissions, for example, could change the arc of these trends. Technological disruptions could also bend the curve.

For business and political leaders, though, the implications are clear. Given that global energy demand will grow, it is likely that prices will continue to be volatile. Better energy efficiency, then, is an important way to reduce related risks. Technology development is critical to ensuring that the world gets the energy it needs while mitigating environmental harm. This will require substantial new investments. Finally, to encourage the creation of the clean and reliable energy infrastructure that the world needs, energy producers will

need to work with local, regional, national, and international regulators. Getting things right the first time is essential; there is extensive evidence to show that dramatic changes in policy act as a powerful deterrent to energy investments by producers. Given the scale of the new investments needed, this will be a factor of growing importance. ■

[This article is adapted from a previously published LinkedIn post.](#)

Scott Nyquist is a senior partner in McKinsey's Houston office.

Copyright © 2016 McKinsey & Company.
All rights reserved.