

FAQ 6.1 | Will energy systems that emit little or no CO₂ be different than those of today?

Low-carbon energy systems will be similar to those of today in that they will provide many of the same services as today – for example, heating and cooling homes, travelling to work or on vacation, transporting goods and services, and powering manufacturing. But future energy systems may be different in that people may also demand new services that aren't foreseen today, just as people now use energy for many information technology uses that were not anticipated 50 years ago. More importantly, low-carbon energy systems will be different in the way that energy is produced, transformed, and used to provide these services. In the future, almost all electricity will be produced from sources that emit little or no CO₂, such as solar power, wind power, nuclear power, bioenergy, hydropower, geothermal power, or fossil energy in which the CO₂ is captured and stored. Electricity, hydrogen, and bioenergy will be used in many situations where fossil fuels are used today, for example, in cars or heating homes. And energy is likely to be used more efficiently than today, for example, through more efficient cars, trucks, and appliances, buildings that use very little energy, and greater use of public transportation. All of these changes may require new policies, institutions, and even new ways for people to live their lives. And fundamental to all of these changes is that low-carbon energy systems will use far less fossil fuel than today.

FAQ 6.2 | Can renewable sources provide all the energy needed for energy systems that emit little or no CO₂?

Renewable energy technologies harness energy from natural sources that are continually replenished, for example, from the sun (solar energy), the wind (wind energy), plants (bioenergy), rainfall (hydropower), or even the ocean. The energy from these sources exceeds the world's current and future energy needs many times. But that does not mean that renewable sources will provide all energy in future low-carbon energy systems. Some countries have a lot of renewable energy, whereas others do not, and other energy sources, such as nuclear power or fossil energy in which CO₂ emissions are captured and stored (carbon dioxide capture and storage, or CCS) can also contribute to low-carbon energy systems. The energy from sources such as solar energy, wind energy, and hydropower can vary throughout the day or over seasons or years. All low-carbon energy sources have other implications for people and countries, some of which are desirable, for example, reducing air pollution or making it easy to provide electricity in remote locations, and some of which are undesirable, for example decreasing biodiversity or mining of minerals to produce low-emissions technologies. For all of these reasons, it is unlikely that all low-carbon energy systems around the world will rely entirely on renewable energy sources.

FAQ 6.3 | What are the most important steps to decarbonise the energy system?

To create a low-carbon energy system, emissions must be reduced across all parts of the system, and not just one or two. This means, for example, reducing the emissions from producing electricity, driving cars, hauling freight, heating and cooling buildings, powering data centres, and manufacturing goods. There are more opportunities to reduce emissions over the next decade in some sectors compared to others. For example, it is possible to substantially reduce electricity emissions over the next decade by investing in low-carbon electricity sources, while at the same time halting the construction of new coal-fired power plants, retiring existing coal-fired power plants or retrofitting them with carbon capture and storage (CCS), and limiting the construction of new gas-fired power plants. There are also opportunities to increase the number of electric cars, trucks, and other vehicles on the road, or to use electricity rather than natural gas or coal to heat homes. And across the whole energy system, emissions can be reduced by using more efficient technologies. While these and other actions will be critical over the coming decade, it is also important to remember that the low-carbon energy transition needs to extend for many decades into the future to limit warming. This means that it is important now to improve and test options that could be useful later on, for example, producing hydrogen from low-carbon sources or producing bioenergy from crops that require less land than today.