

RENEWABLE-ENERGY TECHNOLOGIES ARE GETTING BETTER AND CHEAPER EVERY YEAR

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There is unprecedented interest in renewable energy, particularly solar and wind energy, which provide electricity without giving rise to any carbon dioxide emission. Harnessing these for electricity depends on the cost and efficiency of the technology, which is constantly improving, thus reducing costs per peak kilowatt. Utilising solar and wind-generated electricity in a stand-alone system requires corresponding battery or other storage capacity. But the invention of new battery is rarely greeted with as much excitement as the latest smartphone. The energy industry is widely perceived as sluggish, a provider of basic services and lacking creativity. Low-carbon performance is not visible to most consumers and carbon is not priced in the global market. Therefore public policies to encourage the development and adoption of renewable-energy technologies are essential.

Some governments are considering reducing their support for renewable-energy projects. But now is not the time for this. Each day that we delay implementing low-carbon energy technologies we increase the likelihood of damage from climate change — from storms and floods to forest fires.

The response of the global energy industry to even modest policy interventions has been remarkable. Led by China, Europe, the United States and Japan, the alternative-energy sector is booming worldwide. Solar and wind technologies have improved most rapidly in the past three decades, with photovoltaics a hundred times cheaper today than in 1975.

Rapid innovation

The speed of energy-technology innovation is only just coming to light as long-term data sets become available. Analyses of 30 or more years of data show that the costs of renewable-energy technologies have fallen steeply. Photovoltaic module costs have plunged by about 10% per year over the past 30 years and the costs of wind turbines have fallen by roughly 5% per year. Production levels for both technologies have risen by about 30% per year on average.

Some technologies are more open to improvement than others. Compact, modular systems, such as photovoltaics and electronics, are easily experimented on. And processes that may be achieved through alternative designs or materials offer more avenues for advancement. The diversity of semiconductors, for example, is behind the recent development of high-efficiency perovskite solar cells. Other technologies are harder to improve. Those with high commodity costs, such as coal-fired electricity, soon hit cost floors in the marketplace.

Photovoltaic systems and wind turbines are therefore better candidates for sustained cost reduction than large nuclear or coal plants. The lower price of solar cells today is due to increasing the efficiency with which sunlight is converted to electricity within modules, less manufacturing waste and greater economies of scale.

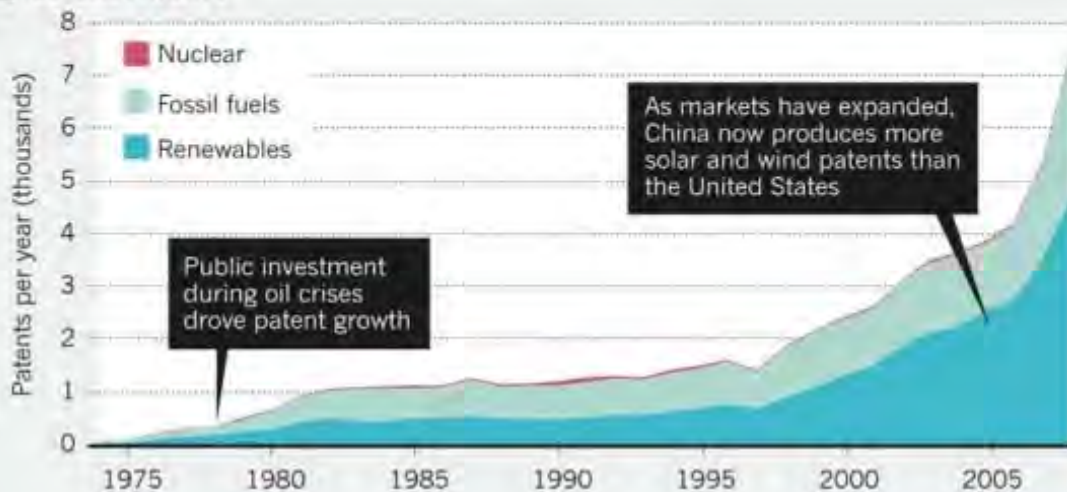
Wind turbines have seen similar progress, reaching higher wind speeds at greater heights to deliver more energy per cost of installed unit. Indeed, wind energy now competes economically with fossil-fuelled thermal power plants in several places, including Texas, and in Denmark it supplies 30% of electricity consumption.

Knowledge about how to design, build and integrate these technologies into the energy infrastructure has also grown. For example, it takes roughly half the time to install a solar system in Germany compared with the United States, thanks to a more experienced workforce and streamlined permit processes.

ENERGY INNOVATION

The number of new patents for energy technologies has risen rapidly in the past three decades, as public policies have driven market growth. Solar and wind installations have become much cheaper through improved designs and experience gained in building and installing them.

1 GLOBAL PATENTS



The recent growth in energy patents reflects the increasing knowledge generated in laboratories and on the manufacturing floor. The numbers of patents for solar and wind technologies have risen globally by about 15% and 20% per year on average, respectively, in the past decade — rates comparable with information technologies.

Patenting rates remained flat for nearly two decades until the early 2000s, when they rose again. This time it was necessary to get investment from industry, in response to various government incentives and regulations.

Certain nations are now clear leaders in innovation. Japan dominates in terms of cumulative energy patents filed. But in the past ten years growth has been driven by China and the United States, which together account for roughly 60% of renewables patents published globally per year and 60% of all energy patents. China has been the front runner in coal patents for 15 years and, in the past decade, has overtaken the United States in annual patent numbers for wind and solar as well. Europe has seen a tripling of renewables technologies patents in the past decade, whereas the region's patents related to fossil fuels have declined.

Underlying these cost and patenting trends is a diversity of national or regional policies, including research funding, market incentives such as feed-in tariffs, subsidies and regulated adoption levels. China has set a target to supply 15% of energy for electricity production with renewables by 2020, and Germany plans to produce 35% of its electricity through renewables by 2020. In the United States, 29 states and the District of Columbia have adopted renewables portfolio standards that require specified installation levels of renewable energy.

Maintain momentum

Even with extreme energy-efficiency measures, developed countries will need to meet from 75% to 100% of their power demand with carbon-free sources by 2050, compared with 30% globally today, to hit emissions targets. The remainder could be produced with clean coal (with carbon capture and storage) and natural gas.

Sustained public policies and monitoring of technology performance are needed to support further progress in a variety of low-carbon technologies for electricity, transport and heating until they can support themselves. Wind and solar energy have delivered the greatest bang per buck so far, in terms of improvements in cost, patenting and market growth, and further developments

should be supported. Because both types of power are intermittent, storage technologies should also be priorities for government investment.

The rapidly changing landscape of energy-technology patents and manufacturing costs, exemplified by the rise of China in these areas, cautions nations and corporations to build experience quickly in these fast-moving markets. Such momentum is evident in the highly efficient assembly lines now running at Yingli Solar's headquarters in Baoding, China, and in petrol stations in Sweden that offer drivers a choice of natural gas, biofuels, diesel and petrol.

What is the nature and importance of the renewable energy in our country? Development and effective use of renewable energy sources has a fundamental importance since in the short term they represent the real potential of local fuel and energy resources that can be efficiently involved in the economy and favor the rise of the energy security of the country.

It is worth noting that the government of Belarus attaches high priority to renewable energy in its overall policy. The country has made certain achievements in this domain on the domestic front. At the same time, Belarus is keen to go to greater lengths in order to contribute to more vibrant co-operation in this area internationally. The Belarusian government has been favoring foreign investors lately, especially in such areas as renewable sources of energy. Such a conclusion may be drawn from the experience of specific foreign investors taking their first steps in Belarus. However, the government still has much room for improvement in this regard, and should provide the investors operating in the renewable energy sector with greater incentives, simplify the procedures for issuing planning permissions, for agreeing upon and issuing expert opinions on designs, connecting to the power grid, and improve the normative technical base. Development of the renewable energy sector is of particular importance for the Republic of Belarus.

References

1. Jessika E.T. Renewable energy: Back the renewables boom. *Nature*, 2014, 507, 300–302. doi:10.1038/507300a.
2. VMP Vlasova Mikhel & Partners. Review on Renewable Energy in Belarus. *Global Renewable Energy Guide*, 2011, 21(4), 46–56.

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STOCK MARKET

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The stock market. To some, it's a puzzle. To others, it's a source of profit and endless fascination. The stock market is the financial nerve center of any country. It reflects any change in the economy. It is sensitive to interest rates, inflation and political events. In a very real sense, it has its fingers on the pulse of the entire world. Taken in its broadest sense, the stock market is also a control center. It is the market place where businesses and governments come to raise money so that they can continue and expand their operations. It is the market place where giant businesses and institutions come to make and change their financial commitments. The stock market is also a place of individual opportunity.

The phrase “the stock market” means many things. In the narrowest sense, a stock market is a place where stocks are traded – that is bought and sold. The phrase “the stock market” is often used to refer to the biggest and most important stock market in the world.

We have said that common stocks are shares of ownership in corporations. A corporation is a separate legal entity that is responsible for its own debts and obligations. The individual owners of the corporation are not liable for the corporation's obligations. This concept, known as limited liability, has made possible the growth of giant corporations. It has allowed millions of stockholders to feel secure in their position as corporate owners. All that they have risked is what they paid for