Renewable Energy Around the World

The demand for energy has sharply increased in parallel with global population growth, the development of the economy, energy intensive industries, the improvement of people's well being and the increase in the demand for domestic electrical appliances and vehicles.

For a long time, as the main energy producer in the world, a wide range of fuel types such as coal, oil and gas have been developed to meet energy demand in many countries of the world.

However, the decline in traditional natural resources, as well as the unstable and volatile prices of fuels, the use of resources such as oil and gas as a means of pressure to serve the political and geological interests of countries and the important role of the use of these fuels in disturbing the ecological balance has increased the interest in renewable energy resources.

It is undeniable that, still for many years, hydrocarbon resources will play an important role and take a major place in the fuel market and demand. However, most influential organisations and specialists of the world do not hesitate in saying that the dominance of hydrocarbon resources in the energy market will end one day.

Renewable energy resources are mainly grouped as solar, wind, geothermal, hydropower, biomass, wave energy and tidal power.

Renewable energy can be understood as sources of energy that can be obtained from natural sources that are constantly replenished. At the same time, renewable energy is very important in terms of factors such as reducing carbon emissions that harm the environment. There is also no need to import energy because they are local resources, thus reducing dependence on foreign energy.

Reports from international and regional organisations show that significant investment in the use of renewable energy resources is ensured and the share of renewable energy resources in the world energy system is growing rapidly day by day.

Statistical Analysis on the Use of Renewable Energy Resources around the World

Global primary energy consumption grew rapidly in 2018, led by natural gas and renewable energy sources. Nevertheless, the highest rate of growth in seven years in the volume of carbon emissions was observed. Primary energy consumption grew at a rate of 2.9% in 2018 and almost doubled its ten-year average of 1.5% per year, which was also the fastest growth since 2010. By fuel, energy consumption growth was driven by natural gas, which contributed more than 40% of the increase. There was a faster increase in all fuel types than their 10-year average. At the same time, renewable energy sources are considered the second largest contribution to energy growth. In 2018, renewable power grew by 14.5%, slightly below its historical average, although its increase in energy terms (71 Mtoe) was close to the record-breaking increase of 2017. Solar energy production grew by 30 Mtoe (only slightly less than wind power growth (32 Mtoe)), which accounted for more than 40% of renewable energy growth. Generation of

hydropower increased more than average by 3.1%, including 12.9% (3.1 Mtoe) growth in European production, which balanced the sharp decline in the previous year[1].

Electricity, undoubtedly, is at the center of the modern economy, providing an increasing share of energy services. The demand for electricity is expected to increase further as a result of rising household income, the electrification of transport and heat and the increasing demand for digitally connected devices and air conditioning systems. Rising electricity demand was one of the key reasons why global carbon dioxide emissions from the power sector reached a record high in 2018, yet the commercial availability of a diverse suite of low emissions generating technologies also puts electricity at the vanguard of efforts to combat climate change and pollution. Decarbonised electricity, in addition, could provide a platform for reducing carbon dioxide emissions in other sectors through electricity-based fuels such as hydrogen or synthetic liquid fuels. Renewable energy has a major role to play both in providing access to electricity for all and in reducing carbon emissions.[2]

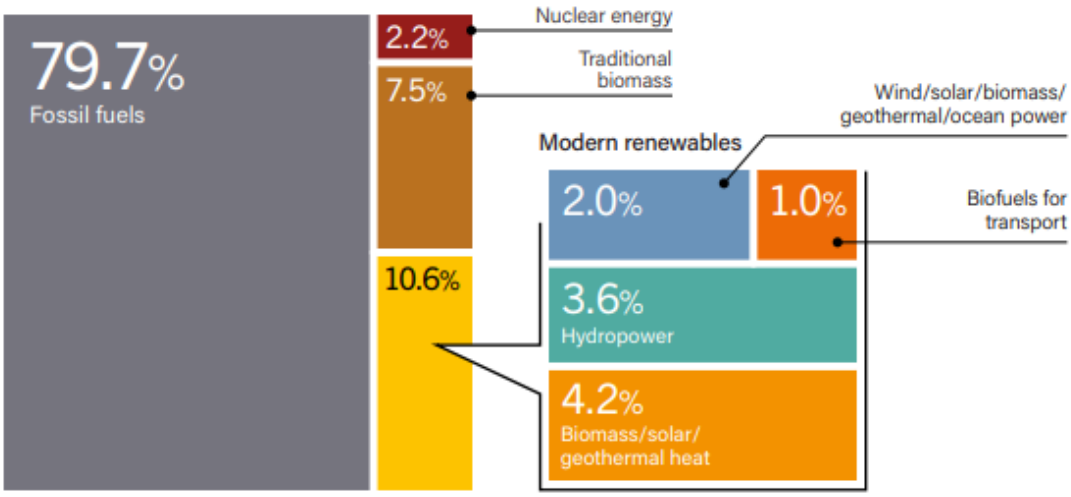
In 2018, electricity production grew more than average by 3.7%, due in large part to China (more than half of the growth), India and the United States. Renewables accounted for a third of the net increase in power generation, followed closely by coal (31%) and then natural gas (25%). The share of renewables increased from 8.4% to 9.3% in power generation. Coal still accounted for the largest share of power generation at 38%.

In 2017, the share of traditional fuels in total consumption was 79.7%, nuclear energy was 2.2% and renewable energy was 18.1%. Approximately 7.5% of the total renewable energy consumed globally is met from energy resources considered to be traditional biomass and used for cooking and heating purposes, while 10.6% is derived from modern renewable energy sources.

Estimated Renewable Share of Total Final Energy Consumption, 2017

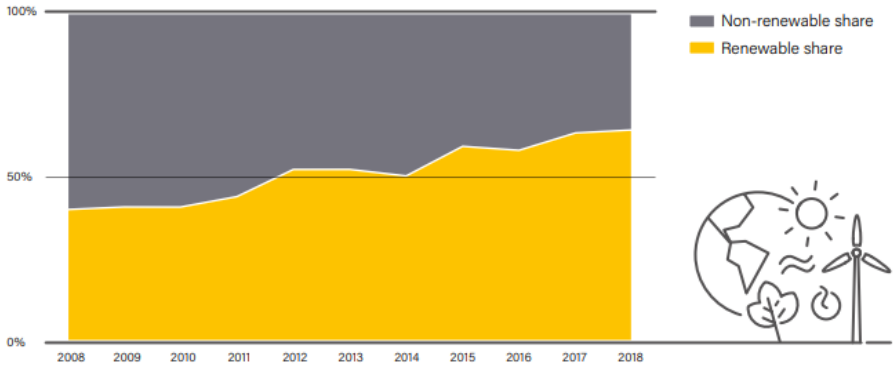
[1] BP Statistical Review of World Energy 2019, 68th edition

[2] IEA, World Energy Outlook 2019, November 2019



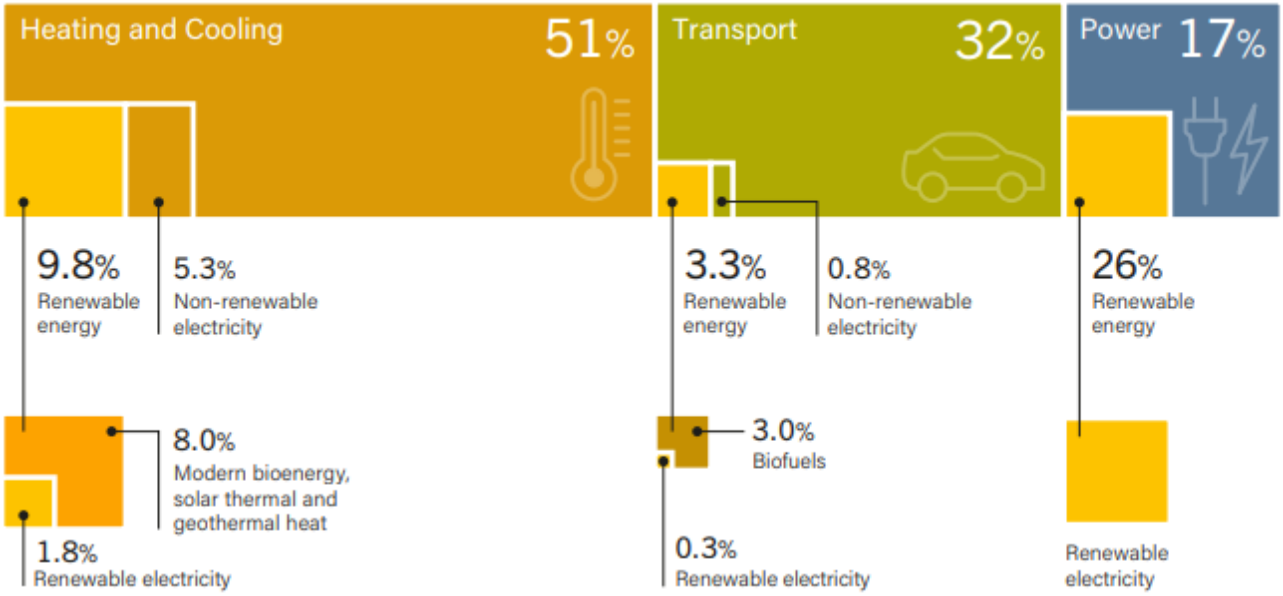
In the power sector, renewables are increasingly preferred for new electricity generation. Around 181 GW of renewable power capacity was added in 2018, setting a new record just above that of the previous year. Overall, renewable energy now accounts for around one third of total installed power generation capacity worldwide. Nearly two thirds (64%) of net installations in 2018 were from renewable sources of energy. It is the fourth consecutive year that net additions of renewable power were above 50%.

Share of Renewables in Net Annual Additions of Power Generating Capacity, 2008-2018



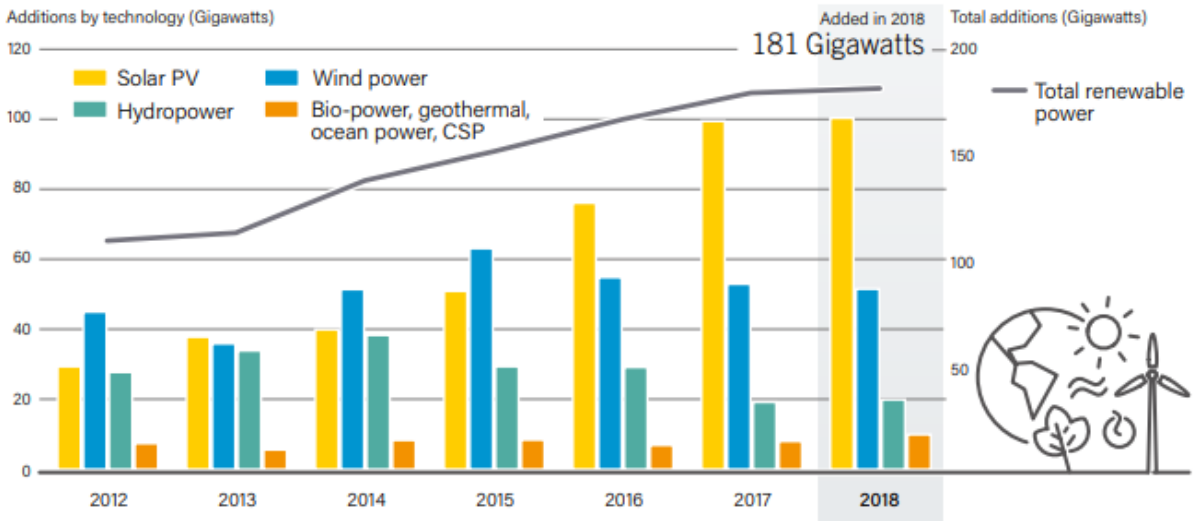
As of the end of 2016, heating and cooling accounted for around 51% of final energy use, transport for 32%, and electricity generation for around 17%. Modern renewable heat supplied around 10% of heating and cooling demand and has not grown significantly. While renewable electricity demand increased 25% between 2013 and 2017, modern renewable heat demand grew just under 5% during this period (around the same rate as global energy demand). In transport, consumption of biofuels (principally ethanol and biodiesel) increased by around 18% between 2013 and 2017, even though they started from a small base.

Renewable Energy in Total Final Energy Consumption by Sector, 2016



Renewable energy in power generation continued its momentum in 2018. An estimated 181 GW was installed worldwide, slightly above 2017 additions, and total installed capacity grew more than 8%. After years of steady growth, the rate of new capacity additions levelled off during the year, and the overall global renewable power capacity totalled some 2,378 GW by the end of 2018.

Annual Additions of Renewable Power Capacity by Technology and Total, 2012-2018

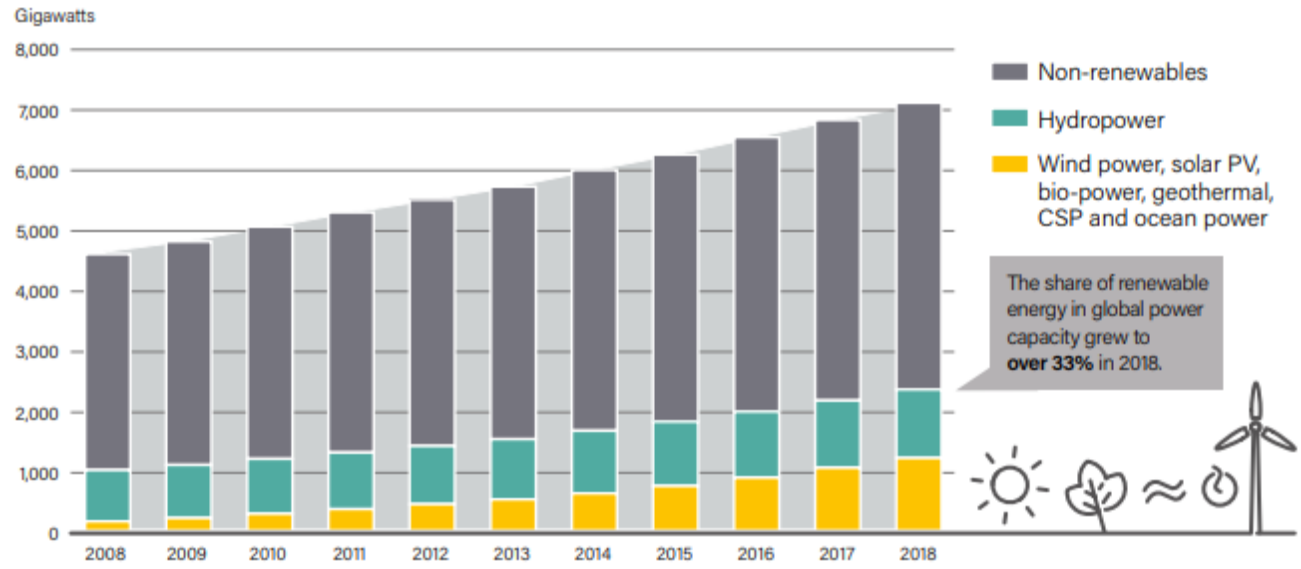


With around 100 GW added, solar PV energy was once again the frontrunner for installed renewable power capacity. Additions from solar PV accounted for 55% of new renewable capacity, followed by wind power (28%) and hydropower (11%). For the fourth year in a

row, additions of renewable power generation capacity outpaced net installations of fossil fuel and nuclear power capacity combined.

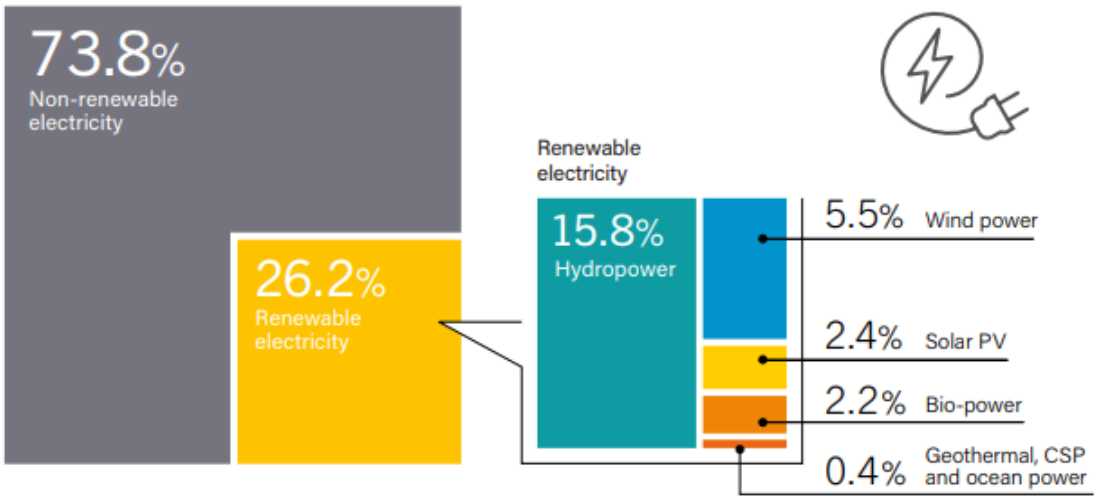
The global composition of installed renewable power capacity continued to shift during 2018. Hydropower no longer accounted for half of the cumulative renewable power capacity in operation, falling below 48% by the year's end. Meanwhile, wind power rose to comprise roughly 25% of the installed renewable power generation capacity, while solar PV exceeded 20% for the first time. Overall, renewable energy has grown to account for more than 33% of the world's total installed power generating capacity.

Global Power Generating Capacity by Source, 2008-2018



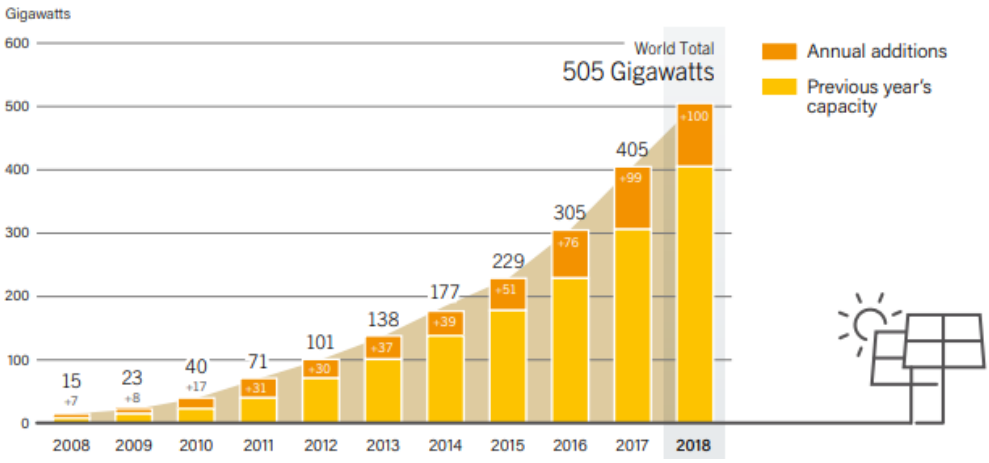
Each year, more electricity is generated from renewable energy than in the previous year. Hydropower still accounted for some 60% of renewable electricity production in 2018, followed by wind power (21%), solar PV (9%) and bio-power (8%). Overall, the installed renewable power capacity by the end of the year was enough to supply around 26.2% of global electricity production. Although renewable electricity is gaining ground quickly in many individual countries and regions, it faces challenges in achieving a larger share of the global total. This is due mainly to continued strong growth in total electricity production (up 4.0% in 2018) as well as to persistent investment in fossil fuel (and nuclear) power capacity and subsidies.

Estimated Renewable Energy Share of Global Electricity Production, End of 2018



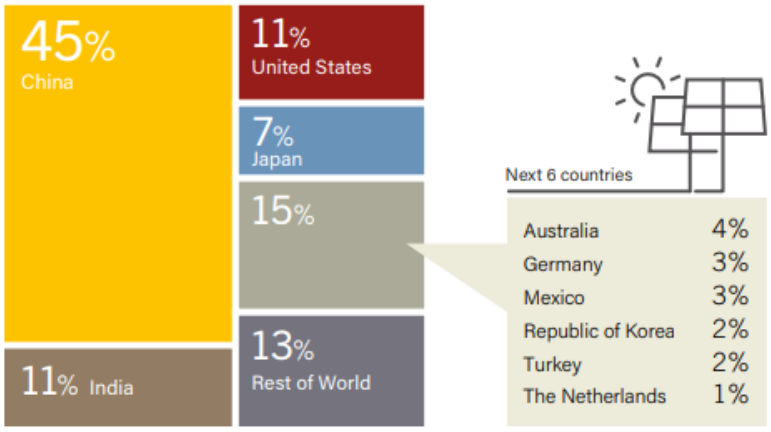
In 2018, the generation capacity of electricity installed from renewable energy sources, including hydropower, increased by 8%, reaching 2,378 GW. The total power increased by 181 GW, solar energy by 100 GW (55% of total growth), wind energy by 51 GW (28% of total growth), hydropower by 20 GW (11% of total growth) and bioenergy by 9 GW (5% of total power). Hydropower is 1,132 GW, which is 47.6% of the installed renewable power capacity. The capacity of the renewables, excluding hydropower, increased by 15% in 2018 to 1,246 GW. More than 90 countries had installed at least 1 GW of renewable generating capacity, while at least 30 countries exceeded 10 GW of capacity. By the end of 2018, the capacity of renewable energy sources amounted to more than 33% of the global installed power generation capacity. Wind power (592 GW) accounts for 25% of the renewables and solar PV (505 GW) covers over 21% of the renewable energy sources. Bioenergy, geothermal, solar and ocean energy account for 6% of the installed power from renewables. Bioenergy is 130 GW, geothermal 13.3 GW and ocean energy 0.5 GW.

Solar PV Global Capacity, 2008-2018

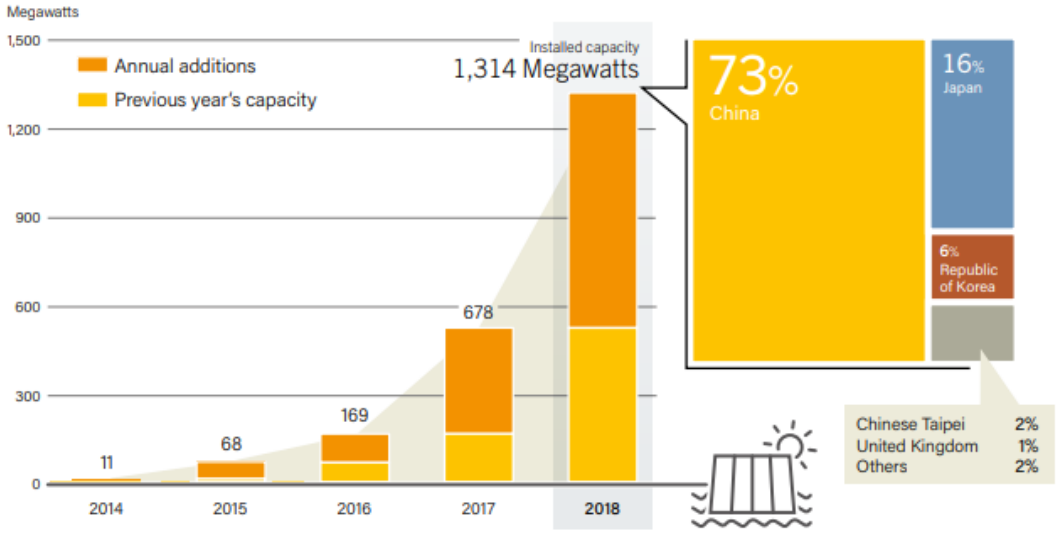


Solar energy capacity increased by 25% compared to 2017, reaching 505 GW. In 2018, 100 GW of new power was installed. Among the technologies for generating electricity from solar energy, photovoltaic (PV) technology, based on the principle of the photoelectric effect, is the fastest growing technology. In 2018, more than 1 GW of power was put into operation in 10 countries with this technology. The number of countries with an installed capacity using this technology exceeding 1 GW is 32. In 2018, 45 GW of new power was put into operation in China, and the country's solar power capacity reached 176.1 GW. It should also be noted that China's solar energy capacity is 34.9% of the world's power.

Solar PV Global Capacity by Country, End of 2018

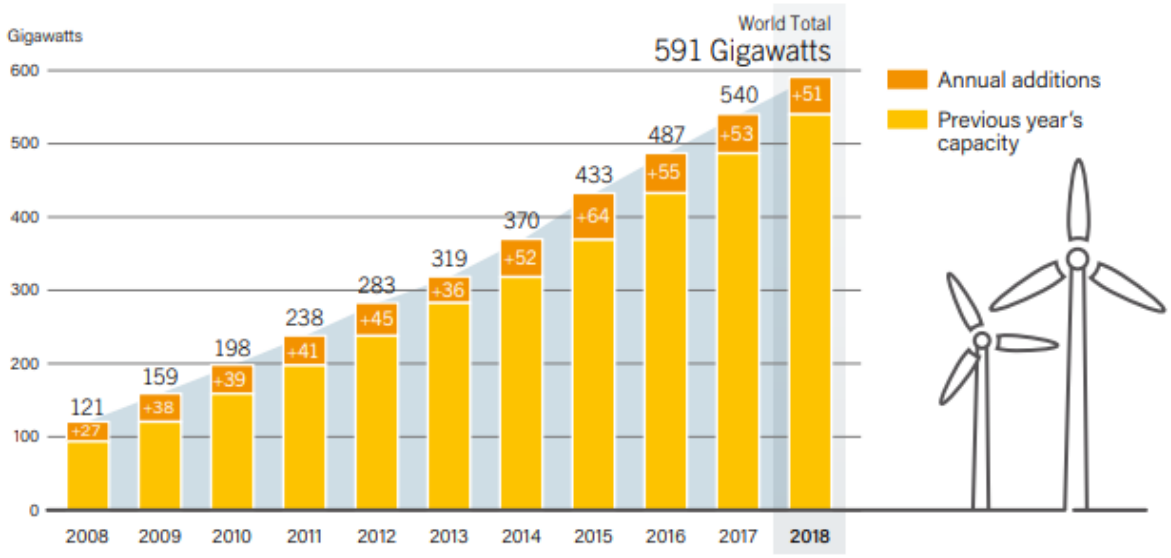


Floating Solar PV Global Capacity, 2008-2018



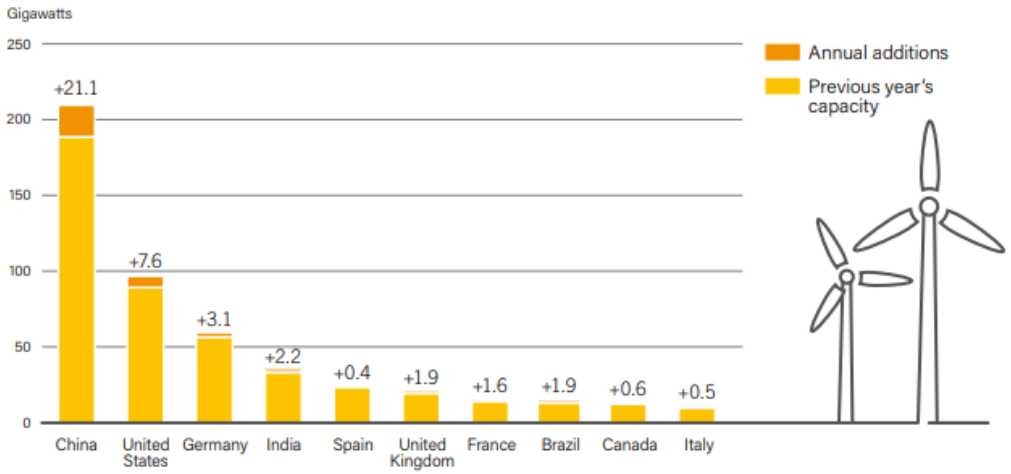
In 2018, the installed capacity on floating solar PV exceeded 1 GW. The floating solar PV system is available in at least 29 countries. China, Japan, South Korea, Taiwan and the UK account for 98% of installed capacity. 960 MW of the total power is in China.

Wind Power Global Capacity, 2008-2018



In 2018, the installed wind power increased by 9% compared to the previous year, reaching 591 GW. Wind power takes second place among renewable energy sources according to the installed power and the amount of electricity generated. In 2018, 51 GW of new wind power was installed, of which 47 GW is onshore and 4.5 GW offshore. 2018 was the fifth consecutive year with annual additions exceeding 50 GW. China became the first country to exceed 200 GW of wind power capacity. At least 103 countries have a commercial wind power capacity and 33 countries have more than 1 GW in operation. 17 countries had offshore wind power facilities. Europe was home to about 79% of global offshore wind power capacity.

Wind Power Capacity by Countries, 2018



Offshore Wind Power Global Capacity, 2008-2018