future planet

Climate Change
Energy Transition

The year 2020 marks the beginning of a turning point in energy transition and climate change. The domino effect triggered by the pandemic has affected every sector – including energy – leading to price and demand shocks, and potentially influencing the pipeline of projects, investment and R&D in the near future. **The energy transition is already taking place, and it is unstoppable.** Great strides have been made in the past decade, with governments and markets – including the financial market – clearly opting for renewable-based energy systems. Over 170 countries have committed with renewables targets. This **new capacity addition patterns show that by 2025-2030,** renewables routinely outpace fossil fuels and nuclear combined. A clear vision of a new energy system is emerging, based on renewable technologies and complemented by green hydrogen and modern bioenergy. This new system is technically viable and ready for accelerated and widespread adoption. Clean energy sources are increasingly being used as cost effective and low emission alternatives to coal, oil and gas. But renewable energy currently makes up just a small part of the global energy mix. This needs to rise substantially if we are to meet climate targets, including the Paris agreement designed to limit temperature rises to 2°C. With this objective in mind, **there is a need to invest in renewable sources of energy.**

There have been two previous transitions to new sources of energy: from wood to coal in the late 19th century, and from coal to oil and gas in the mid 20th century. While full adoption of coal took around 70 years and full adoption of oil and gas took around 50 years, **the full adoption of renewables could be implemented in less than 30 years.**

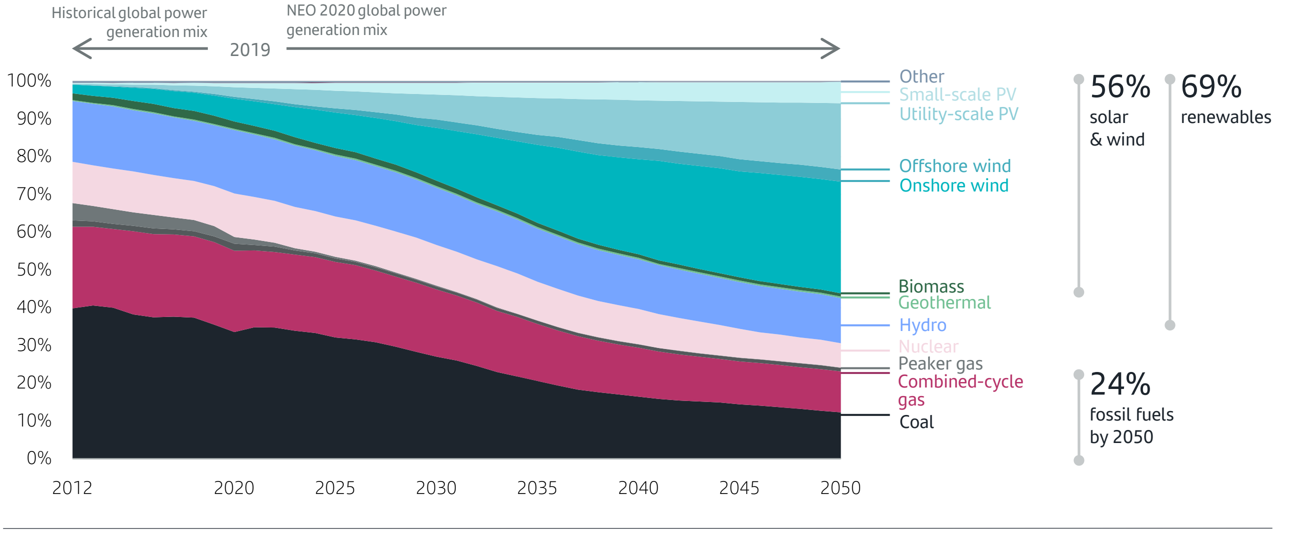
New solar and wind projects are undercutting the cheapest and least sustainable of existing coal-fired plants, the International Renewable Energy Agency (IRENA) said in a study[1]. IRENA attributed the shift to improving technologies, economies of scale, competitive supply chains and growing developer experience. The trends are accelerating, reinforcing the case to phase out coal entirely.

Solar and wind power recently crossed a new threshold, moving from mainstream to preferred energy sources across the globe. As these **renewable energies reach price and performance parity with conventional sources, demonstrate their ability to enhance grids and become increasingly competitive via new technologies,** obstacles to their deployment are dissolving. Already among the cheapest energy sources globally, solar and wind have much further to go as costs continue to fall. The demand for renewables is inexorably growing as they are meeting the **three energy priorities of consumers: reliability, affordability and environmental responsibility.**

Switching to energy generated by renewables and away from fossil fuels is only one part of the energy transition. Just as crucial is the **development of the infrastructure needed to enable the switch.** For example, wind and solar farms can generate a huge amount of power when it's windy or sunny, but this will need to be stored until it's needed by consumers. **There is a lot of growth potential from investing in companies that improve overall resource efficiency and provide environmentally positive solutions in fields such as energy production, manufacturing, construction, transportation, agriculture and sanitation.**

Global electricity generation mix

Source: Bloomberg NEF New Energy Outlook 2020



1. IRENA World Energy Transitions Outlook: 1.5ºC Pathway

Innovations and trends in Energy Transition

Wind Energy Technology

Wind energy is one of the fastest-growing energy sources in the world and is poised to play a key role in mitigating global climate change and future energy provision. Of the renewable energy technologies, wind energy ranks **second only to hydroelectric power in terms of installed capacity**, globally[2]. The global wind power market has achieved exceptionally high growth rates over the past few years, with more than half of the world's wind power capacity developed over the past five. **The global wind power market is expected to reach a cumulative installed capacity of 1,000 GW by the end of 2025**, with Asia-Pacific as the dominant region. The offshore wind market is expected to grow much faster than the onshore wind market. Considering the ample resource availability, large market potential and cost competitiveness, wind is expected to drive overall renewables growth in several regions over the next decade.

According to IRENA, wind power would supply more than one-third of total electricity demand by 2050 and is well aligned with energy transformation scenarios of various institutions, clearly highlighting the importance of scaling up the wind power generation share in order to decarbonize the energy system in the next three decades. This represents a nearly **nine-fold rise in the wind power share** in the total generation mix by 2050 compared to 2016 levels.

Solar Energy Technology

The **abundance of solar energy** is not the only aspect that makes it **the best candidate to fulfill increasing energy demand**. Over the last few years, it has overcome several hurdles that prevented it from last-scale adoption. **The International Energy Agency has recently published that it is now consistently cheaper to generate electricity by capturing the sun's energy than by burning coal or natural gas in most countries[3].** Solar photovoltaic cells are now one of the cheapest sources of electricity in history thanks to maturing technologies and policies that have reduced the cost of investments, the Paris-based agency said.

Grid parity (or socket parity) occurs when an alternative energy source can generate power at a levelized cost of electricity (LCOE) that is less than or equal to the price of power from the electricity grid. Just 10 years ago it was much cheaper to build a new power plant that burns fossil fuels than to build a new solar photovoltaic (PV) or wind plant. Electricity from utility-scale solar photovoltaics cost $359 per MWh in 2009. Within just one decade the price declined by 89% and the relative price flipped: the electricity price that you need to charge to break even with the new average coal plant is now much higher than building a solar plant. In one scenario explored by the IEA, **renewables (thanks mainly to solar energy) make up about 80% of the growth in global electricity generation over the same period, overtaking coal by 2025 as the primary means of producing electricity.**

Hydrogen Fuel Technology

A **fuel cell** is a device that converts chemical potential energy (energy stored in molecular bonds) into electrical energy. A PEM (Proton Exchange Membrane) cell uses hydrogen gas (H2) and oxygen gas (O2) as fuel. While fuel-cell cars produce zero emissions at the tailpipe, **producing the hydrogen in the first place has historically been a polluting business**. Most of the hydrogen produced today uses natural gas as a feedstock, which is hardly a zero-carbon fuel. This 'grey hydrogen' makes up about 95% of current production and is relatively cheap. However, **it is possible to produce hydrogen from renewable sources of energy.** Current pricing a key barrier to adoption and **green hydrogen pricing needs to decline to <US$2/kg to make hydrogen widely adopted**, particularly in non-transport sectors. Experts believe that it is already possible to manufacture green hydrogen at US$2/kg on a LCOE of US$30/MWh, but prices ideally need to fall by another 50% to make hydrogen truly competitive across all sectors. **Transport represents the largest single end market opportunity for hydrogen** given its high energy density and relatively high price of competing transportation fuels. Initial applications will focus on **trucks and buses**, but rail, marine and aviation will all be important end use markets.

Heat and power markets could become also a sizeable opportunity for hydrogen. Experts also see a **role for hydrogen in back-up power as renewables take a greater share of the power mix**. Some countries are planning at least 10% of power capacity on hydrogen for utility scale and back-up power generation. **Opportunities along the hydrogen value chain are considerable** stretching from green hydrogen production (solar, wind and electrolyzer companies), fuel cell manufacturing and component makers, hydrogen infrastructure (storage and transport) and hydrogen fuel cell vehicle manufacturing.

2. IEA data
3. https://www.iea.org/reports/renewables-2020

Examples of relevant companies in Energy Transition

Vestas Wind Systems is helping to meet growing demand for sustainable energy. The Danish company is a **global leader in sustainable energy solutions** based on wind turbines across the globe. **With more wind power installed than any other company,** Vestas's products help reduce carbon emissions, reduce air pollution, increase renewable energy penetration in the global energy mix and provide access to electricity for off-grid communities. **Vestas turbines have been installed in 83 countries** around the world, operating on every kind of site, from high altitude to extreme weather conditions.

On April 3, 2017, Siemens Wind Power and Gamesa concluded the merger of their wind power businesses becoming the **world's second largest wind turbine manufacturer**. The two companies complement one another and provide a wide range **product portfolio for wind power onshore, offshore and services, with a presence in more than 90 countries.** The united company is based in Zamudio, Spain, and trades on the Spanish stock market. To date it is one of the biggest industrial companies of the blue-chip index Ibex 35.

Within its products the company is notable for its SG 14.0-222 wind turbine, the **largest in the world that,** given its size, allows a 25% increase in annual energy production when compared with the previous model[4].

Enphase Energy Inc. manufactures solar power solutions. Enphase Energy brings a **system-based, high-tech approach to solar energy**, leveraging expertise in semiconductor integration, power electronics and networking technologies to continually advance the performance, intelligence and reliability of solar energy systems. Enphase's vision is to **make solar simple and energy smart** so everyone is empowered to create a zero energy footprint.

The Company **provides solar micro inverters,** primarily into the residential and commercial markets. Microinverters convert the direct current power from the solar panel directly into the grid-compatible alternating current for use or export.

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NextEra Energy, Inc. provides sustainable energy generation and distribution services. With a market capitalization of over 150Bn$ as of March 2021, NextEra is the world's largest utility company and generates more wind and solar energy than any other company in the world.

In 2019, **NextEra's energy resources segment owned or operated 15.1 GW of wind and 2.5 GW of solar power generating capacity**[5]. That's enough to power 12.8 million average American homes, and the company had another 11 GW of renewable energy projects in its backlog as of the middle of 2019.

NextEra Energy recently announced it has been named **to Fortune's 2021 list of the "World's Most Admired Companies"** and ranked No. 1 in the electric and gas utilities industry for the 14th time in 15 years.

First Solar Inc. designs and manufactures solar modules. The Company uses a thin film **semiconductor technology to manufacture electricity-producing solar modules.** While most solar panel manufacturers make their products out of silicon, First Solar produces and sells thin film solar panels using **cadmium telluride as its material of choice.**

The company is also unique in that it only works on utility-scale solar projects. According to the First Solar website, the company "has developed, financed, engineered, constructed and currently operates many of the world's largest grid-connected PV power plants." First Solar refers to itself as **"vertically integrated",** meaning that it is involved in every level of utility solar installations, from manufacturing the solar panels to providing operations and maintenance services for its installed arrays.

Brookfield Renewable Partners L.P. produces electricity from environmentally friendly hydroelectric resources. The Company owns, **operates, and manages hydroelectric power generating stations in the United States, Canada, and Brazil.**

The company was established as Brookfield Renewable Energy Partners in 2011, when Brookfield Asset Management combined the hydroelectric stations and wind farms of the Brookfield Renewable Power Fund with those of Brookfield Renewable Power Inc. The company changed its name to Brookfield Renewable Partners in 2016.

The company is **a global leader in hydroelectric power, which comprises approximately 66% of its portfolio**[6]. It is also an experienced global owner and operator of, and investor in, wind, solar, and storage facilities.

4. https://www.siemensgamesa.com/es-es/sala-de-prensa/2020/05/200519-siemens-gamesa-turbine-14-222-dd
5. http://www.investor.nexteraenergy.com/
6. https://bep.brookfield.com/

Did you Know that?

1500

The average onshore wind turbine can power more than 1,500 average EU households.

Source: Opus Energy

8 min

It takes a little more than eight minutes for sunlight to reach the Earth and a few seconds more to come into contact with the solar panels.

Source: Quora

1h

More solar energy hits the earth in 1 hour than the whole world uses all year.

Source: Forbes

www.santanderprivatebanking.com