

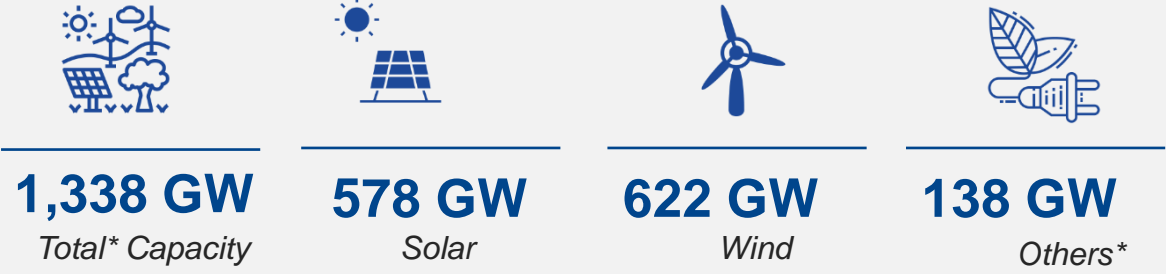
Special Report

Global Clean Energy Industry Outlook

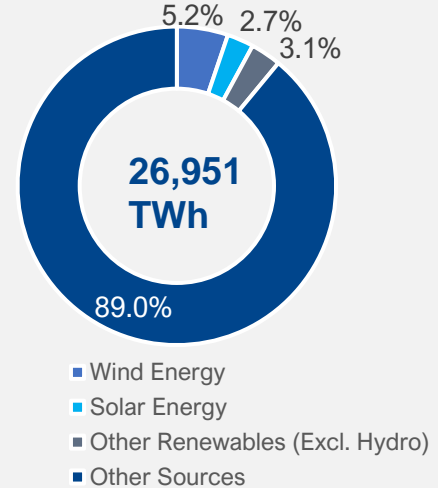


Wind and solar, key renewable energy sources; global electricity generation from renewables accounting for ~11% in 2019

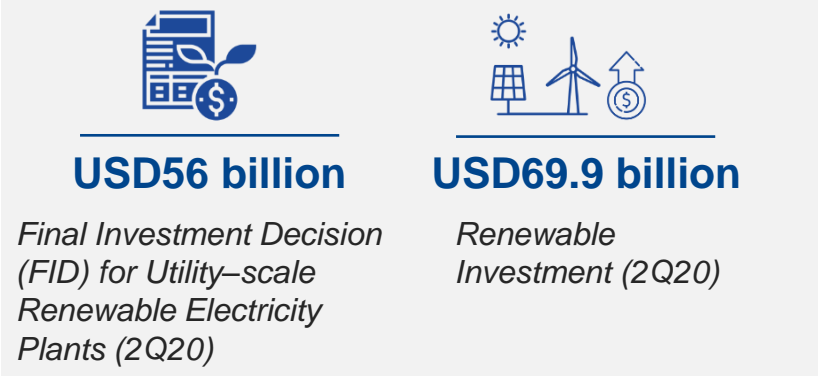
Global Renewable Energy Capacity (2019)



Contribution in Power Generation – 2019



Investments



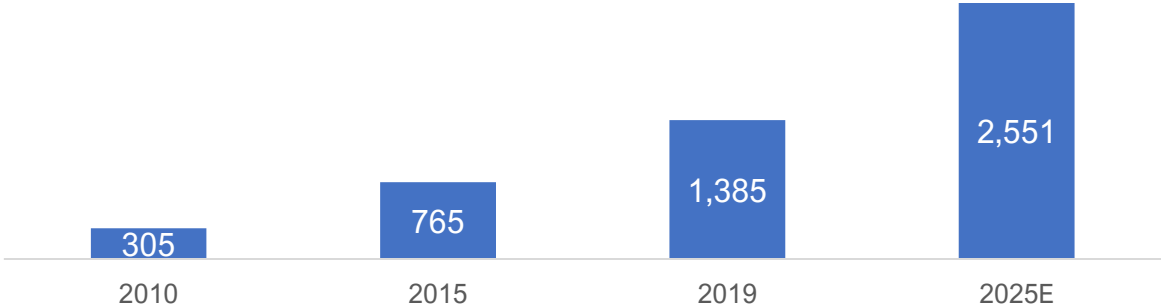
- During 2010–19, more than USD2.6 trillion was invested in renewable energy globally.
- Investments in solar and wind projects declined the most in 1Q20 due to cost-cutting measures adopted by companies.
- China is the largest investor in renewable energy, followed by the US.

Source: IRENA, OURWORLDINDATA, BNE, Aranca Analysis

*Excluding hydropower

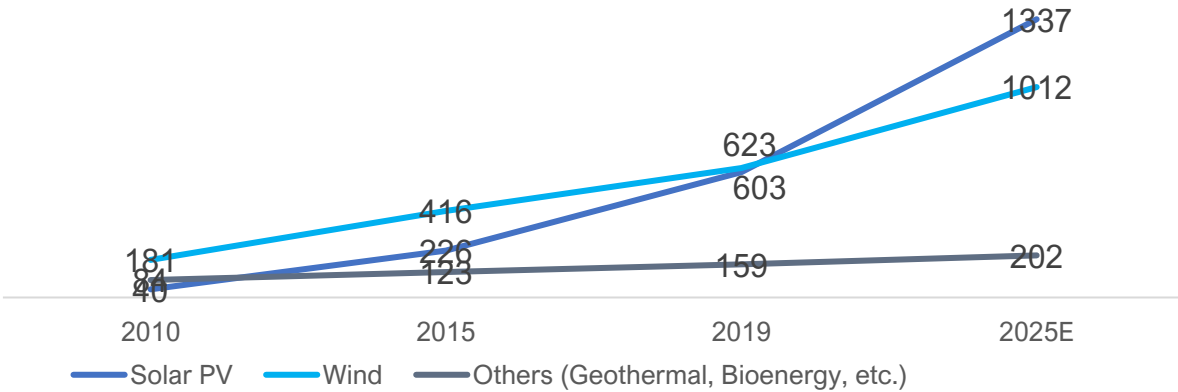
Global renewable energy capacity expected to nearly double in next five years, driven by increased solar and wind capacities

Renewable Energy* Capacity (GW)



*Excluding hydropower

Capacity of Different Types of Renewable Energy (GW)



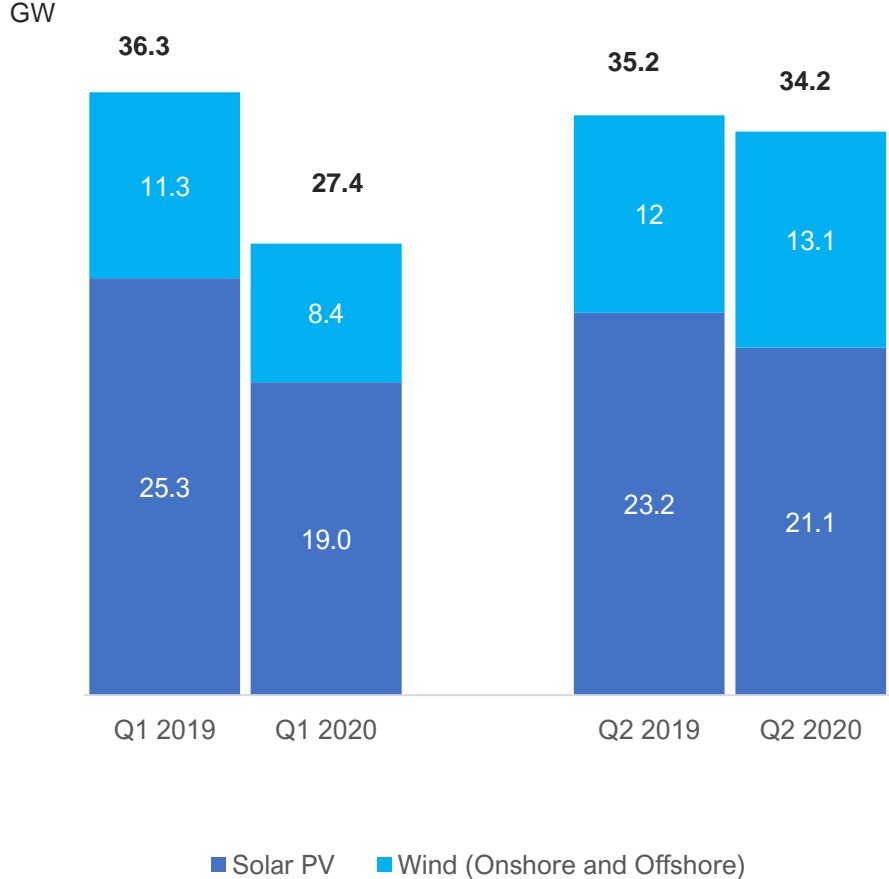
- By 2025, renewable energy would become the largest source of electricity, overtaking coal.
- Hydropower will likely continue to be the largest source of renewable energy in 2025, supplying almost half of the global renewable electricity, followed by wind and solar PV.
- Growth of renewable energy capacity in the coming years would be driven by the reduction in the cost of electricity generated from renewables, along with supportive government policies globally.
- Growth would be driven by increased investments in renewable energy by major oil & gas companies.

Source: International Energy Agency (IEA), British Petroleum (BP), Aranca Analysis

Pandemic led to drop in solar PV, wind capacity additions in 1Q20; recovery noted in 2Q20

Renewable Energy Capacity Additions

Solar PV and Wind Capacity Additions – 1Q19 vs 1Q20; 2Q19 vs 2Q20



- In 1Q20, solar PV and wind capacity additions declined by ~25% compared with 1Q19, principally due to the pandemic-induced lockdown in China.
- In 2Q20, wind and solar PV capacity additions recovered due to ease of lockdown measures, which led to the completion of utility-scale solar PV and wind projects.
- As per the initial analysis by the International Energy Agency, in most of the other countries, renewable energy projects were not halted completely due to the lockdown. Moreover, construction activities were expedited once the situation improved slightly to make up for the initial delays.

Source: International Energy Agency (IEA), British Petroleum (BP), Aranca Analysis

Several renewable energy projects announced/planned worldwide; APAC recording strong growth

Key Renewable Energy Projects

North America

The US

- Pecan Prairie Solar Project: Large-scale solar project in Texas, with installed capacity of 500 MW
- Project Owner: ConnectGen
- Project Completion Year: 2022

Mexico

- Durango Wind Farm Project: Includes construction of 154 MW wind farm in Durango, Mexico
- Project Completion Year: NA

South America

Brazil

- Enel Green Power Project: Includes four wind farms and one solar plant located across four states in Brazil
- Project Owner: Enel
- Project Completion Year: 2022

Chile

- Likana CSP Power Plant: 450 MW capacity
- Project Owner: Cerro Dominador
- Project Completion Year: NA

Europe

The UK

- Seagreen Offshore Wind Farm Phase 1: 1 GW capacity; located ~40 km off the coast of Scotland
- Project Owner: SSE Renewables
- Project Completion Year: 2022/23

The Netherlands

- IJmuiden Ver: 4 GW offshore wind development zone in the Dutch North Sea off the Northern coast
- Project Owner: NA
- Project Completion Year: 2030

Spain

- Caceres Solar Power Plant: Total capacity of ~590 MW
- Project Owner: Iberdrola SA
- Project Completion Year: 2022

APAC

India

- 8 GW solar power project
- Project Owner: Adani Group
- Project Completion Year: 2025

Australia

- 78 MW photovoltaic power plant
- Project Owner: Chint Solar ZheJiang Company
- Project Completion Year: 2025

Vietnam

- 350 MW Wind Farm Project in Soc Trang
- Project Completion Year: 2025

- 3400 MW ThangLong Ke Ga offshore wind farm
- Project Completion Year: 2027

- 3500 MW La Gan offshore wind farm
- Project Completion Year: 2030

Middle East

Egypt

- 1,000 MW wind power production plants; 400 MW solar power plant in Gulf of Suez - Minya
- Project Completion Year: 2021

Oman

- 1,200 MW solar power plant in Duqm, Al Wusta, Oman.
- Project Completion Year: 2022

Africa

Uganda

- 500 MW solar power plant in Moroto, Northern Uganda
- Project Completion Year: 2024

Zambia

- Three solar power plants with total capacity of 600 MW in Chibombo Chirundu and Siavonga
- Project Completion Year: 2021

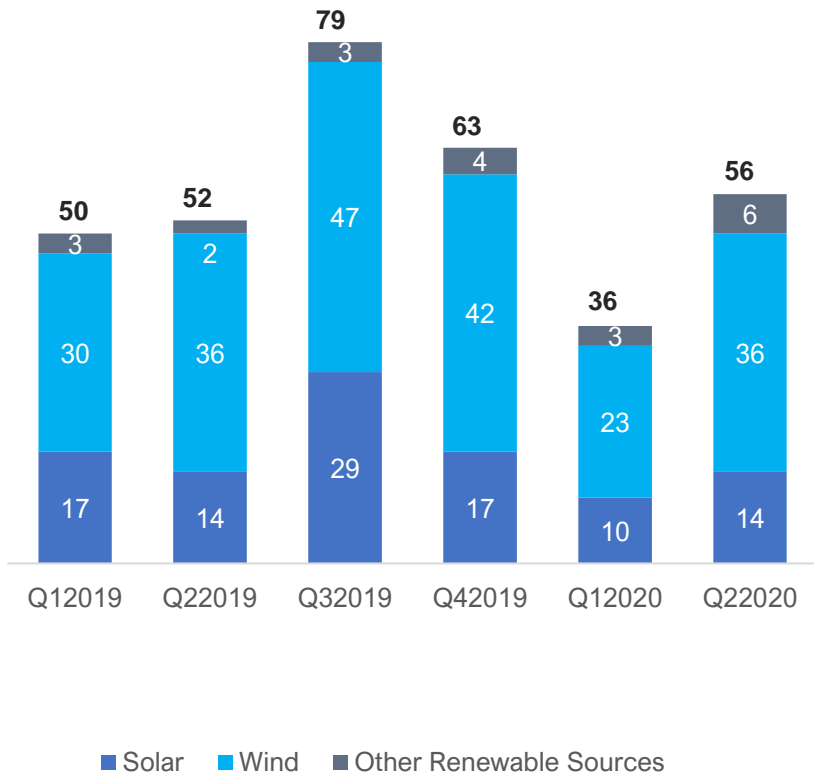
Source: Various NEWS Articles

Pandemic led to decline in FIDs on renewable projects in Q120; recovery recorded in 2Q20, driven by boost in FIDs for wind energy projects

Renewable Energy Investments

Final Investment Decision (FID) for Utility-scale Renewable Electricity Plants

USD billion



- FID is the final step before commencing the construction of any renewable energy project. Solar PV and onshore wind projects usually commence operations 6–12 months after the FID. Higher lead times are witnessed for other renewable projects.
- Investments in solar PV and wind projects declined the most in 1Q20 due to cost-cutting measures adopted by companies in this sector.
- Offshore wind projects witnessed highest FIDs in 1H20, as the lockdown did not impact major deals in Europe (the largest market).
- Investments in offshore wind projects would continue to grow in the near future due to an increase in the number of ongoing projects planned worldwide.
- Investments in other renewables grew in 2Q20, especially in major hydropower projects in China.

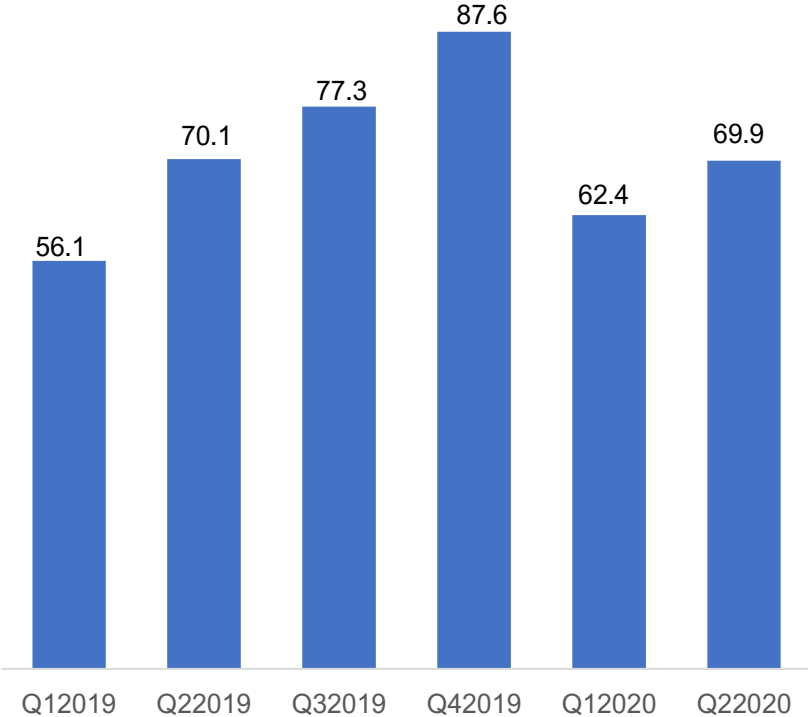
Source: International Energy Agency (IEA), British Petroleum (BP), Aranca Analysis

Pandemic led to drop in renewable energy capacity investments in 1H20; recovery likely in 2021

Renewable Energy Investments

Investment in Renewable Energy Capacity

USD billion



- During 2010–19, more than USD2.6 trillion was invested in renewable energy globally.
- The surge in renewable energy investments was driven by the reduction in the cost of solar and wind power by ~85% and ~49%, respectively, in the past 10 years.
- In 1H20, offshore and onshore wind projects attracted the highest investments.
- China is the largest investor in renewable energy, followed by the US.
- In 2021, global solar PV installation capacity is expected to exceed 150 GW, driven by further reduction in the overall cost of solar modules.
- New wind energy capacity additions will likely total ~84 GW.

Source: BloombergNEF, Aranca Analysis

Government policies/initiatives – Key growth drivers of global renewable energy industry

Government Policies/Initiatives



China

- In November 2020, the Ministry of Finance announced to increase the country's renewable power subsidy by 4.9% to RMB5.95 billion (USD905.7 million) for 2021.
- Wind farm operators and biomass power generators received overall subsidy of RMB2.31 billion (down 24.3% Y-o-Y) and RMB59.78 million (down 18.5% Y-o-Y), respectively, in 2021.
- Total subsidy for solar power projects was estimated to be RMB3.38 billion in 2020, up 56.8% compared with 2019.



Singapore

- The government announced plans to increase the total installed capacity of solar energy from 350 MW-peak (MWp) in 2020 to 2 GWp by 2030 and 5 GWp by 2050.
 - To achieve this target, the government aims to install solar panels of 60 MW capacity across 1,154 Housing Development Board (HDB) blocks and 46 government sites under the SolarNova program by 2023.



The EU

- In November 2020, the EU aims to increase the offshore wind capacity from its current level of 12 GW to 60 GW by 2030 and 300 GW by 2050.
- Offshore wind projects can be installed at all of the EU sea basins, including the Baltic Sea, the Black Sea, the North Sea, the Mediterranean Sea, and the Atlantic sea.
- The region aims to increase the capacity of ocean energy and other emerging technologies (such as floating wind and solar panels).

Source: International Energy Agency (IEA), British Petroleum (BP), Aranca Analysis

Significant technological trends foreseen in solar and wind energy sectors, such as adoption of digital technology, increase in capacity of wind turbines,...

Technology Innovation (1/2)

The renewable energy sector, including solar and wind energy, is recording significant technological developments, mostly focused on improving efficiency and reducing cost. Some of the technology trends observed in these segments are described below.

Key Technology Trends

Impact



Adoption of Digital Technology

- Almost all sectors are seeking avenues for digitization. The renewable energy sector is following this trend, especially to monitor and maintain solar and wind farms.
- Digital technologies such as big data, advance analytics, and resource management tools help in providing real-time data of wind and solar farms to improve their efficiency and reliability.



(Highly Positive)



Technology Advancements for Larger-capacity Turbines:

- Over the years, significant improvements have been noted in the design and capacity of wind turbines, driven by innovations in wind turbine technology.
- Wind turbine capacity has increased significantly over the years, with larger-capacity turbines (10 MW and beyond) being developed, supported by increased hub heights and rotor diameters (onshore: 170 m; offshore: >230 m).
- By 2022, with turbine sizes expected to increase rapidly, wind turbines with average rating of 5.3 MW are expected to be installed in onshore wind farms (current rating: 2.6 MW).



(Highly Positive)

Source: International Energy Agency (IEA), British Petroleum (BP), Aranca Analysis

...use of advance technology for operation and maintenance, and use of innovative materials, especially for solar energy

Technology Innovation (2/2)

Key Technology Trends



Advance Technology for Operations and Maintenance :

- Drones with HD and thermal cameras are being used by wind equipment managers for operating and maintaining wind farms.
- Drones display HD video footage and images of wind turbines from the air for damage inspection. Thermal imaging is used to identify internal abnormalities.



Innovations in Solar Equipment

- New technology such as light-sensitive nanoparticles can be revolutionary for the solar PV industry. Panels containing light-sensitive nanoparticles are estimated to have ~8% more solar conversion efficiency.
- Bifacial solar modules, which produce solar power efficiently from both sides, can also benefit the solar industry. Using this technology, ~30% more electricity is estimated to be generated compared with mono-facial solar modules.

Impact



Source: International Energy Agency (IEA), British Petroleum (BP), Aranca Analysis

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