# Clean Energy Market Assessment, By Type [Hydro Power and Tidal Power, Wind Power, Solar Power, Geothermal Power, Biomass and Waste, Nuclear Power, Green Hydrogen], By End-use [Residential, Commercial, Industrial, Others], By Region [Asia Pacific, Europe, North America, South America, Middle East and Africa], Opportunities and Forecast, 2016-2030F

Market Report | 2024-04-19 | 114 pages | Market Xcel - Markets and Data

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**Report description:**

Energy plays a vital role in global development, economy, and sustainability. It is crucial for powering industries, transportation, and infrastructure, and meeting the daily needs of individuals and communities. However, the increasing demand for energy has also raised concerns about its environmental impact, particularly in terms of greenhouse gas emissions and climate change. Globally 606.817 Quadrillion British Thermal Unit (Btu) of energy was generated in 2021 using fossil fuel and clean energy sources combined, hence owing to the surging energy demand, there is a pressing issue to cut down greenhouse emissions and adopt clean energy. Additionally, increasing measures to ensure sustainable development across the globe are prompting governments and industries to adopt clean energy to meet energy demand. Clean energy refers to energy derived from renewable and low-carbon sources that have minimal environmental impact. Clean energy sources include solar, wind, hydro, geothermal, biomass, and Nuclear, and energy generated using Green Hydrogen with each offering unique advantages. Total capacity additions for clean energy in 2022 were recorded at 110 GW making it to nearly 336.5 GW in 2023. The adoption of clean energy has been driven by declining costs of solar panels and wind turbines, technological advancements, supportive policies, and increasing public awareness. Governments, businesses, and individuals are embracing clean energy solutions to reduce carbon emissions, improve air quality, and achieve energy independence.
With the population being on the rise, a continuous uninterrupted power supply has become a necessity, and to address the adverse effects of climate change, and air pollution, and simultaneously promote sustainable development, governments across the world are building the necessary infrastructure to harness clean energy. Renewable energy sources form a major part of clean

energy sources and by the end of 2022, global renewable generation capacity amounted to 3372 Gigawatt (GW). As per International Energy Agency (IEA), global renewable capacity is expected to increase by almost 2400 GW between 2022 and 2027.

Furthermore, in 2022, wind and solar power were responsible for the majority of new energy capacity, comprising 90% of the net additions globally, out of which Asia contributed almost half of the new capacity, with China leading at the forefront contributing 141 GW. Hence, as the world grapples with the challenges of climate change and the need for sustainable development, clean energy stands as a crucial pillar for a greener and more resilient future.

Clean Energy Sources Offer Ways to Mitigate Climate Change

United Nations Framework Convention on Climate Change (UNFCCC), Paris Agreement aims to limit global warming to well below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5 degrees Celsius. More than 70 countries that cover about 76% of global emissions, including the biggest polluters like China, the United States, and the European Union have set a net-zero target, and have committed to achieving net-zero emissions, to balance between emitted greenhouse gases and removed or offset greenhouse gases. Countries like the United Kingdom, Japan, the United States, EU have set their net zero targets to be achieved by 2050.

Clean energy has emerged as a vital solution in the global pursuit of net-zero targets, as it offers significant reductions in greenhouse gas emissions. CO2 emissions level in 2021 stood at more than 6.3% above 2019 levels, displaying the vital need to cut down rising emissions. This has attracted investments from both governments as well as private players, such that clean energy investment is expected to reach USD 1.4 trillion in 2022. Hence, surging investment in clean energy to mitigate greenhouse gas emissions is propelling the market growth.

Technological Advancements Boosts Solar Energy

Declining costs of solar panels and associated components due to advancement in technology, have made solar PV more affordable and economically viable. Additionally, supportive government policies and incentives, such as feed-in tariffs and tax credits, have encouraged investments in solar PV projects. Moreover, the need to cut dependency on fossil fuel-based energy sources has led to surge in demand for solar energy. The year 2020 saw a substantial increase in solar PV installations, with a record-breaking addition of 138 gigawatts (GW) of new capacity, making the total installed solar PV capacity to 773 GW globally. Moreover, IEA estimates Solar PV additions will account for two-thirds of increase in renewable power capacity in 2023 and are expected to continue their growing trend. Global organizations like International Solar Alliance (ISA) with its 'Towards 1000' strategy aims to mobilize USD 1,000 billion of investments in solar energy solutions by 2030 to deliver energy access to approx. 1 billion people using clean energy solutions by installing 1,000 GW of solar energy capacity. This would mitigate global solar emissions to the tune of 1,000 million tons of CO2 every year.

Governments Push for Energy Transition Towards Clean Energy

Governments across the globe and their investments have played a central role in the rapid growth of clean energy production since 2020. The cumulative spending rose to USD 1.34 trillion in June 2023, an increase of 25% from 2021 levels. However, the spending isn't uniform with developed economies leading the charge to transition to cleaner energy sources, as example the European Union is responsible for two-thirds of government affordability support worldwide. However, the emerging and developing economies are also following a rising trend in end-user support spending, primarily driven by governments compensating energy companies to maintain stable prices amidst the energy crisis of 2020 due to COVID-19. As a result, governments in these economies have allocated a larger amount of funding (approximately USD 140 billion) towards consumer affordability measures compared to clean energy investment support (around USD 90 billion) since 2020.

The desire for energy security and independence coupled with growing recognition of the environmental and health hazards associated with conventional energy sources is pushing countries across the world to enact laws promoting clean energy. International organizations such as International Renewable Energy Agency (IRENA), the United Nations Environment Programme (UNEP) with its Clean Energy Ministerial (CEM), International Energy Agency (IEA) under Organization for Economic Co-operation and other independent decision-making body under United Nations Framework Convention on Climate Change (UNFCCC) brings together countries to share best practices and collaborate on clean energy policies.

For example, the United Kingdom (UK) Offshore Wind Sector deal launched in 2019 aims to quadruple the UK's offshore wind capacity by 2030. Moreover, the EU 'Fit for 55' has set a higher renewable energy target of 40% of total energy consumption by

2030, up from the previous target of 32%. In addition, regulations like the Australian Climate Change Bill, GX Green Transformation from Japan and national net zero emissions pledges announced by countries like India and Indonesia and China shows the global progressive outlook to boost clean energy market.

Private Sector Discovering New and Affordable Clean Energy Sources

In recent years, private companies have increasingly occupied a substantial share of the renewable energy market. They are involved in various aspects, including project development, financing, construction, and operation of renewable energy facilities, furthermore, private companies are actively investing in R&D to advance clean technologies such as Green Hydrogen and fuel Cells.

The private sector's primary involvement in renewable power extends beyond companies directly engaged in renewable project development. One significant activity is the adoption of corporate power purchase agreements (PPAs). These agreements allow companies to procure clean electricity directly from renewable energy producers, mitigating price risks and ensuring the use of sustainable technologies. In 2020, the capacity secured through PPAs reached nearly 25 GW , primarily concentrated in the United States and Europe, with solar and wind power projects being the dominant sources.

Corporates across the globe are taking initiative containing renewable energy targets and net zero emission initiatives, such as the RE100, the Climate Pledge, and mandates by government like the European Union's binding 2030 renewable energy targets drive the global Clean Energy market. To boost renewable energy governments are increasingly adopting auctions for centralized competitive energy procurement via renewable and clean sources. These auctions have been crucial in determining cost-effective prices for solar PV and wind projects, while promoting private sector competition and controlling policy costs.

Impact of COVID-19

Clean energy investment has received a substantial boost as a result of the recovery from the economic downturn caused by the Covid-19 pandemic and the global energy crisis response. Compared to 2021 annual investment in clean energy has experienced a more rapid increase than investment in fossil fuels in 2023 . Clean energy investment has grown by 24%, while investment in fossil fuels has seen a growth rate of 15%.

According to the World Economic Forum's Energy Transition Index, which measures the progress of countries towards clean energy transition, the global average score increased from 54.8 in 2015 to 62.7 in 2020, indicating an overall improvement in clean energy adoption.

Impact of Russia-Ukraine War

Russia is one of the global leaders in crude oil exports and ranked as the 3rd largest crude oil exporter in 2021. Europe, including countries like Germany, the Netherlands, and Poland, is a major end-user for Russian oil, however Russia Ukraine war created intense volatility in fossil fuel markets which resulted in an accelerated momentum behind the deployment of a range of clean energy technologies as a measure to reduce dependency to meet energy demand.

The ongoing war has prompted several countries to explore alternative sources of energy to reduce their dependence on Russian oil. European countries have been actively pursuing measures to decrease their reliance on Russian oil imports including exploring new trade routes, establishing energy alliances, and increasing imports from non-Russian suppliers and most importantly investing in clean energy.

The EU installed 47%  more solar panels in 2022 compared to 2021, solar energy generation increased by 25% overall in 2022. As per IEA approximately USD 2.8 trillion is projected to be invested worldwide in the energy sector in 2023, with over USD 1.7 trillion  earmarked specifically for the development of clean energy technologies.

Key Players Landscape and Outlook

Major companies are investing in research and development and expanding their range of clean energy options. Governments are encouraging private sector competition by using auctions to buy renewable and clean energy, which is benefiting not only established companies but also startups like Sunnova Energy Corp., Bright Source Energy, Kite Kraft, GSF Energy B.V.  Airturb, and Wind Catching systems. These companies are now able to offer both on-grid and off-grid solutions. Large corporates are going for corporate power purchase agreements (PPAs) that allow companies to procure clean electricity directly from renewable energy producers, mitigating price risks and ensuring the use of sustainable technologies.

For example, ACCIONA Energia entered into a strategic agreement with The Blue Circle to develop, build and operate its pipeline

of projects in Southeast Asia in September 2022 and in March 2023 signed Power Purchase Agreement (PPA) with the Office of Energy Regulatory Commission (ERC), Thailand for five wind projects totaling 436MW.Key Players Operating in Global Clean Energy Market

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