

Aquila Capital Insights 2024

CLEAN ENERGY - CYCLICAL OPPORTUNITY FOR LONG-TERM INVESTMENTS



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1. Introduction - Investments in clean energies have rarely been more attractive

The urgent need to tackle climate change is becoming increasingly apparent. Both the public and political decision-makers are well aware of the environmental challenges. The focus is on promoting renewable energies and reducing CO₂ emissions to slow down global warming. However, a purely idealistic approach is not enough to achieve these goals. We are convinced that solutions in the clean energies sector must make economic sense as well as ecological sense if we are to secure and increase prosperity. For years, we have been offering our clients attractive investment opportunities which enable them to contribute actively to the ecological solution. We are convinced that the current market situation, which is characterised by political and economic disruptions, offers a unique and attractive long-term opportunity to invest in clean energies. In the following, we demonstrate that the trend towards clean energies is continuing. We show how the latest developments in inflation, interest rates, commodities, CO₂ certificates and electricity prices are resulting in compelling investment opportunities. Furthermore, we do not see fluctuating electricity prices as an obstacle, but rather as an opportunity that boosts our strategy for battery storage.



2. The cyclical situation provides a tailwind for the expansion of clean energies

2022/23 was the perfect storm for many real asset investments. Many projects and portfolios had to contend with decreasing valuations, some of them significant, due to a combination of several factors. Much higher inflation and the associated rise in interest rates led to a significant increase in discount factors. There were also supply chain problems caused by the COVID pandemic and the war in Ukraine, as well as a number of other unfavourable factors that resulted in a material increase in capital expenditure. At the same time, commodity prices, particularly for energy, fell substantially in some cases, which in turn had a negative impact on the revenue side of projects. These effects have eased off since November 2023 and, in our view, will continue to abate and even reverse in some cases.

Inflation

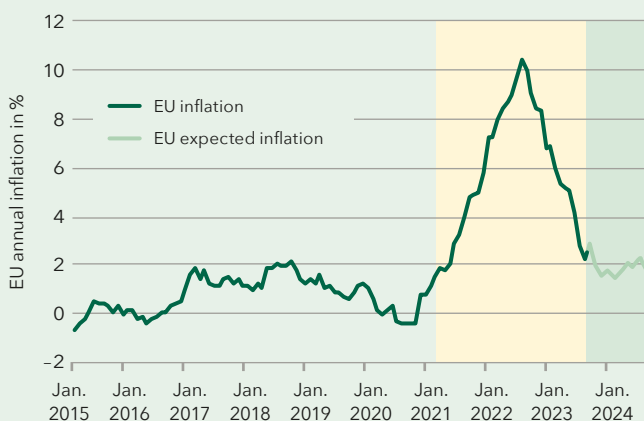
The inflation experienced in 2021-2023 resulted from a unique shock caused by the short-term disruption of global supply chains as a consequence of the coronavirus pandemic and the unprecedented fiscal support for the economy and households provided by governments. In the meantime, the imbalance between supply and demand has been redressed and inflation is falling.

Nevertheless, we do not expect inflation rates to return to the levels of 0 to 2%, as was the case between 2009 and 2020. The trend towards less globalisation and an increased focus on “nearshoring” or “friendshoring”, i.e. the relocation of production facilities close to their own domestic market or to friendly economies, will continue to generate price pressure. A second important aspect is the end of cheap energy from Russia, from which Germany in particular benefited.

Interest rates

The cycle of interest rate hikes is complete, and the base rate is gradually being lowered. We expect even long-term interest rates (10 years) to stabilise at between 2 and 2.5%. The rapid rise in interest rates led to a steep increase in financing costs with correspondingly lower project profitability. This effect is now reversing and boosting the profitability of clean energies. Furthermore, the risk-free interest rate is a key determinant of the discount factor for future cash flows. As interest rates fall, the discount factor decreases, which leads to higher valuations in the present value approach.

INFLATION



Source: European Central Bank, Aquila Capital forecast

INTEREST RATES



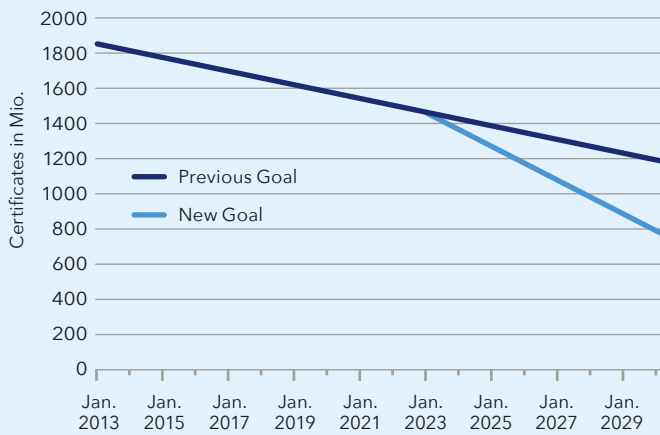
Source: European Central Bank, Aquila Capital forecast

CO₂ certificates

The CO₂ market in the EU is based on fixed emission limits set by the European Union and notably affects energy-intensive industries and the power generation sector. The falling supply has seen CO₂ prices multiply in recent years, and this has had a knock-on effect on the price of electricity generated from fossil fuels in particular. On the one hand, this is resulting in higher electricity prices for consumers, while on the other, it is making electricity generation from clean energies more attractive because these do not

emit CO₂. The enhanced relative attractiveness of renewable energies for electricity generation will lead to an increase in supply in the medium term. We see the fall in the CO₂ price over the past 12 months as a consolidation due to energy savings. In the medium term, we expect CO₂ prices to rise sharply, while supply will fall to zero in 2045.

CO₂ CERTIFICATES IN THE MARKET



Source: The European Emissions Trading System | German Environment Agency

PRICE OF CO₂ CERTIFICATES



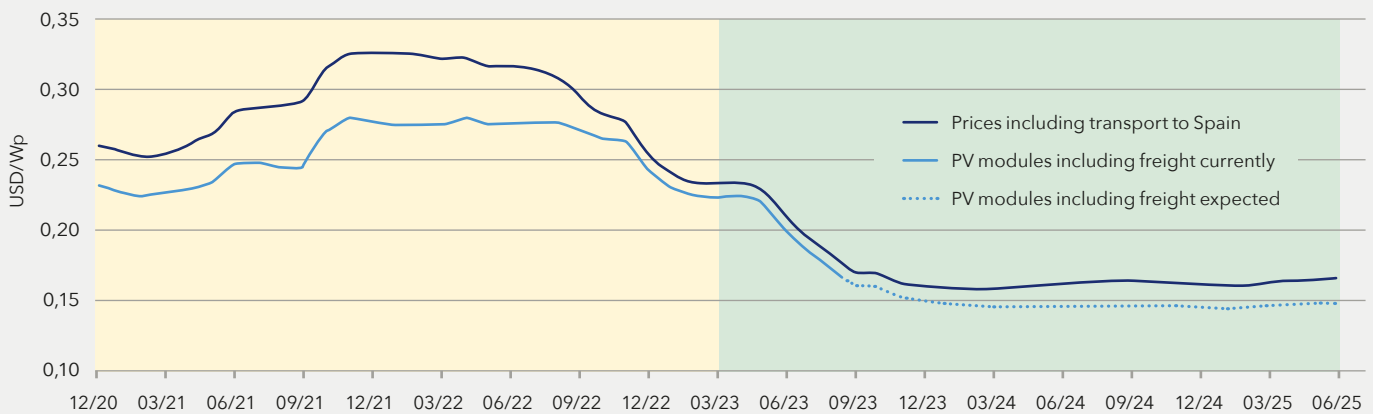
Source: EEX

Production costs

The production costs for photovoltaic (PV) modules have fallen by 50% since 2022, reducing construction costs for all future building projects. The drop in prices is due to the expansion of commodity extraction and processing, the restoration of supply chains in the producing countries and the competition between the

large PV module producers from China. Battery energy storage systems (BESS) have also fallen in price due to the recent decrease in commodity prices and increasing competition between manufacturers.

PRICE FOR PV MODULES INCL. SHIPPING



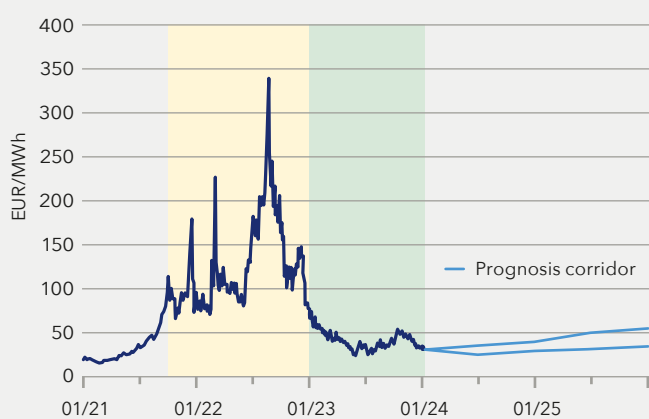
Quelle: Calculations Aquila Capital

Electricity prices

The lifting of the coronavirus protection measures marked the start of an economic upturn, which also affected electricity prices. In 2021, the electricity price increased to €180/MWh and peaked at €340/MWh in 2022 owing to the war in Ukraine. Newly concluded energy supply contracts have resulted in the required gas being delivered by sea as liquefied gas. The import of other fossil fuels such as oil and coal has also been reorganised. On

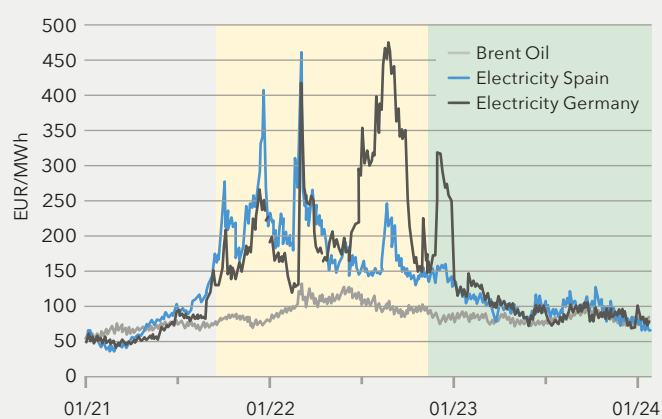
the demand side, companies have scaled down their production and invested in energy savings. Also consumers have been encouraged to heat their homes less and to use alternative forms of transport to their cars to save energy. As a result, electricity prices have fallen again, but have not reached pre-crisis levels. We expect electricity prices to remain at a higher level and to increase moderately in the future.

EUROPEAN NATURAL GAS FUTURE



Source: Refinitiv

ENERGY PRICES



Source: Refinitiv

One cyclical factor that is currently dampening prices but will soon cause them to rise again is the restrained demand for energy in Europe and China. Both regions are currently in a state of stagnation, with declining economic activity in industry and manufacturing. Once this crisis has been overcome, demand for energy will increase and lead to rising energy prices. Furthermore, we are facing structural challenges that are keeping electricity prices at a high level: given the geopolitical tensions, the risk of supply shocks and resulting gas shortages has increased sharply.

Longer transport routes for fossil fuels, volatile global markets and a limited number of reliable natural gas producers are further contributing factors. The risk of environmental impacts is also increasing. Long periods of drought led to the shutdown of nuclear power plants in France last summer, while extremely cold weather in Texas caused electricity prices to quadruple at the beginning of 2024. These risks have become a reality and are resulting in structurally higher energy costs due to increased liquidity and volatility risk premiums.

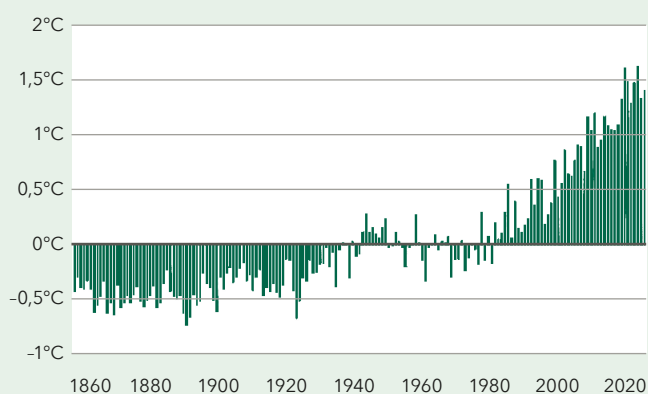


3. Climate change is accelerating and exerting pressure on policy makers

Decarbonisation of the global infrastructure, with a shift towards a clean, decentralised and independent energy infrastructure and the comprehensive electrification of our world, is in full swing and will continue to accelerate rapidly. The warnings of the consequences of climate change are well documented. The underlying trends of global warming¹ are already omnipresent and will grow

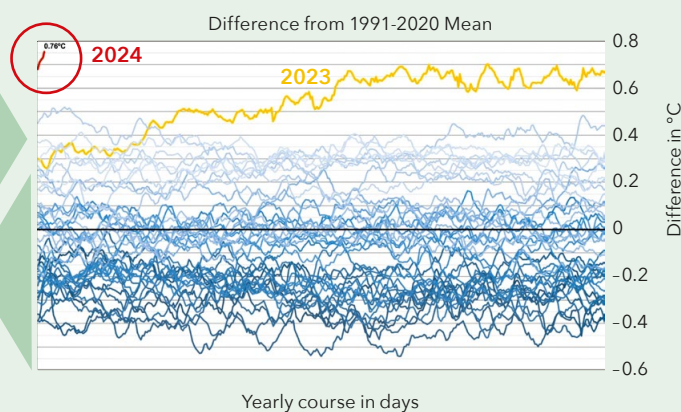
exponentially, with dramatic consequences for the environment, politics, society and the economy. The current scenarios and events underscore the need for action. The average global temperature rose from 1.16°C in 2022 to 1.5°C in 2023. The attainment of this historic global warming milestone of 1.5°C (officially 1.48°C) marked the beginning of a new climatological era for mankind. According to the latest forecasts, the 2.0°C mark will be reached by the 2030s at the latest if global CO₂ emissions are not reduced rapidly and extensively.

AVERAGE GLOBAL TEMPERATURE
IN DEGREES CELSIUS



Source: <https://www.umweltbundesamt.de/en/data/environmental-indicators/indicator-global-surface-temperature#at-a-glance>

AVERAGE GLOBAL SEA TEMPERATURE
(1982 - 2024)



Source: <https://de.statista.com/statistik/daten/studie/1387104/umfrage/ozeane-mittlere-temperatur/>

The expansion of clean energies and the comprehensive electrification of industry, construction and transport sectors are crucial elements for achieving the climate targets. In October 2023, the European Union further increased the short-term expansion targets for clean energies by 2030. Globally, a tripling of annual investments in decarbonisation will be required over the coming years if the climate targets are to be achieved by the end of this decade. In addition, regulatory barriers to approval procedures are to be reduced to shorten the average project development period. Another key aspect that legislators are focussing on is the grid infrastructure, which needs to be expanded on a large scale and adapted to future requirements.

Even without political support, clean energies have lower electricity generation costs than fossil fuels. Irrespective of the debate on climate policy, the build-out of clean energies is the most economically viable strategy for meeting the growing demand for electricity.

¹ Read our excursus on ocean warming in the annex

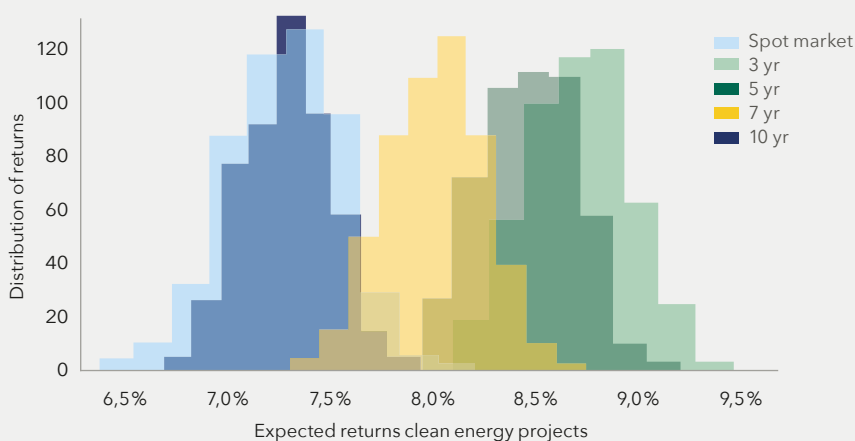


4. The investment opportunity - capitalising on opportunities in the current market environment

We are convinced that renewable energies are an attractive asset class in the current market cycle. Cyclical factors such as inflation, interest rates, commodities and electricity prices all indicate that now is a very good time to invest in clean energies. Additionally,

the asset class benefits from long-term factors such as the political will to combat climate change and to ensure energy security², which will support clean energies in the coming decades.

CURRENT ENERGY FORWARDS - LEVELS AND VOLATILITY PROVIDE NEW OPPORTUNITIES



Long-term electricity prices are often based on political expansion targets, which are usually not achieved. The gap between expectations and reality leads to increasing volatility. The chart on the left shows the distribution of returns for clean energy projects to hedge electricity prices over different terms. We think that active risk management offers opportunities in this dynamic environment.

Source: Aquila Capital Investmentgesellschaft mbH

In addition to the arguments already mentioned, we have identified two more specific arguments in favour of the clean energies sector that we regard as interesting opportunities: conservative electricity price forecasts and opportunities due to volatility.

² Read our excursus on energy security in the annex

Electricity price forecasts for clean energies are conservative

Long-term electricity price forecasts are largely based on the political expansion targets for clean energy generation. These targets will actually be achieved later than scheduled. Turmoil on the markets over the past 36 months – COVID, supply chain problems, postponement of financing due to high interest rates, low equity valuations for manufacturers and operators with such financing limitations, political barriers – have resulted in the expansion progressing much less quickly than planned. In addition, an end to coal-based generation is expected soon. The absolute contribution of nuclear energy remains largely stable³. At the same time, demand for electricity will increase further, despite short-term cyclical fluctuations. We expect further price-stabilising and price-increasing effects in the future.

Utilising volatility and diversification as an opportunity

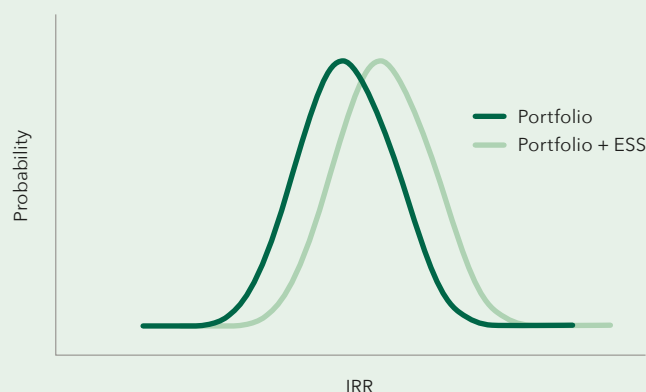
Volatile electricity prices offer opportunities for added value and returns through a targeted investment strategy in storage technologies and the hybridisation of clean energy generation projects. The hybridisation of renewable energy systems – complemented, for instance, by adding alternative technologies (such as wind/solar or hydropower/solar) – offers return opportunities through the use of weather-related fluctuations in production as well as positive economies of scale from joint use of the grid connection. Battery energy storage systems are a logical and attractive addition to both existing and planned projects. In almost all scenarios, storage systems result in better project returns. Aquila Capital pursues a diversified investment approach: strategic focus on Southern Europe and the Nordic countries, selective addition of high-return new markets in Eastern Europe, plus a combination of solar PV, wind, hydropower and storage technologies. In times of higher volatility, targeted portfolio diversification offers a high level of protection against valuation fluctuations.

REVENUE CORRELATION MATRIX

SOLAR Spain	1	0,58	0,97	-0,12
WIND Greece	0,58	1	0,67	0,25
SOLAR Portugal	0,97	0,67	1	-0,02
BATTERY	-0,12	0,25	-0,02	1
	SOLAR Spain	WIND Greece	SOLAR Portugal	BATTERY

Source: Aquila Capital Investmentgesellschaft mbH

IRR STANDARD DISTRIBUTIONS



Source: Aquila Capital Investmentgesellschaft mbH

A diversified portfolio with a balanced allocation in terms of both a geography and technology stabilises uncertainties from production, price and regulatory factors. Our portfolio diversification is complemented by the active management of electricity sales. A simple and permanent decision in favour of a rigid hedging strategy is no longer expedient in a dynamic market environment. The targeted design and structuring of power purchase agreements in terms of price, term and share of total electricity production versus

targeted market risk thus plays an important role in achieving sustainable portfolio returns.

In summary, the current environment, with a combination of short-term and long-term trends, offers the perfect entry point for investments in clean energies.

³ Read our excursus on nuclear energy in the annex

Annex

The warming of the oceans

The oceans are the earth's cooling system and regulate the global climate. Over the past 150 years, they have absorbed more than 90% of the excess heat generated by climate change. Research shows that the warming of the oceans started to gather pace in the 1960s. This is particularly problematic since warmer oceans have a self-reinforcing effect on the average global temperature that is difficult to disrupt.

Record-high sea temperatures from April to December were the main reason for the average temperature increase of 1.5°C. The release of heat stored in the Pacific Ocean by El Niño, which began in June 2023, shows just how complex climate events are. In the subsequent six months, a historically strong El Niño will release enormous amounts of heat from the oceans into the atmosphere, virtually guaranteeing that 2024 will be warmer than 2023. At 6.1 sigmas, the current sea temperatures are already far up on the 1982-2011 average, marking another record high. Warmer oceans intensify the weather patterns. The extra heat and moisture entering the atmosphere make storms more violent with heavier rainfall, stronger winds and more severe flooding. The ecological, but also the considerable economic damage, will inevitably trigger political pressure to act and further promote social acceptance of decarbonisation.

Renaissance of nuclear energy?

Since last year, voices in the European political debate, in Germany in particular, have increasingly been calling for an expansion of or return to nuclear energy as the solution to achieving climate neutrality and the most economically viable technology for meeting the growing demand for electricity. We do not take part in the political debate on nuclear energy. The debate on the construction of new nuclear power plants is an illusion from a pragmatic as well as an economic perspective. Development horizons, costs and construction times far exceed those for clean energies. Given the urgent need for action, a 'relaunch' of nuclear energy would not be able to make any appreciable positive contribution to combating climate change in the years to come. The three nuclear power plants currently under construction in Europe, Hinkley Point C in the UK, Flamanville in France and Olkiluoto 3 in Finland, are sobering examples of the misallocation of capital and resources in a nuclear energy strategy: Flamanville was due to go online in 2012 after five years of construction at a cost of €3.3 billion. The reactor is currently expected to be operational in 2024,

by which time the costs will have risen to €13.2 billion. Olkiluoto was planned in 2005 at a cost of €3.0 billion, with commissioning scheduled for 2010. The actual commissioning took place in May 2023, with costs currently standing at €11.0 billion. Hinkley Point was initially expected to cost £4 billion with a commissioning date of 2017. According to the latest projections, it will only be operational in 2027 and costs of £40 billion (10 times the original figure). Horizon Nuclear Power could also be mentioned as an example of a failed project. Originally founded as a joint venture between RWE and e.On in 2009, Hitachi acquired the project in 2012. Development costs totalling around £2 billion were spent before the project was ultimately discontinued in 2019/20. What all these projects, as well as plants developed in the past, have in common is that, even at the original planning stage, they only appeared to be economically feasible given regulated subsidy mechanisms and regulated electricity prices respectively. In all the above cases, costs for final storage and dismantling have not been taken into account.

Energy security

With the war in Ukraine and its associated impact on the energy market, the issue of energy security has now become a matter of great priority for many countries and governments. The gas price in particular became extremely volatile as a result of these developments, with negative consequences for the electricity market and the European economy in general. The threat to the energy system has increased significantly in recent years as society and the economy have become more and more dependent on energy.

A country's energy sovereignty is essential for security, economic prosperity and social cohesion alike. This finding provides considerable political tailwind for the expansion of clean energies and green technology. A diversified and modular energy system offers clear advantages in terms of resilience and reliability. Specifically, the EU member states adopted a new, more stringent version of the Renewable Energy Directive in 2023, which targets a share of at least 40% renewable energy sources in the overall mix by 2030. In context, this means doubling the share of clean energies in the EU compared to 2021. This ambitious goal will have a positive impact on the duration of approval procedures, helping to boost the pace of expansion.

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