AQUILA CAPITAL

# INFLATION HEDGING – RENEWABLES MAKE THE DIFFERENCE

## Abstract

After about a decade in which inflation despite massive monetary policy efforts was well below target, current developments are driving concerns among investors. Whilst the current high inflation rates should be considered relatively, hedging against price increases in the future is becoming increasingly important. Whilst real assets in energy infrastructure and commodity markets have historically correlated positively with inflation, renewable energies offer a number of further advantages. The inflation of energy prices, which is significantly higher than the consumer price index in the long term, the high capital intensity of renewable energies and factors resulting from the ambitious climate targets open up corresponding opportunities in the field of renewable power generation. The pricing mechanism on the electricity market in combination with the zero-cost resources of wind, sun and water offer an inflation hedge that exceeds the possibilities of other asset classes.

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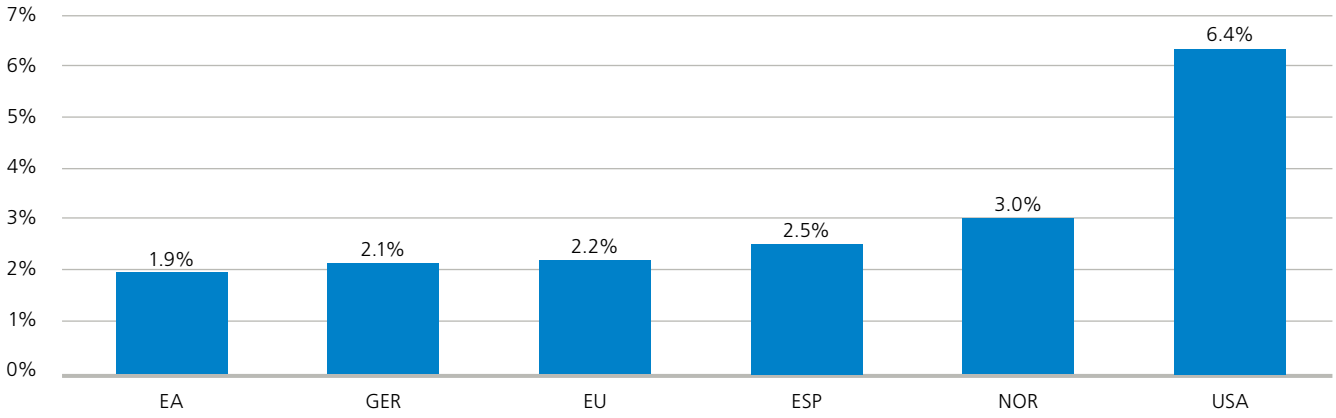
## 1. Return of inflation?

Inflation is understood to be an environment of rising prices, as a result of which the real value, i.e. the purchasing power of money, decreases. The primary task of central banks is to maintain price stability. In order to avoid the negative consequences of deflation and to maintain some leeway for monetary policy measures, the European Central Bank's goal was an annual inflation rate close to but below 2%. Similar to the FED in the US, the target was recently raised to 2% and instead of the annual inflation rate, the long-term average is considered to ensure the stability of the price development. However, since inflation rates in the past decade have mostly been well below this mark, the central bank has pursued and continues to pursue an extremely expansionary monetary policy. Key interest rate cuts and the massive purchase of government bonds significantly depressed bond yields. In this environment, equities and real assets in particular, which offer an attractive alternative to bonds, benefited. However, there are correspondingly high concerns about rising inflation and a reversal of the process.

In the past, even unconventional instruments like the so-called quantitative easing, hardly had any effect. Whilst on the one hand there are good arguments for a "new normal", other economists warn of a delayed onset of inflation. Thus, the current inflation rates are increasing concern among investors.

**Figure 1: Annual inflation rates June 2021[1]**




However, this raises the question of the reasons for the current price increases, which have not been achieved in the past ten years - despite the efforts of central banks.

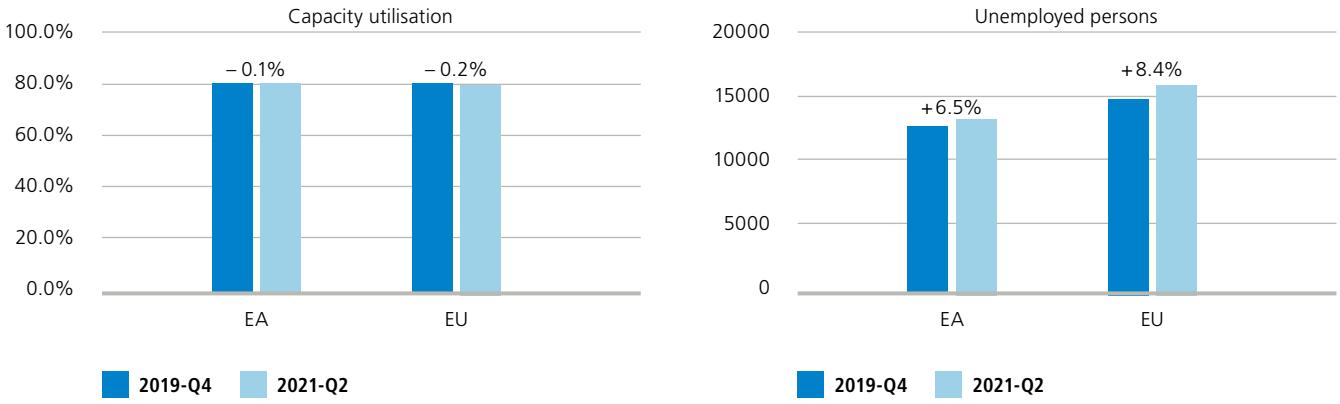
[1] *Eurostat (2021)*

## 2. Drivers of inflation progression

Current inflation rates have increased in particular due to the global pandemic and the increasingly resurgent economy. An early-cycle positive development of the economy is currently causing demand to rise faster than supply - also due to supply chains that are still disrupted. Whilst higher demand causes a rise in price levels, the current situation is largely determined by a massive increase in energy prices. As pre-crisis levels are reached, related base effects come into play. These are arithmetical based and come as a result of the price decline during the crisis and the incipient recovery. The connection can be explained well using the example of the oil price. If the price of oil falls from USD 60 to USD 10, this corresponds to a drop of about 80%. If, however, it rises back to the old level, from 10 USD to 60 USD, the price increase amounts to 500%. Accordingly, the question arises: how sustainable are the current inflation rates?

Base effects are only temporary one-off effects and also supply chain disruptions will disappear – supported by the progress of vaccinations. A general price-wage spiral is contradicted by the fact that the EU economy is only operating at 80% of capacity and unemployment figures have risen.

**Figure 2: Capacity utilisation and unemployment development pre-crisis level vs. expectations June 2021[2]**




Nevertheless, current monetary policy environment is highly biased towards an increase in the money supply that clearly exceeds economic growth, the theoretical result of which should be rising inflation rates.

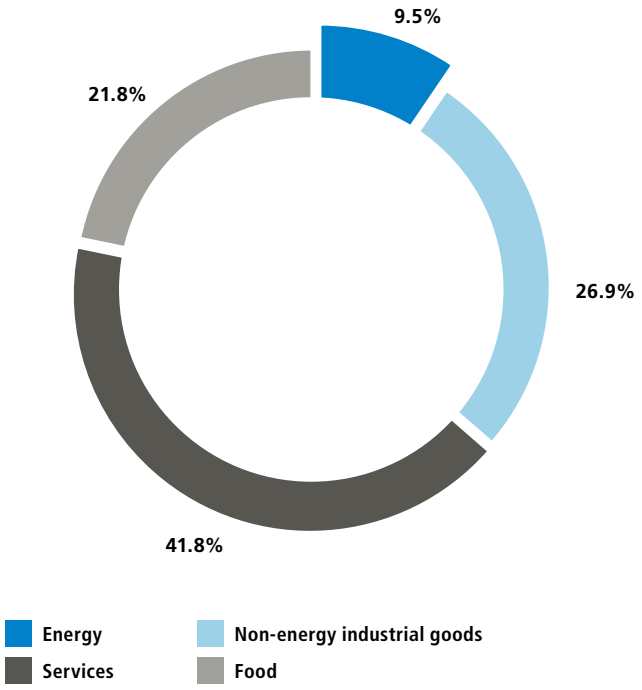
However, there are opportunities to hedge these developments, both historically and prospectively.

[2] *Eurostat (2021)*

## 3. Drivers of inflationary development

The inflation rate is calculated from the price changes of a defined basket of goods. The core components of this basket of goods are weighted when determining the inflation rate.

**Figure 3: Weighting of inflation components within the Eurozone (2021)[3]**




With a share of only 9.5%, energy prices play a rather subordinate role. Nevertheless, energy price changes have a significant weight in current inflation rates.

**Table 1: Inflation rate and energy component Eurozone (2021)[4]**

| | Weight | May 2020 | Dec 2020 | Jan 2021 | Feb 2021 | Mar 2021 | Apr 2021 | May 2021 | June 2021 |
|---|---|---|---|---|---|---|---|---|---|
| CPI | 100.0% | 0.1% | –0.3% | 0.9% | 0.9% | 1.3% | 1.6% | 2.0% | 1.9% |
| CPI ex. Energy | 90.5% | 1.4% | 0.5% | 1.5% | 1.2% | 1.0% | 0.7% | 0.9% | 0.8% |
| Energy Inflation | 9.5% | –11.9% | –6.9% | –4.2% | –1.7% | 4.3% | 10.4% | 13.1% | 12.6% |

In the table it can be seen that more than 50% of the inflation rate of 2% in May 2021 is influenced by the price increase of the energy component. If this influence is factored out, the current inflation rate would remain at just 0.8%, well below ECB's target value.

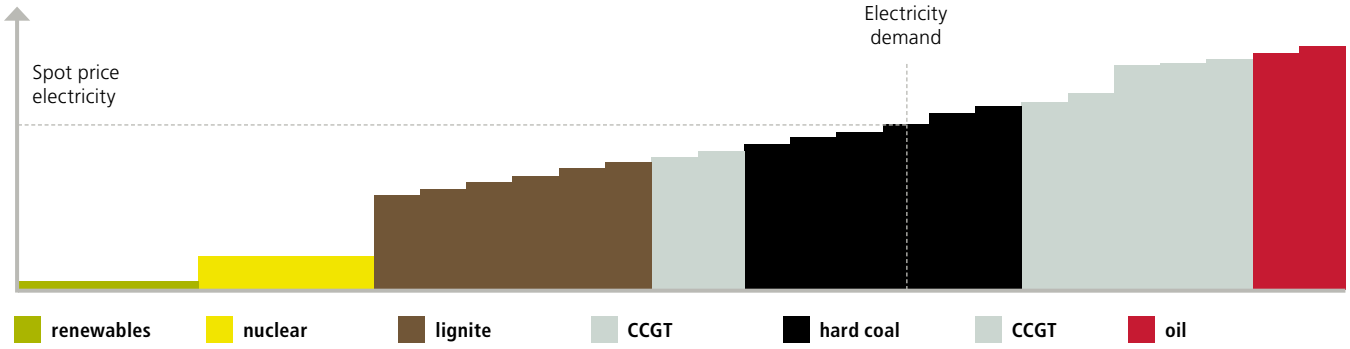
[3] *Eurostat (2021)*
[4] *Eurostat (2021)*

## 4. Renewable energies in an inflationary environment

### 4.1 Electricity market

Higher fuel prices – i.e. an increase in the price of the raw materials needed to generate energy, such as coal, gas and oil – have a direct impact on the electricity prices. This correlation results from how prices are formed in a liberalised electricity market. Power producers must send offers for their power plants at their marginal cost as recognized by the regulator. In this process, power plants are sorted in ascending order depending on their respective marginal costs (price bids); this is known as the merit order.

Figure 4: Merit-order model; plants sorted by marginal costs of running[5]




The last power plant in this order that is needed to cover demand – hard coal in the figure above – sets the hourly price for all units committed. This price is indeed the marginal cost, i.e. the variable cost (fuel, emission certificates) of this power plant. Despite daily and seasonal fluctuations, this results in a direct connection between the raw material costs and the electricity price.

Thus, if the fuel costs of conventional power plants rise, the price of electricity that can be achieved on the market increases, and the producers of renewable energy profit directly from this price increase. The great advantage is that the variable costs of wind, solar and run of river hydropower are almost zero, since the resources used (wind, sun, water) do not entail any costs. So, whilst thermal power plants compensate for higher costs via a higher electricity price, renewable plants benefit from higher revenues without the corresponding cost burden.

This correlation leads to inflation protection that is higher than the consumer price index and thus also overcompensates for inflation-indexed costs, such as technical maintenance. This advantage also comes into play against inflation-indexed investment products. In particular it should be emphasised that this is not a one-off effect.

Figure 5: Inflation rates of different components in comparison (12/2000-04/2021 ; 12M)[6]

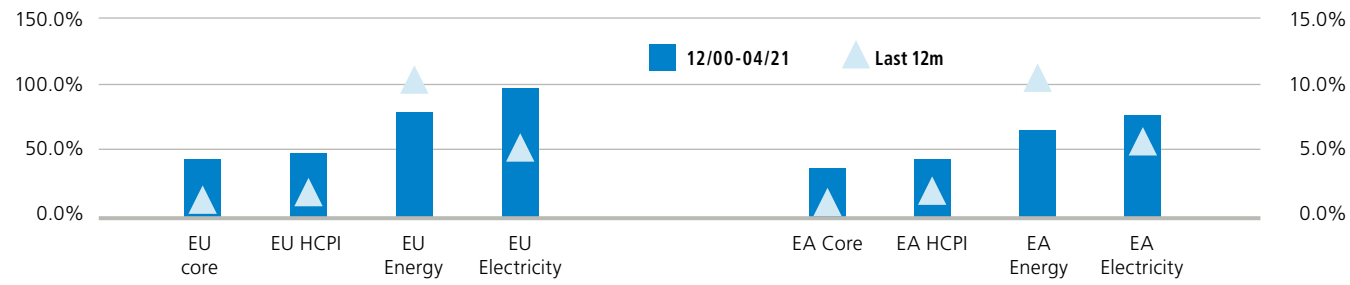
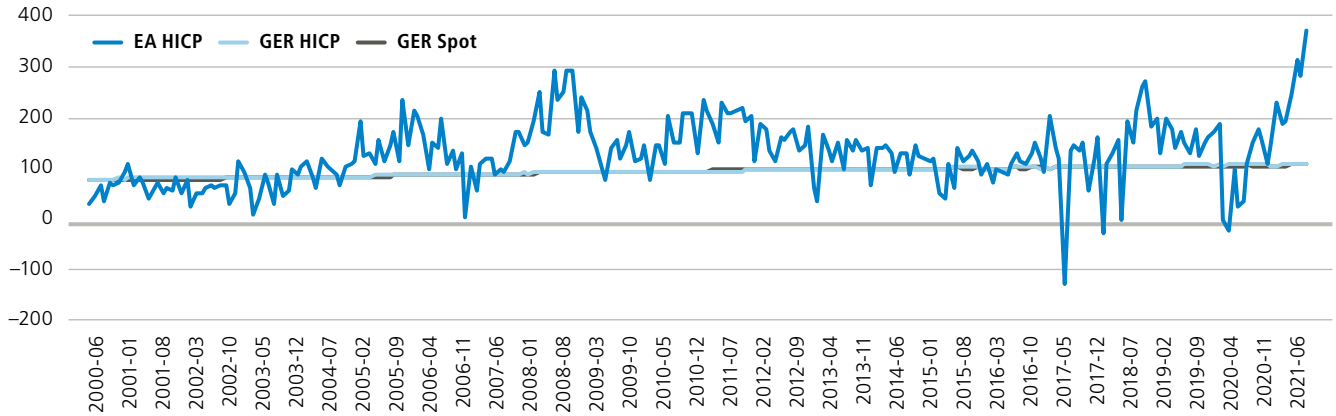



Figure 5 illustrates the development over a period of 20 years. In order to sharpen the view, the inflation component electricity is also included, which as part of energy inflation explicitly measures the price changes of electricity, gas, solid fuels and thermal energy. Compared to the consumer price index and core inflation[7], it can be seen that electricity prices have grown about twice as fast as overall inflation over time. This relation holds true for the European Union as well as the euro currency area. Moreover, the prices of the

[5] *Aquila Capital; illustrative*
[6] *Eurostat (2021)*
[7] *Core inflation=consumer prices minus energy and food*

electricity component also exceed the overarching energy inflation in the long run. Only due to the considerable influence of the oil price in the last 12 months does a stronger growth of energy inflation shows up in the short term. The direct effects of this correlation can be exemplified for the German electricity price in the long term.

**Figure 6: Harmonised consumer price index and German electricity spot price index (2015=100)[8]**



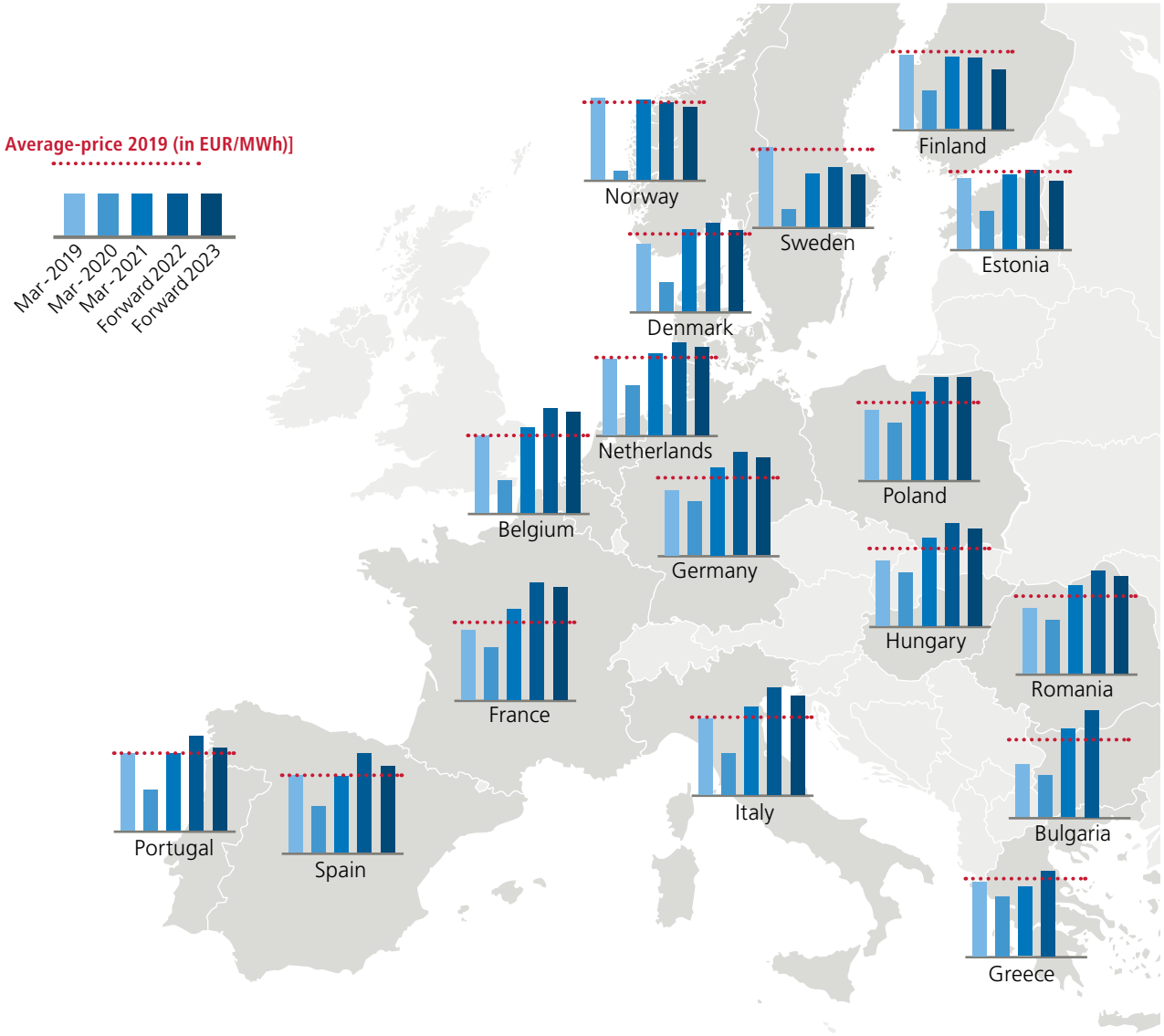

The electricity price shown corresponds to the exchange electricity price, which directly reflects the income from electricity sales. Although the development of the spot price is significantly more volatile over time, the growth rate is nevertheless at a significantly higher level. In view of the relatively long investment horizons for investments in energy infrastructure, the electricity price shows a significantly disproportionate correlation with an annual growth rate of more than 7% in the period under consideration. The inflation rates for Germany and the Eurozone are far below this, at 1.5% and 1.6% respectively.

[8] *Bloomberg (as of 26th of July 2021); Eurostat (2021)*

### 4.2 Power purchase agreements

The market for power purchase agreements (PPAs) is becoming increasingly important. For electricity producers as well as consumers, electricity supply contracts concluded at a fixed price offer effective protection against fluctuations in electricity prices. With regard to the above-mentioned market-dependent advantages, however, only indirect benefits are derived from rising electricity prices. PPAs are typically not indexed and thus do not directly benefit from rising inflation in terms of electricity prices. Nevertheless, secured off-take agreements have a number of advantages with only moderate disadvantages, e.g. due to indexed OPEX costs, in an inflationary environment. PPAs offer planning security for investors and have a significant impact on financing costs. Thus, a higher leverage effect can be achieved via lower borrowing costs. After the end of the contract term, adjustments can subsequently be made to a changed electricity price level. Therefore, there are no significant negative effects from a valuation perspective.

Figure 7: Historical electricity prices and electricity futures Europe[9]




[9] *ENTSO-E 2021; eex (as of June 2021); nasdaq (as of June 2021)*

Figure 7 illustrates, on the one hand, the advantages of PPAs in times of crisis, as they ensured stable payment profiles even during the demand shock in the pandemic, which had a massive impact on prices. On the other hand, it becomes clear that the current developments are significantly reflected in the futures prices for the coming years. Futures form the basis for PPA negotiations and allow higher prices to be realised through the inflationary effects. Whilst the effects in Scandinavia are more moderate due to high shares of renewable energies, especially scalable hydropower, the developments in the rest of Europe show electricity prices on the futures market that are significantly above pre-crisis levels. Similarly, PPAs in Scandinavia tend to have long-term maturities (normally above 10 years), whilst shorter maturities (10 years or less) dominate in Southern Europe. On the one hand, this results in secure payout profiles for investors and, on the other, PPAs can only gradually benefit from an inflationary environment, which also ensures stability from a valuation perspective. With regard to inflation expectations and the investor's orientation, tailor-made solutions can be made in this context. The trade-off between fixed prices in PPAs and the merchant component, which offers a direct hedge against the risks of rising inflation, leads to a high degree of flexibility in the design of investments in renewable energies.

Negative effects of indexed service provider contracts, e.g. for maintenance and repair measures, are very limited due to the high EBITDA margin of renewable energies. Furthermore, it is typical for PPAs to contractually fix only a certain share of the energy produced. The higher the merchant share, the greater the impact of the effects described. In this context, the merchant share offers a flexible adjustment to expected rising inflation rates. In phases of higher inflation, rising OPEX costs can accordingly be compensated by higher electricity prices, as renewable energy assets have high EBITDA margins (typically 70% to 80%) and the increase in OPEX is offset by the increase in revenues caused by realizing higher than expected inflation. Furthermore, a merchant share impacts equity returns positively in times of higher inflation, thus securing real dividend payments.

Due to increased EBITDA and typically hedged debt service, there is more cash to service debt and to distribute to equity. In this regard leverage is the main component. Long-term and high volume (60 to 70%) PPAs need to be combined with enough leverage to ensure a level of immunization towards higher than expected inflation. For unlevered projects PPAs should be shorter in nature (3 – 5 years) and for medium volumes (~50%). If the right balance between PPAs and leverage is struck, final investor real and nominal returns can be immunized against higher inflation.

### 4.3 Potential risks

Due to the long-term nature of investments in renewable infrastructure, inflationary effects on the discount rate are of particular importance in the valuation.

**Formula 1: DCF valuation approach**

$$NAV = \sum_{t=1}^{T} \frac{Dividend_t}{(1+rf + premia)^t}$$

Conceivable in this context is particularly an increase in the risk-free interest rate (rf), e.g. German government bond. A theoretical increase in financing costs due to a change in the interbank interest rate (part of premia in weighted average costs of capital) is avoided as interest is typically hedged. In this context EDHEC, a renowned provider of infrastructure indices and research, proposes that in general infrastructure can only be considered a partial inflation hedge due to CPI revenue pass-throughs are not universal and often capped.[10] Further it must be considered, whilst the risk-free rate and premia shows a high positive correlation, dividends are often imperfectly correlated with inflation. Thus, the correlation of the dividend determines the effect and that depends on the asset class. As explained above revenues of renewables show an increase which historically exceeds significantly this of CPI. Furthermore, must be considered that the current overshoot of inflation is linked to temporary effects, whilst showing the resilience of Renewable Energy Investments.

[10] *EDHEC (2021)*

**Figure 8: Historical development of German government bond, German CPI and EURIBOR[11]**

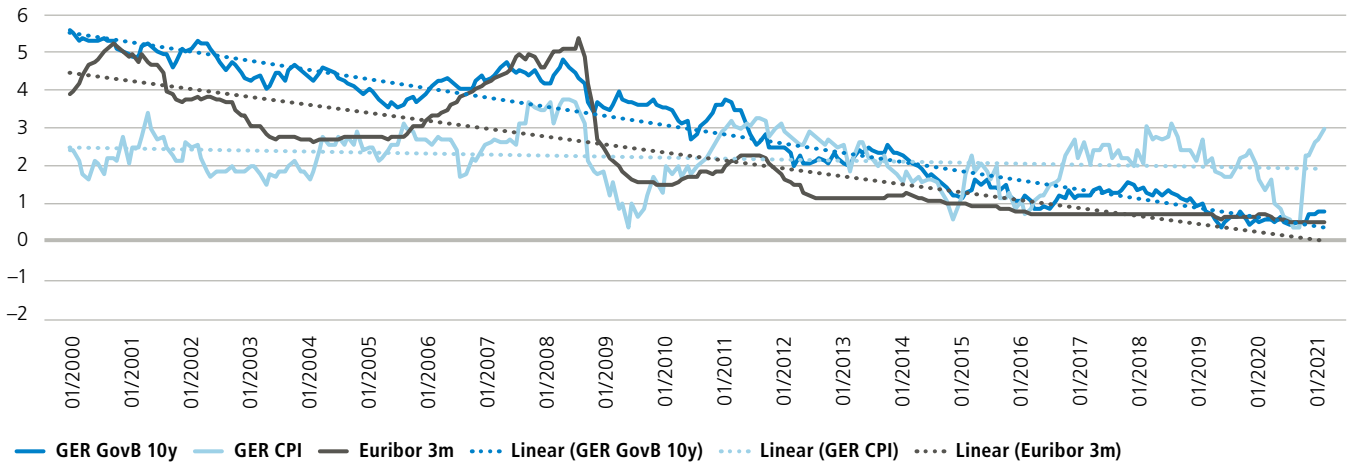



Figure 8 shows, using Germany as an example, that in the past 20 years the development the of risk-free rate as well as debt interest rates have been relatively decoupled from inflation with a clearly falling trend. Noticeable changes would therefore require interest rate steps by the European Central Bank.

**Figure 9: Inflation expectations (Euro inflation swap zero coupon 5 and 10 years (01/2010-06/2021))[12]**

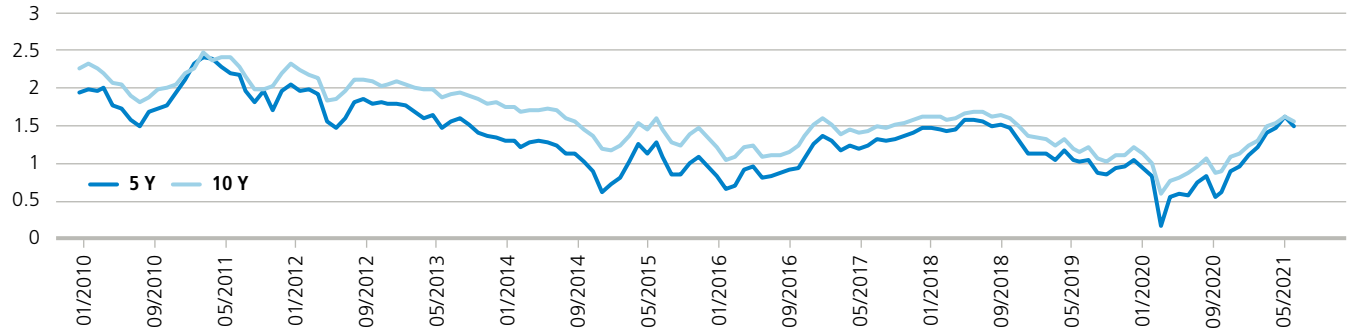



Figure 9 illustrates market based future inflation expectations which increased significantly in the beginning of 2021. Nevertheless, they are with about 1.5% quite below ECB's target. Moreover, they went down in recent weeks supporting the argument of a temporary effect.

Given that the inflation rate has not been stable, unemployment has risen, new debt has increased significantly as a result of the crisis, and debt ratios within the EU are strained overall, the probability of higher interest rates is very limited. In addition, the ECB has recently made adjustments to the inflation target. The increase of the target rate to 2% as well as the orientation towards a long-term mean increase the ECB's monetary policy leeway. In addition, other asset classes are subject to the same criteria, whilst the positive effects on cash flows for renewable energies compensate for other effects. Government bonds, on the other hand, do not offer effective protection against a rising interest rate environment, which would require stable, overshooting inflation.

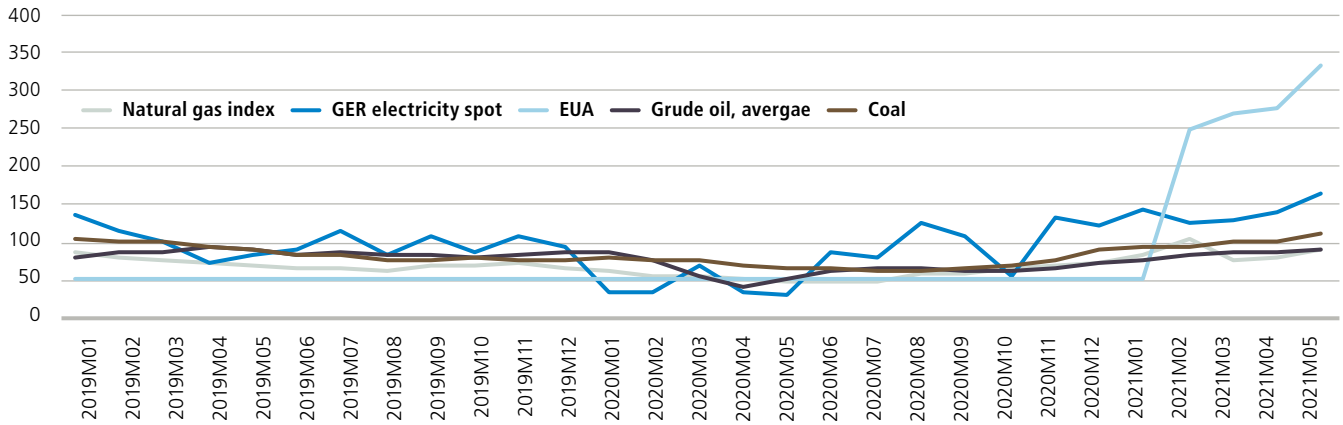
Currently higher material and construction costs could burden assets under construction. In this context, contracts at fixed prices offer protection. As already described above, this is temporarily limited by the varying recovery of the economy and still partially disrupted supply chains. With the return to normality, pre-crisis levels will level off again, as the price increases are not fundamentally justified, e.g. by limited supplies.

*[11] Bloomberg (2021)*
*[12] Bloomberg (as of 26th of July 2021)*

### 4.4 Additional price drivers on the electricity market.

Increasing climate targets – in particular the Green Deal within the EU – will additionally increase the earnings potential of renewable energies independently of inflation but with the same direction of effect.

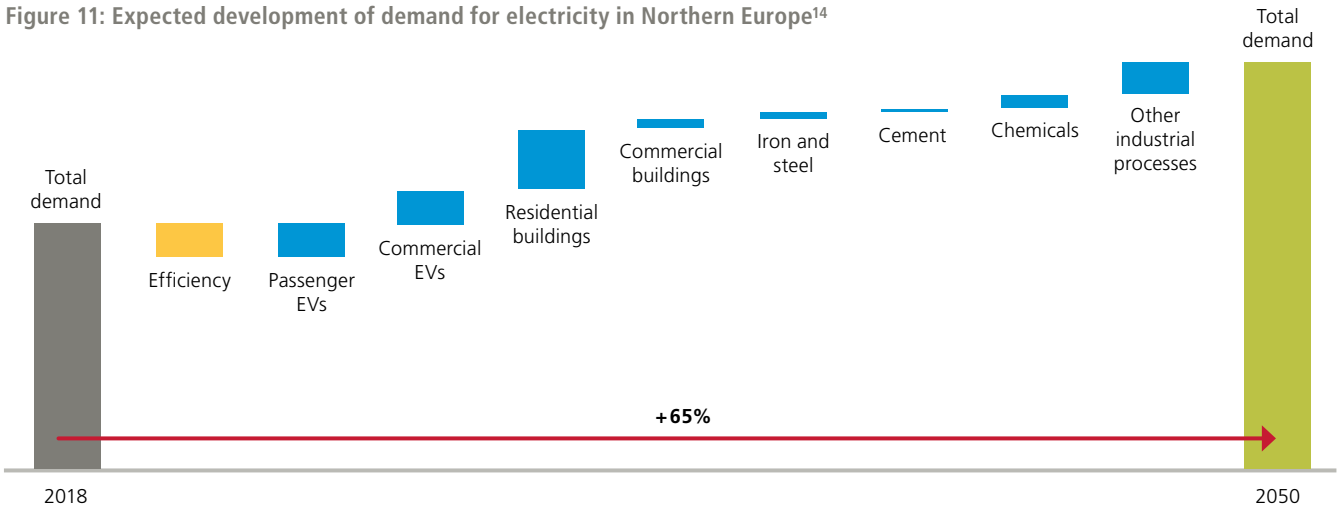
Figure 10: Index fuel costs, emission certificates and German exchange electricity price[13]




Analogous to the effects of rising fuel costs, European Emission Allowances are additional increasing the marginal costs of conventional power plants. In this context, further increases in the electricity price level are justified by the cost side. In this effect, too, renewable energies benefit from higher revenues whilst no additional costs are incurred. In order to achieve the raised climate targets, an increase in certificate prices is expected as more sectors get decarbonized.

In addition, the need for electrification of further sectors will massively drive the demand for electricity.

Figure 11: Expected development of demand for electricity in Northern Europe[14]



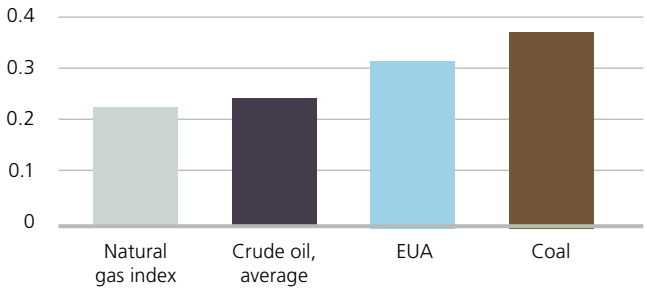

A significant increase in demand for electricity, as illustrated in Figure 11, will keep inflation in the energy component above the consumer price index stable in the future.

[13] *Worldbank, Bloomberg (2021)*
[14] *BNEF (2021)*

## 5. Conclusion

Already in past phases of high inflation, investments in real assets within the energy sector as well as the commodities sector proved a positive correlation with the inflation rate[15]. Renewable energies benefit from rising electricity prices with no burden on the cost side in relation to the use of resources. The fact that electricity markets are marginal and power producers must send their offers at their recognized marginal cost as well as growth rates of energy inflation exceeding the consumer price index have a significant positive effect on the earnings potential of renewable electricity generation plants. The merchant share and leverage determine the sensitivity on returns, whilst debt interest rates are typically hedged.

**Figure 12: Correlations to the German exchange electricity price[16]**




A high positive correlation of the electricity price with fuel costs as well as further price-increasing effects open up opportunities in the renewable energy sector that clearly exceed the potential of other asset classes.

*[15] cf. Invesco: „Concerned about inflation? These real assets could help" (2021); MAN Institute:"How should investors reposition their portfolios in the face of heightened inflation risk?" (2021)*
*[16] Worldbank, Bloomberg (2021)*

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