ABN·AMRO

Group Economics | Financial Markets & Sustainability Research | 10 October 2022

Marketing Communication

SustainaWeekly

The implications of the war on the energy transition

- **Economist: The war and energy crisis look like being a near term negative for the transition. In Germany, renewables – but also coal – have helped to replace gas. Indeed, IEA projections point to increased EU coal consumption for 2022 as a whole. However, we remain of the view that we are likely to see a quicker energy transition to 2030 compared to a pre-crisis baseline.**

- **Strategist: We highlight three main pitfalls of the methodologies applied by the Science-Based Targets Initiative (SBTi): (i) the lack of a common baseline year (ii) no re-assessment of targets is required in case companies miss targets and (iii) targets estimated using methods that require assumptions on market share are also not re-calculated on new information.**

- **Social Impact: The EU reports on the impact of its pandemic programme: Support to mitigate Unemployment Risks in an Emergency (SURE). They show that EUR 91.8 bn in social bonds was used to protect jobs and incomes. The EU claims that around 1.5 million people were prevented from unemployment in 2020. We assess the robustness of this estimate.**

- **Sectors: The European Parliament voted in favour of leniency against green hydrogen produced by grid power. The idea is to scrap the hourly matching principle and move towards a monthly, quarterly or even annual matching of renewable power to the electrolyser. This makes sense given EU's ambition to reach 10mn tonnes of renewable hydrogen by 2030.**

- **ESG in figures: In a regular section of our weekly, we present a chart book on some of the key indicators for ESG financing and the energy transition.**

In this week's SustainaWeekly, we start by reassessing the implications of the war on the energy transition given recent economic data. Our key conclusion is that it could be a near term negative but a medium term positive. On the one hand, we are seeing a regression to coal in the near term, on the other hand renewable targets for the coming years have been stepped up. We go on to review the different methodologies applied by the Science Based Targets Initiative (SBTi) to validate targets. We then turn to the social impact of the EU's SURE programme and the tweaking of the rules on what constitutes green hydrogen. Enjoy the read and, as always, let us know if you have any feedback!

Nick Kounis, Head Financial Markets and Sustainability Research | nick.kounis@nl.abnamro.com

The implications of the war on the energy transition

Nick Kounis – Head Financial Markets & Sustainability Research | nick.kounis@nl.abnamro.com

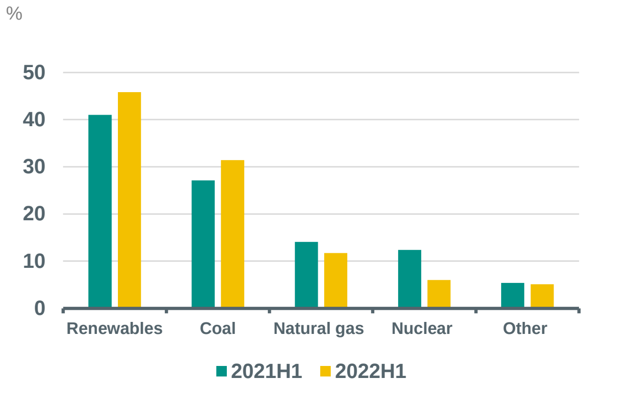
- **In March of this year we assessed the impact of the war and energy crisis on the transition**
- **Our key conclusion was that it could be a near term negative but a medium term positive**
- **Given recent data and analysis we think this judgement remains valid**
- **Data on Germany's power mix for H1 show renewables – but also coal – have helped to replace gas**
- **Indeed, IEA projections point to increased EU coal consumption for 2022 as a whole**
- **However, we are likely to see a quicker energy transition to 2030 compared to a pre-crisis baseline**

One of the themes in Sustainability this year has been the implications of Russia's invasion of Ukraine and the subsequent energy crisis and cost of living crisis for Europe's pathway to net zero. Would it speed up the transition because of the extra momentum provided by the need to achieve independence from Russian gas? Or would it distract governments from a focus on climate policy, while seeing a regression to more carbon-intensive fuels? Our judgement in several articles immediately following the invasion was that the crisis could be a near term negative, but would likely see a quicker energy transition to 2030. In this article we review this conclusion on the basis of recent data and developments.

A look at Germany's shifting energy mix

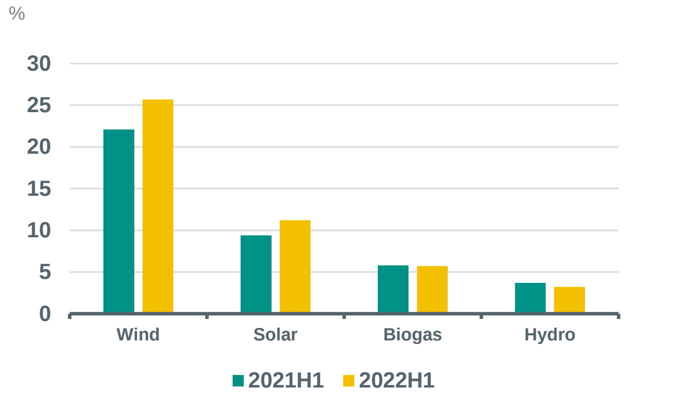
One interesting point of departure is data on the energy mix in Germany's power sector in the first half of this year compared to the first half of last year. We set out the data in the charts below. The share of renewables has increased significantly (see chart on the left), driven mainly by wind and to a lesser extent solar (see chart on the right). However, the share of coal has also increased materially and coal-generated electricity that was fed into the grid increased by 17.2% compared with the first half of 2021. On the other side of the coin, nuclear (reflecting the shutdown of three nuclear power plants) and natural gas (reflecting of course the surge in price and restrained supply) have seen their shares decline. So the good news story is the rise in the renewable share, the bad news is the increased use of coal, which emits roughly 50% more CO2e (carbon dioxide equivalent) than natural gas.

Energy sources in German power production



Source: Destatis, ABN AMRO Group Economics

Renewable breakdown in German power production



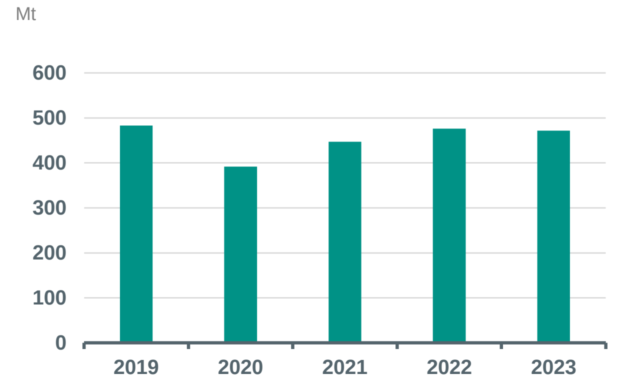
Destatis, ABN AMRO Group Economics

Coal consumption on the EU level is on the up

In line with the trends seen in Germany, coal consumption at the EU level is also set to climb this year (see chart below on the left). This would build upon a post-Covid rebound in 2021. The IEA estimates that coal consumption rose by 10% in the first six months of 2022, driven by demand from the power sector, which increased by an estimated 16%. These trends are set to have continued in the second half of this year. Indeed it notes that a number of EU states are extending the lifetimes of coal plants scheduled for closure, reopening closed plants or raising caps on the working hours of coal plants. This of course all reflects the increasingly urgent need to replace Russia gas. Although LNG imports and energy efficiency measures have been a big part of the story. Switching to other fossil fuels where possible is a way to make up the remaining deficit in the short term. For industry, a shift to oil is visible, while in the power sector, it looks to be coal.

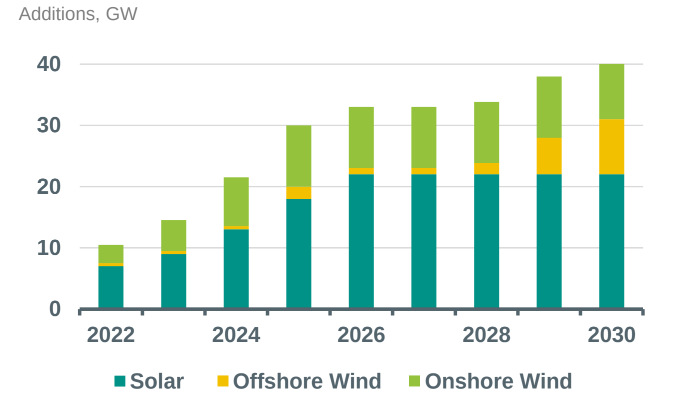
Overall, coal consumption is estimated to climb by 7% this year according to the IEA, whereas it looks set to remain at high levels next year. Pre-crisis, the IEA had expected EU coal consumption to run down at a compound average annual growth rate of -8.5% between 2021 and 2024. So clearly the war has meant that the transition away from coal has stalled at least through to next year. However, we do expect a significant change in trend from 2024, given the ambitious plans, which have been set out. In the meantime, it seems that power sector carbon emissions are on the up. According to estimates from Carbon Monitor, overall EU emissions were up by 3.6% in the first seven months of this year compared to the same period last year. Power sector emissions were up much more strongly (+9%) but this was partly offset by a significant decline in residential emissions (-8.3%).

EU coal consumption



Source: IEA, ABN AMRO Group Economics

Germany's planned renewable energy capacity



Source: German government's Easter Package

Speeding up the transition

Indeed, both the European Commission (EC) and a number of member states have stepped up their ambitions over recent months. The EC earlier this year set out a plan increase biomethane (doubling the previous objective), accelerating renewable hydrogen ambitions, front-loading the roll-out of rooftop solar PV systems, heat pumps and wind capacity, while increasing energy efficiency. The EC proposes steps to facilitate the above ambitions. For instance, the EC is bringing forward the implementation of the Innovation Fund, with the aim of supporting the switch to electrification and hydrogen. It is also looking at the simplification and shortening of permitting for renewable energy projects. The Commission will also help further develop the value chain for solar and wind energy and for heat pumps. There are also multiple examples of increased ambition at a national level. For instance, Germany set a new target of 80% for renewables power by 2030, from 65% previously. Overall, we remain of the view that we are likely to see a quicker energy transition to 2030 compared to a pre-crisis baseline.

There is still room for improvement in SBTi's target validation methodologies

Larissa de Barros Fritz – ESG & Corporates Strategist | larissa.de.barros.fritz@nl.abnamro.com

- **We have reviewed the different methodologies applied by the Science Based Targets Initiative (SBTi) to validate targets**
- **We also highlight three main pitfalls of the current approach: (i) the lack of a common baseline year, which makes comparison of different company targets challenging, (ii) the fact that no re-assessment of targets is required in case companies operate above their science-based decarbonization pathways, and (iii) targets estimated using methods that require assumptions on market share are also not re-calculated once new (and actual) information becomes available**
- **Missing targets or a late baseline could prove disruptive to a company's financial health, as also shown in the case of Dutch airport company Royal Schiphol Group**

We have extensively written about the Science Based Targets Initiative (SBTi) (see for example, one of our previous notes here). The SBTi is a partnership initiative between Carbon Disclosure Project (CDP), the United Nations Global Compact (UNGC), the World Resources Institute (WRI) and the World Wide Fund for Nature (WWF). It was launched in 2015 (the same year of the Paris Agreement) and has as its main goal to validate whether a company's targets are in line with what the latest climate science findings deem necessary to meet the goals of the Paris Agreement – limiting global warming to well-below 2°C above pre-industrial levels and pursuing efforts to limit warming to 1.5°C. Below we have highlighted a brief overview of the methodology currently used by the SBTi in its process to validate targets, as well as potential shortfalls, where we see room for improvement.

The methodology used by the SBTi

The SBTi makes use of mainly three types of methodologies when validating alignment of targets to the Paris Agreement. All of them rely on so-called "carbon budgets" (or greenhouse gas budgets), which are amounts of carbon emissions that can be emitted over a period of time by a company before warming exceeds a specific temperature thresholds (such as 1.5°C). These carbon budgets need to then be allocated to the company, and this can be done through several different methodologies. Below we have included a brief explanation of three methods used by the SBTi.

The Sectoral Decarbonization Approach (SDA)

This method involves allocating carbon budgets based on the sector that the company operates in. The SDA uses the International Energy Agency (IEA) decarbonization pathways, comprising emissions and activity projections, to compute sectoral intensity pathways. The allocation is based on initial emission intensities (such as CO2/kWh) and companies' market shares. The idea is that the sum of all individual companies' emissions targets does not exceed the total carbon budget consistent with a decarbonization trajectory aligned with, for example, a 2°C mitigation scenario.

The IEA decarbonization pathways (and more specifically, the Energy Technology Perspectives) includes three emissions scenarios that run from 2014 and until 2060: the Reference Technology Scenario (RTS), the 2°C Scenario (2DS) and the Beyond 2°C Scenario (B2DS). It is mainly a bottom-up model, that relates energy supply to certain sectors. These sectors are, in principle, energy-intensive sectors, including for example power generation/utilities, iron and steel, cement, chemicals and petrochemicals, road transportation/aviation, etc. It therefore does not include all sectors (e.g. agriculture). A company operating in one of those sectors can rely on the IEA's decarbonization path to estimate their total carbon budget.

In contrast to other methods (see more below), the SDA relies on a sector differentiation approach, and that can be particularly interesting as it therefore accounts for the fact that some sectors decarbonise faster or slower than the global average, and this is reflected therefore in a company's carbon budgets. You can find the full methodology for the SDA method here.

The Absolute Contraction Approach (ACA)

Contrary to the SDA, the ACA method relies on absolute emissions reductions in line with global decarbonization pathways. Necessarily applied for companies that operate in sectors that are not covered by the SDA, the ACA assumes a minimum equal percentage of emission reductions for every company. Under a 1.5°C scenario, for example, the ACA assumes an equal absolute reduction target for all companies of 4.2% per year. These are based on a series of scenario envelopes, which involves estimating temperature limit probabilities as per e.g. IPCC, emission budgets, year of peak of emissions, etc. The linear reduction rates are calculated based on the timespan 2020-2035, which aligns with the lifetime of a science-based target that is assessed by the SBTi and minimizes distortion. The full methodology can be found **here**.

According to SBTi, this is the approach that the vast majority of companies setting science-based targets choose: two-thirds of the targets approved by the SBTi in 2020 used the ACA method to set targets limiting global warming to 1.5°C.

The Greenhouse gas emissions per unit of value added (GEVA)

The SBTi has recently moved away from this approach. Nevertheless, it is still currently applied in some cases, but exclusively to scope 3 (that is, indirect) emissions. Contrary to ACA, the GEVA method does not assume the same emission reduction for every company, but instead equates a carbon budget to total GDP and assigns a company's share of emissions via its gross profit, since the sum of all companies' gross profits worldwide equate to global GDP. Applicability of this method is currently restricted to modelling of scope 3 targets, as it may not constrain global emissions to a specified budget in its current formulation. Under the GEVA method, companies are required to reduce their GEVA by 7% per year (compounded). The 7% year-on-year reduction rate is based on an absolute emissions reduction of about 75% by 2050 from 2010 levels (baseline year).

What are potential shortfalls from these methods?

Using also as basis the paper by Rekker et al. (2022) named "Measuring corporate Paris Compliance using a strict science-based approach" (see full paper **here**), we have reviewed a few criticisms related to the three aforementioned methodologies.

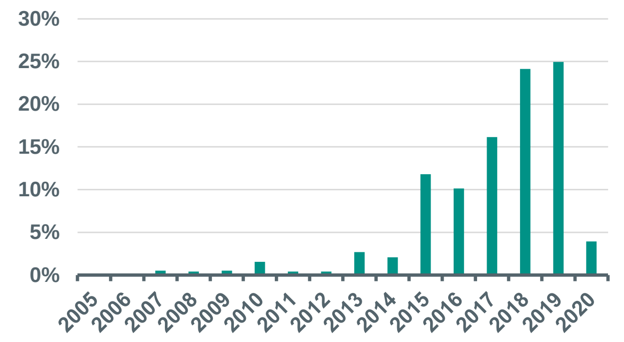
Differences in baseline years

One of the biggest criticism related to the methodology currently applied by SBTi is the fact that the base year can vary depending on the approach being applied. For the SDA method, it is usually 2014 if following the IEA B2DS scenario. However, the ACA method (which is used by around 2/3 of the targets validated by SBTi) could allow for more recent years being used as baseline (e.g. 2020). As shown in the chart on the next page, there is currently a wide variety in terms of baselines being used by companies that have their targets validated by the SBTi.

The difference in terms of baseline year results in two main issues: firstly, different baselines result in lack of comparability amongst targets. This ultimately means that it is very hard (or nearly impossible) for investors to assess (i) the ambition of companies against their own peers and (ii) the extension of ambition aligned with the Paris Agreement (that is also due to the fact that companies make use of different methodologies – hence, hard for investors to judge which decarbonization pathway is more or less ambitious). On the latter point (and that brings us to the second main issue), Rekker et al. argue that the optimal baseline year should be 2015 or earlier. That is because this was the year in which the Paris Agreement was signed, and therefore captures emission reductions "well before 2020" – which is also a section of the Paris Agreement. Also IPCC makes use of the 2015 year as either base year or milestone in their analysis (see for example **here**), which makes the decarbonization pathway more aligned with its scenarios. A baseline year of 2015 ensures, as well, that companies are accountable for past emissions. As shown in the chart on the next page (right), only around 20% of the companies with validated targets have so far set a baseline year of 2015 or earlier. That ties well to the fact that 2/3 of the targets make use of the ACA method, which as we previously highlighted, allows for more recent target baseline years.

SBTi-validated targets refer to a different variety of baseline years

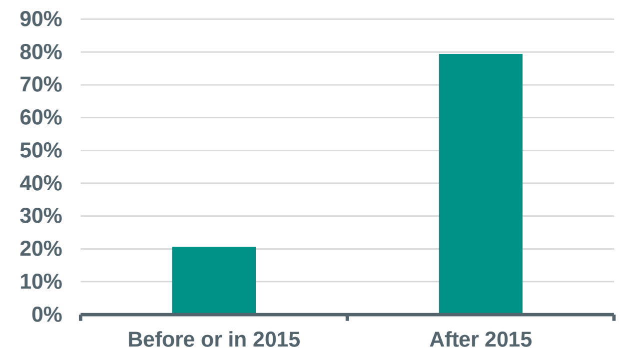
Share of companies with validated SBTi targets



Source: Science Based Targets initiative (SBTi), ABN AMRO Group Economics.

Only a small minority makes use of baseline years on or before 2015

Share of companies with validated SBTi targets



Source: Science Based Targets initiative (SBTi), ABN AMRO Group Economics

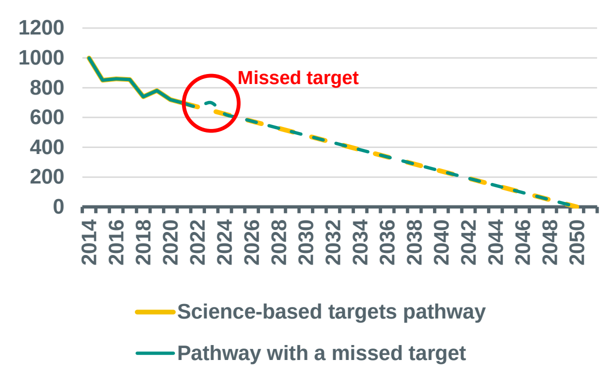
No “realignment” required in case company misses targets

Another pitfall from the current methodology applied by the SBTi is the fact that targets are not re-calculated in case they are missed. This is specifically important as carbon budgets are calculated based on e.g. a company’s market share. In the end, the absolute cumulative emissions until 2030 or 2050 for example determine whether the Paris goals of holding warming to less than 2 degrees are met, and that means that if a company fails one year, its projected carbon budget should also be re-adjusted and hence also its decarbonization pathway. Companies need to compensate by increasing their reductions in subsequent years and this means also decarbonizing at a faster pace.

To make our point more clear, we would like to give a figurative example as shown below. Given that a company has only a limited carbon budget it can spend, if a company exceeds its budget within a certain year, it consequently needs to overcompensate in the years thereafter. So that means, more than exclusively looking at achieving a certain target within a certain year (e.g. carbon neutrality by 2050), this company needs to decarbonize at a faster pace thereafter in case it missed its targets within a certain year. The chart below on the right hand side shows a situation in which a company has within a certain year failed to meet its targets. Nevertheless, the following year, it has compensated and managed to be “back on track”. Ultimately, it has reached its initial carbon neutrality target by 2050. However, this resulted in it exceeding its carbon budget (see chart on the right hand side), which means that its initial decarbonization path was no longer compliant with the Paris Agreement.

Example: A company fails to meet its target in one year but has come “back on track” thereafter…

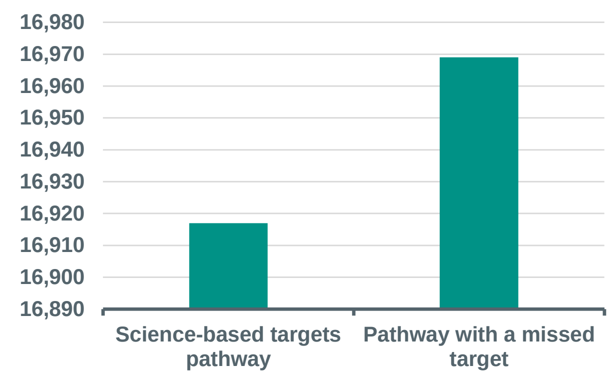
Carbon intensity (e.g. CO2/KWh)



Source: ABN AMRO Group Economics

…But this has resulted in it exceeding its allowed carbon budget

Carbon emissions (million tonnes of CO2)

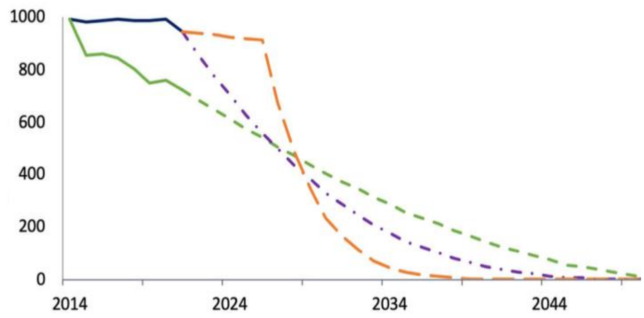


Source: ABN AMRO Group Economics

Pathways re-calculated in case a target is missed necessarily rely on a faster decarbonization pace. The chart below on the left hand side (extracted from the paper of Rekker et al.) exemplifies how different pathways can take place depending on baseline year (blue line uses baseline year as 2020, while green line uses baseline year as 2014) and as well whether targets are missed or not (exemplified by the orange line). In both cases (missed targets and/or later baseline year) companies are required to speed up their decarbonization process in order to meet their carbon budgets, and this can be a highly disruptive process for the company, forcing them to accelerate the retirement of carbon-intensive assets and more rapidly mobilise capital to low-carbon assets. Hence, this faster transition can also have an impact on a company's financial health, which is why it is so important for investors to not only focus on end goal targets (e.g. carbon neutrality by 2050) but to rather also do annual checks on whether companies decarbonize according to science-based decarbonization pathways.

Different pathways need to take place depending on baseline and/or whether targets were missed

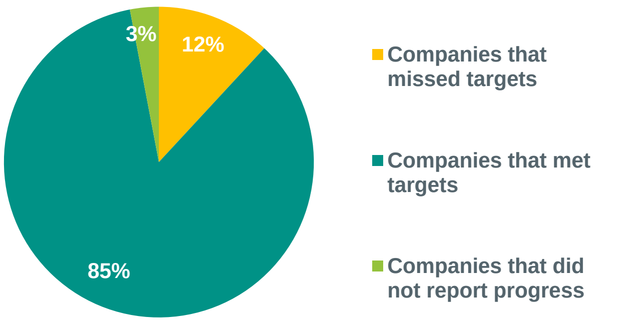
Carbon intensity (e.g. CO2/KWh)



Source: ABN AMRO Group Economics. Note: green line indicates pathway using 2014 as baseline. Purple line indicates pathway using 2020 as baseline. Orange line indicates situation where the company does not comply with the science-based targets until 2025, but still needs to meet its carbon budget thereafter.

…But missed targets do not necessarily trigger new SBTi validation

Share of companies with validated SBTi targets



Source: Science Based Targets initiative (SBTi), ABN AMRO Group Economics. Note: with "missed targets" we refer to companies that operate with emissions above their baseline.

A good example of how companies' financials (and consequently credit quality) can be impacted by transition risks is the case of **Royal Schiphol Group**, the Dutch airport operator. A few weeks ago, the company was downgraded by both Moody's and S&P on the back of the Dutch government's decision to cap the number of flights due to environmental reasons. The company's inability to act in due time to reduce emissions and control e.g. noise levels has resulted in government intervention, and this had a negative impact on the company. The need for now Schiphol to decarbonize at a faster pace will likely be cost intensive and disruptive, while the company will also suffer from the government restrictions in the near term.

According to SBTi latest data, around 12% of the companies have reported that they operated above their science-based decarbonization pathways. Given that pathways are not specifically disclosed (only end targets), this figure reflects the share of companies that reported a regress against emissions in their baseline year.

We acknowledge though that SBTi has been monitoring companies' progress, and requires in theory the ones that missed targets to "explain why and the strategy for addressing these deficits in the future". SBTi will also make it mandatory as of 2025 for companies to revaluate their targets every five years from the date of the original target approval. Nevertheless, immediate action is, at this point, not in the scope of SBTi's work.

Pathways based on market shares are not adjusted regularly

Another important point to mention is that some of the methodologies applied by the SBTi (e.g. the SDA method) relies on assumptions about the company's market share, and this ultimately determines its carbon budget. However, the SBTi does not require companies to recalculate emission pathways once the situation changes. That means, yearly checks on whether assumed market share (significantly) differs from actual market shares are at this point not taking place.

The SBTi does mention that “long-term targets, in particular, may require recalculation to update the company growth assumptions used to project the target and also to reflect the latest climate science.” However, as previously mentioned, at this point recalculating targets is more of a recommendation rather than a requirement. SBTi intends to make targets revision mandatory as of 2025.

What was the social impact of the EU's EUR 92 bn SURE programme?

Piet Rietman – Economist | piet.rietman@nl.abnamro.com

- **The EU reports on the impact of its pandemic programme: Support to mitigate Unemployment Risks in an Emergency (SURE)**
- **They show that EUR 91.8 bn in social bonds was used to protect jobs and incomes in member states**
- **The EU claims that around 1.5 million people were prevented from unemployment in 2020**
- **Does that mean the SURE was a success?**

In its **fourth bi-annual report**, the EU recently assessed the so-called SURE programme. SURE – Support to mitigate Unemployment Risks in an Emergency – was a crisis instrument that aimed to raise EUR 100 bn via the issuance of social bonds to protect jobs and workers' incomes during the Covid pandemic. Because all EU Member States provided bilateral guarantees, the EU could borrow at very favourable conditions to finance loans to member states. In the last quarter of 2020 and the first half year of 2021, most of the loans were issued. In 2022 the latest EUR 2.2 bn was disbursed. Right now EUR 93.3 bn is granted to member states, of which EUR 91.8 bn has been disbursed to member states. As there doesn't seem to be new unemployment schemes coming up and the SURE instrument ceases to exist at the 31st of December, this fourth bi-annual report seems to give a good overview of the impact of the programme.

The EU shows that EUR 91.8 bn in social bonds was used to protect jobs and incomes in member states

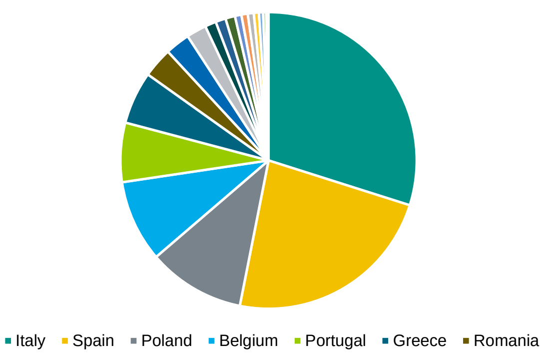
The vast majority of the EUR 91.8 bn that was disbursed to member states has been allocated to short-time work schemes and similar measures for the self-employed. 50% of the total expenditure went to short-time work schemes, 32% to measures for the self-employed, 9% to wage subsidies and 6% to other measures such as sick-leave benefits. All these expenditures fit the policy goal of 'protecting jobs and incomes'. However, some countries made more use of the SURE loans than others.

Italy and Spain, with just 18% of the EU's GDP and 24% of its population, together claimed more than half of the SURE loans. Germany, France, the Netherlands, Austria, Denmark, Finland, Luxembourg and Sweden didn't take any SURE loans since they either didn't have unemployment programmes, didn't aim to run bigger budget deficits to fund them, or, of course, could borrow at relatively favourable conditions already.

There is also a big divergence in impact on the budget. Apart from the eight member states that did not borrow, we see that SURE loans could be either just 1% of the total government expenditure (in the case of Hungary), or up until 7% (Malta). The countries that take relatively big loans usually have a bigger number of different programmes that are all applicable for funding under the policy goal of 'protecting jobs and incomes'.

More than half of SURE went to Italy and Spain

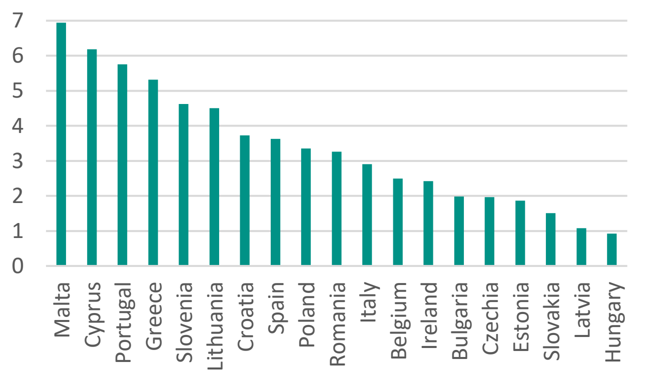
EUR billions



Source: EU, ABN AMRO Group Economics

Big divergence in impact on national budgets

SURE loans as % of total government expenditure, 2020



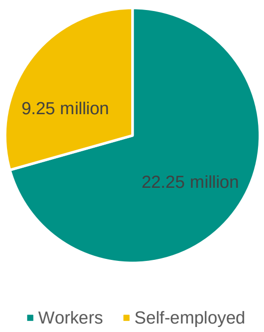
Sources: ABN AMRO Group Economics

The EU claims that around 1.5 million people were prevented from unemployment in 2020

As one of the SURE conditions, member states have to regularly send reporting tables to the EU on, for example, number of people and firms that were supported. Neither the EU or a third party checks these tables, so the bi-annual reports of the EU rely fully on self-reporting. The EU adds up the reporting tables from all the 19 member states that joined the programme and present these totals in their bi-annual reports. These totals tell us that SURE supported 31.5 million people and 2.5 million firms. These 31.5 million consist of an estimated 22.25 million employees and 9.25 million self-employed. Of these 22.25 million employees, 1.5 million are estimated to have been prevented from becoming unemployed in 2020. This is simply the difference between what member states estimated to be their policy measures before and after the SURE loans were taken.

Over 70% of supported people were employees

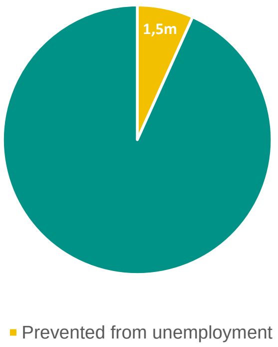
%



Source: EU

Of them 6,7% were prevented from unemployment

%



Source: EU

Does that mean the SURE program was a success?

Reading the individual reporting of member states and the 4th bi-annual EU report, five questions arise on the reliability of the estimate of 1.5 million people that were saved from unemployment.

1. Of the 19 member states that took SURE loans, 15 have spent more than the amount granted using national funds. This means that a part of the 1.5 million people that are claimed to be prevented from unemployment, were prevented from unemployment by national spending. It is of course possible that this national expenditure wouldn't have taken place if there were no SURE loans. One could, however, also claim that there would have been *more* national expenditure if there wouldn't have been SURE loans. Member states felt the need to protect employment and if SURE wouldn't have been there, they could have chosen for the second cheapest option: borrowing directly themselves.
2. The EU claims that, at a country level, the higher the amount received through SURE in 2020, the more moderate was the rise in unemployment among beneficiary member states. This claim is correct in the sense that there is a correlation. But it is possible that there are third factors that cause member states to both apply for a big SURE loan and have a moderate rise in unemployment. For example, countries that usually borrow at higher interest rates and have bigger deficits, could have a lower percentage of jobs that are vulnerable to Covid measures such as service sector jobs.
3. As stated in the EU's bi-annual report, it is difficult to design a counterfactual scenario of labour market performance in the absence of SURE. Unemployment could, as the member states claim, have risen more in the absence of employment programs. However, they made these claims at the moment they were applying for a loan. Nationally funded employment programs could have led to the same unemployment outcomes, but could just have been more expensive.
4. Self-reporting is also not a reliable method when the reporting party has a financial stake in the way the results are perceived. Countries that are in favour of more future joint debt have an incentive to present current joint debt initiatives as successful. Member states did not follow a fixed and transparent method when self-reporting.

5. The number of 1.5 million could also be too low. The unemployment forecasts could be based on a number of bankrupt companies or a number of lay-offs. In a normal economy, these numbers could lead to a number of 1.5m unemployed. In economies with Covid measures however, it is more difficult to find a new job after losing one. People were discouraged from actively seeking employment due to the shutdown of large parts of the economy.

While we can't say for sure how many people were prevented from becoming unemployed from the EUR 91.8 bn borrowed by the EU, we can say that this initiative was probably the best given the circumstances. Policy tools using social bonds were never on this scale before. As there is **again debate** on the question of whether there should be new EU-denominated debt, it is fair to say that SURE discovered unknown terrain and will possibly be very valuable in developing instruments like this one in the future.

Not-so-green hydrogen perhaps a necessary evil

Shanawaz Bhimji, CFA – Senior Fixed Income Strategist | shanawaz.bhimji@nl.abnamro.com

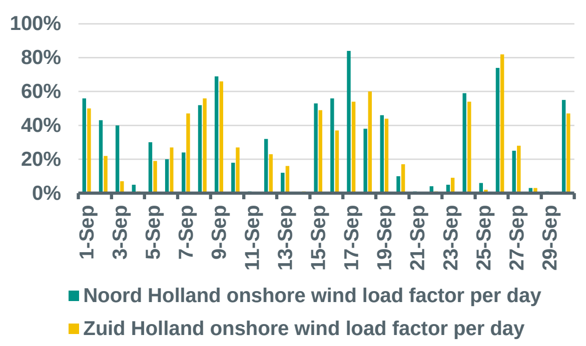
- **European Parliament voted in favour of leniency against green hydrogen produced by grid power**
- **The idea is therefore to scrap the hourly matching principle and move towards a monthly, quarterly or even annual matching of renewable power to the electrolyser**
- **Which makes sense given EU's ambition to reach 10mn tonnes of renewable hydrogen by 2030**

Recently the rules on what constitutes green hydrogen were tweaked. The objective behind the rules set by the European Union is to ensure that green hydrogen is produced from an (additional) source of renewable electricity. This matters most when an electrolyser is connected to the grid, where obviously multiple sources of electricity (renewable and conventional) are simultaneously flowing through the grid's power cables and identifying the exact source becomes difficult. Green hydrogen producers might prefer a grid solution as large scale green hydrogen pipelines and storage (such as Gasunie's green hydrogen backbone) are not yet available.

A couple of weeks ago the European Parliament voted in favour of leniency against green hydrogen produced by grid power. Under the original draft delegated act, the production of green hydrogen when the electrolyser is connected to the grid required temporal correlation. Temporal correlation requires an hourly matching of available renewable power on the grid against what the electrolyser is able to churn out. While it might be the purest of approaches, the problem starts when weather and therefore the load factor become variable. For example, if there's a sunny day with limited clouds then solar panels should have a stable output between dusk and dawn and the hourly temporal correlation principle would work. However, if there's a rain shower between 10.00 am and 11.00 am, while this is followed-up by a very bright sky after 12.00 am till dawn, there's less electricity going into the electrolyser in the morning and too much in the afternoon as the electrolyser capacity might not be strong enough to cope with the strong load caused by the bright sky. The running time of the electrolyser would be inefficient if hourly matching is required, which would obviously bump up the cost price of green hydrogen. However, if the solar panel output would have been aggregated and proved to be the same output as during a normal sunny day with limited clouds, the electrolyser would not need to have produced less because the extra load in the afternoon would have compensated for the low load in the morning and it could have therefore run on conventional electricity during the 10-11am time window.

We looked at a hypothetical variable weather pattern in our example above, but variability really starts to kick-in on a monthly level. The chart below shows the realized load factors on Dutch on-shore wind energy in two provinces which are populated by large industrial activities, namely Noord Holland and Zuid Holland. Clearly, there have been many days where on-shore wind output was close to zero. Yet the average load has been roughly 30% and under a monthly temporal correlation scheme the electrolysers would not needed to switch off when the load was close to zero such as on the 14th or 21st of September.

High variability in Dutch on-shore load factors



Source: Energieopwek.nl, ABN AMRO Group Economics

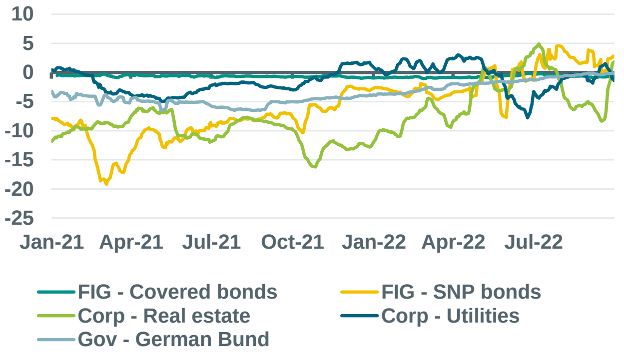
The idea is therefore to scrap the hourly matching principle and move towards a monthly, quarterly or even annual matching of renewable power to the electrolyser. This is a similar to what is agreed for example in the Dutch domestic solar power space where annual settlement is applied.

Indeed, until large scale battery solutions become available which allow for storage of renewable energy, expanding the time horizon is a good proposition, simply because renewables in a large part of Europe exhibit huge amount of variability in their output. According to Bloomberg New Energy Finance, the cost to produce green hydrogen through the grid under a more lenient temporal correlation drops by nearly a third to $6.18 per kg. A lower cost proposition helps when Europe still has a long learning curve ahead to get to desired large scale production of 10mn tonnes renewable hydrogen in 2030. We will have to take the high conventional power consumption and therefore also the tolerance of less green hydrogen than envisaged as a given to reach this goal without the burden being back-ended to the end of this decade. In the amendment to the delegated act, the European parliament also applied more leniency towards the need for dedicated renewable capacity.

ESG in figures

ABN AMRO Secondary Greenium Indicator

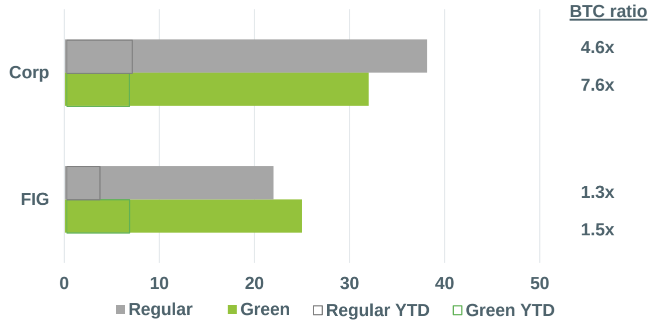
Delta (green I-spread – regular I-spread)



Note: Secondary Greenium indicator for Corp and FIG considers at least five pairs of bonds from the same issuer and same maturity year (except for Corp real estate, where only 3 pairs were identified). German Bund takes into account the 2030s and 2031s green and regular bonds. Delta refers to the 5-day moving average between green and regular I-spread. Source: Bloomberg, ABN AMRO Group Economics

ABN AMRO Weekly Primary Greenium Indicator

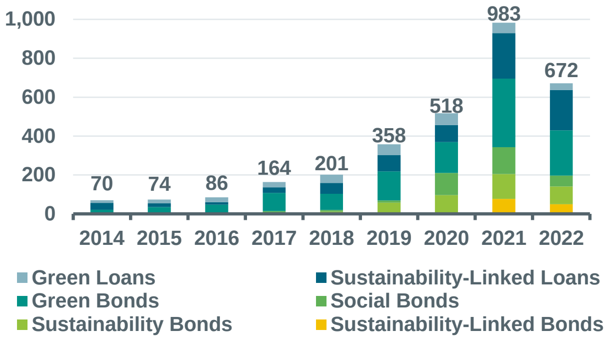
NIP in bps



Note: Data until 7-10-22. BTC = Bid-to-cover orderbook ratio. Source: Bloomberg, ABN AMRO Group Economics.

Sustainable debt market overview

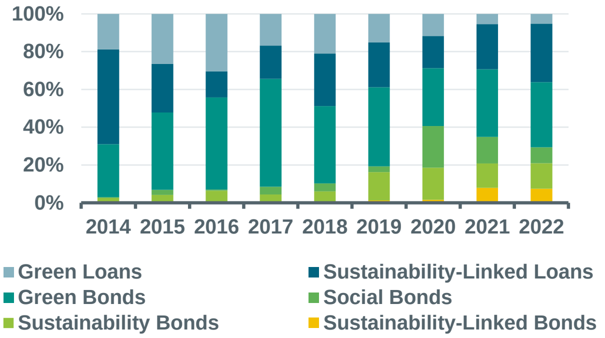
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of sustainable debt by type

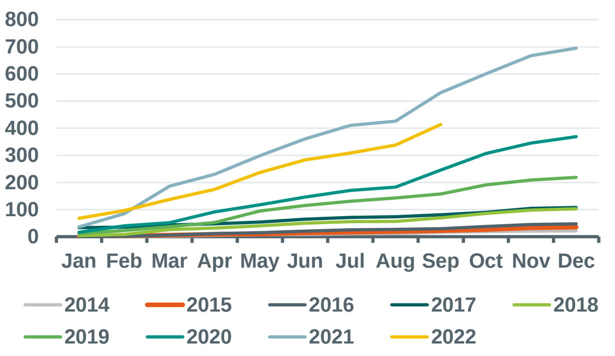
% of total



Source: Bloomberg, ABN AMRO Group Economics

YTD ESG bond issuance

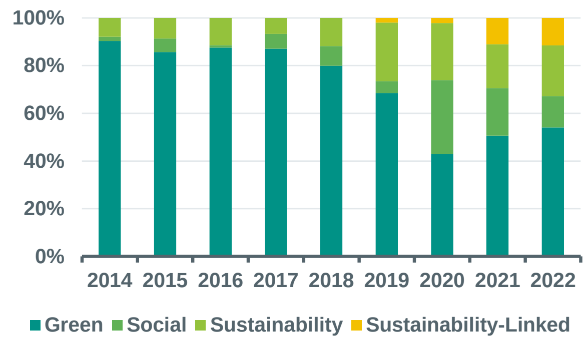
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by type

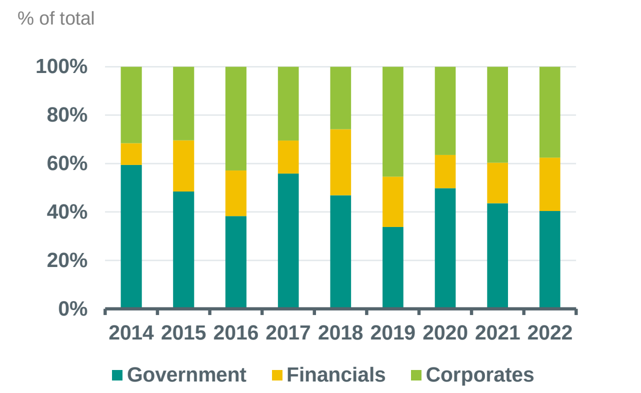
% of total



Source: Bloomberg, ABN AMRO Group Economics

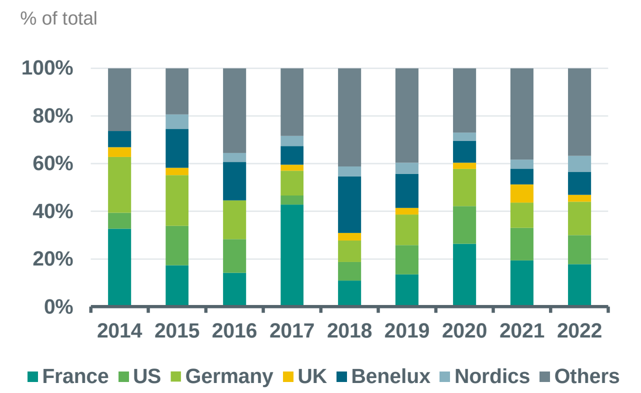
Figures hereby presented take into account only issuances larger than EUR 250m and in the following currencies: EUR, USD and GBP.

Breakdown of ESG bond issuance by sector



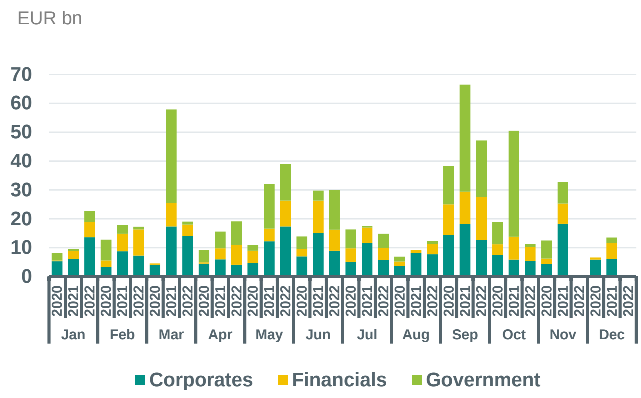
Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by country



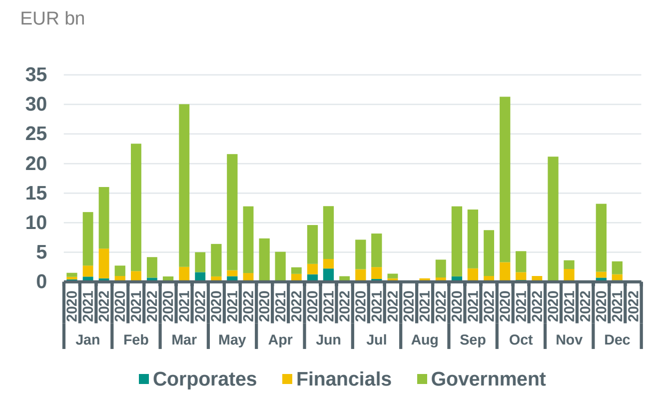
Source: Bloomberg, ABN AMRO Group Economics

Monthly Green Bonds issuance by sector



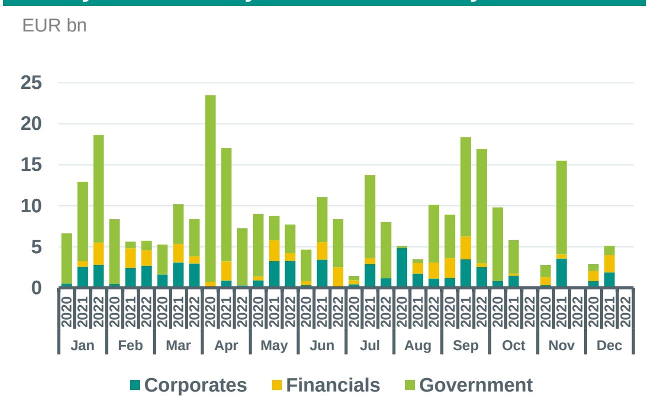
Source: Bloomberg, ABN AMRO Group Economics

Monthly Social Bonds issuance by sector



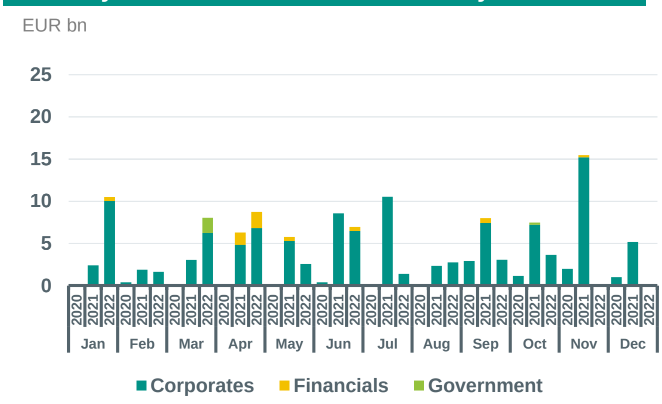
Source: Bloomberg, ABN AMRO Group Economics

Monthly Sustainability Bonds issuance by sector



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sust.-Linked Bonds issuance by sector



Source: Bloomberg, ABN AMRO Group Economics

Figures hereby presented take into account only issuances larger than EUR 250m and in the following currencies: EUR, USD and GBP.

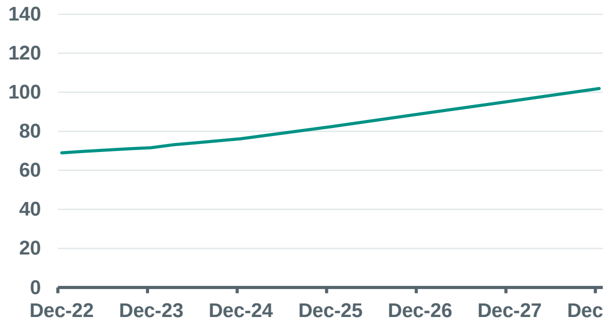
Carbon contract current prices (EU Allowance)

EUR/MT

Source: Bloomberg, ABN AMRO Group Economics

Carbon contract future prices (EU Allowance)

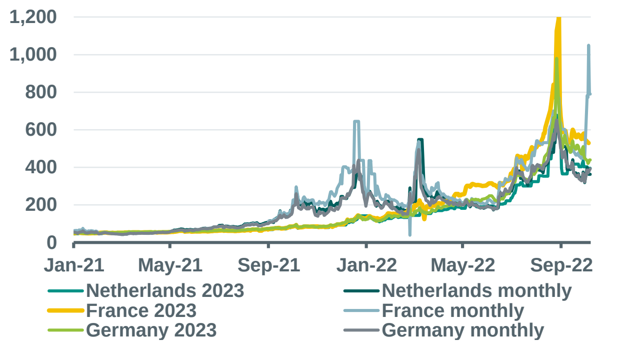
EUR/MT



Source: Bloomberg, ABN AMRO Group Economics

Electricity power prices (monthly & cal+1 contracts)

EUR/MWh

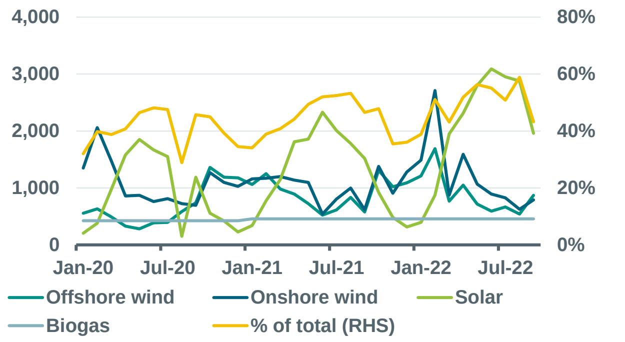


Source: Bloomberg, ABN AMRO Group Economics. Note: 2023 contracts refer to cal+1

Electricity generation from renewable sources (NL)

GW

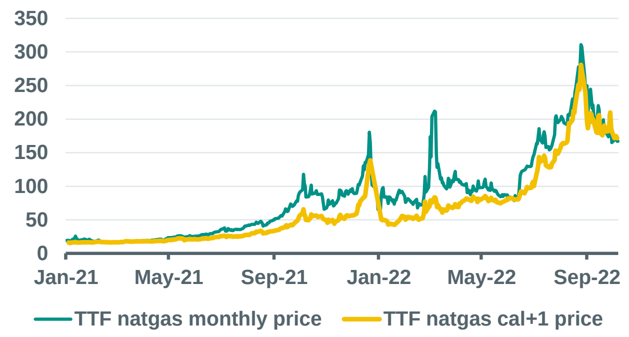
% of total



Source: Energieopwek (Klimaat-akkoord), ABN AMRO Group Economics

TTF Natgas prices

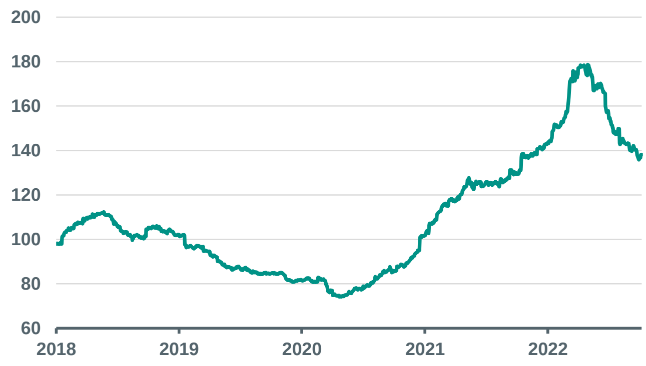
EUR/MWh



Source: Bloomberg, ABN AMRO Group Economics

Transition Commodities Price Index

Index (Jan. 2018=100)



Note: Average price trend of 'transition' commodities, such as: corn, sugar, aluminium, copper, nickel, zinc, cobalt, lead, lithium, manganese, gallium, indium, tellurium, steel, steel scrap, chromium, vanadium, molybdenum, silver and titanium. Source: Refinitiv, ABN AMRO Group Economics

DISCLAIMER

ABN AMRO Bank
Gustav Mahlerlaan 10 (visiting address)
P.O. Box 283
1000 EA Amsterdam
The Netherlands

This material has been generated and produced by a Fixed Income Strategist ("Strategists"). Strategists prepare and produce trade commentary, trade ideas, and other analysis to support the Fixed Income sales and trading desks. The information in these reports has been obtained or derived from public available sources; ABN AMRO Bank NV makes no representations as to its accuracy or completeness. The analysis of the Strategists is subject to change and subsequent analysis may be inconsistent with information previously provided to you. Strategists are not part of any department conducting 'Investment Research' and do not have a direct reporting line to the Head of Fixed Income Trading or the Head of Fixed Income Sales. The view of the Strategists may differ (materially) from the views of the Fixed Income Trading and sales desks or from the view of the Departments conducting 'Investment Research' or other divisions

This marketing communication has been prepared by ABN AMRO Bank N.V. or an affiliated company ('ABN AMRO') and for the purposes of Directive 2004/39/EC has not been prepared in accordance with the legal and regulatory requirements designed to promote the independence of research. As such regulatory restrictions on ABN AMRO dealing in any financial instruments mentioned in this marketing communication at any time before it is distributed to you do not apply.

This marketing communication is for your private information only and does not constitute an analysis of all potentially material issues nor does it constitute an offer to buy or sell any investment. Prior to entering into any transaction with ABN AMRO, you should consider the relevance of the information contained herein to your decision given your own investment objectives, experience, financial and operational resources and any other relevant circumstances. Views expressed herein are not intended to be and should not be viewed as advice or as a recommendation. You should take independent advice on issues that are of concern to you.

Neither ABN AMRO nor other persons shall be liable for any direct, indirect, special, incidental, consequential, punitive or exemplary damages, including lost profits arising in any way from the information contained in this communication.
Any views or opinions expressed herein might conflict with investment research produced by ABN AMRO.
ABN AMRO and its affiliated companies may from time to time have long or short positions in, buy or sell (on a principal basis or otherwise), make markets in the securities or derivatives of, and provide or have provided, investment banking, commercial banking or other services to any company or issuer named herein.

Any price(s) or value(s) are provided as of the date or time indicated and no representation is made that any trade can be executed at these prices or values. In addition, ABN AMRO has no obligation to update any information contained herein.
This marketing communication is not intended for distribution to retail clients under any circumstances.
This presentation is not intended for distribution to, or use by any person or entity in any jurisdiction where such distribution or use would be contrary to local law or regulation. In particular, this presentation must not be distributed to any person in the United States or to or for the account of any "US persons" as defined in Regulation S of the United States Securities Act of 1933, as amended.

CONFLICTS OF INTEREST/ DISCLOSURES
This report contains the views, opinions and recommendations of ABN AMRO (AA) strategists. Strategists routinely consult with AA sales and trading desk personnel regarding market information including, but not limited to, pricing, spread levels and trading activity of a specific fixed income security or financial instrument, sector or other asset class. AA is a primary dealer for the Dutch state and is a recognized dealer for the German state. To the extent that this report contains trade ideas based on macro views of economic market conditions or relative value, it may differ from the fundamental credit opinions and recommendations contained in credit sector or company research reports and from the views and opinions of other departments of AA and its affiliates. Trading desks may trade, or have traded, as principal on the basis of the research analyst(s) views and reports. In addition, strategists receive compensation based, in part, on the quality and accuracy of their analysis, client feedback, trading desk and firm revenues and competitive factors. As a general matter, AA and/or its affiliates normally make a market and trade as principal in securities discussed in marketing communications.

ABN AMRO is authorised by De Nederlandsche Bank and regulated by the Financial Services Authority; regulated by the AFM for the conduct of business in the Netherlands and the Financial Services Authority for the conduct of UK business.