SustainaWeekly

ETS reforms to result in adoption of more expensive technologies

- **Economist: The EU ETS sits at the heart of EU decarbonisation plans. The ETS is expanding in scope and turning more stringent. The overall supply of allowances is set to fall and at the same time demand for allowances is expected to rise. The ETS allowance price is likely to rise as a result, which in turn will encourage wider adoption of technologies, such as carbon capture and storage.**

- **Strategist: We have entered a research partnership with ValueCo with the aim of providing additional insights and analysis on ESG to our clients. ValueCo gathers the internal ESG scores assigned by investors and harmonizes them for comparability. We show the latest ESG opinions and consensus score amongst a range of European GSIB's, though a more comprehensive note will follow as part of our ESG Strategist publication series.**

- **Sectors: Solar power is the fastest growing among all renewables. However, capacity could slow down the roll out of solar power and limit its potential. Cannibalization in renewables could trigger a lower capture rate, which in turn could lead to a slower deployment rate for solar panels. Securing supply chains for solar panels are essential to achieve Europe's targets for solar power.**

- **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 edition of the SustainaWeekly, we first look at how ETS reforms may impact the price of emission allowances. We then provide estimates of marginal abatement costs of various decarbonization technologies and what carbon price would be needed to make them economical. We then go on to present a sneak preview of internal investor ESG scores provided by ValueCo, focusing on the assessments for European Globally Systemic Important Banks (GSIB's). A more comprehensive note will follow as part of our ESG Strategist publication series. Finally, we zoom into solar power focusing on current trends in Europe and globally, its role in the transition and the challenges facing this technology currently and in the future.

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

ETS reforms to result in adoption of more expensive technologies

Georgette Boele – Senior Economist Sustainability | georgette.boele@nl.abnamro.com
Amit Kara – Senior Economist Sustainability | amit.kara@nl.abnamro.com

- **The EU ETS sits at the heart of EU decarbonisation plans. The ETS is expanding in scope and turning more stringent.**
- **The overall supply of allowances is set to fall and at the same time demand for allowances is expected to rise**
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Introduction

The EU has set for itself an ambitious target of reducing net GHG emissions by 55% by 2030 compared with 1990 levels. This is an intermediate target enroute to the final objective, which is climate neutrality in the EU by 2050. The Emission Trading System (ETS) is a key instrument of abatement in the EU. The ETS covers around 40% of total EU emissions and is also one of the biggest and most well-established emission trading markets in the world. In this note we outline important changes that are afoot for the ETS and the implications of those changes for the ETS price.

Emissions Trading Scheme

The EU ETS is a trading system that is designed to reduce GHG emissions by setting a price on those emissions. The EU ETS works on a 'cap and trade' principle. A cap is set on the total amount of GHG that can be emitted by the operators covered by the system. The cap corresponds to the total amount of permits issued. Member states auction their allowances and participating companies must buy these tradeable allowances to compensate for the GHG that they emit. The price of the permit is set in the ETS market. By internalising the cost of emissions, the ETS encourages participating firms to invest in emission reduction technologies. The system is also designed to achieve emission reduction at the lowest cost to industry.

The ETS will undergo important reforms over the next few years. The overarching objective of the reforms is to reduce GHG emissions for ETS sectors by 62% by 2030 (source: EC). This will be gradually reducing the cap on emissions and the associated permits in circulation.

To begin with, there will be a one-off reduction of the overall emissions cap by 117 million allowances (re-basing) phased over two years: 90 million will be removed in 2024 and 27 million in 2026. To place this in context, the total amount of allowances was 1,134,794,738 in May 2023. Every allowance corresponds to 1 ton of CO_2 emissions. Auction volumes from 1 September 2023 to 31 August 2024 will be reduced by 272,350,737 allowances, which will be placed in the Market Stability Reserve (MSR). The Market Stability Reserve aims to provide stability to the EU Emissions Trading System.

Taken together, these new allowances will be accompanied by a steeper annual reduction factor of 4.2% until 2027 and to 4.4% from 2028-2030. This is double the speed of the existing 2.2% target (see chart below). These reform measures will together lower the supply of ETS permits and act to raise the price of the permit.

Another important change is the withdrawal of free allowances to ETS industries. Free allowances will be phased out from 2026 to 2034 and in particular from 2028 onwards. Removing free allowances will increase the demand for permits and increase their price.

The ETS is also expanding in scope with the inclusion of the maritime transport sector. The maritime sector accounts for around 2% of global emissions and is widely considered, along with aviation which, as it happens, is already included in the ETS, as one of the hardest sectors to decarbonise. The maritime sector will be phased into the EU ETS from 2024 to 2026.

Phase 4 ETS 2021-2030

PHASE 4: 2021-2030

In place:

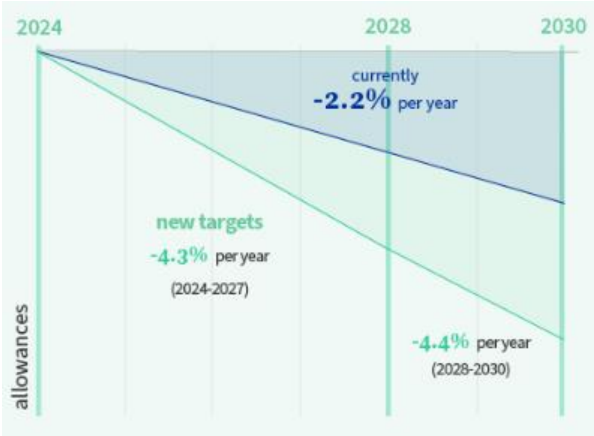
- Geography: the United Kingdom left the EU ETS
- Cap: annual reduction factor increased from 1.74% to 2.2%
- Doubling of the intake for the MSR (from 12% to 24%) until 2023
- Starting in 2023, allowances held in the MSR are limited, excess volumes become invalid

Proposed under the "Fit for 55" package:

- Cap: reduction factor raised from 2.2% to 4.2%
- Allowances: maintaining conditionality for free allowances based on decarbonisation efforts; gradual reduction in free allowances
- Sectors: inclusion of maritime transport in the EU ETS
- Introduction of a separate emissions trading system for building and transport emissions
- Intake of the MSR maintained at 24%

Source: EC

Proposed a faster reduction of the cap



Source: EC

In addition, the EU will create a new and separate ETS known as ETS II for the building and road transport to complement the existing ETS. ETS II will be operate from 2027. The EU ETS will put a price on the fuel that will be used in the building and transport sectors. An emission reduction cap of 42% by 2030 compared with 2005 levels is set for ETS II. A separate price stability mechanism will be set-up for this new market which will kick-in when the ETS price rises above 45 Euros.

What is the role of marginal abatement costs of decarbonization technologies?

The price of emissions set on EU ETS reflects the balance between supply of permits (or emission allowances) and the demand for these permits which is driven the total amount of GHG emissions. As discussed above, the supply of permits is on a pre-determined glide path which is set to steepen (see chart above). The demand for permits is however, unknown. It will depend on the economic growth generally, but more specifically, on the demand for the products and services covered by the sectors included in the ETS scheme.

Demand will also depend on the cost of abatement which is heavily influenced by technological developments. The abatement cost is simply the cost of an intervention or technology that will reduce greenhouse gas emissions by one tonne. In practical terms it means that the abatement cost for a technology to reduce greenhouse gas emissions is the total additional costs, i.e. investment costs plus the difference in operating costs, divided by the avoided emissions.

The abatement price ranges from negative values to many hundred euros for hard to decarbonise sectors and technologies. A good example of negative abatement costs is LED lights that are operated by a motion sensor. In this case, the gains from energy cost saving outweigh the investment. More difficult sectors include aviation and shipping where existing technologies are currently prohibitively expensive and in case of shipping the future energy carrier is not yet decided.

The marginal abatement cost curve (MACC) summarises the cost of abatement for technologies. More specifically, the MACC represents the incremental cost of reducing one additional tonne of emissions/pollution. The MACC varies across countries and evolves over time. For example, heat pumps are an attractive alternative to a gas boiler in countries where the cost of electricity is low relative to the price of gas. These costs will also evolve over time in line with technological developments and the fiscal regime that is in place. Put differently, a MACC curve represents a point in time estimate of the abatement cost for different technologies in a **particular** county or region.

What are the marginal abatement costs for the 11 crucial technologies?

In **our Sustainaweekly of 3 April** we defined eleven technologies/group of technologies that help to decarbonize the world by 2050. These are: lithium-ion batteries, heat pumps, permanent magnets, electrolysis & fuel cells, photovoltaics, concentrated solar power, wind energy using aerodynamic force, technologies that produce synthetic fuels, carbon capture and storage and combined heat and power and digital technologies. Complete decarbonisation will require the adoption of most, if not all, these technologies.

We summarise the pecking order of each of these technologies based on an estimate of the cost of removing one tonne of carbon. Our stylised MACC starts with least cost options, such as efficiency gains, at the bottom of the graph below, followed by solar and wind. These technologies are widely adopted and profitable at the current ETS price. Next in line is heat pumps which sits on the 90 Euro current ETS price. The other technologies on right side of the red line are not yet profitable but will come into play if, as we expect, the ETS price rises in response to the reforms discussed previously.

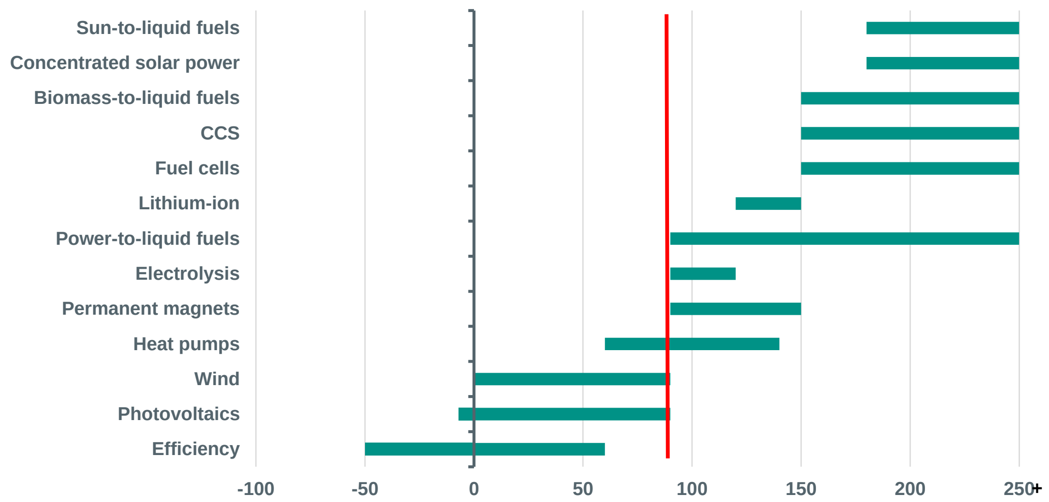
As seen in the figure below, there are three types of synthetic fuels (see more on these fuels in our **ESG Economist – No easy road to decarbonizing road mobility)**. They are:

- Biomass-to-liquid produces biofuels (any fuel that is derived from biomass) such as renewable diesel/hydrotreated vegetable oil (HVO)
- Power-to-liquid produces e-fuels such as e-methane, e-kerosine and e-methanol
- Sun-to-liquid produces solar fuels such as hydrogen, ammonia

The technology to manufacture these fuels varies along with the price. Most of the technologies to produce synthetic fuels for aviation and shipping are in the expensive territory.

Indicative Marginal Abatement Cost per technology

Cost in EUR/tonne, red line is current ETS price



Source: IEA, CRU, McKinsey, own estimates

What is the impact of the marginal abatement costs on ETS prices?

With an ETS price currently around EUR 90 per tonne CO2, the majority of decarbonisation technologies are more expensive than the ETS price. Only efficiency measures, wind to replace coal and gas and solar to replace coal power are attractive to invest in which involves small scale and large scale power generation. In order to invest more in the other decarbonization technologies, the marginal abatement costs for these technologies need to decline or the ETS price need to increase or a combination of both.

Based on current state of technological developments, the maritime sector will likely buy allowances until a clear technology emerges for the future energy carrier, resulting in upward pressure on the ETS price. The higher ETS will nevertheless serve as an important first signal for the sector to decarbonise. The higher ETS price will however, encourage the widespread adoption of other less-hard-to-decarbonise technologies such as carbon capture and storage. In other words, by lowering the cap and by introducing hard-to-decarbonise sectors, the ETS will incrementally bring into play less expensive technologies that are currently too expensive relative to a carbon price at 90 euros.

To sum up, the EU ETS will continue to play a central role in setting an emission price that will encourage the market to adopt the most cost effective transition technologies. Reforms to the ETS will result in a wider gap between demand and supply and that in turn will raise the price of emissions and bring into play technologies such as carbon capture and storage. As the MACC suggests, the ETS price alone is not sufficient for decarbonisation. Complementary measures, such as targets for emission efficiency and outright bans on certain technologies such as ICE for passenger cars, will be necessary to achieve overall climate neutrality.

How do investors score bank ESG?

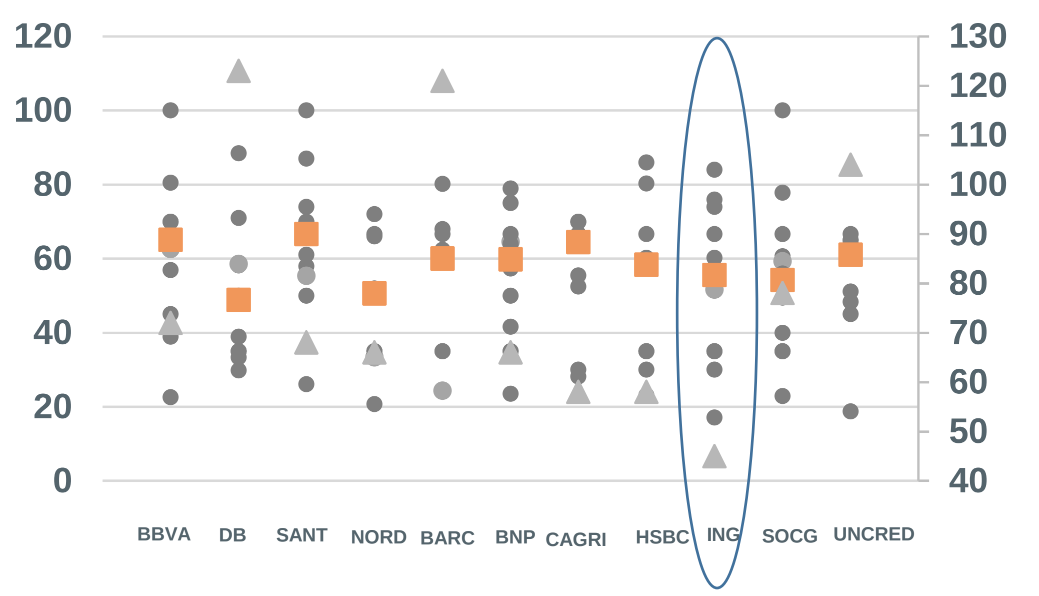
Shanawaz Bhimji, CFA – Head of Corporate Bond Research | shanawaz.bhimji@nl.abnamro.com
Marta Ferro Teixera – Fixed Income Strategist | marta.ferro.teixera@nl.abnamro.com

- **We have entered a research partnership with ValueCo with the aim of providing additional insights and analysis on ESG to our clients**
- **ValueCo gathers the internal ESG scores assigned by investors and harmonizes them for comparability**
- **These anonymized opinions are then made available for investors and issuers**
- **We show the latest ESG opinions and consensus score amongst a range of European GSIB's, though a more comprehensive note will follow as part of our ESG Strategist publication series**

ValueCo is a start-up in the ESG data space. It collects proprietary sustainability-related scores from 23 investors on more than 5 thousand listed issuers and shares this buy-side view on ESG. The contributor investor base includes well-known asset managers, private banks and institutional investors, predominantly in Europe. To remain up-to-date, the contributor investor scores are provided at least every quarter or each time they are modified/updated. We have entered a research partnership with ValueCo with the aim of providing additional insights and analysis on ESG to our clients based on this data. In this short note, we show the latest ESG opinions and consensus score amongst a range of European Globally Systemic Important Banks (GSIB's) in something of a sneak preview. A more comprehensive note will follow as part of our ESG Strategist publication series.

Looking at the internal investor scores, a good place to start is the consensus score calculation, which is rather straightforward as it is a simple median. But since contributions formats can vary, ValueCo first needs to standardize the opinions in the same scale, ranging from 0 to 100 (0 being the worst grade and 100 the best). Also important is the consensus strength, which illustrates the degree to which contributors agree in their ESG assessments. This is calculated as the mean absolute deviation (MAD) around the median and rescaling this into a score between 0 and 100, with 100 suggesting a perfect consensus (i.e. all contributors agree on the same score).

Some investors disagree a lot when scoring GSIB issuers on ESG – but spreads less affected



Source: ValueCo, ABN AMRO Group Economics, dots = investor contributions score, square = median score, triangle = 5y EUR CDS spread on Senior Preferred/Opco debt

There are some clear outliers in the responses, which might suggest different things. For instance, the methodologies used by the investors may still vary a lot; or the weights assigned to each ESG factor might also differ across investors. **ING** has the widest range in contributor scores, while 4 out of 11 contributors assigned a score below 50 (two contributors scored the bank at 35). We have also included the issuer 5y Credit Default Swap (CDS) spread (tight hand scale, triangle points) and it shows that the ING contracts offer the lowest credit spread in this sample. Therefore, bond pricing wise the market seems to agree more with the bank's most generous contributors and/or draws more comfort from ING's above-peer average equity capital ratio outlook. Either way, the weakest of ESG opinions are clearly not priced in.

Transitioning with a shining sun

Moutaz Altaghlibi – Energy Economist, Sustainability | moutaz.altaghlibi@nl.abnamro.com

- **Solar power is the fastest growing among all renewables**
- **Solar power is the most accessible renewable energy for households, which allows them to participate in the transition and shelter them from any surge in energy prices**
- **Limited grid capacity could slow down the roll out of solar power and limit its potential**
- **Cannibalization in renewables could trigger a lower capture rate, which in turn could lead to a slower deployment rate for solar panels**
- **Securing supply chains for solar panels are essential to achieve Europe's targets for solar power**

When we think about the transition, the first image that comes to mind is those wind turbines we see when we drive on the highway, or those shining roof tops with solar panels. Indeed, in order for the transition to work, we need to build enough renewable capacity to replace conventional fossil fuel power plants and meet the expected rise in power demand triggered by the electrification of various sectors. Solar power is a key renewable source for the energy transition. It has many advantages and unique properties as it provides clean electricity that is relatively easy to deploy and close to demand. As such, together with wind, it will form the cornerstone of the future power system by providing around 70% of global power by 2050.

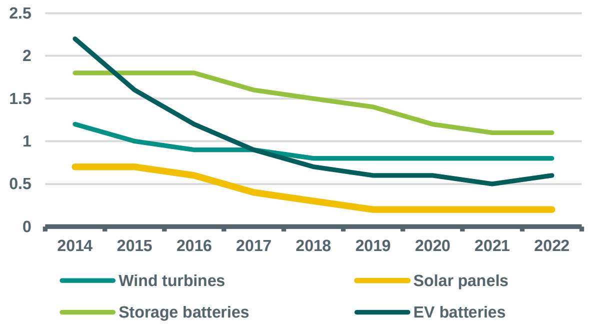
There is a distinction between utility and distributed solar generation, which coincides with on-grid and off-grid solar generation. Utility solar generation takes place in solar farms and they act as any conventional power supplier to the grid, while distributed or off grid generation mainly happens in a small scale, such as those panels installed on rooftops of houses and other buildings. In this note, we zoom into solar power focusing on current trends in Europe and globally, its role in the transition and the challenges facing this technology currently and in the future.

The current trends of solar power globally and in Europe

Globally, solar power has been the fastest growing clean technology, with solar deployments being the largest among all renewables in 2023. This is partly because of the decrease in the cost of solar panels as seen in the left hand chart of the figure below which shows the competitive position of solar panels among other clean technologies, along with the momentum in the uptake of distributed solar PV systems and supporting policies for large scale deployment. Accordingly, global capacity additions have been rising as seen in the right hand chart. Global solar manufacturing is set to reach 1000GW by 2024, with China grabbing the lion's share with more than 75%. Moreover, in a recent IEA update on the renewable energy market, manufacturing for solar PV and wind is set to meet global Net Zero targets in 2030 (source).

Average prices for selected clean technologies

Units: million USD/MW (nominal prices)



Source: IEA, ABN AMRO Group Economics

Net solar global capacity addition 2017-2024

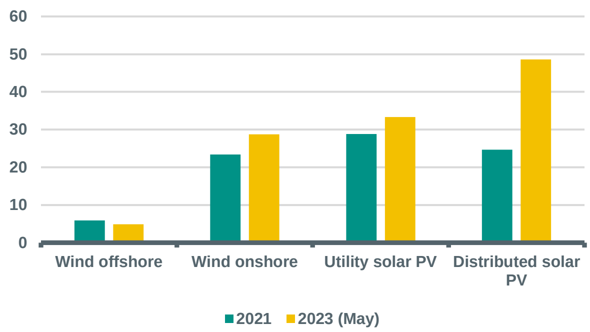
Unit: GW

Source: IEA, ABN AMRO Group Economics

Prices of solar PV and wind have risen due to the increase in shipping costs and prices of basic materials in 2022. They reached their peak and subsequently decreases in 2023, but are still above 2020 averages. Even with these trends solar and onshore wind are still the most competitive and cheapest option for new electricity generation for most countries. In addition, the high electricity prices in most countries along with technological progress, that increases efficiency and reduces costs further, will increase the momentum and attractiveness of solar power.

European capacity additions

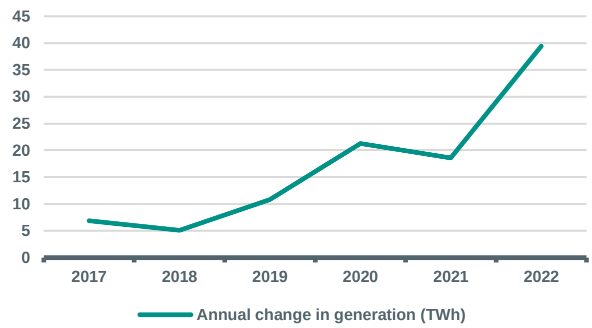
Unit: GW



Source: IEA, ABN AMRO Group Economics

Growth in European solar generation

In percentages



Source: EER, ABN AMRO Group Economics

The charts above set out the developments of solar energy in Europe. It shows an increase in European capacity additions since the start of the Russian Ukraine invasion (the left hand chart), along with the steep growth in solar generation (the right hand chart). The increase in the uptake in wind and solar in Europe was due to the need to reduce reliance on Russian natural gas. Relatedly, market forces, such as the increase in energy bills, was a main driver for the enhancement of small scale rooftops solar PV for final consumption. IEA reported that EUR 100 billion of savings have been made during 2021-2023 by EU consumers due to newly installed solar and wind capacity (see here). Accordingly, solar share in the power mix has been rising in many European countries, reaching 14.4% in the Netherlands and 12.6% for Greece in 2022, while the combined solar and wind share is expected to rise to more than 40% by 2024 for Spain, Germany and Ireland.
In term of policies, solar energy is a backbone for the EU's Green Deal and Repower EU plan. The target shares for renewables in the reviewed European Renewable Energy Directive are set to 42.5% with an ambition to reach 45% by 2030. In order to achieve these targets a new framework for permits is to be developed, along with setting up Renewables Acceleration Areas (RAA). RAA are envisioned to have lower environmental impact and shorter permit delivery periods.

The role of solar in the transition

For Europe, investing in renewables is a strategic goal not only to reduce emissions, but also to provide energy security and achieve price stability. From the lens of the transition, solar has a unique property compared to other renewables: it can be deployed on a small scale with a competitive efficiency. That is, solar can be scaled up by households allowing them to take part of the transition themselves. The increase in the electricity price coming from the grid is one of major incentives for households to install solar PV to curb power bills.

The installation of solar panels by households has three fold transition benefits: first it contributes to additional renewable power supply; second, it absorbs some of the increase in demand coming from electrification off-grid, which eases congestion in the grid and makes it more flexible; third, it boosts electrification by home owners, whether by buying electric vehicles or heat pumps. All these channels would result in reducing emissions whether those coming from electricity generation or those by final consumption.

With regard to utility solar power, of course its major role is in replacing conventional fossil power supplies. Moreover, solar and wind power are essential prerequisite to boost and produce green hydrogen, which is envisioned to be an important pillar for a successful transition in Europe.

Challenges for solar power

Even with the great success for solar power so far, there are some challenges associated to it. A major challenge of solar is intermittency, which needs accompanying solutions, like storage to smooth fluctuations. In the following paragraphs, we lay down other challenges associated with solar power.

VRE curtailment

Variable Renewable Energy (VRE) curtailment is an issue that is mainly happening because of limited grid capacity, which cannot accommodate the rise in supply by renewable sources. The higher the curtailment rate, the worst the situation. A major issue is the time needed for planning and implementing grid extensions, which could be long due to permitting and coordination issues. Policies aiming to promote and increase storage capacity could be useful to reduce curtailment rates.

Spatial challenge for solar power

One challenge for the energy transition in the future is the scarcity of space. Renewable energy systems have their spatial limits as they claim more land for deployment, supporting infrastructure, and supporting technologies (storage, for example) compared to their fossil fuel based counterparts. In other words, fossil power installations have higher spatial power density (the amount of power produced per square meter) than renewables. Furthermore, limited space could hinder the deployment of renewables due to the competing spatial claims of many transformations such as circular economy, adaptation measures and housing. These issues are especially relevant for high densely populated countries such as the Netherlands where space is scarce and the development of the planned solar projects will have a high spatial claim.

Effects on bio-diversity

Another challenge to solar panel deployment is to achieve a balance with biodiversity conservation. There is a challenge to roll out utility solar power as these installations cannot be deployed everywhere and they have a crowding out effect on species. For example, solar panels in the fields may prevent light to pass through for plants to flourish underneath. This highlights the need for innovative solutions that allows for integrating solar panels with the local environment where they are installed.

Securing supply chains

As part of REpowerEU plan, Europe intends to double its solar PV capacity by 2025, and further install additional 600 GW by 2030. To support this plan, a rooftop solar initiative is put in place, with enhanced legal obligation to install solar panels on different buildings (public, commercial and residential). However, in order for Europe to achieve these goals, it should make solar panel supply chains more resilient. That is in part a resilience to raw materials used in solar panels produced domestically, and in another part a resilience to imported panels.

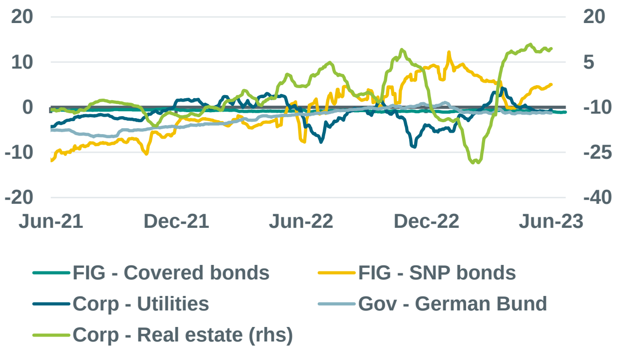
Cannibalization in renewables

Cannibalization happens when several renewable sources, with the same profile, generate at the same time depressing the electricity price, which in turn reduces the capture rate (the portion of the price paid back to producers) by generators. For example, in the sunny month of May 2023, the capture rate by solar producers in the Netherlands was around 55%. With more installed solar panels, the capture rate will be lower and incentives to install more panels will decrease and the transition will be slower.

ESG in figures

ABN AMRO Secondary Greenium Indicator

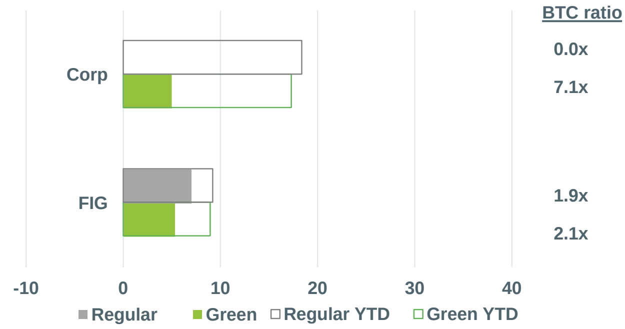
Delta (green I-spread – regular I-spread)



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

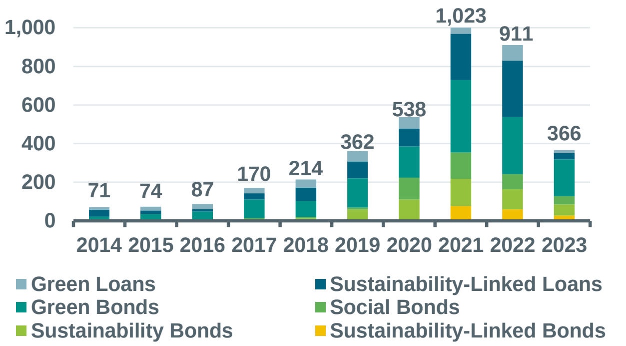
NIP in bps



Note: Data until 23-06-23. BTC = Bid-to-cover orderbook ratio. Source: Bloomberg, ABN AMRO Group Economics

Sustainable debt market overview

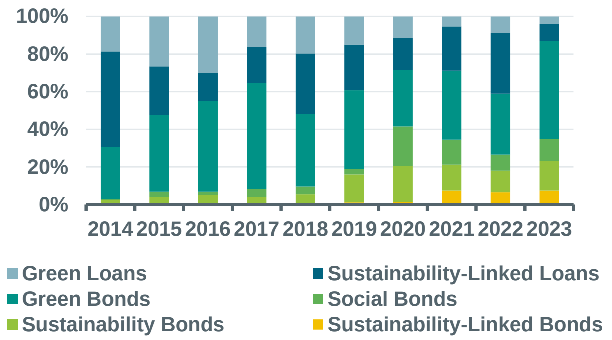
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of sustainable debt by type

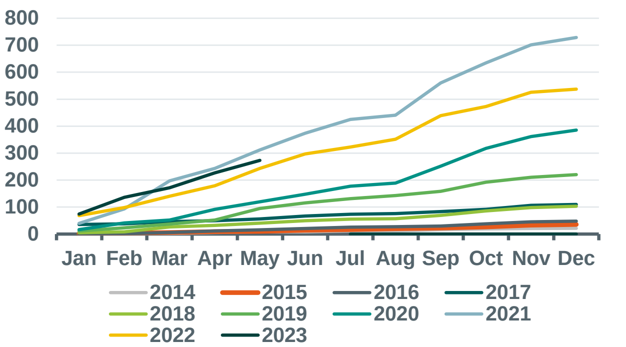
% of total



Source: Bloomberg, ABN AMRO Group Economics

YTD ESG bond issuance

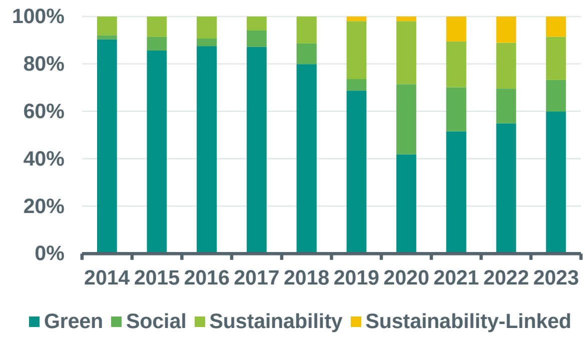
EUR bn (cumulative)



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by type

% of total

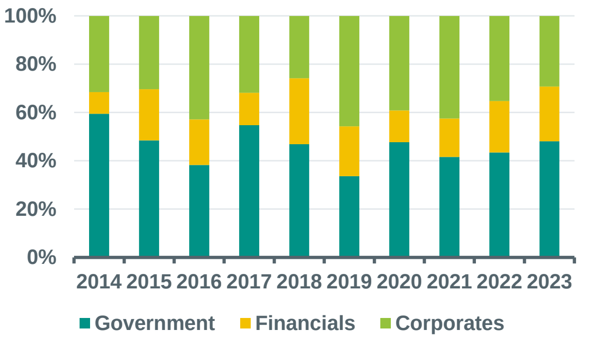


Source: Bloomberg, ABN AMRO Group Economics

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

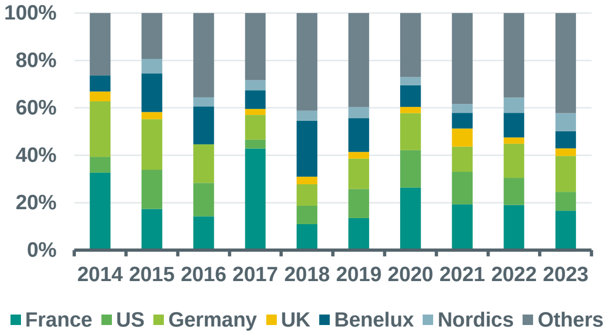
% of total



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by country

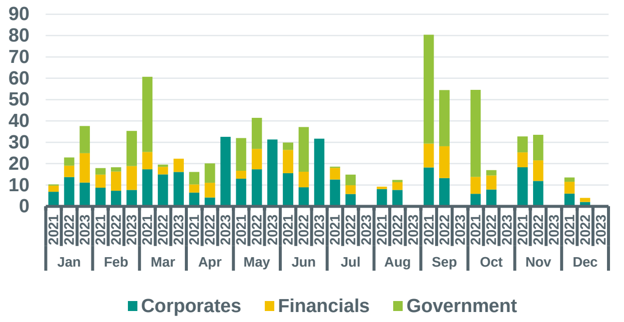
% of total



Source: Bloomberg, ABN AMRO Group Economics

Monthly Green Bonds issuance by sector

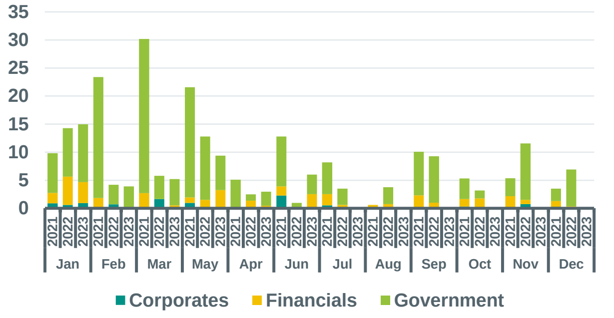
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Social Bonds issuance by sector

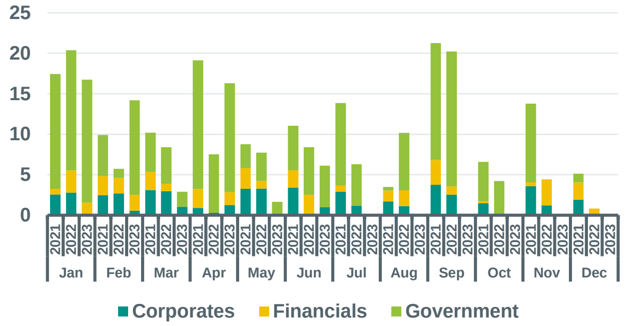
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sustainability Bonds issuance by sector

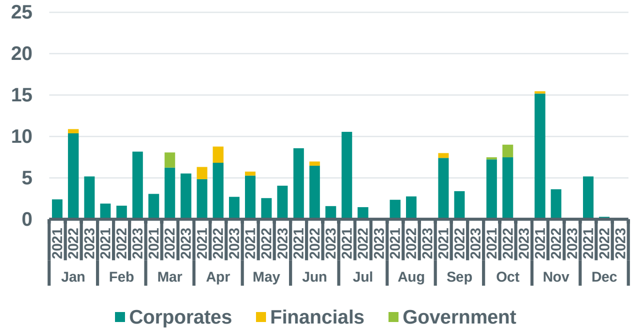
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sust.-Linked Bonds issuance by sector

EUR bn



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.

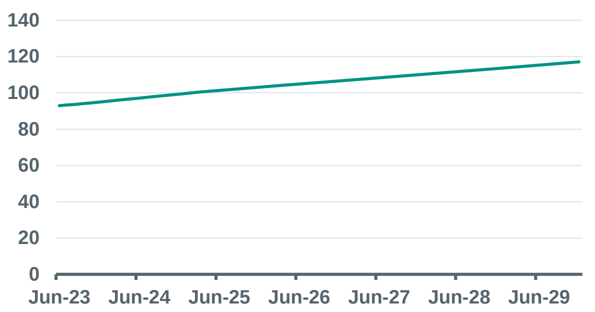
Carbon contract current prices (EU Allowance)

EUR/MT

Source: Bloomberg, ABN AMRO Group Economics

Carbon contract futures curve (EU Allowance)

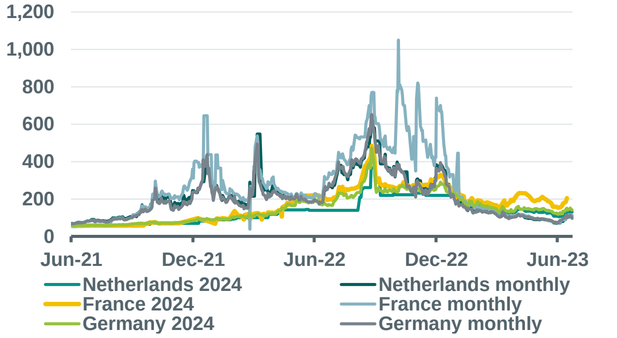
EUR/MT



Source: Bloomberg, ABN AMRO Group Economics

Electricity power prices (monthly & cal+1 contracts)

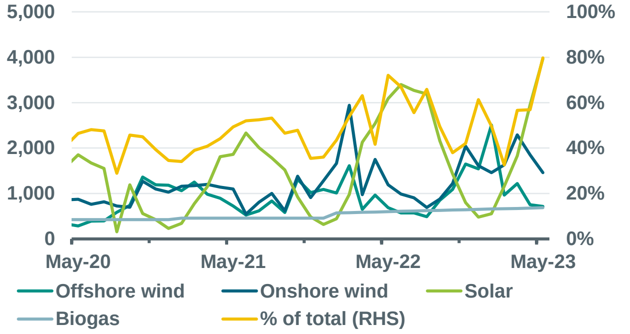
EUR/MWh



Source: Bloomberg, ABN AMRO Group Economics. Note: 2024 contracts refer to cal+1

Electricity generation from renewable sources (NL)

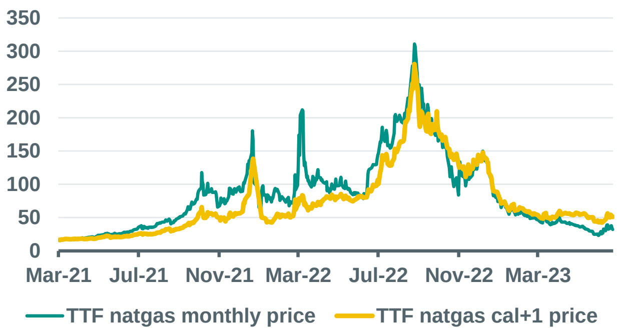
GW % of total



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

TTF Natgas prices

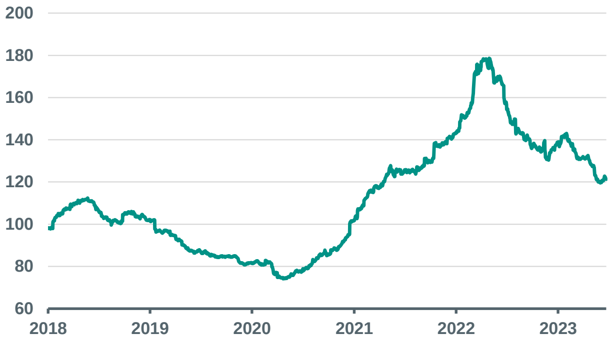
EUR/MWh



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

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

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