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Marketing Communication

SustainaWeekly

Smarter grids for a faster transition

- **Economist:** **The digitalization of power grids translates into lower operating costs, higher efficiency in electricity production, lower network losses, and extended lifetimes for power plants and networks. However, current levels of investments in grid digitalization need to double through 2030 in order to reach net zero emissions in 2050 and there are also a number of challenges in making the grid smarter, including cybersecurity and privacy.**

- **Sector:** **The International Maritime Organisation (IMO) revised its strategy to bring down GHG emissions faster. The aim is to reach net-zero GHG emission by or around 2050 by reducing carbon intensity and increasing uptake zero or near-zero GHG emission technologies, fuels and/or energy sources. The new IMO pathway is ambitious compared to existing net zero benchmarks but the midterm reduction measures are still to be agreed.**

- **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 focus on the role of smart grids in the energy transition. We dive into the expected benefits of grid digitalization, the smart grid investments trends and we end with some of the challenges associated with the roll out of smart grids. We then go on to look at the International Maritime Organisation's revised strategy to bring down GHG emissions at a faster pace, comparing the new pathway with existing net zero benchmarks.

This is the last edition of this publication until after the summer break. However, we will be publishing the results of our ESG investor survey as part of our ESG Strategist series in the next few days. Enjoy the read and, as always, let us know if you have any feedback!

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Smarter grids for faster transition

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- **Smart grids have an important role in the energy transition as they optimize the flow of information and electricity to maintain the reliability, efficiency, and the security of the system**
- **The digitalization of power grids translates into lower operating costs, higher efficiency in electricity production, lower network losses, and extended lifetimes for power plants and networks**
- **Current levels of investments in grid digitalization need to double through 2030 in order to reach Net Zero emissions in 2050**
- **Cybersecurity, privacy, and distortions of economic activities are some of the challenges associated to making the grid smarter. However, a wholistic cost-benefit analysis, that accounts for all direct and indirect aspects related to making the grid "smarter", is needed when evaluating the digitalization of energy systems.**

The electricity grid refers to all infrastructural components necessary to generate and transmit electricity from where it is produced to where demand (the load) is. Such infrastructure involves power stations, electrical substations that step the voltage up or down, electrical transmission networks that transmit the electricity regionally or between regions, and the power distribution network to get the electricity to final consumers. Crucially, in electricity markets, supply should match demand at all times, otherwise outages or excessive power could emerge and efficiency is undermined.

The energy transition will unavoidably complicate the power market, as we will rely more and more on intermittent renewable resources for supply, which are widely distributed in place and capacity (distributed solar PV, for example). Moreover, the expected growth in power supply and demand put more pressure on the grid and necessitate its expansion in capacity and flexibility. This comes with a need to optimize the grids as well by employing the latest digital solutions that can play an important role in grid management. The digitalisation of different components of the electricity grid is usually referred to as making the grid "smarter". Accordingly, smart grids are based on an integrated data and energy networks that allow for a two-way communication and control of electricity and information to optimize the flow of electricity and maintain its reliability, efficiency and security.

This note focuses on the role of smart grids in the energy transition. We dive into the expected benefits of grid digitalization, the smart grid investments trends and we end with some of the challenges associated with the roll out of smart grids.

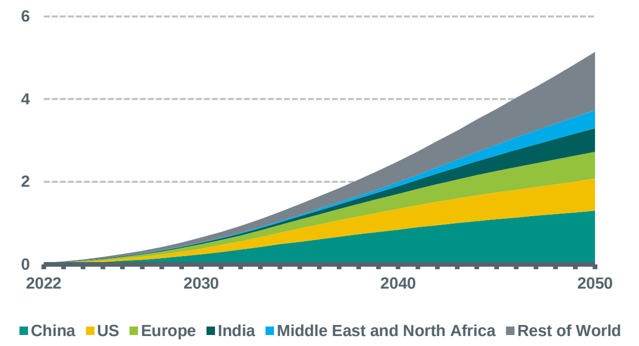
The benefits of smart grids

Digital solutions have been penetrating every aspect of our lives at an unprecedented rate. The digital age brought more and more connectivity. We are witnessing a roll out of new technologies that simplifies the gathering of power data. Many examples could be mentioned here such as the Internet of Things (IoT) which allows for home appliances to be monitored from distance, smart power meters that can be communicated remotely, bidirectional exchange of power between consumers and electricity suppliers (bidirectional charging for electric vehicles for example), the extension of smart grid infrastructure, energy controls for buildings, industrial energy management software, and electricity system software. Accordingly, variable renewable energy sources are better integrated, weather conditions can be accounted for in real time, and the rollout of small-scale distributed power supply, such as rooftops solar PV, is further facilitated. Furthermore, with storage playing a wider role in the energy transition, adding one more layer of complexity to the system, the benefits of digitalizing the grid are more pronounced by optimizing the grid capacity and coordinating the system components. All these developments facilitate gathering the data in real time which helps in making the grid more flexible and predictable. For example, energy consumption and production can be better scheduled which provide more predictability to supply and demand and the traffic through the grid in any direction.

All in all, making the grids smarter translates to lower operating costs (lower losses associated to power delivery through remote monitoring, for example), higher efficiency in electricity production, lower network losses (lower frequency of unplanned outages), and extended lifetimes for power plants and networks, as shown in the right-hand panel of the figure below. The left-hand panel depicts the regional cumulative capex on making the grid "smarter". Accordingly, the digitalization of power grid helps in boosting the energy transition further.

Cumulative capex on power grid digitalization by region

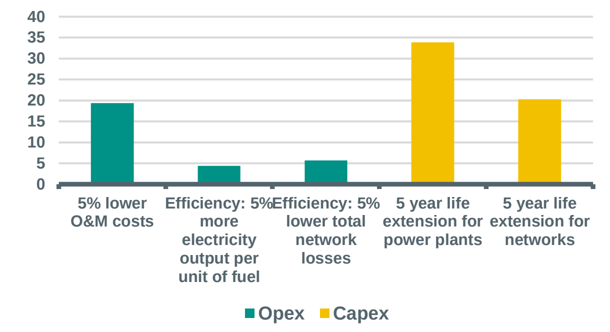
Unit: trillions USD



Source: Bloomberg, ABN AMRO Group Economics

Global cost savings from enhanced digitalisation in power plants and electricity networks 2016-2040

Unit: USD billion (2016)



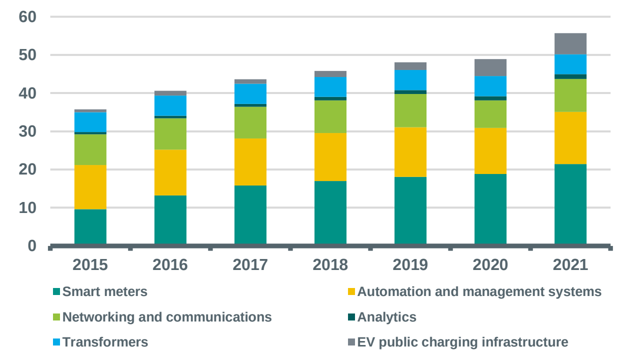
Source: IEA, ABN AMRO Group Economics

Where do we stand in making the grid "smarter"?

Given the urgency of the energy transition, grid extensions and digitalization are becoming an unavoidable necessity. This has been acknowledged by governments worldwide, which is evident through the continuous increase in digital infrastructure investments since 2015, as shown in the left-hand panel of the figure below. The panel further illustrates that deployment of smart meters and networking and communication technologies represents more than half of these investments. This is further emphasized in the right-hand panel where grid controls have the highest number of global grid digitalization projects.

Global Investments in digital Infrastructure

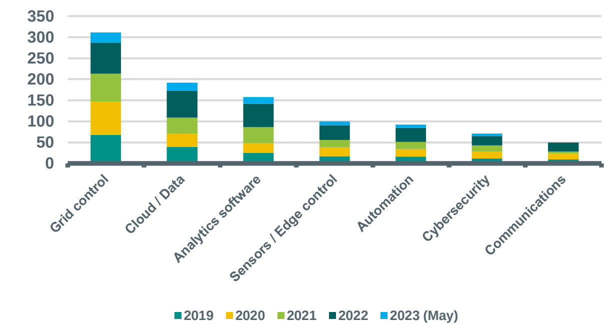
Unit: Billion USD (2021)



Source: IEA, ABN AMRO Group Economics

Global digital power projects

Unit: number of projects and partnerships



Source: Bloomberg, ABN AMRO Group Economics

According to the IEA, on average USD 600 billion investments in electricity grids are needed annually through 2030 to stay on track with Net Zero emissions by 2050. This translates in doubling the current investment levels for smart grids (**source**). Bloomberg on the other hand estimates a USD 5.1 trillion of total digitalization investments to 2050, with a share of 30% allocated towards grid controls (**source**).

Challenges for smart grids

Like any other technology, the benefits of smart grids come with associated challenges. The first challenge relates to cybersecurity, as more reliance on digital technologies is associated with higher vulnerability of the energy system to cyberattacks. The handling of data and information may also create a challenge to personal privacy with a wider integration of digital solutions in the power systems. Furthermore, more digitalization comes along with spill over impacts on economic activities. For example, digitalization will make some jobs idle, but also create new opportunities. Finally, even though digitalization has a positive effect in decreasing energy intensity, increasing efficiency, but at the same time it may induce a rebound effect that increases energy use. For example, more efficient EV, in terms of charging times and travelled distance, would increase incentives to drive more.

In order to better account for the current or any emerging consequences of smart grids, understanding the effects of digitalization on consumer trends is crucial. Moreover, to mitigate any inconsistencies, standardization is essential for the development of smart grids. Accordingly, a wholistic cost-benefit analysis, that accounts for all direct and indirect aspects related to making the grid “smarter” is needed when evaluating the digitalization of energy systems.

New strategy to reduce GHG emissions from maritime shipping

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- **International shipping is responsible for around 2% of greenhouse gas emissions**
- **The International Maritime Organisation revised its strategy to bring down GHG emissions faster**
- **The aim is to reach net-zero GHG emission by or around 2050 by reducing carbon intensity…**
- **…and increasing uptake zero or near-zero GHG emission technologies, fuels and/or energy sources**

Introduction

The aim is to become net zero by 2050. The shipping industry has to play a role in achieving a net zero pathway, which would limit global warming to 1.5 degrees. International shipping accounts for around 2% of global greenhouse gas emissions. The shipping industry is tied to several regulations and ambitions of a number of organizations such as the targets of the International Maritime Organization (IMO), the Poseidon principles and the European Commission's Fit for 55. When it comes to emissions regulations, there are two key standards to consider: IMO regulations and EU stage V. The main difference between them is that IMO regulations apply to sea-going vessels, while EU stage V diesel emissions apply to inland waterway vessels. There is another key policy drive adding to these: maritime shipping will become part of the ETS in 2024. In our Sustainaweekly of 18 April (**here is the link to this report**) we focussed on this. In this publication we focus on the strategy revision of the International Maritime Organization to bring down greenhouse gas emissions faster, which was published recently.

UN International Maritime Organization Strategy update

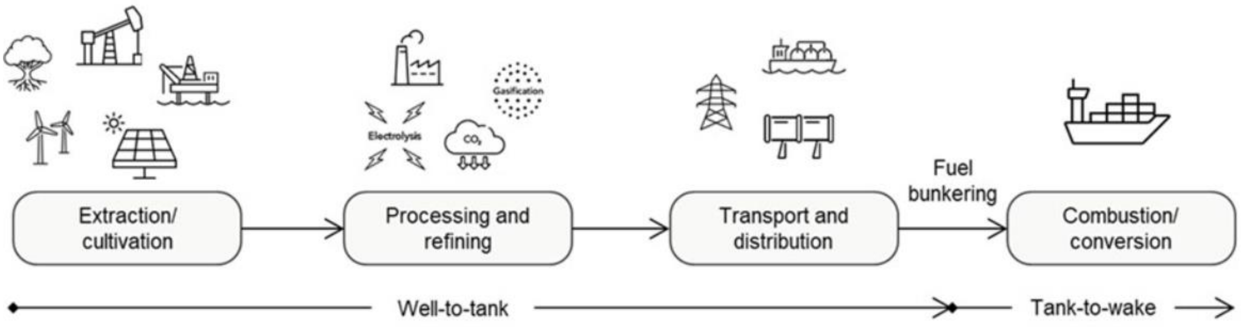
The International Maritime Organization (IMO) is the UN specialized agency responsible for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. On 7 July it revised its strategy on reduction of greenhouse gas emissions from ships. It revoked the 2018 Initial IMO GHG Strategy of 2018. It announced its new strategy, which is a continuation of the work done by the IMO to address greenhouse gas emissions from international shipping. The strategy is aimed at enhancing IMO's contribution to global efforts addressing greenhouse gas emissions from international shipping.

The strategy identifies levels of ambition (more on this below) for the international shipping sector noting that technical innovation and the global introduction and availability of zero or near-zero GHG emission technologies, fuels and/or energy sources for international shipping will be integral part to achieving the overall level of ambition. The levels of ambitions and indicative checkpoints should be taken into account the well-to-wake GHG emissions of marine fuels as addressed in the guidelines on lifecycle GHG intensity of marine fuels (LCA guidelines). Below we set out more details on the well-to-wake basis and LCA guidelines. The regulations will be mandatory for all ships. Vessels will not get any exceptions based on a flag they are registered under.

Life cycle assessment

To reduce emissions it is crucial to have a good understanding of what the emissions are, the number of emissions emitted and when they are emitted. In its previous IMO strategy international shipping measured CO2 emissions via the tank-to-propeller approach. In this approach the total CO2 emissions from combustion on board of a ship and potential leakage are measured. In its strategy IMO changed to a new approach. The IMO has adopted a lifecycle assessment (LCA). The lifecycle assessment method refers to the assessment of greenhouse gas emissions from the fuel production to the end-use by a ship or well-to-wake approach; it results from the combination of a well-to-tank part (from primary production to carriage of the fuel in a ship's tank, also known as upstream emissions) and a tank-to-wake (or tank-to-propeller) part (from the ship's fuel tank to the exhaust, also known as downstream emissions). So it is a calculation method. It also defines a fuel life cycle label that specifies the information relevant for the life cycle assessment. The graph below is the visual overview of the different approaches.

Well-to-wake = well-to-tank + tank-to-wake



Source: IMO

New ambition levels and intermediate levels

What are the new ambition levels and indicative or intermediate targets? Below we set out the key areas:

- Carbon intensity of the ship to decline through further improvement of the energy efficiency for new ships
- To reduce CO2 emissions per transport work (this is distance sailed x capacity) as an average across international shipping by at least 40% by 2030 compared to 2008.
- Uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to represent at least 5% and striving for 10% of the energy used by international shipping by 2030
- To reduce the total annual GHG emissions from international shipping by at least 20%, striving for 30% by 2030 compared to 2008 (indicative checkpoint)
- To reduce the total annual GHG emissions from international shipping by at least 70%, striving for 80% by 2040 compared to 2008 (indicative checkpoint)
- GHG emissions to peak as soon as possible and to reach net-zero GHG emissions by or around 2050 taking into account different national circumstances.

Timelines

The ambition levels translate into specific measures of how to reach net-zero by or around 2050. There are short-term, mid-term and long-term reduction measures. The short-term strategy reduction measures are the measures finalized and agreed by the committee between 2018 and 2023. This is a review of the mandatory goal-based technical and operational measures to reduce carbon intensity of international shipping. They need to be completed by January 2026.

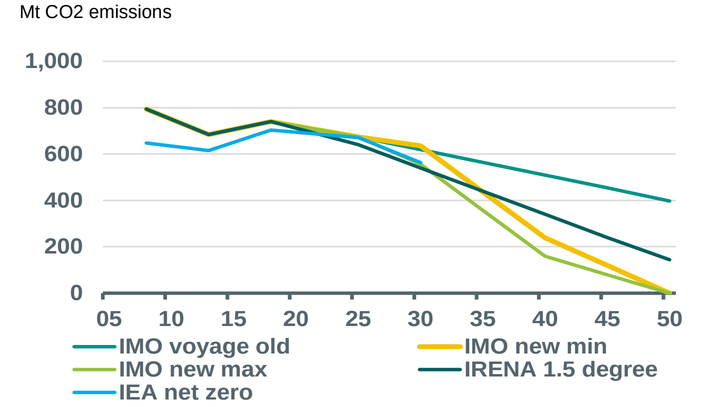
The basket of mid-term reduction measures should be finalised and agreed by the Committee by 2025. These should both comprise a technical element and an economic element. A technical element means a goal-based marine fuel standard regulating the phased reduction of the marine fuel's GHG intensity. The economic element is on the basis of a maritime GHG emissions pricing mechanism. This could be in line with EU ETS. The reduction target should take into account the Well-to-Wake GHG emissions of marine fuels. These measures enter into force in 2027.

Other candidate mid-term GHG reduction measures could be finalized and agreed by the Committee between 2023 and 2030. Possible long-term measures could be measures finalized and agreed by the Committee beyond 2030 to be developed as part of the 2028 review of the IMO strategy.

Maritime shipping pathways

With the review of its strategy, the IMO has also significantly changed its reduction pathway. Previously the strategy aimed at a 50% reduction in greenhouse gasses by 2050 and to be net zero in 2100. The revised strategy is far more ambitious. It aims to be net-zero 50 years earlier in a hard to abate sector. The new pathway is close to the IEA net zero pathway and even more ambitious than the IRENA 1.5-degree pathway. The graph below shows the old and new IMO pathways (voyage-based calculation method), the IRENA 1.5-degree pathway and IEA net zero.

IMO strategy old and new versus IRENA and IEA



Source: IMO, IRENA, IEA

With this ambitious pathway the IMO assumes that technical innovation and the global introduction and availability of zero or near-zero GHG emission technologies, fuels and/or energy sources for international shipping will be integral part to achieving the overall level of ambition. This is exactly where the bottlenecks are. The future energy carrier has still to be decided. Most fuels have lower energy density compared to the maritime fuels used currently. This means more storage and alterations to the ships to deal with the extra weight and safety of these other fuels would be vital. Engines need to be adjusted accordingly as well. The life of a maritime ship is on average 25 years so the risk of stranded assets is high. Even if the future energy carrier has been decided, there also needs to be enough production. The marginal abatement costs of the possible future energy carriers are still high. So the uptake of zero-or near-zero GHG emission technologies, fuels and or energy sources of at least 5% by 2030 may be quite a challenge.

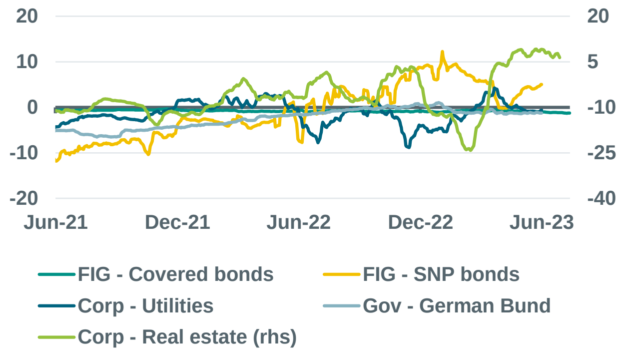
Conclusion

International shipping is responsible for 2% of the global greenhouse gas emissions. The IMO has revised its strategy to bring down greenhouse gas emissions faster. It aims to be net zero by or close to 2050 in a hard to abate sector. It has also set some indicative targets for 2030 and 2040. In addition the IMO has as target that the uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to represent at least 5% and striving for 10% of the energy used by international shipping by 2030. This comes at a time that the marginal abatement costs of these technologies/fuels are still very high and the fuels are not produced in large quantities. The new IMO pathway is roughly in line with IEA net-zero (up to 2030) but more ambitious than the IRENA 1.5-degree pathway. Overall we think the new IMO pathway is very ambitious and may not take into account the challenges. Changing the energy carrier is crucial and with that comes other challenges such as safety using a new energy carrier, adjusting design of the ship, and the engine readiness of using a new fuel. So the path to decarbonize shipping is likely to be a long one.

ESG in figures

ABN AMRO Secondary Greenium Indicator

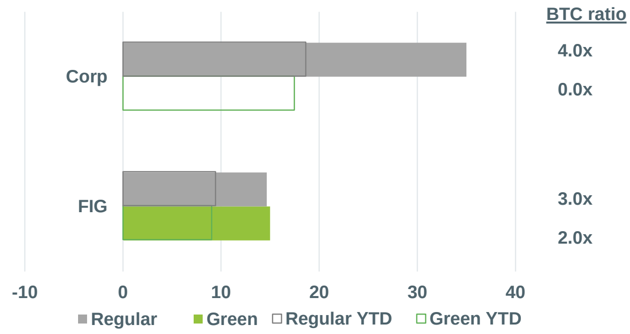
Delta (green I-spread – regular I-spread)



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

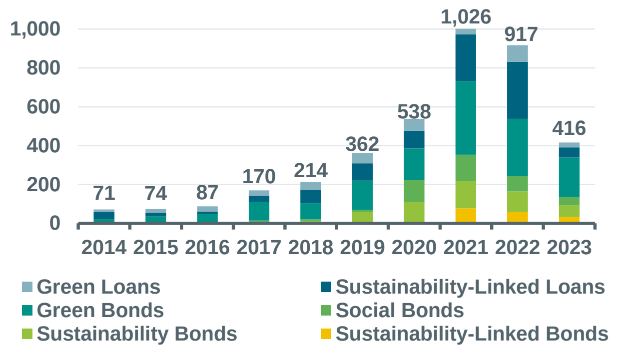
NIP in bps



Note: Data until 05-07-23 (except FIG: data as of 04-07). BTC = Bid-to-cover orderbook ratio. Source: Bloomberg, ABN AMRO Group Economics

Sustainable debt market overview

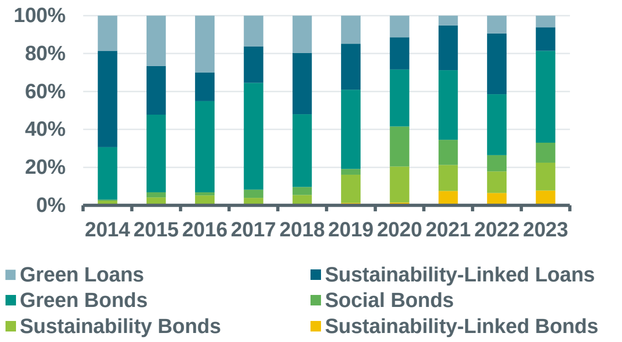
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of sustainable debt by type

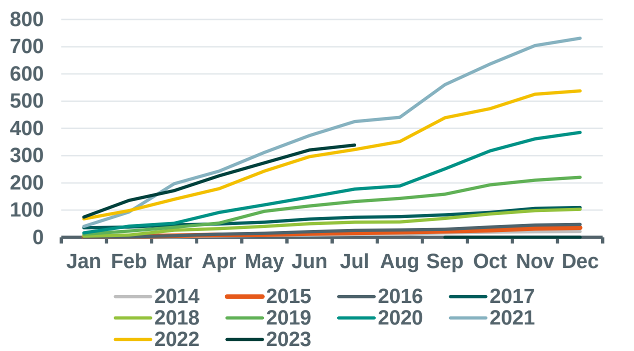
% of total



Source: Bloomberg, ABN AMRO Group Economics

YTD ESG bond issuance

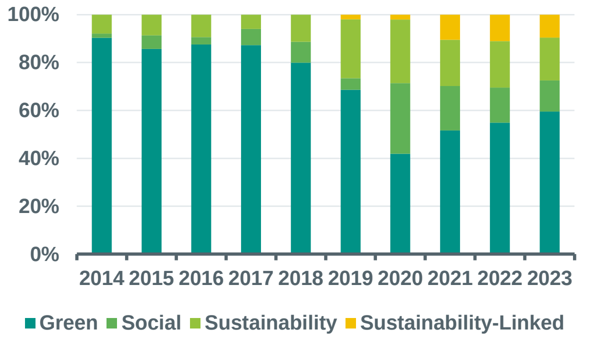
EUR bn (cumulative)



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by type

% of total

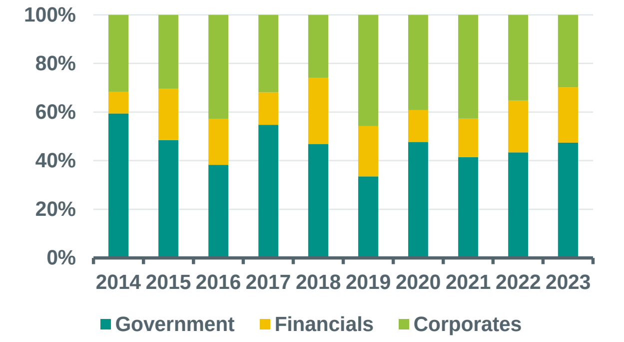


Source: Bloomberg, ABN AMRO Group Economics

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

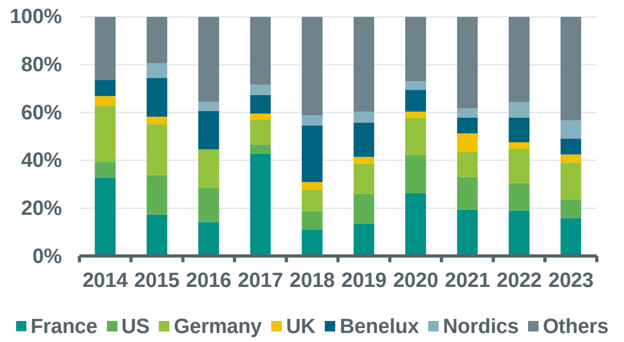
% of total



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by country

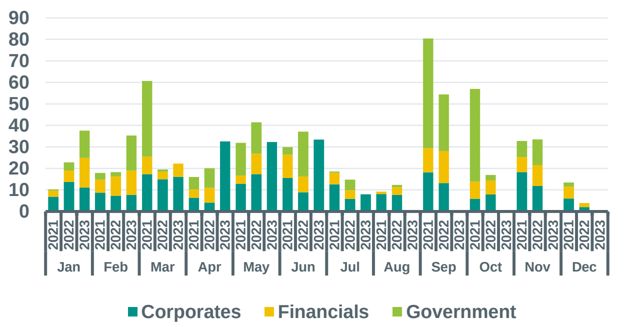
% of total



Source: Bloomberg, ABN AMRO Group Economics

Monthly Green Bonds issuance by sector

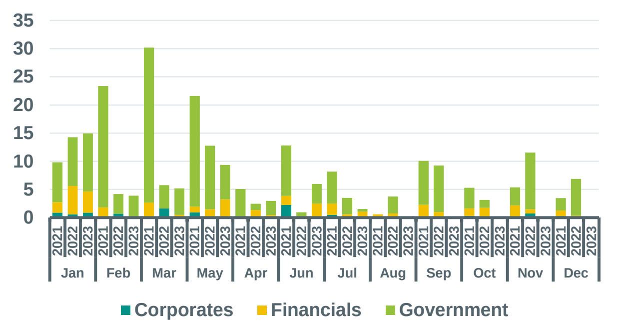
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Social Bonds issuance by sector

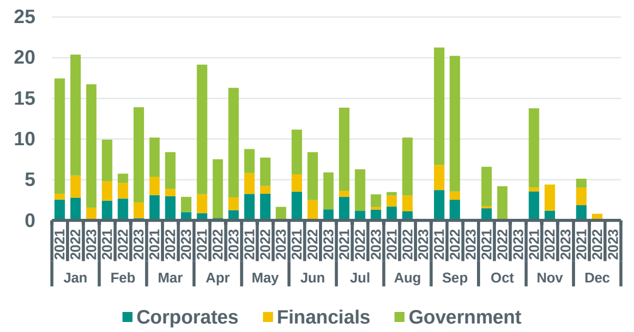
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sustainability Bonds issuance by sector

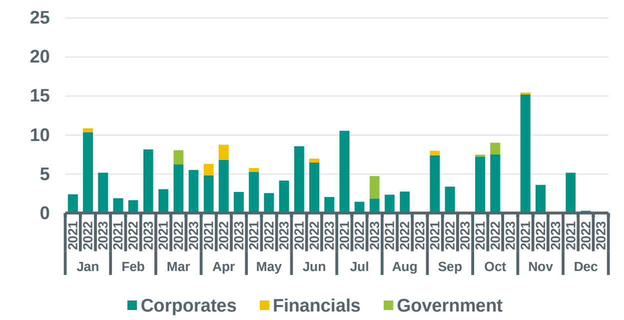
EUR bn



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.

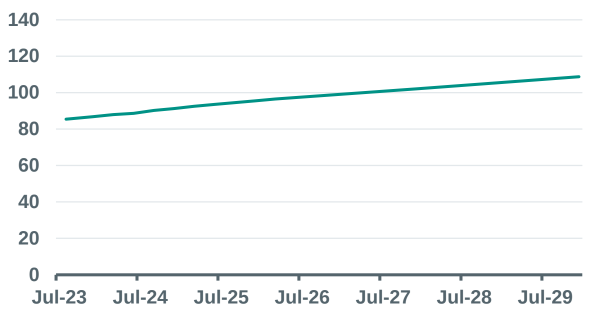
Carbon contract current prices (EU Allowance)

EUR/MT

Source: Bloomberg, ABN AMRO Group Economics

Carbon contract futures curve (EU Allowance)

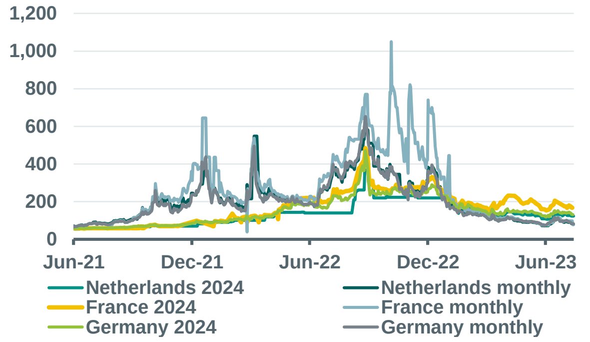
EUR/MT



Source: Bloomberg, ABN AMRO Group Economics

Electricity power prices (monthly & cal+1 contracts)

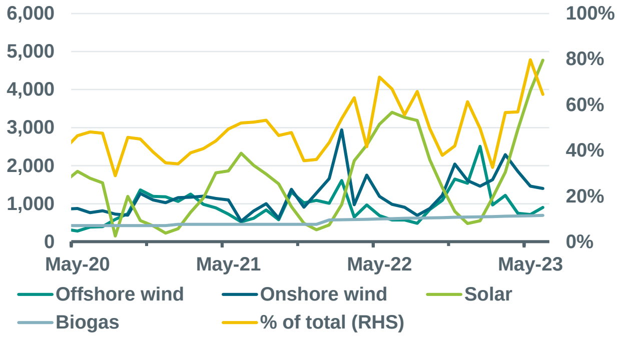
EUR/MWh



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

Electricity generation from renewable sources (NL)

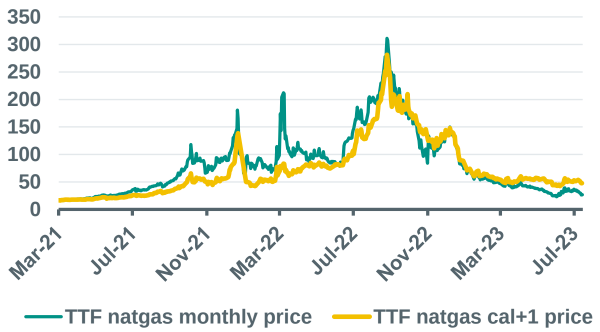
GW % of total



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

TTF Natgas prices

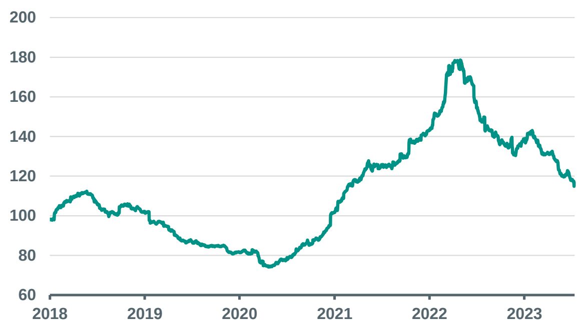
EUR/MWh



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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