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Marketing Communication

SustainaWeekly

Shinning a light on battery technologies

- **Economist:** **The problem with renewables is intermittency and batteries can solve this problem. However, batteries also have their challenges: energy density, life cycles, use of materials. The choice of technology is mainly a trade-off between energy density, life cycles and availability and costs of materials with safety always being at a high standard. Emerging battery technologies could solve some of the challenges that the current technologies face.**

- **Policy & Regulation:** **The market for sustainable covered bonds has been growing steadily. However, still much improvement is needed with regards to ESG data disclosure. The ECBC's Harmonised Transparency Template (HTT) already offers issuers the opportunity to disclose the most important ESG data but not many issuers do so. Next year, ESG data reporting in HTT will be expanded and will become mandatory for sustainable covered bond issuers.**

- **Strategist:** **Stronger demand for SLBs versus regular or green bonds is not translating into lower new issue concessions. Indeed, last week's SLB issuance by Wienerberger came with a significant pick-up to other building material names and high curve steepness. Yet the limited specification by this issuer on how exactly it will reduce emissions and an absence of absolute emission intensity disclosures could explain the premium it had to pay.**

- **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 a world where renewable power becomes dominant, a way to store energy is crucial. In this week's SustainaWeekly we shine the spotlight on battery technologies, not only existing ones, but also emerging technologies. We focus on the pros and cons of the various technologies. In a separate note, we go on to look at the issue of ESG data disclosures from the issuers of sustainable covered bonds. In our final note, we look at the issuance of sustainability-linked bonds so far this year, as well as recent demand and pricing dynamics.

Enjoy the read and, as always, let us know if you have any feedback!

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The pros and cons of battery technologies

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- **The problem with renewables is intermittency but batteries can solve this problem**
- **Batteries store energy for later use, for mobility and portable dices**
- **Batteries also have their challenges: energy density, life cycles, use of materials**
- **The choice of technology is mainly a trade-off between energy density, life cycles and availability and costs of materials with safety always being at a high standard**
- **Emerging battery technologies could solve some of the challenges that the current technologies face**

Introduction:

To reach net-zero by 2050 renewables play a crucial role. The main problem with renewables is intermittency, so they come and go and patterns can be difficult to predict. Therefore, we need a way to store this energy. There are two main objectives/reasons to store energy: storage for home/office or for mobility. An example of the former is a home battery that stores energy produced during the day by solar panels to consume it when the sun sets. So this battery is used to store energy from renewable sources to use it at a later moment. An example of the latter is a battery used in an electric car instead of an internal combustion engine that burns fossil fuels. So this is a battery to store energy to drive instead of burning fossil fuels and thereby reducing greenhouse gas emissions. Batteries are crucial in the energy transition. However, there are quite some challenges. Batteries for home storage are expensive, generally not supported by subsidies and they rely on materials that are in short supply. Batteries used in mobility need higher energy density to increase the range. They are also expensive because of the critical metals used, while these metals could also be in a shortage in the future. In this report we focus on the current and emerging battery technologies to solve some of these challenges. We start with some basics on batteries, then look at the batteries that are currently available followed by the emerging technologies.

What is a battery?

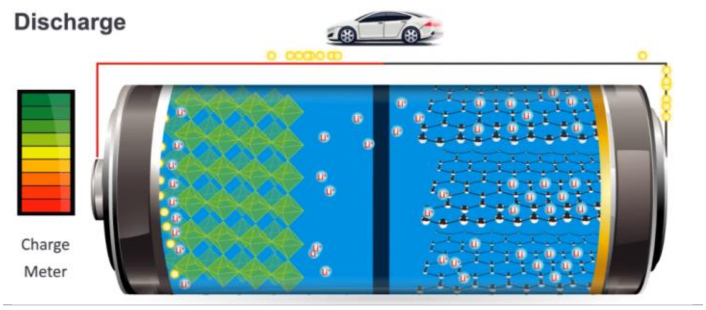
A battery is a device that produces electricity from a chemical reaction. Each battery has a cell that has three components: two electrodes (positive and negative) and an electrolyte between them. The electrodes are immersed in chemicals inside the battery. The chemicals react with the metals causing excess electrons to build up on the negative electrode producing a shortage of electrons on the positive electrode. If you connect a circuit then there is a way for the electrons to travel from the negative to the positive side. So conventional batteries store energy by using chemical reactions to trap ions that move from one electrode to the other. As noted above, batteries are used to store renewable energy for later use and for electric vehicles. There are different types of batteries. There are non-rechargeable batteries (alkaline, coin cell) and rechargeable batteries (lead-acid, nickel-cadmium, nickel-metal hybrid and lithium-ion). They are explained in detail in the table below.

Today, more than 50% of the entire market uses lithium-ion. These batteries are preferred in electric vehicles due to their high energy per unit mass, high power to weight ratio, energy efficiency and low self-discharge (source: **eTechnophiles**). The two most common concepts associated with batteries are energy density and power density. Energy density is measured in watt-hours per kilogram (Wh/kg) and is the amount of energy the battery can store with respect to its mass. Power density is measured in watts per kilogram (W/kg) and is the amount of power that can be generated by the battery with respect to its mass (source: **www.energy.gov**). So it is the rate of charging/discharging the battery. Other important aspects are thermal runaway especially for lithium-ion batteries and cycle life. Thermal runaway is defined as a critical condition arising during constant voltage charging in which the current and the temperature of the battery produces a cumulative, mutually reinforcing effect which further increases them, and may lead to the destruction of the battery. A battery cycle life is the number of charge, discharge or rest cycles a cell or battery can provide. Below we go into more details about lithium-ion batteries because they are currently the most used batteries

Lithium-ion battery

As indicated above, a lithium-ion battery is a family of rechargeable battery types. The battery has a cathode, anode, separator, electrolyte and two current collectors (positive and negative). The anode and cathode store the lithium. The electrolyte carries positively charged lithium ions from the anode to the cathode and vice versa through the separator. The movement of the lithium ions creates free electrons in the anode which creates a charge at the positive current collector. The electrical current then flows from the current collector through a device being powered (mobile phone, computer, EV) to the negative current collector. The separator blocks the flow of electrons inside the battery. While the battery is discharging and providing an electric current, the anode releases lithium ions to the cathode, generating a flow of electrons from one side to the other. When plugging in the device, the opposite happens: Lithium ions are released by the cathode and received by the anode (source: www.energy.gov). A battery can be packed in various ways: cylindrical, prismatic or pouch. Every way of packing has a different system of thermal management.

How lithium-ion batteries work



Source: energy.gov

The battery's capacity and voltage are determined based on what type of active material is used in the cathode. Most cathodes contain nickel, lithium, cobalt and manganese but in different quantities. Some batteries contain aluminium. Each battery chemistry has a specific energy density, stability, safety and durability and one chemistry could be better suited for storage for electric vehicles and vice versa. Nickel has high capacity, manganese and cobalt have high safety and aluminium increases the power of the battery. The different types of lithium-ion batteries are mentioned in the table below. A higher energy density means that vehicles can travel further without the need to recharge. Safety and durability are also important to take into account. The anode is responsible for the lifespan and is mostly made of natural or synthetic graphite. The electrolyte and separator determine the safety of a battery.

Current rechargeable battery technologies

	Chemistry	Energy density	Thermal runaway	low temperature limit	Cycle life	Cost $/kWh	Pros	Cons	Use
Flow	Store energy in liquid electrolyte solutions Carbon-based electrodes together with iron, bromine or organic molecules	170 Wh/kg			+/- 30 years	20-100	Long lifespan Large storage Can be upgraded Component can be substituted No critical metals	Low energy density Not commercially mature	Storage
Lead-Acid	Lead dioxide cathode Lead anode	40-60 Wh/kg		-40 °C	500-1,200	100 141	Low self-discharge Perform well in cold temp	Low energy density High density of lead	Storage
LCO	Lithium Cobalt Oxide (60% Cobalt) cathode Graphite anode	150-200 Wh/kg	150 °C		500-1,000		High energy density Rapid charging	Thermal instability Capacity degradtion No high-load applications	Small portable electronics
LFP	Lithium Iron Phospate cathode Graphite anode	120-165 Wh/kg	270 °C	-20 °C	2,500	96	Longer life cycle Less thermal runaway risk Lower cost, less critical metals	Lower energy density More sensitive to cold temp	Storage, EV
LMO	Lithium Manganese Oxide cathode Graphite anode	100-150 Wh/kg	250 °C		300-700	104	Higher thermal stability No cobalt	Short lifespan	EV, portable power tools
LTO	LMO or NMC cathode Lithium Titanate anode	50-80 Wh/kg	One of safest Li-Ion		3,000-7,000		Wide operating temperature Long lifespan Safety and stability	Low energy density Expensive	EV, charging stations, aerospace
NCA	Lithium Nickel Cobalt Aluminium Oxide cathode Graphite anode	260-350 Wh/kg	150 °C		<1000	139	Higher energy density No use of Manganese	Shorter life cycle Use of critical metals incl cobalt	Medical devices, industrial, EV
NMC	Lithium Nickel Manganese Cobalt Oxide cathode Graphite anode	240 Wh/kg	210 °C	-30 °C	1,000	133-148	Higher energy density Better in cold temperature	More expensive Not as safe as other Li-ion	E-bikes, EV, medical devices
Nickel-cadmium	Nickel oxide hydroxide cathode Metallic cadmium anode	40-60 Wh/kg			5-7 years		Not expensive Easy to recharge Workable despite the weather	Toxic heay metal Low energy density Full charge/discharge	Portable devices
Nickel metal hydrid	Nickel hydroxide cathode Metal hybrid anode	70 Wh/kg			700-1,000		Withstand harsher weather Easier to recycle Cheaper than Li-ion	Low energy density Heavier	Hybrid EV, EV, portable devices
Sodium-sulfur	Molten sodium and sulfur	150-240 Wh/kg			2,500	50-100	High energy density Low cost	High operating temperature Safety and durability	Storage

Source: BNEF for costs, battery university, arenaev, batterymanguide, several scientific papers (chemical, electronics)

There are several ways to increase the energy density of a lithium-ion battery. First use more lithium, cobalt and other components. Second, change the composition of the battery and the materials used (battery chemistry). So, for example a lower use of cobalt and a higher use of nickel. A Nickel Cobalt Aluminium Oxide (NCA) battery has the greatest energy density. A Nickel Manganese Cobalt Oxide (NMC) battery has a lower energy than NCA battery but has a longer life cycle. They both use critical metals and have relatively low thermal runaway temperatures (150-210 °C). A Lithium Iron Phosphate (LFP) battery offers thermal stability at even high temperatures, is low cost, has high cycles and high durability. A Lithium Titanate battery has low energy density and is expensive, but is one of the safest Lithium-ion batteries and has long life cycles.

There is a drive to increase the range (higher energy density) especially for road transport, to increase the cycles, to reduce the number of critical metals used, and to reduce the costs in order to make batteries for storage and electric vehicles more affordable. One way to reduce costs and use of critical metals is to use another battery or change the battery chemistry. More car manufacturers are opting for an LFP battery instead of NMC. This is a cheaper, safer, has a longer lifespan and uses less critical metals but the energy density of LFP batteries is much lower than NMC batteries (see table above). LFP also seem to suffer from poor performance at very low temperatures. Another way to solve, or partly solve, the current challenges is waiting for the emerging battery technologies. More on this in the subsequent section.

Emerging battery technologies

The table above is an overview of the emerging battery technologies. Some of these are revamped editions of already available technologies such as NMC955, flow batteries, ultracapacitor and hybrid capacitor, some are already existing ideas but not rolled out on a commercial scale and others are new technologies. In terms of energy density, the battery technologies Lithium-Sulfur, Lithium-Air and Sodium-Sulfur (revamped) are very promising. But they have considerable stability, durability and/or safety issues. These challenges need to be solved first before they become available on a commercial scale. The technical readiness level of these technologies are between 1 and 5 depending on the technology. (the table below is an explanation of technical readiness levels.

Emerging battery technologies

	Composition and description	Energy density potential	Cycle life	Pros	Cons	TRL
NCM 9.5.5	Lithium Nickel Manganese Cobalt Oxide	280 Wh/kg	1,000	Higher range Lower Cobalt content.	Other critical metals Expensive	
Solid state * SSB	Solid electrolyte, not a liquid.	400-2,600 Wh/kg	1,000-10,000	Improvement in safety Higher energy density Improvement in cycle life	Technology under development Dendrite forming Critical metals	4-8
Silicon in anode	Silicon in anode	30% higher density (100% Silicon)	Now very low	Higher capacity	Under development Silicon grows and shrinks with charge/discharge Shorter life cycle	7
Li-S	Lithium anode Lithium and sulfur cathode	550-2,700 Wh/kg	Now very low	Higher energy density Faster charging Lower cost Sulfur is inexpensive, abundant, non-toxic	Lithium in anode difficult material to work with Energy causes the battery to break apart Low life cycle	4
Lithium-air	Lithium anode Porous carbon acts as cathode Oxidation of lithium at anode Reduction of oxygen at cathode	11,400	Now very low	Ultra-high energy density Low cost No cadmium of lead	Stability of electrolyte is a weakness. High charge voltage Formation of undesired by-products Low round-trip efficiency Degradation challenge Large portion of irreversible components	1-2
Sodium-ion	Use sodium ions instead of lithium ions	160	3,000-6,000	Sodium more abundant than lithium Cheaper than lithium Potential to offer similar energy density Less affected by low temperature Less prone to overheating and catching fire	For energy storage Slower charge/discharge rate	8-9
Flow	Carbon-based electrodes together with iron, bromine or organic molecules	170 Wh/kg	+/- 30 years	Can store large quantities of energy The same system can be upgraded Selective substitution of the components Non-rare metallic electrodes	Low energy density Not commercially mature	8-11
Sodium-sulfur 2	Molten sodium and sulfur	2,600 Wh/kg	2,500	High energy density Low cost	High operating temperature Safety and durability	4-5
Ultracapacitor	Separation of charges	Low	0.5-1million	Higher power density No chemical reactions involved Faster charge More stable No heavy metals Good temeprature performance For low-voltage systems	Low energy density Higher self-discharge	
Hybrid capacitor	Combi battery and ultracapacitor	Better		Solve limitations ultracapacitor Reduce stress in battery Last longer	Still low energy density compared to Li-ion	

Source: European Commission, Chemical Engineering Journal Advances, arenaev, harvard gazette, several scientific papers (chemical, engineering)
TRL 1 – basic principles observed TRL 2 – technology concept formulated TRL 3 – experimental proof of concept TRL 4 – technology validated in lab TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies) TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies) TRL 7 – system prototype demonstration in operational environment TRL 8 – system complete and qualified TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Solid state is a promising technology that will come more quickly to the market. Toyota expects to produce its solid state batteries as early as 2027. Solid state technology is a battery that uses a solid electrolyte compared the liquid electrolyte in lithium-ion batteries. Liquid electrolyte can be dangerous and unstable accidentally short-circuiting or overcharging. The liquid electrolyte can spark a fire or explode. A solid electrolyte prevent such event from happening. Another advantage is that solid state batteries have higher energy density from 400 Wh/kg potentially to up to 2,600 Wh/kg. This is substantially higher than current lithium-ion batteries with an energy density of 240-350 Wh/kg. Finally they also are said to have higher cycles compared to lithium-ion batteries. This emerging technology also has some disadvantages. For a start, solid state batteries have high internal resistance at solid electrodes and electrolyte interfaces, which slows down the fast charging and discharging process. Moreover, the cost is still high as it is an emerging technology. Mass production seems difficult as there is scarcity of a reliable candidate for a solid electrolyte. Finally, during charges and discharges root-like build-up (dendrite) form on lithium metal in the anodes. Dendrite build-up reduces the amount of solid electrolyte capacity and thus the stored charge.

Another technology that could gain more traction is sodium ion batteries. They use sodium-ions instead of lithium-ions. The energy density is low compared to NMC, but they are safer and have substantially more cycles. So they could be a strong competitor for the LFP and lead-acid batteries for storage. But sodium-ion technology is about where lithium-ion technology was a decade ago.

ESG data disclosures on covered bonds to improve in 2024

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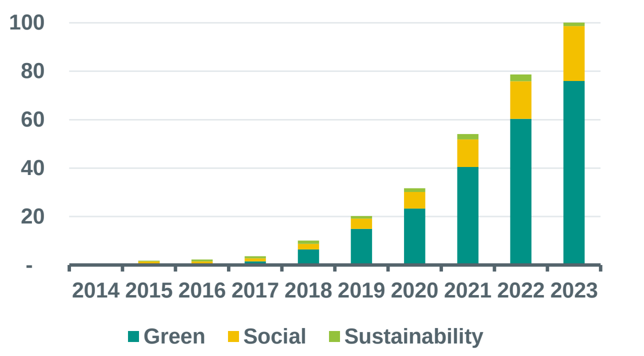
- **The market for sustainable covered bonds has been growing steadily over recent years**
- **However, still much improvement is needed with regards to ESG data disclosure**
- **The ECBC's Harmonised Transparency Template (HTT) already offers issuers the opportunity to disclose the most important ESG data (on building energy labels and energy use)**
- **Currently not many issuers (even green covered bond issuers) fill in all ESG data fields**
- **Next year, ESG data reporting in HTT will be expanded and will become mandatory for sustainable covered bond issuers**

Sustainable covered bond market breached the EUR 100bn mark

The market for sustainable covered bonds has been growing steadily since the first sustainable covered bond was issued in 2014. In fact, the total amount of outstanding covered bonds breached the EUR 100bn mark this year. Currently, sustainable covered bonds, which are green, social and sustainability bonds, account for 8% of the iBoxx euro benchmark index, with the majority being in green format. Meanwhile, issuance of sustainable euro benchmark covered bonds was EUR 17.3bn so far this year, which compares to EUR 19.1bn during 2022, while already exceeding the total amount of EUR 16.3bn issued in the prior years. Sustainable covered bonds tend to finance energy-efficient mortgages, social housing, and other social/green public sector loans. As such, they can play a key role in financing the energy transition (see more here).

Outstanding amount of sustainable covered bonds

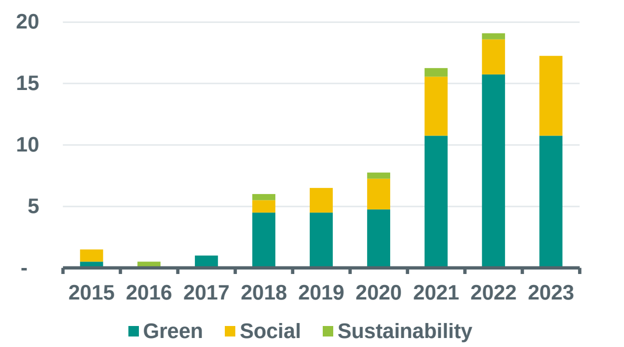
EUR bn, all currencies



Source: Bloomberg, ABN AMRO Group Economics

Issuance of sustainable covered bonds

EUR bn, euro benchmarks only



Source: Bloomberg, ABN AMRO Group Economics

Improvements needed regarding ESG data disclosures

Indeed, nearly 40% of total greenhouse gas emissions result from the real estate sector, which implies that decarbonising the real estate sector will be a big challenge in the years to come. However, there are still challenges and questions from regulators, issuers, investors and other involved parties about data disclosures for sustainable covered bonds. This limits the assessment and comparability of sustainable covered bonds. The European Banking Authority (EBA) also mentioned this specific issue during a speech at the European Covered Bond Council's plenary meeting in Munich mid-September. In light of this discussion, it is worth mentioning that more ESG data will become available in the coming years, reflecting the various initiatives taken (e.g., the Sustainable Finance Disclosure Regulation and Corporate Sustainability Reporting Directive, see here). Moreover, the Harmonised Transparency Template (HTT) of the ECBC is likely to play a key role regarding ESG disclosures for covered bonds.

HTT offers a good starting point

The HTT (see here) is 'the worldwide standardised, Excel-based form that issuers who have been granted the Covered Bond Label use to disclose information on their covered bond programs. Currently, around 130 covered bond issuers have the Covered Bond Label, providing information about 170 labelled covered bonds, with a total outstanding amount of EUR

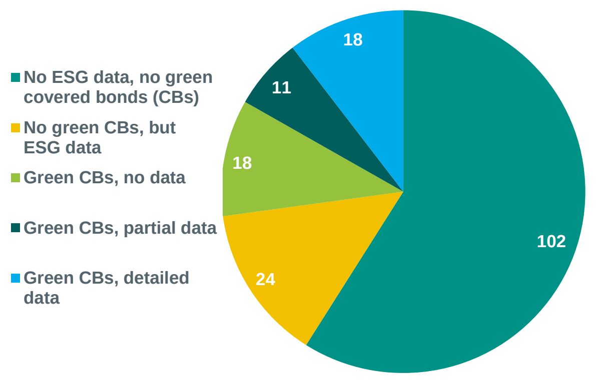
2.2 trillion (covering roughly 70% of all covered bonds outstanding). The HTT provides information that is standardised and harmonised, supporting comparability as well as transparency. It is also reviewed every year by a panel of experts in order to keep the HTT up to date with the latest market and regulatory practices. As a result, it currently already includes some ESG-related fields, while next year the HTT will further expand ESG reporting.

The 2023 HTT includes data fields about whether the cover pool is part of the sustainable strategy of the issuer, while in case of mortgage assets, questions are included about the EPC Label of residential properties, the average energy use intensity (kWh/m2 per year), the property age structure, and CO2 emissions by dwelling type (ton CO2 per year). Meanwhile, covered bond issuers have the option to fill-in more detailed data about sustainable mortgages in a separate sheet, which covers the share of energy-efficient mortgage loans as well as that of social impact mortgage loans (and a further split by residential and commercial properties).

Data from the ECBC shows that at the start of September, 115 covered bonds (that have the Covered Bond Label) were in green format. They were issued by 40 institutions across 14 countries. Moreover, they were issued out of 47 covered pools (bear in mind that some issuers have multiple covered pools, for instance one backed by mortgages and another by public sector loans). Interesting to note is that, of these 47 pools with green bonds outstanding, more than one third (18 in total) do not report any ESG information in the HTT, while issuers disclose only partial ESG data on 11 cover pools, with detailed data being available for the remaining 18 cover pools. However, this will change from 2024 onwards, as issuers that have green labelled cover pools need to disclose ESG data in order to keep the Covered Bond Label.

Breakdown of HTT ESG reporting, by number of cover

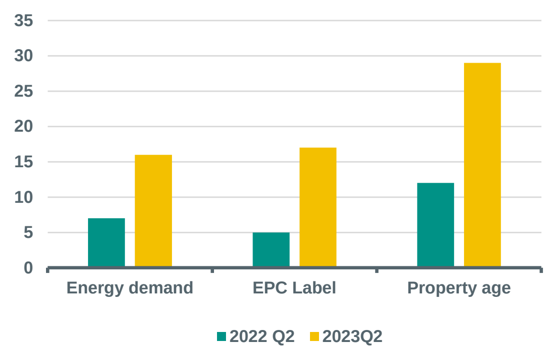
Number of cover pools



Source: ECBC

HTT ESG data reporting over time

Number of cover pools



Source: ECBC

The graph above left shows the current state of play regarding ESG reporting in the HTT. It reveals that there is ESG data available for 24 cover pools out of which not yet any green covered bonds have been issued. Still, the majority (roughly 60%) of covered bond issuers do not provide any ESG data on the assets in the cover pools. A closer look at specific data disclosures (see graph above right) shows that less than 10% of cover pool reporting disclose data on the EPC Label of the mortgages in the cover pool and/or the energy demand of these mortgages. A slightly higher portion reports data about the age structure of the properties, which of course also gives some information about the energy use of properties. As such, there seems to be ample room for improvement.

HTT 2024 to include more ESG reporting

As said, the 2024 HTT (effective from 30 March 2024) will force issuers that benefit from the Covered Bond Label to step up ESG data disclosures. The 2024 template (see here) will include improvements related to ESG reporting, both at a general cover pool level as well as for public sector covered bonds, which will also get a dedicated part to report on sustainable public sector covered bonds. But more important is that more issuers will start disclosing already existing ESG data fields. As such, the HTT will help to further improve ESG data disclosures on covered bonds.

SLB's not taking off yet in 2023

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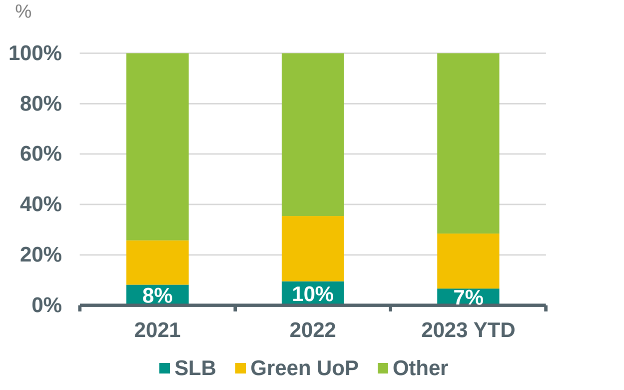
- **Relative SLB issuance is lower YTD than in previous years**
- **Stronger demand for SLBs versus regular or green bonds is not translating into lower new issue concessions**
- **Indeed, last week's SLB issuance by Wienerberger came with significant pick-up to other building material names and high curve steepness**
- **Yet the limited specification by this issuer on how exactly it will reduce emissions and an absence of absolute emission intensity disclosures could explain the premium it had to pay**

The primary market for sustainability-linked bonds (SLB) is not taking off as we had expected at the start of this year. The chart below shows the share of SLB in total EUR investment grade corporate issuance has dropped this year. This also applies to green use of proceeds bonds, yet green bonds clearly make up a larger share of issuance and continue be the dominant choice for ESG debt at issuers. The trend is even worse in other currencies as only 23 USD and 1 Sterling SLBs have been printed so far this year.

The EUR IG SLB market is not taking off in 2023



Source: Bloomberg, ABN AMRO Group Economics

High demand not translating in lower new issue concessions

The lack of issuance cannot be attributed to soft demand as the chart on the left below shows that especially this year SLB deals achieve a much stronger orderbook than regular or green bond deals in the corporate space. The right hand chart shows that of the handful of SLB deals printed after the summer, the orderbook seems to be more in line with other instruments. Although this could suggest that demand for SLBs could be softer, the limited number of SLB observations make this difficult to confirm.

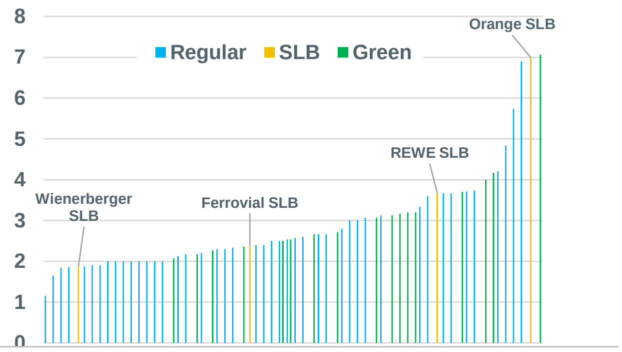
Highest 2023 orderbooks on SLB's

BtC annual issuance (2023 = YTD)

Source: Bloomberg, ABN AMRO Group Economics

Strong order trend softens a bit post summer??

BtC post summer issuance

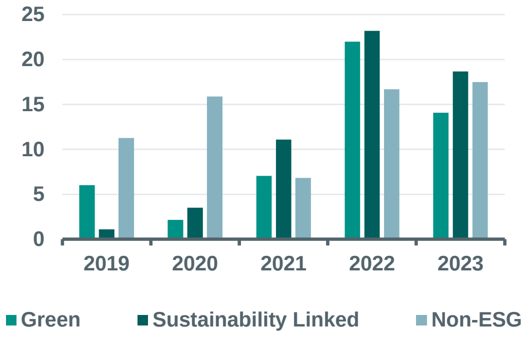


Source: Bloomberg, ABN AMRO Group Economics

The problem however is that the high demand has not translated in lower new issue concessions and SLBs on average have seen the largest concessions out of the main issuance flavours, as shown on the left hand chart below. Last week's SLB by Austrian building materials company **Wienerberger** was no exception. A variety of factors play a role in bond pricing, including an issuer's credit rating and Wienerberger's higher credit spread as shown in the right-hand chart could be largely driven by its borderline BBB3 IG rating, while peer building material issuers St Gobain and even Heidelberg enjoy a slightly better credit standing. Still, we do not see such steepness in the broad market for BBB3 basic material names, while chemicals and metals, like building materials, are all feeling the pain from a weakening economy. The St Gobain SLB printed over a year ago actually trades at a relatively low spread at the long edge of its curve and its tight bond spread levels suggest that there might be more than purely the credit rating driving the bond pricing on the new Wienerberger SLB.

SLB's pay higher new issue concession

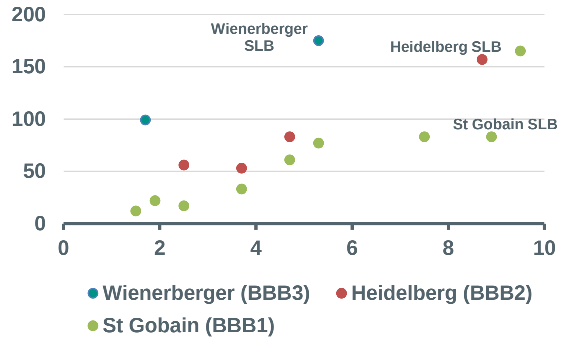
Average NIP across all issuance (bp)



Source: Bloomberg, ABN AMRO Group Economics

New Wienerberger SLB creating a steep credit curve

I-spread (bp)



Source: Bloomberg, ABN AMRO Group Economics, X-axis = years to workout (maturity)

Heidelberg shows more tangible plans to reduce carbon

All of the above three issuers have carbon reduction as the KPI in their SLB framework, which makes sense given the high level of emissions coming from construction activities. But between these building materials companies there is difference in the level of emissions, with bricks (Wienerberger) having 345kg of embodied carbon per cubic metre, while reinforced concrete (Heidelberg) has 635kg of embodied carbon. Theoretically, issuers would be facing higher climate risks on Heidelberg in comparison to Wienerberger, suggesting that the steepness on the Wienerberger curve after the new SLB could be a buying opportunity. Furthermore, Wienerberger has agreed to a 25% reduction in its carbon intensity from 2020 until 2026, while Heidelberg could commit to much less during the same period (13% reduction). Finally, despite working with the same baseline of 2020, Wienerberger has already achieved a 13% reduction, while Heidelberg again lags with only a 4.3% achieved reduction since 2020. So why did the Heidelberg issue attract 4.5x orderbook earlier this year, while the Wienerberger orderbook topped at 1.9x?

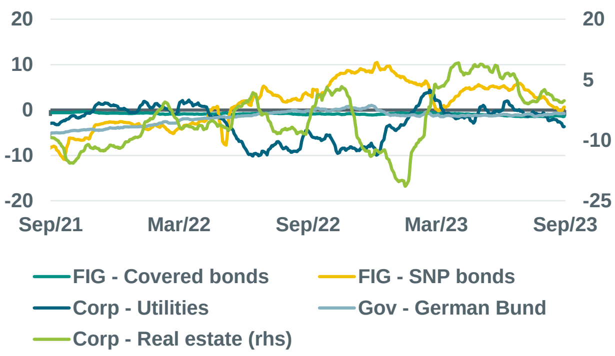
The carbon reduction measures at Heidelberg seem to be more tangible, including the installation of carbon capture installations. Such tangible actions could give investors a better understanding than general actions propagated by Wienerberger for emission reduction such as higher plant efficiency and new technologies. This could perhaps also explain why investors seem to be happy with only a 15bp annual coupon step-up at Heidelberg, while the Wienerberger SLB offers 25bp annual coupon step-up. Finally, we were surprised that Wienerberger did not disclose the level of intensity, but only the emission reduction achieved and its potential in percentages. Every other building material SLB also discloses the absolute level of intensity. Perhaps this was due to their inclusion of various other materials next to bricks into the denominator of the intensity measure, but in that case one could have worked with various sub-KPI's.

The Wienerberger case therefore shows that disclosure is key when issuing SLB's. While new issue concessions are already higher in the SLB space, one cannot be complacent on the disclosure side.

ESG in figures

ABN AMRO Secondary Greenium Indicator

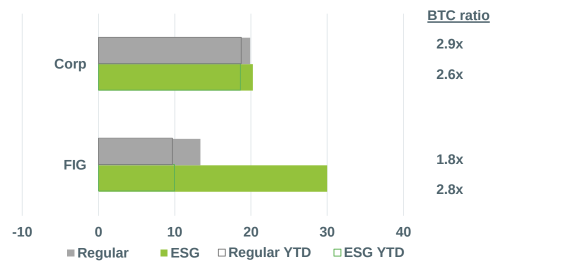
Delta (green I-spread – regular I-spread)



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

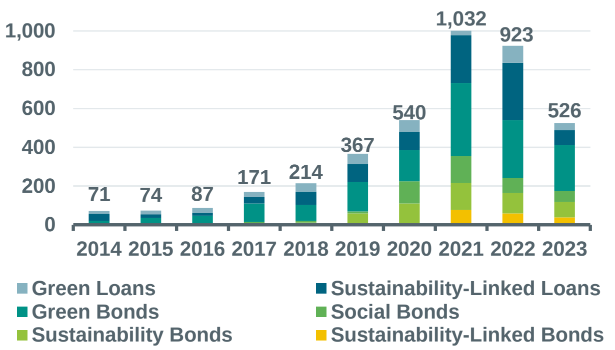
NIP in bps



Note: Data until 29-09-23. BTC = Bid-to-cover orderbook ratio. Source: Bloomberg, ABN AMRO Group Economics

Sustainable debt market overview

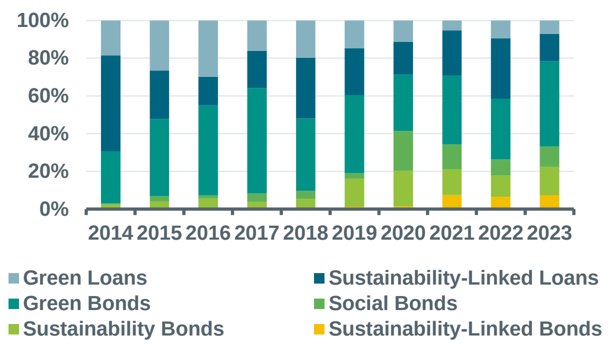
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of sustainable debt by type

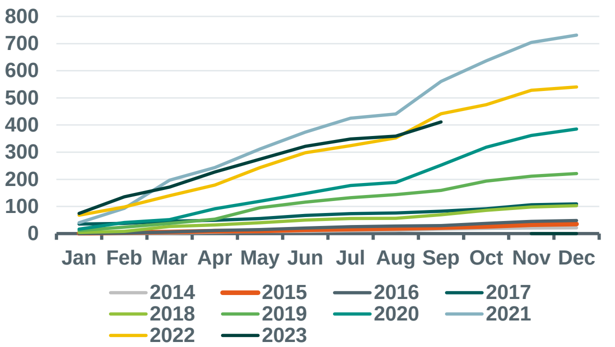
% of total



Source: Bloomberg, ABN AMRO Group Economics

YTD ESG bond issuance

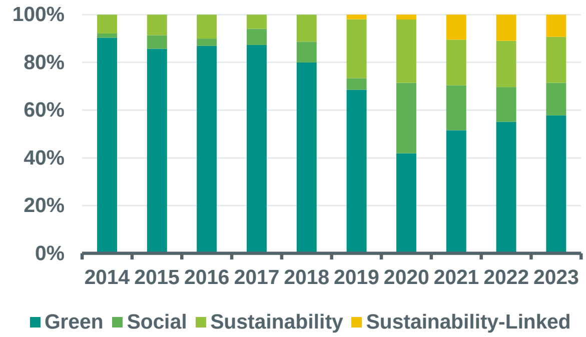
EUR bn (cumulative)



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by type

% of total

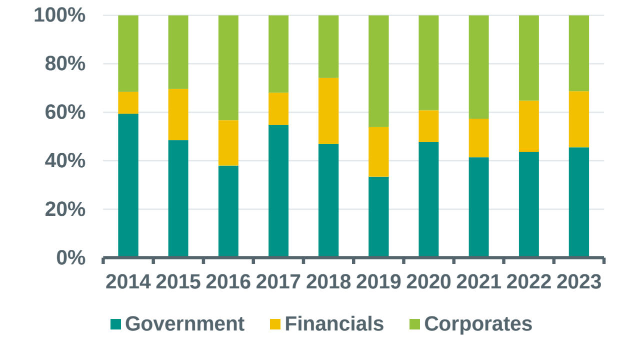


Source: Bloomberg, ABN AMRO Group Economics

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

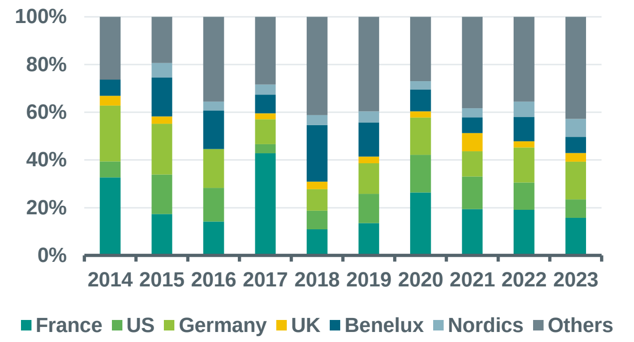
% of total



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by country

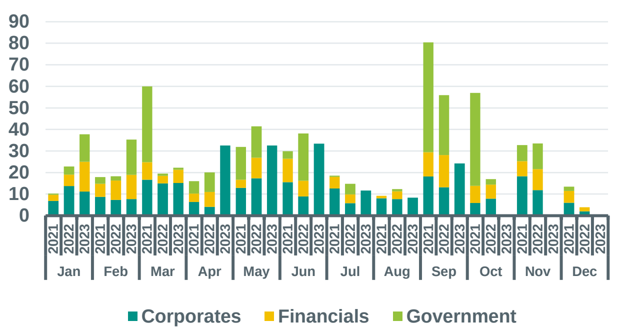
% of total



Source: Bloomberg, ABN AMRO Group Economics

Monthly Green Bonds issuance by sector

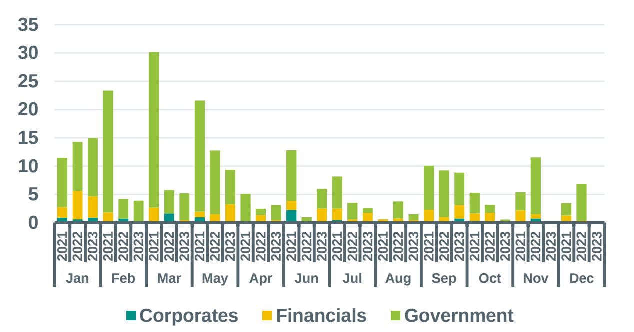
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Social Bonds issuance by sector

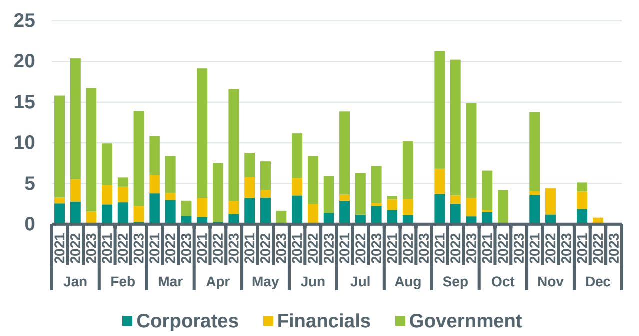
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sustainability Bonds issuance by sector

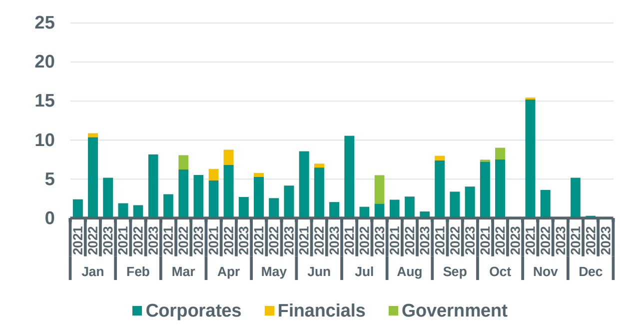
EUR bn



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.

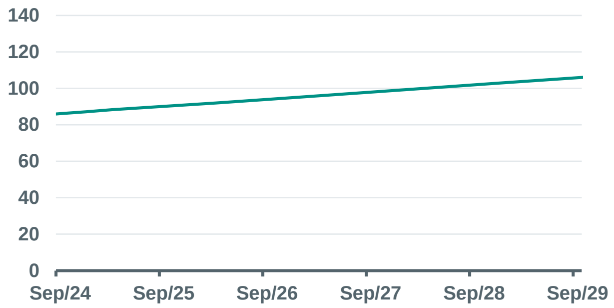
Carbon contract current prices (EU Allowance)

EUR/MT

Source: Bloomberg, ABN AMRO Group Economics

Carbon contract futures curve (EU Allowance)

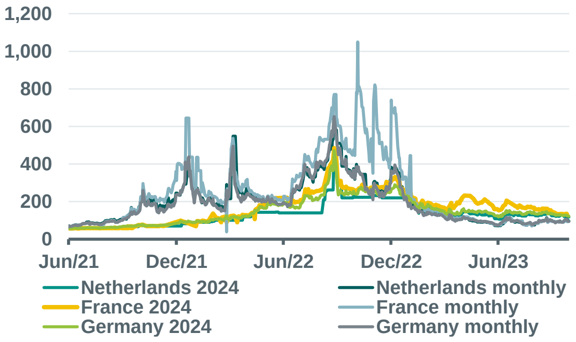
EUR/MT



Source: Bloomberg, ABN AMRO Group Economics

Electricity power prices (monthly & cal+1 contracts)

EUR/MWh

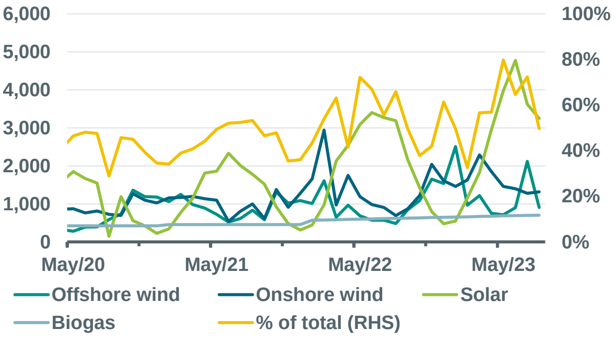


Source: Bloomberg, ABN AMRO Group Economics. Note: 2024 contracts refer to cal+1

Electricity generation from renewable sources (NL)

GW

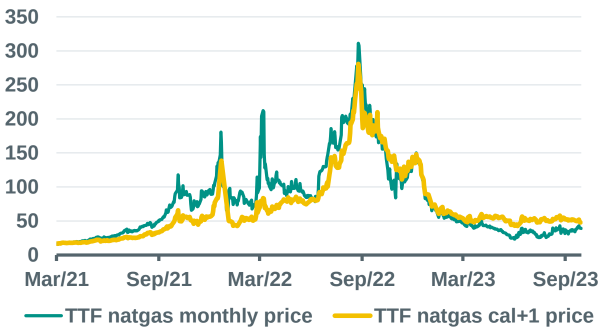
% of total



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

TTF Natgas prices

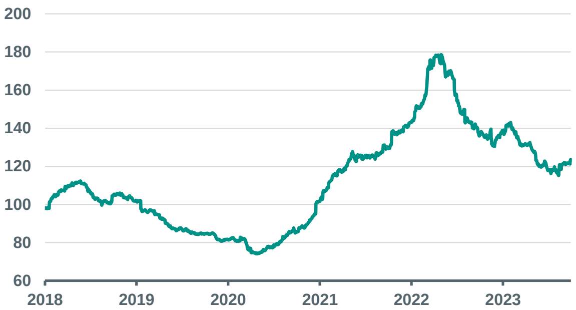
EUR/MWh



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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