SustainaWeekly

Electrification of the dairy industry also makes financial sense

- **Economist: Using Royal Friesland Campina's published carbon emissions, we tried to estimate whether a switch from gas powered to electric boilers makes sense, both from a financial and sustainability perspective. We show that at existing natural gas prices such an electric boiler investment could be recovered by one year of savings in energy cost and gas prices would need to drop to EUR 78 MWh before the electric boiler solution becomes more expensive than the gas boiler.**

- **ESG Bonds: We take a closer look at the ESG bond issuance by financial institutions in 2022 and in particular in the third quarter. Large volatility in the financial markets resulted in more ESG bond issuance, which was met with strong demand from investors. Nevertheless, new issue premia for those bonds was on the rise. This was particularly true for riskier ranks of debt.**

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

In this week's SustainaWeekly, we take a closer look at the electrification of the dairy industry. Using data from the Dutch dairy company, Royal Friesland Campina, we try to quantify the benefits from a switch away from gas powered boilers, to electric ones. Electric boilers can prove to be a financially rewarding investment, and have also the benefit of acting as a low carbon technology. We also discuss the current usage of energy in the dairy sector, the source of the emissions within its production process and its cost structure. We then move to providing a short review of how the ESG bond market for financial institutions developed over the last quarter. We analyse whether the financial advantage of issuing ESG-labelled debt still holds in the primary market, and which ranks of debt have been mostly exposed to the rise of new issue premia.

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

Sustainable electrification in dairy industry

Casper Burgering – Economic Transition Economist | casper.burgering@nl.abnamro.com
Shanawaz Bhimji, CFA – Senior Fixed Income Strategist | shanawaz.bhimji@nl.abnamro.com

- **The diary processing industry can invest in energy efficiency, which yields relatively high returns at low risk**
- **Electric boilers are efficient to use, but require a good connection and sufficient mains capacity**
- **From Royal Friesland Campina's published carbon emissions we were able to reverse engineer a business case for electric boilers**
- **At existing natural gas prices such an electric boiler investment could be recovered by one year of savings in energy cost and gas prices would need to drop to EUR 78 MWh before the electric boiler solution becomes more expensive than the gas boiler**

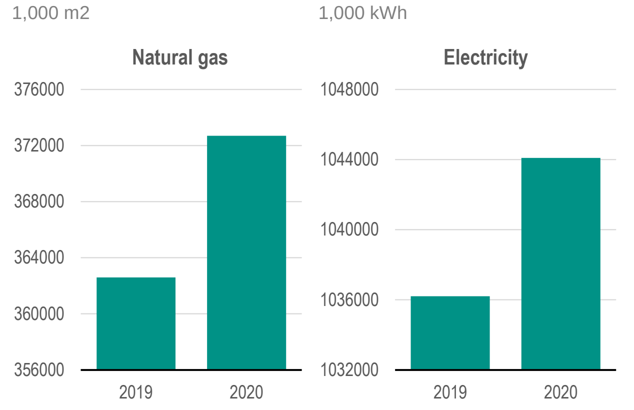
Sustainability is receiving a lot of attention within the Dutch dairy sector. The themes are diverse for the sector and for the entire value chain. Consider climate-responsible milk production, animal health and welfare, biodiversity and encouraging outdoor grazing. Within these themes, it is about maintaining high milk quality, safety, reduction of pesticides, minimum requirements for maximum greenhouse gas (GHG) emissions and sustainability through electrification instead of natural gas, for example. For dairy processors, with today's relatively high energy costs, having a plan for energy reduction and efficiency has become more of a priority. More electrification of the production process also helps to reduce GHG emissions from their own operations. But at the same time, this should also be a business-friendly option. In this note, we explore the use of electric boilers to replace (or, in better words, complement) natural gas as a sustainable option at dairy processing plants and showcase through Royal Friesland Campina's data what potential financial and sustainability lie behind such a switch.

Energy usage and efficiency

The production process of dairy processing plants requires a lot of heat and steam. Heat treatment requires a relatively large amount of energy and steam is the main secondary energy carrier in the dairy industry. Typically, a lot of natural gas is consumed for this purpose. A variety of alternative sustainable methods can now be used to produce steam, such as electric boilers, biogas or green gas boilers, heat pumps or geothermal energy. The dairy industry is characterised by high consumption of raw materials and relatively low consumption of energy. To reduce GHG emissions, the sector can focus mainly on fuel substitution and process redesign for better results.

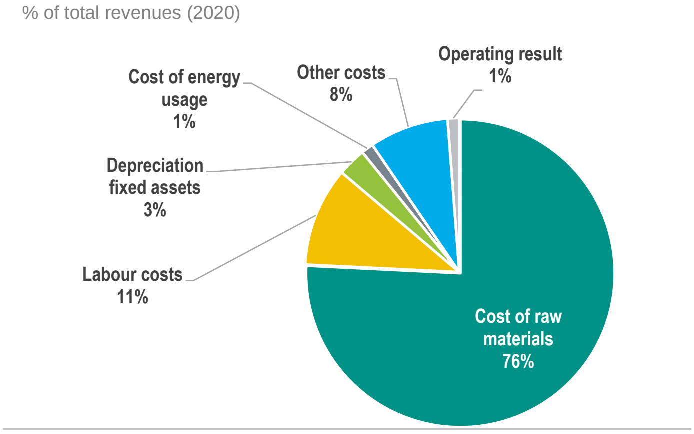
Investing in energy efficiency - if done properly - usually yields relatively high returns and the risks are usually low. Such an investment ultimately results in substantial savings on overall energy costs. Energy consumption in the dairy industry consists largely of natural gas (around 75%) and electricity (around 25%). The supply of natural gas and electricity to the diary processing industry increased by 2.7% and 0.8% year-on-year, respectively, in 2020. At the time of writing, 2021 figures regarding natural gas and electricity supply to the dairy industry were not yet available. Most likely, supply in 2021 for both natural gas and electricity will be at a similar level or slightly lower than corona year 2020, as in 2021 corona also had a significant impact on business activities as the out-of-home business segment was still confronted with lockdowns.

Supply natural gas & electricity dairy industry



Source: CBS, ABN AMRO Group Economics

Cost structure dairy industry



Source: CBS, ABN AMRO Group Economics

The sector is characterised by relatively high consumption of raw materials and relatively low consumption of energy. Thus, the cost of energy consumption in the dairy industry is only around 1% of operating income. Partly as a result, rising energy prices have not directly led to falling energy demand or deteriorating financial results.

Electrification of the production process mainly helps to reduce direct and partly indirect (that is, scope 1 and 2) GHG emissions. Reducing scope 1 and 2 emissions is the low-hanging fruit. For this, the sector has several technological options at its disposal. Our analysis focusses on these quick gains in direct energy usage, although we must admit that these have the least bearing on the diary industry's total emissions. Indeed, reducing scope 3 emissions, which are largely tied to the dairy farm and make up a much bigger part of total value chain emissions, is considerably more complex. This is because they are more difficult to measure and control. Dairy processing companies will therefore continue to look at these upstream emissions as well as they contribute a lot to their scope 3 basket.

An electric boiler as low carbon technology

Most energy consumption in the dairy processing industry comes from the spray drying process to create powdered milk. This requires a lot of steam, which in many cases is produced using natural gas. Electric boilers can be used to decarbonise existing gas powered boilers used for heating purposes. Especially when the electricity used is produced entirely from a renewable energy source, it becomes a GHG-free source of energy.

Electric boilers are efficient in use. For instance, a boiler needs only a short time to reach full power. Moreover, it can be deployed in multiple ways. Besides being used in the energy intensive spray drying process, it can also be used for pasteurization or medium heat warming of milk to kill bacteria, provided that electricity prices are relatively low. The MIDDEN project by PBL and TNO (**see here for more information**) suggests that the investment in an electric boiler is between EUR 150-190 per kW. Maintenance costs are around EUR 1.10 per kW per year. An electric boiler is assumed to have an economic lifespan of 15 years. However, an obstacle is still that an electric boiler requires a proper grid connection and that sufficient grid capacity is available, but this strongly depends on the local infrastructural grid situation, government policy and grid operator expansion investments.

From carbon emissions to installation energy usage – Friesland Campina

To test the viability of electric boilers in the milk processing industry, we use Dutch diary company **Royal Friesland Campina**'s (RFC) proxied factory energy usage as an example. By comparing this energy usage with the cost of renewable electricity (for the electric boiler option) and gas (for the existing fossil fuel powered boiler), we should be able to conclude whether an investment in an electric boiler makes sense.

We get to the proxied factory energy usage by converting RFC's reported emissions through standard emission factors. RFC reported in 2021 691 MT of carbon emissions related to factory & transport. All electricity requirements are fulfilled by zero carbon sources suggesting that the remaining emission are tied to natural gas and transport fuel. According to the company, 92% relates to the milk processing plants (factory) and 8% relates to transport. Hence, the factory's emissions of 634MT (92% times 691MT) would come close to 355mn cubic metre of natural gas assuming 1.788kg carbon per one cubic metre of natural gas being used to heat the entire factory installations. 355mn cubic metre gas would require roughly 3474 GWh of electricity to achieve a similar level of heating.

	Units	Amount
Total greenhouse which has not been electrified	MT (Megaton)	691
Out of which 92% relates to factory	MT (Megaton)	635.7
Proxied 2021 factory energy (natural gas) use - 1.788 kg from burning 1 cubic metre gas	M3 (mn)	355.5
How much electric power is required to achieve same level of energy - 1M3 = 9.77 kWh	GWh	3473.7

Source: FCF, Gasunie Unit Converter, CO2emissiefactoren.nl, ABN AMRO Group Economics

The main issue with the electric boiler is the intermittency of renewable electricity, as for example, on-shore wind turbines only operate 26% of the time on average (this is also known as the load factor). However, since RFC would like to have full boiler capacity being available when the renewables are churning out power, they would have to invest accordingly as if the renewables were operating at 100%. Assuming that the RFC factories operate 24/7 for 360 days per year (leaving some time for maintenance), the required thermal capacity for the electric boiler is 402 MW. Using the high range of EUR 190 per KW in capex, we get to EUR 76mn outlay for electric boilers. RFC reports EUR 7.6bn worth of gross property plant & equipment in its 2021 annual report, hence such a small investment will hardly require big capital allocation needs.

	Units	Outcome
Total electric power required for electric boilers	GWh	3473.7
Factory running time in hours	hrs	8640
Total electric capacity required for electric boilers	MW	402
Total capex - 1kW = EUR 190	EUR mn	76.4

Source: TNO/PBL – decarbonisation options for Dutch diary process industry, ABN AMRO Group Economics, gas boilers have, due to exhaust pipes and other side equipment, opex attached to it as well. Hence we leave out opex in our analysis.

At the existing high gas price level the rewards for switching to electric boilers is very attractive, both financially and from a sustainability perspective

Now we try to compare the cost of the new installation against continuing the existing gas powered boilers. Regarding the cost of renewable electricity, we think a long-term contract (or PPA) would make sense. Pexapark (a PPA data provider) in its latest market update suggested that, although the current PPA market was currently illiquid due to stress in broad power markets, a 10y contract in Germany and the Netherlands would transact at EUR 98.5 and EUR 81.3 per MWh respectively (so roughly EUR 89.9 per MWh on average). Gas prices currently sit at elevated levels and the outlook remains uncertain. Hence we applied 2 gas price scenarios in our electric/gas boiler trade-off, being EUR 200 and EUR 100 per MWh gas price. A final point is that the intermittency of renewables (remember the 26% load factor mentioned above) obviously implies that when opting for an electric boiler, the gas boilers act as back-up. A full electric set-up will basically imply sourcing energy in wholesale markets, which could be very expensive as the downtime in renewables tend to be will be felt through a higher spot price across the entire power market.

The table below shows the calculation and trade-off when going for an electric/gas boiler setting or sticking with the gas boiler setting. Under a EUR 200 per MWh gas price, the new electric & gas installation costs EUR 625mn in fuel costs, which is a whopping EUR 111mn in savings against the full gas powered installation. Essentially, RFC would be able to recoup its entire investment in one year and would still be left with EUR 35mn spare change. A go-ahead should make sense even at extraordinary high level of capital costs. Under a EUR 100 per MWh gas price, the financial benefit drops to EUR 20mn, but would still imply a reasonable 4year pay-back period on the investment, whereas the electric boiler has an economic lifespan of 15 years. Actually, the electric/gas combination breaks-even against the full gas combination at EUR 78 per MWh price for natural gas.

Use electric and gas boiler (EUR 200 MWh gas price)	Units	Outcome	Continue using gas boiler (EUR 200 MWh gas price)	Units	Outcome
Load factor - use Dutch on-shore wind as input	%	26.20%	Gas used for thermal needs	M3 (mn)	355.5
Electricity used under 26.2% load factor	MWh	910,111	**Total energy costs: EUR 200 per MWh or EUR 2.07 per M3 when including emission allowance**	**EUR mn**	**736.1**
A: Cost of electricity: PPA = EUR 89.9 per MWh	EUR Mn	81.8			
Remaining thermal needs to be covered by switching back gas	%	73.80%			
Gas used for remaining thermal needs	M3 (mn)	262.4			
B: Cost of gas: EUR 200 per MWh or EUR 2.07 per M3 when including emission allowance	EUR Mn	543.3			
C: Total energy costs (=A+B)	**EUR Mn**	**625.1**	**Electric and gas boiler cheaper**	**EUR mn**	**111**
Use electric and gas boiler (EUR 100 MWh gas price)	**Units**	**Outcome**	**Continue using gas boiler (EUR 100 MWh gas price)**	**Units**	**Outcome**
Load factor - use Dutch on-shore wind as input	%	26.20%	Gas used for thermal needs	M3 (mn)	355.5
Electricity used under 26.2% load factor	MWh	910,111	**Total energy costs: EUR 100 per MWh or EUR 1.09 per M3 when including emission allowance**	**EUR mn**	**388.8**
A: Cost of electricity: PPA = EUR 89.9 per MWh	EUR Mn	81.8			
Remaining thermal needs to be covered by switching back gas	%	73.80%			
Gas used for remaining thermal needs	M3 (mn)	262.4			
B: Cost of gas: EUR 100 per MWh or EUR 1.09 per M3 when including emission allowance	EUR Mn	286.9			
C: Total energy costs (=A+B)	**EUR Mn**	**368.7**	**Electric and gas boiler cheaper**	**EUR mn**	**20**

Source: Pexapark, ABN AMRO Group Economics. We included the latest carbon allowance price of EUR 65.15 per tonne (or EUR 0.116 per M3 burnt) in our overall-gas price calculation, to reflect the externalities of burning gas for thermal purposes

There's more good news. Because of lower gas usage the electric/gas boiler combination saves roughly 26%(!) in carbon emissions as the electricity used comes entirely from renewable sources.

Our analysis is obviously based on simplistic assumptions. Perhaps RFC's gas powered boilers are super-efficient and the energy content is much stronger that it would require less than 0.6 cubic metre per kg of carbon, which we use as a critical starting point of our analysis. Renewable wind power could under-perform on generation due to adverse weather conditions, by which the load factor drops and RFC would need to resort back to using more gas in its boilers. On the upside, replacing gas powered steam generators with electric steam generators in the energy intensive spray dying process could yield even larger financial and carbon reduction benefits. Our objective however was to show that under existing energy price levels, a switch to an electric boiler for the diary processing industry should immediately capture the attention of the plant's Chief Financial Officer, but also the Chief Sustainability Officer.

ESG labelled euro bank bonds issuance in Q3 - Overview

Marta Ferro Teixeira – Global Markets Associate | marta.ferro.teixeira@nl.abnamro.com
Joost Beaumont – Senior Fixed Income Strategist | joost.beaumont@nl.abnamro.com

- **82 ESG labelled euro bank bonds have been issued so far this year, 31 of which were in the third quarter alone**
- **Large volatility in financial markets has resulted in more ESG bond issuance, which has attracted large demand from investors**
- **Still, the large demand could not prevent NIPs from rising, having reached an average of 27bp in Q3**
- **Riskier ranks of debt, like SNP and Tier 2, have seen the largest increase in NIPs this quarter**

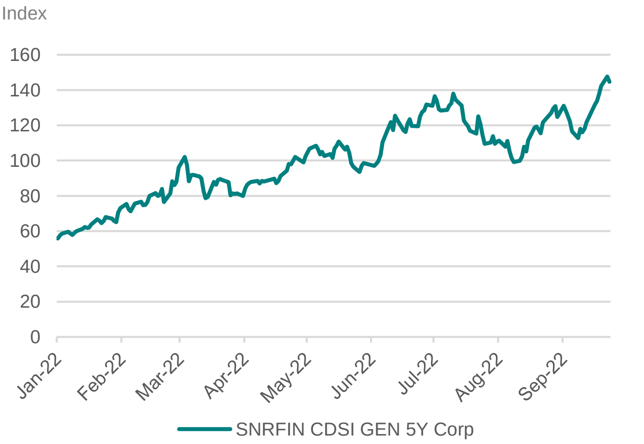
Since the beginning of the year, supply of ESG labelled euro bank bonds has been increasing every quarter, with a total of 82 bonds being issued so far this year, totalling EUR 53.9bn.

ESG bond issuance in the last two quarters has been larger than in the first quarter, while at the same time market conditions deteriorated, reflected, for instance, by a rise in the iTraxx Senior Financials index (see chart below). As such, it seems that banks increasingly used ESG labelled bonds to assure sufficient demand against the backdrop of fragile market conditions, and investors taking risk-off positions.

Indeed, demand for ESG labelled bonds has been strong, while in the first quarter EUR 15.85bn of ESG bank bonds were met with EUR 32.3bn of demand in the primary market, in the third quarter investors put in orders worth EUR 49.3bn for EUR 20.9bn of ESG labelled issuance.

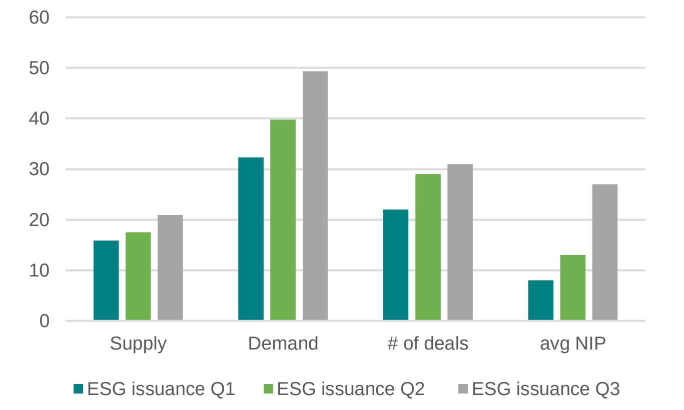
Still, strong demand has not resulted in issuers being able to achieve greeniums – that is, the pricing advantage from ESG bonds vis-à-vis non-ESG ones. In fact, new issue premia (NIPs) were quite large in Q3 when compared to previous quarters. ESG bond issuers paid an average NIP of 27bp in Q3, which compares to 13bp in Q2 and 8bp in Q1. This compares to an average NIP of 10bp that was paid for non-ESG labelled bank debt in Q3.

iTraxx Index Jan 2022 – Sep 2022



Source: Bloomberg, ABN AMRO Group Economics

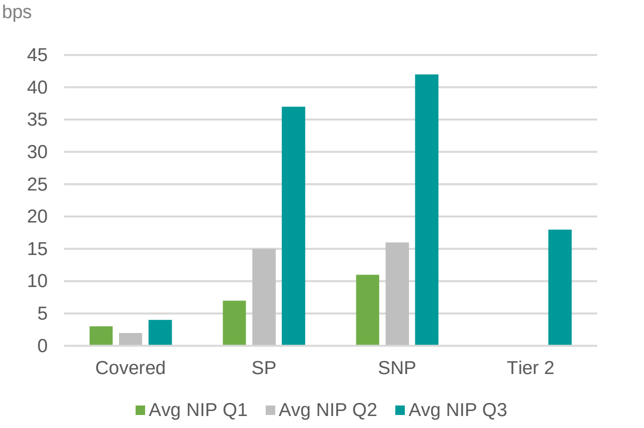
ESG labelled bonds issuance overview



Source: Bloomberg, ABN AMRO Group Economics

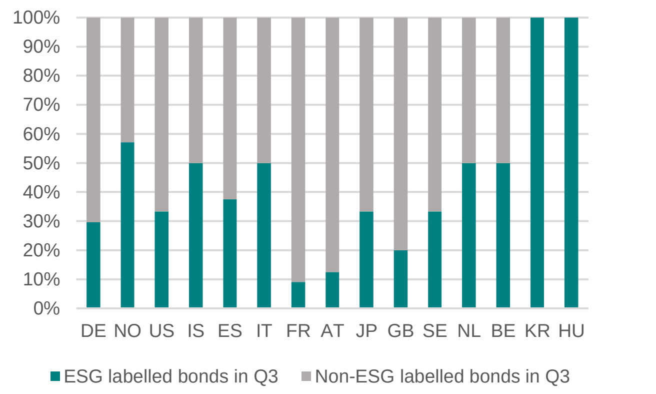
A closer analysis per rank of debt indicates that ESG bonds issued in riskier type of debt format paid larger NIPs in Q3 when compared to the previous quarters. This is particularly the case for SNP bonds and for Tier 2 bonds. However, the difference is larger for Tier 2 bonds due to the amount issued. While in the first quarter no Tier 2 ESG labelled bond was issued, in the third quarter three ESG labelled Tier 2 bonds were issued. On the next page, we present the average NIP per debt rank for each quarter of 2022. For ESG covered bonds, the average NIP has been quite stable through the entire time period.

Average NIPs for ESG bonds across ranks of debt



Source: Bloomberg, ABN AMRO Group Economics

Geographical dispersion of bonds issuance



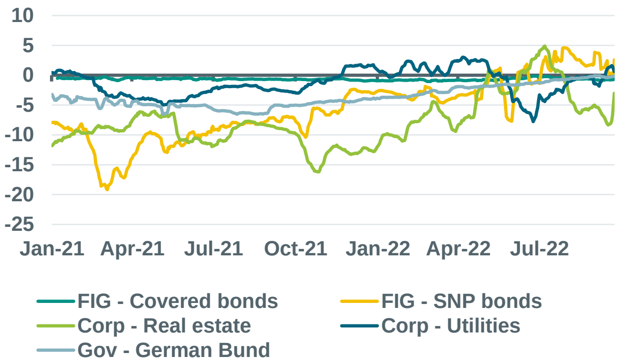
Source: Bloomberg, ABN AMRO Group Economics. Note: refers to share relative to the number of bonds issued.

Finally, and taking a closer look at this quarter specifically, issuance has been quite diverse in terms of geographical dispersion. Out of the 22 jurisdictions that have issued euro bank debt so far this year, 15 issued at least one ESG labelled bond in Q3. Germany still stands out, as German banks issued eight ESG labelled bonds out of a total of 27 bonds in Q3. And issuers from South Korea and Hungary issued exclusively ESG labelled bonds so far in 2022.

ESG in figures

ABN AMRO Secondary Greenium Indicator

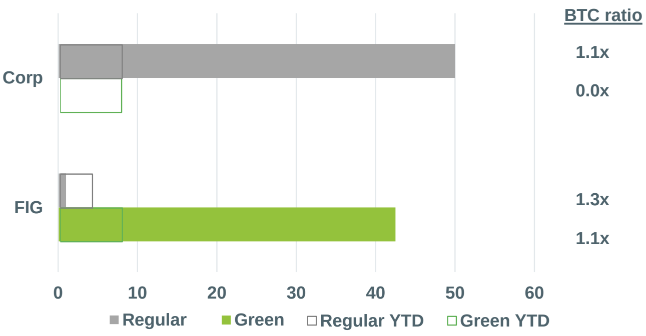
Delta (green I-spread – regular I-spread)



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

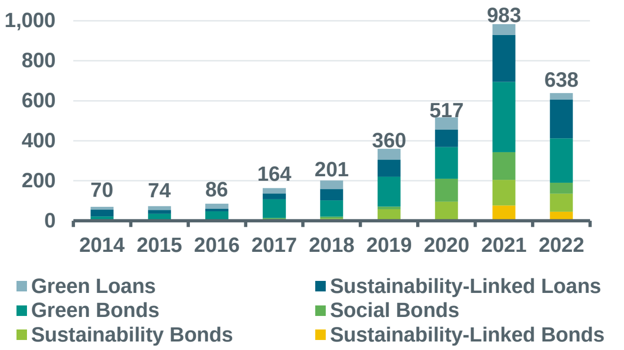
NIP in bps



Note: Data until 30-09-22. BTC = Bid-to-cover orderbook ratio. Source: Bloomberg, ABN AMRO Group Economics.

Sustainable debt market overview

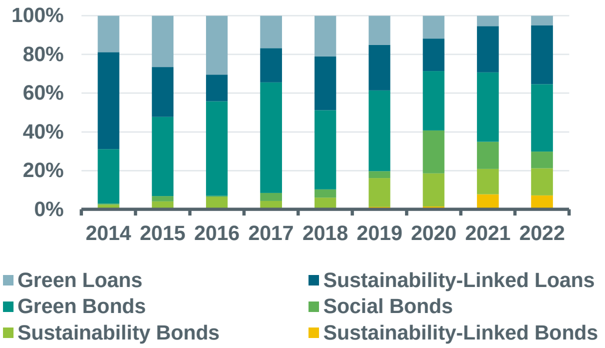
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of sustainable debt by type

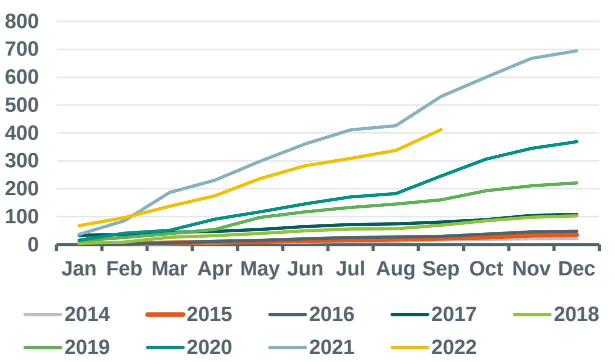
% of total



Source: Bloomberg, ABN AMRO Group Economics

YTD ESG bond issuance

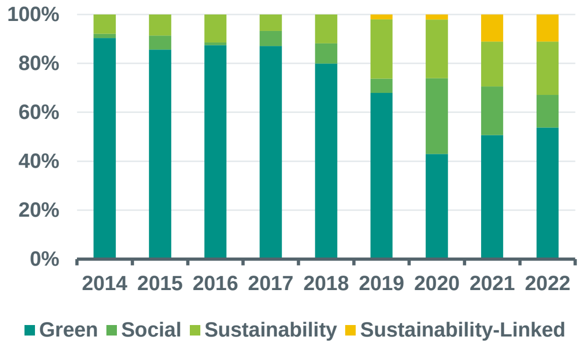
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by type

% of total

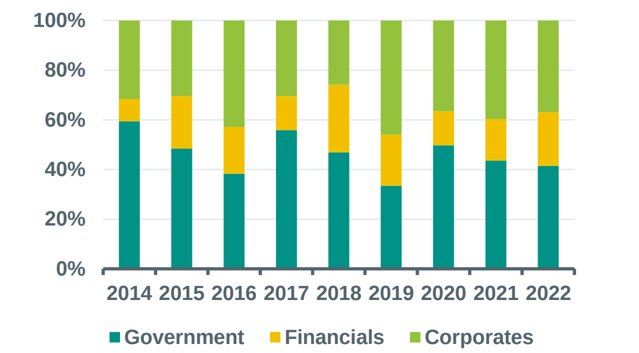


Source: Bloomberg, ABN AMRO Group Economics

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

Breakdown of ESG bond issuance by sector

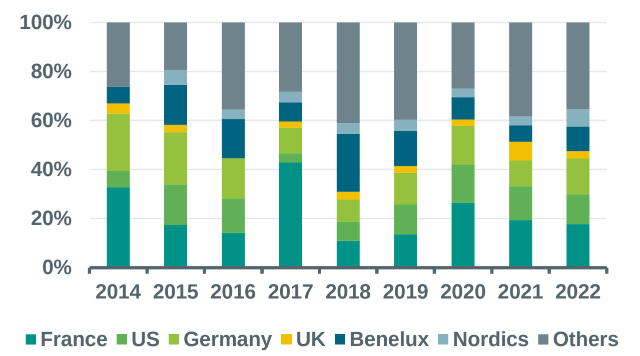
% of total



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by country

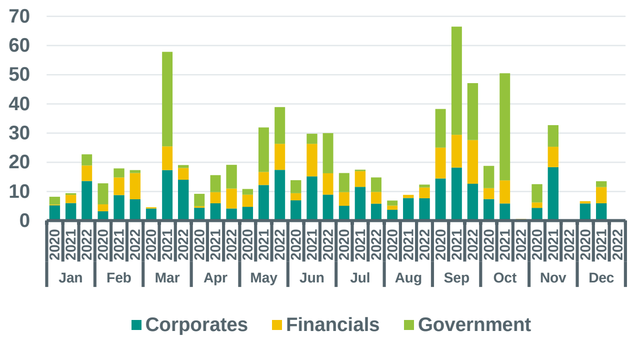
% of total



Source: Bloomberg, ABN AMRO Group Economics

Monthly Green Bonds issuance by sector

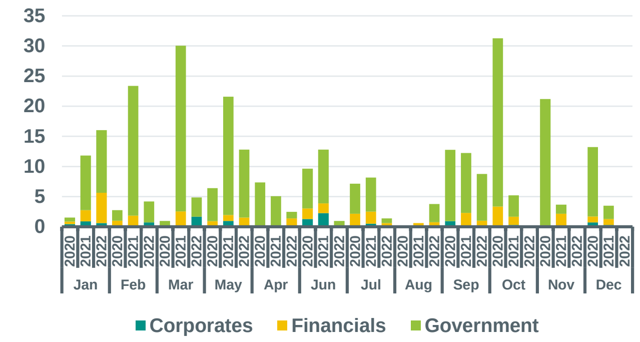
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Social Bonds issuance by sector

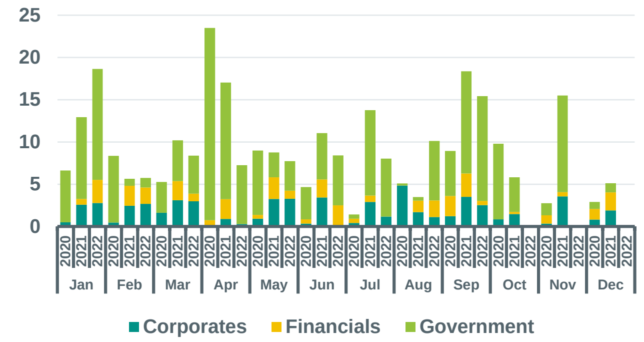
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sustainability Bonds issuance by sector

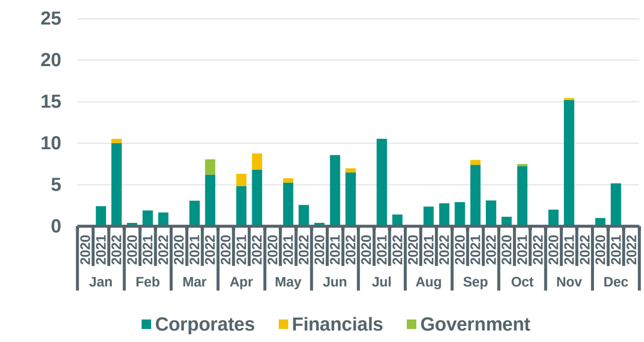
EUR bn



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.

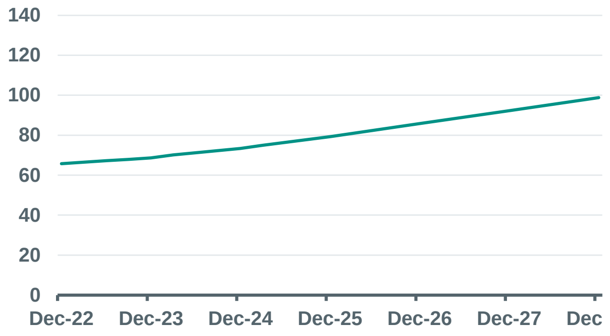
Carbon contract current prices (EU Allowance)

EUR/MT

Source: Bloomberg, ABN AMRO Group Economics

Carbon contract future prices (EU Allowance)

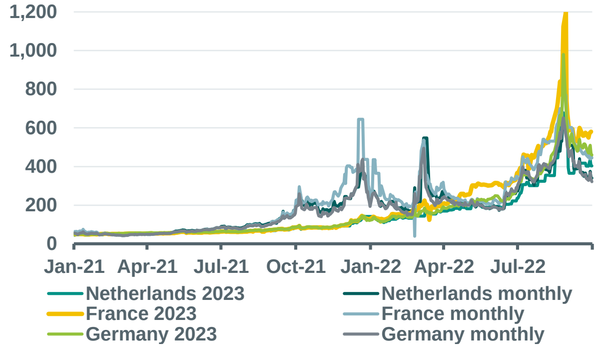
EUR/MT



Source: Bloomberg, ABN AMRO Group Economics

Electricity power prices (monthly & cal+1 contracts)

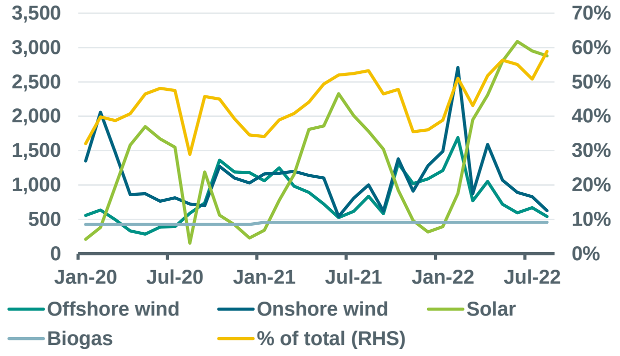
EUR/MWh



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

Electricity generation from renewable sources (NL)

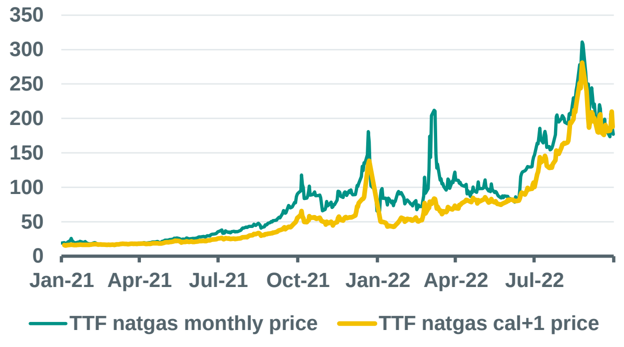
GW % of total



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

TTF Natgas prices

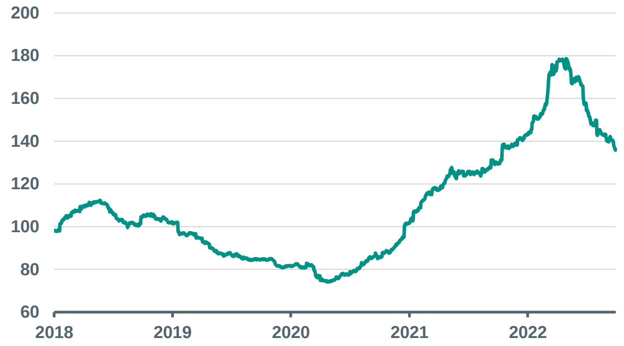
EUR/MWh



Source: Bloomberg, ABN AMRO Group Economics

Transition Commodities Price Index

Index (Jan. 2018=100)



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

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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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