SustainaWeekly

Solutions for grid scale storage

- **Economist: Grid scale storage is essential to meet Net Zero targets by ensuring grid stability as the share of renewables in the power mix increases. Pumped-storage hydropower, electrochemical batteries, and green hydrogen are among the widely scalable technologies that can be used. While thermal and mechanical storage are promising, especially for long duration storage, they need time to reach scalable maturity.**

- **Strategist: The UK residential building space has significant energy renovation requirements. The valuation uplift from improving the energy efficiency, measured by means of the EPC, seems less pronounced for UK properties. Still, the high savings on energy cost from renovation still make such renovations attractive, despite the lack of subsidies and a high financing rate.**

- **Sector: By 2022, the climate sector Industry was the largest consumer of energy with a 32% share of total final energy consumption. Still the energy mix of the climate sector Industry is dominated by fossil fuels, especially natural gas and oil. So far, the pace in the transition to more renewable energy is still slow; this is actually also true for the overall greening of the sector but sustainable steps have been taken.**

- **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.**

Grid scale storage refers to the use of power storage technologies connected to the grid to store excessive power when demand is low or supply is high and feed it back to the grid when needed. In this edition of the SustainaWeekly, we first look at the various options for grid scale storage. We then go on to look at the economics of renovating buildings in terms of the savings from energy costs, this time for the UK residential building sector. Finally, we use various indicators to see whether the Climate sector Industry is moving at a sufficient pace to reduce emissions.

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

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Saving power for the darkest cold nights

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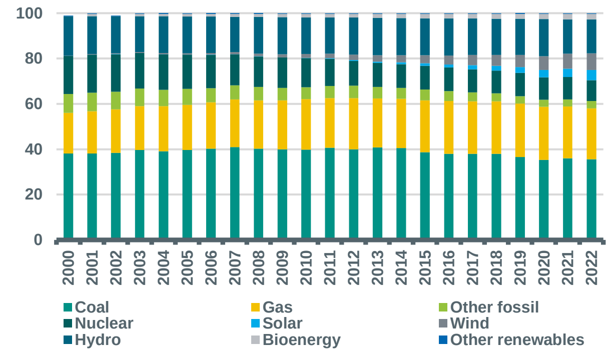
- **Grid scale storage is essential to meet Net Zero targets by ensuring grid stability as the share of renewables in the power mix increases**
- **Pumped-storage hydropower, electrochemical batteries, and green hydrogen are among the widely scalable technologies that can be used for grid-scale storage driven by their cost efficiency and government support**
- **Other technologies like thermal and mechanical storage are promising, especially for long duration storage, but they need time to reach scalable maturity**
- **The longer it takes to build the needed storage capacity, the longer natural gas will be needed to smooth out power supply and provide stability to the grid, and the longer the period that Europe will be vulnerable to the supply of natural gas**

Introduction

Grid scale storage refers to the use of power storage technologies connected to the grid to store excessive power when demand is low or supply is high and feed it back to the grid when needed. It plays a role in stabilizing the grid.
With more investments going into renewable power sources, such as wind and solar, power systems become more and more vulnerable because of the intermittency of renewables. The higher the share of renewables in the power mix, the higher the need for more storage capacity. Therefore, storage is envisioned to play an essential role in the energy transition by providing security and flexibility to the grid and power markets. This role is being acknowledged by different countries, as seen in the figure below, which depicts a rising share of renewables in the global power mix (left hand panel), associated with a rise of investments in storage capacity (right hand panel).

Global power mix

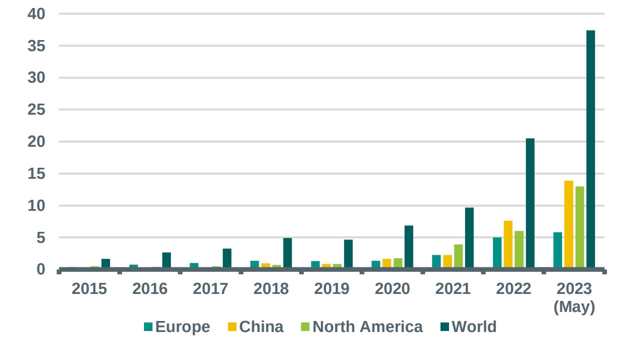
Units: percentage



Source: EMBER, ABN AMRO Group Economics

Regional storage investments

Units: billion (USD 2022)



Source: IEA, ABN AMRO Group Economics

The first thing that comes to mind when thinking about storing power is the use of electrochemical batteries. Other (innovative) solutions to store power have also been emerging with some promising technologies. This note touches up on recent developments in the power storage technologies, the associated pros and cons, and their potential role in the transition.

Electrochemical batteries

The past few years have witnessed the emergence of new generations of electrochemical batteries that have seen improvements in their cost and efficiency, such as lithium-ion batteries, which are widely used in the electrification of final sectors, such as transportation. With regard to the storage at the grid level, the feasibility of large scale batteries is growing and are already taking place. For example, the Moss Landing Energy Storage Facility in California, with 300 MW, and the Hornsdale power reserve in South Australia, with a capacity of 150 MW.

Moreover, other storage solutions that take advantage of the fleet of batteries embedded in Electric Vehicles (EV) is being proposed and promoted, by using the so-called bi-directional charging. The concept depends on the ability to access the power stored in EV batteries by feeding it back to the grid when needed. Bi-directional charging relies on optimizing and managing the time of (dis)charging EV batteries connected to the grid. Accordingly, these batteries are charged when there is excessive supply of renewable energy and discharged when demand is peaking or when renewable energy is halted or redundant. More details on bidirectional charging can be found in our earlier 8th of May **Sustainaweekly**.

One of the main disadvantages of electrochemical batteries is their vulnerability to degradation as time passes as they rely on chemical processes that lose efficacy over time. Furthermore, the fact that these batteries need to be used on a regular basis to maintain their efficacy make them inappropriate for long term storage. Moreover, these batteries have as adverse environmental impact associated with the emissions from the production/mining of materials such as lithium and other minerals. These metals are also scarce and/or critical. Accordingly, the cost of these batteries is sensitive to the prices of these minerals which makes their cost vulnerable to any development in the mineral markets.

Pumped storage hydropower

Also called water-batteries. From its name this technology relies on excessive renewable power to pump water up to fill in water reservoirs behind dams or waterfalls. The water is consequently released to move electrical turbines that generate power when needed. According to IEA, this type of storage will constitute a large share of new investments in hydropower in Europe and China.

This technology is appropriate for long duration storage and its operational cost is quite cheap once the initial infrastructure is built. But there are many specificities and challenges to this technology that limit its adoption. For example, hydro-storage cannot be applied everywhere, rather, it is only viable in regions abundant with water resources with elevated landscape or mountains. Additionally, hydro projects are capital intensive for the initial infrastructure, which could be prohibitive for some countries.

Thermal energy storage

There are several technologies under this kind of storage that mainly differ in the material used to store energy, but the concept is the same: excessive heat or renewable power is converted to heat which consequently conserved using different materials, and the heat is converted back to electricity that feeds back to the grid when needed. Thermal storage is carried out under controlled conditions and specifications that minimize the leakage of heat, with no or very low daily loss rate. Thus, these technologies can deliver long duration conservation of heat. For example, excessive renewable power could be used to heat up an array of brick to high industrial temperatures as achieved by a pilot project by a startup in the US using bricks as the main material to store heat for days with a daily 1% loss rate (**see more here**). Another example would be to use sand to preserve heat in a well isolated container with heat pipes and using this heat later to generate power. In Finland a start-up was able to build a relatively cheap sand battery with 8 MWh maximum capacity of thermal energy, which gives back around 200kW of power. The very tight isolation used in the battery allows it to conserve heat for months in very low temperatures (**see more here**).

The thermal storage technologies mentioned above are promising in that they could be eventually scaled up to a grid-level storage. The cheap and abundant nature of their material inputs is their advantage compared to materials needed for electrochemical batteries. For example, sand batteries are up to 10 times cheaper than their lithium-ion counterparts. However, a dis-advantage of sand batteries is that they save up to 10 times lower energy for the same unit volume than lithium batteries. Another disadvantage for thermal batteries lies in conversion loss from heat back to power which is still high at this stage. One solution could be channelling the excessive heat back to use it in central or industry heating.

Green hydrogen

Green hydrogen is made using renewable energy by separating the water molecules through the electrolysis process using electrolysers. The main condition for hydrogen to be labelled as 'green' is to use renewable electricity to produce it. Within Europe, and even globally, green hydrogen is envisioned as playing a prominent role in power storage as an energy carrier. Europe has set up an ambitious strategy to boost investments in the green hydrogen value chain, such as strengthening renewable power capacity, holding a leading role in the manufacturing of electrolysers, and aiming to boost green hydrogen demand from hard to abate sectors.

Green hydrogen has many advantages. In comparison with other storage alternatives, green hydrogen is convenient for long duration storage (for example seasonal storage). It also can be used as a feedstock fuel for many sectors and can be transported from one place to another off the power grid by using repurposed gas pipelines, which relieves the pressure on the grid to transport electricity to where it is needed without the need to extend the grid. Though, still the high conversion loss associated to green hydrogen is one major disadvantage. Additionally, technology[1] and market immaturities hold back private investments at scale.

Mechanical batteries

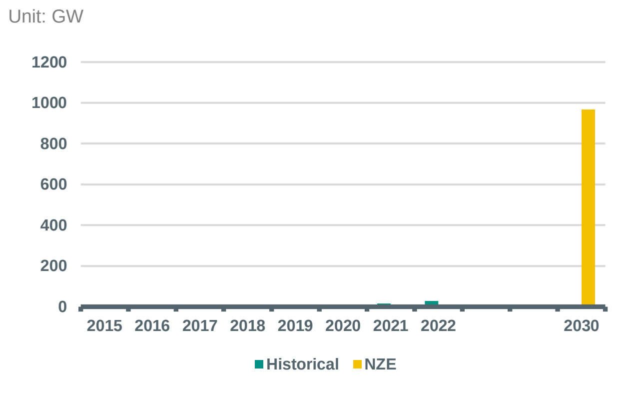
One kind of mechanical storage relies on the physics of gravity. The idea is simple: using cheap renewable electricity, when supply is excessive, to lift weights up, and harness back this power in times of high demand and price rise by releasing these weights to fall and power a generator with the downward gravitational pull.

The upside of this technology is the storage duration. Due to its nature, this kind of storage can be considered a long term storage. Another upside of gravity storage is that the discharge of power is almost instant which saves time compared with other alternatives and hence makes it appropriate to maintain the balance of the grid (see more here). A downside for this technology is possible breaks of its mechanical parts. However, the possible repairability of the physical parts of gravity based storage extends it lifetime to up to 50 years, which outperform other technologies such as electrochemical ones. Some other mechanical storage technologies involve the use of renewable power to compress air/gas, and consequently, by using heat, expanding the compressed air/gas in a turbine, which can then generate electricity whenever needed. This storage technology has been used since the 18th century.

Grid-scale storage and the transition process

According to the IEA, grid scale battery storage has a role to meet the Net-Zero targets, as illustrated in the figure below. So far pump-storage hydropower is the most used grid storage wherever appropriate. Electrochemical batteries are catching up and spreading fast because of the recent reductions in their cost. Mechanical batteries have a limited role in current power system, while thermal storage, is on its early stages of development and needs time to reach a scalable maturity. Finally, green hydrogen is envisioned to scale up fast in the upcoming years benefiting from government support.

Global installed grid-scale battery storage capacity in the NZE 2015-2030



Source: IEA, ABN AMRO Group Economics

Before the energy crisis, and because of its relatively lower emissions compared to other fossil fuels, natural gas was envisage as being a transition fuel in Europe to smooth out any fluctuations in power supply caused by the natural intermittency of renewables. After the Russian invasion of Ukraine, Europe has set a goal to reduce its reliance on Russian

[1] Green hydrogen that relies on Alkaline or PEM electrolysers is on a demonstration-early adoption phase, while green hydrogen produced using solid oxides electrolyser is at large prototype/demonstration phase.

gas. Thus, building up sufficient storage capacity to reduce the role of natural gas in balancing the grid became a strategic priority. Thus, the longer it takes to build the needed storage capacity, the longer natural gas will be needed to smooth out power supply and provide stability to the grid, and the longer the period that Europe will be vulnerable to the supply of natural gas.

There is value in UK home energy efficiency renovation

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- **In previous research we showed that energy efficiency renovations in Dutch residential property made sense, despite the high cost of capital**
- **The UK residential building space also has significant energy renovation requirements**
- **The valuation uplift from improving the energy efficiency, measured by means of the EPC, seems less pronounced for UK properties**
- **Still, the high savings on energy cost from renovation still make such renovations attractive despite the lack of subsidies and a high financing rate**

In our previous Sustainaweekly (see here) we illustrated that there should still be strong incentives driving the market for energy renovations in the Netherlands, as external research by NVM/Brainbay had shown considerable valuation differentials between various EPC (energy performance certificate) in property sales (see below).

Valuation difference by energy label for Dutch residential real

Nieuw label

Oud label	A	B	C	D	E	F	G
A							
B	2.8%						
C	5.0%	2.2%					
D	7.2%	4.3%	2.1%				
E	8.2%	5.3%	3.0%	1.0%			
F	10.2%	7.2%	4.9%	2.8%	1.8%		
G	13.3%	10.3%	7.9%	5.7%	4.8%	3.0%	

Bron: brainbay

Afbeelding 2: %-stijging woningwaarde voor alle woningen in Nederland. Voor een woning met label C wordt gemiddeld 7,9% meer betaald dan voor een vergelijkbare woning met label G. Bron: brainbay

Source: NVM/Brainbay, footnote translates as follows: "Value increase throughout the Netherlands (i.e. not region specific),a C labelled unit fetches 7.9% more than a comparable G-labelled unit"

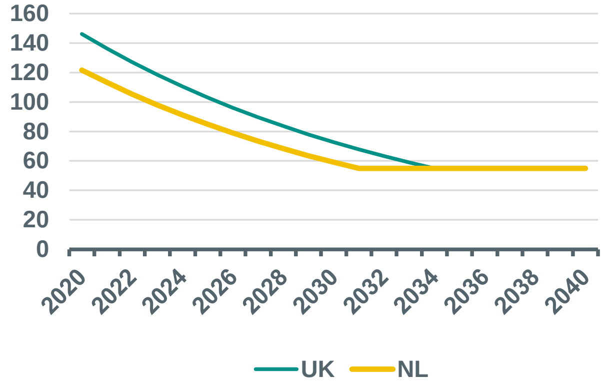
The reason behind such valuation uplifts (or discounts depending on how you look at this matrix) are quite straightforward. Firstly, energy renovations drive a lower utility bill, which especially matters a lot in a high energy cost environment and enables buyers to pay more for such properties. Furthermore, decarbonization targets are ambitious and in order to meet these targets government might possibly impose a higher cost of carbon on weaker energy label properties in the future or other regulations, especially since the built environment remains responsible for a high share of emissions. The potential cost of renovation to be consistent with such regulations could also drive a valuation discount.

Such EPC driven valuation differences should be stronger in the UK…

Given the pan-European issue of higher energy prices and ambitious carbon reduction plans, one would expect such valuation differences between property EPC labels to be also visible elsewhere. We shift our focus to the UK, especially since UK residential properties tend to use even more energy, i.e. heat, in comparison to the Netherlands as shown in the chart below, taken from the CCREM decarbonisation dashboard. The chart illustrates that there should be more effort to get the UK residential sector on track of a 1.5 degree pathway, which should make already strong EPC properties in the UK a sought after investment.

UK residential has higher energy usage per square meter

Energy intensity – KWh per sqm per annum



Source: CRREM Decarb Target Tool, ABN AMRO Group Economics

...but studies reveal a diverse outcome

There have been multiple studies on the relationship between EPC labels/home energy efficiency and the effect on property values as measured in transaction prices. One of the earliest studies for the UK goes back to 2015 when **Fuerst et al** revealed a premium of 5% on A/B labelled properties against the UK median of D. A 2013 study commissioned by the UK government (see here) highlighted a 14% premium between a G labelled and a A/B labelled property. More recent studies, continue to point towards premiums assigned to high EPC labels and we shall take the lowest 5.4% premium from the Nationwide study as outcome as input in our analysis on the next page. The Nationwide paper actually flags a 3.5% discount for a G labelled property and a 1.7% premium on a A/B labelled property against the median D label, which boils down to a 5.2% difference between the G and A/B label. With an average UK property price of £3.2k per square metre (psqm) assumed to apply on the Dlabel, the gain from jumping from a G label to an A/B label is roughly 5.2% or £166 psqm.

Recent studies on EPC and UK property prices

Publisher/Study	Date	Labels under consideration	Price premium
Nationw ide	2021	G to B	5.2%
Rightmove	2021	F to C	16.0%
Knight Frank	2022	F/G to C	19.6%

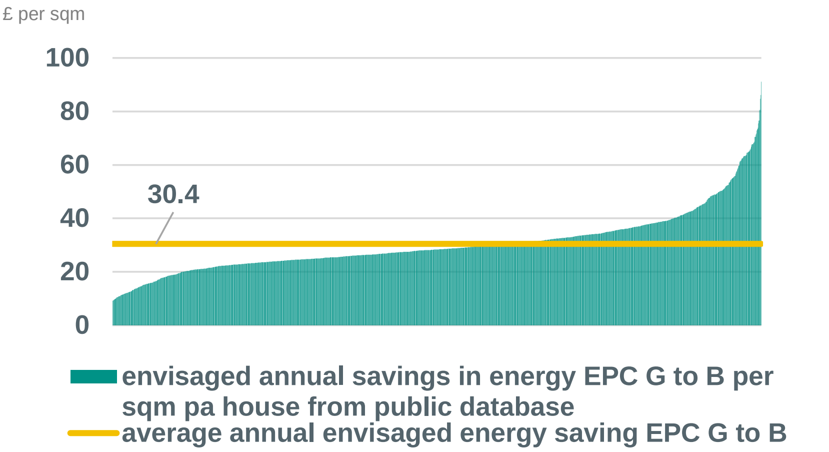
Value uplift close to required investment

The property obviously needs renovation to improve energy efficiency before one could capitalize on the aforementioned £166 psqm gain. We looked at various measures such as loft- and cavity wall insulation, triple glazing and installing a highly efficient boiler. Each measure has energy (i.e. heat consumption) reduction potential and the cumulative of the featured savings would result in an 80% reduction. Perhaps as a set of combined measures the reduction potential would slightly dilute, but an upgrade from an EPC label G to a label B should be feasible through these measures. These measures together would require roughly £170 psqm in upfront investment. Although this £170 psqm is considerably lower than the €500 psqm of energy efficiency refurbishment for assumed in our earlier piece based on research done by residential real estate bond issuer **LEG Immobilien**, it just about covers the envisaged price appreciation. Also, further retrofits could still apply if natural gas used for heating is phased-out, as for now we have only switched to a high efficiency boiler. This would imply that the required investment would be higher, perhaps even as close to the €500 psqm as expected by LEG Immobilien.

The immediate energy savings would suggest a higher valuation uplift than 5.2%

But why should one focus purely on price appreciation, when direct savings on the energy bill are also up for grabs, especially if one decides to keep on inhabiting the renovated property. As we explained earlier, the reason behind the price appreciation on better EPC label should chiefly be driven by a lower cost to operate the property and should therefore theoretically reflect a discounted value of these savings over the lifespan of these investments. While the Nationwide paper implies only £166 per sqm gain, the annual savings on the utility bill are close to £27.5 per sqm, based on October 2022 prices for gas and electricity. We also found average theoretical savings of £30 per sqm per annum when upgrading from an EPC G to a B label from the EPC database (see chart below). Such savings would imply a 6 year pay-back period and since the underlying renovations have a much longer lifespan the valuation uplift could perhaps be estimated too conservatively.

£30 per sqm on averaged saved in utility bills per annum



Source: UK EPC database, ABN AMRO Group Economics

There is value to be found in UK's energy efficiency renovation

Assuming that the cost of utilities and the £166 per sqm envisaged valuation gain stay steady for the foreseeable future and the cost of the energy renovation is financed through a 5y mortgage (a green mortgage rate by UK banks is quoted as cheap as 5.2%) with the idea to sell the renovated property in 5 years, the renovation would still be value accretive from a discounted cash flow perspective, as shown in the table below. Importantly, such a decision should not depend on the general state of the property market. Even in the unlikely situation that the less tangible valuation premium would suddenly disappear (for example because of a massive renovation wave and therefore less price differentiation) the investor would still be able to recover the investment purely from savings on utility bills in as little as 7 years.

	Y0	Y1	Y2	Y3	Y4	Y5
Renovation cost	-170.7					
Utility bill savings		30.4	30.4	30.4	30.4	30.4
Value uplift conversion						166.5
Discount factor	1.00	1.05	1.11	1.16	1.22	1.16
Annual Discounted Cashflows	**-170.7**	**28.9**	**27.5**	**26.1**	**24.8**	**169.1**
Sum of discounted cashflows (Y0 - Y5)	**105.7**					

Source: Nationwide House Price Index, Virgin Money, UK EPC label database, ABN AMRO Group Economics; per sqm

Greening of industrial activity still lacks a good pace

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- **By 2022, the Climate sector Industry was the largest consumer of energy with a 32% share of total final energy consumption**
- **Still the energy mix of the climate sector industry is dominated by fossil fuels, especially natural gas and oil**
- **So far, the pace in the transition to more renewable energy is still slow; this is actually also true for the overall greening of the sector but sustainable steps have been taken**

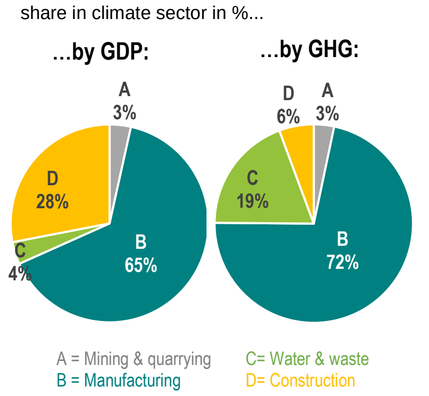
The so-called 'Climate sector Industry' – which consists of several subsectors with various types of industrial activity – accounts for the largest share of greenhouse gas emissions and, at the same time, a great responsibility to reduce them. To give momentum to the reduction of greenhouse gases in the coming years, climate policy will be tightened and legal regulations are expected to become stricter. In addition, public pressure will also only increase. This means that industrial companies will increasingly transform themselves towards carbon neutrality. The pace of this transition is all-important. In this analysis, we will use various indicators to see whether the *Climate sector Industry* is indeed keeping up the pace in reducing greenhouse gases and becoming more sustainable.

Climate sector Industry in indicators

There is a total of five so-called 'Climate sectors' in the Netherlands: Industry, Electricity, Mobility, Agriculture and Built environment. Adding the emissions from these *Climate sectors* together gives the total GHG emissions in the Netherlands. Of these five, the 'Climate sector Industry' has the highest greenhouse gas (GHG, CO2-eq) emissions, accounting for 31% of the total emissions. That's why it is important to continuously monitor sustainability trends and follow the progress made with decarbonisation in this specific *Climate sector* closely.

The *Climate sector Industry* itself consists of four subsectors with industrial activity, namely: mining & quarrying, manufacturing, water companies & waste management and construction. Of these four subsectors, manufacturing has a substantial share within the Climate sector Industry, both in terms of added value (GDP) and by GHG emissions. See the left-hand figure below for this. Manufacturing is followed by construction in terms of share in GDP and followed in terms of GHG by water companies & waste management. Mining & quarrying plays only a minor role in both cases.

Sectors in *Climate sector Industry*



Source: CBS (National Accounts 2021)

Trend in indicators *Climate sector Industry* and subsectors

% change 2021 vs. 2015	**Climate sector Industry**	Mining & quarrying (A)	Manufacturing (B)	Water- & waste companies (C)	Construction (D)
Labour productivity	**3%**	-47%	14%	-6%	12%
GHG-emissions	**-3%**	-24%	3%	-10%	8%
GHG-intensity	**-11%**	121%	-13%	-16%	-17%
Final energy consumption	**0%**	-18%	0%	4%	2%
Energy-intensity	**-6%**	99%	-9%	3%	-20%
Share fossil fuels (%-point)	**0,7**	-0,7	1,3	-1,8	-3,6
Share energy costs (%-point)	**-0,3**	0,5	-0,4	-0,1	-0,2

Source: CBS, ABN AMRO Group Economics
Note: GHG intensity and energy intensity are expressed at GDP (constant prices)

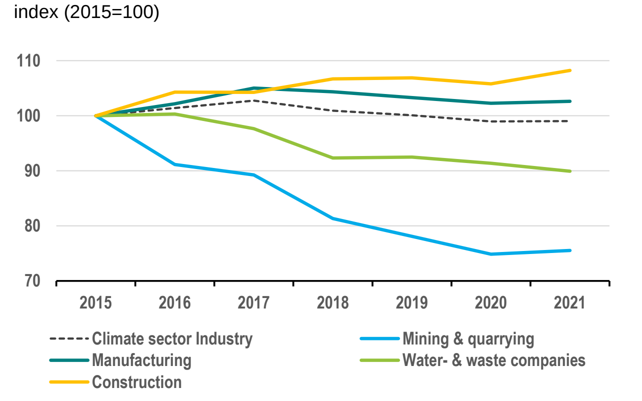
To track the progress of decarbonisation, several indicators are available. The table above shows some of these indicators. The trend in labour productivity (APT) is also part of this and can be interpreted in several ways. On the one hand, an increase in productivity could just be at the expense of sustainability. After all, more production and more use of raw materials have a negative impact on the environment the moment the (energy) efficiency of the production process remains the same or decreases. But when the (energy) efficiency improves and the efficiency of resource utilisation also increases, the increase in productivity drives decarbonisation.

From the table above, we can see that the trend in productivity growth in the manufacturing and construction sectors has improved over the period 2015-2021, while the trend in energy intensity has decreased. With the decrease in energy intensity, we can conclude that (energy) efficiency increased in these sectors. The opposite is true for the mining & quarrying and water & waste management sectors. In particular, the trends in these indicators, but also in GHG intensity and the share of energy costs, are very negative for the mining & quarrying sector in relation to sustainability. For companies in the *Climate sector Industry*, it is therefore permanently important to look for and invest in production solutions that make final products more (energy-) efficient, in order to further optimise production processes while also minimising waste. Some studies show, for example, that manufacturing companies often invest in digital technologies. This enables them to make more efficiency gains, realising productivity gains and product improvements, as well as producing less waste.

What further stands out from the table is that in the manufacturing sector, the share of fossil fuels in the energy mix increases by 1.3%-points over the period 2015-2021. This is in contrast to the other three sectors within the *Climate sector Industry*, where this share decreases over the same period. In particular, the share of energy costs in production costs is relatively high in manufacturing (especially heavy industry) and in water companies & waste management. In such a case, companies automatically have a motivation to keep those costs low or reduce them further, which succeeded in the period 2015-2021. This shows that investing in energy-efficient (and low-carbon) technologies can be interesting. To maintain this positive momentum, financial incentives from the government help. For instance, there is the scheme *Stimulating Sustainable Energy Production and Climate Transition* (SDE++) in the Netherlands. This is a subsidy for companies and also non-profit organisations that focuses on roll-out of techniques that reduce carbon dioxide (CO_2) emissions. But there are **numerous other subsidy options**.

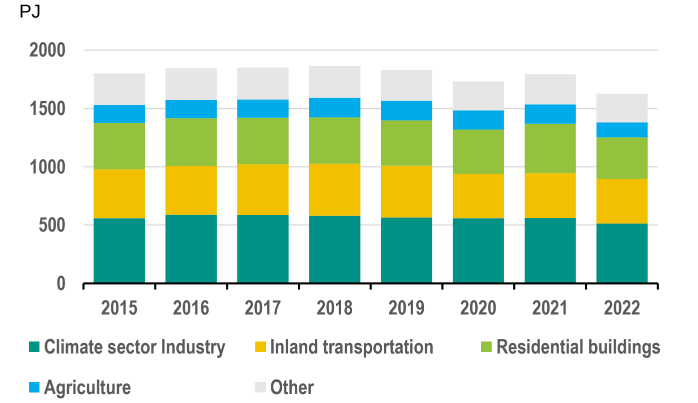
The industrial and construction sectors may show a positive trend in (energy) efficiency, but this is not the case for the trend in GHG emissions. Both sectors show an increase in GHG emissions over the period 2015-2021, unlike the mining & quarrying and water companies & waste management sectors. In the latter two sectors, GHG emissions actually decreased significantly over the past six years. But despite the increase in GHG emissions in manufacturing and construction, the GHG intensity of these sectors is significantly lower. In short, growth in value added (in constant prices) was higher than growth in GHG emissions between 2015-2021.

Trend in GHG-emission intensity by subsector



Source: CBS, ABN AMRO Group Economics

Final energy consumption by end users of energy



Source: CBS, ABN AMRO Group Economics

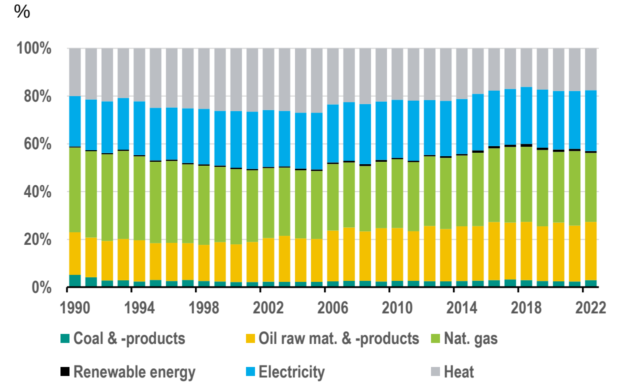
The GHG emission intensity of the *Climate sector Industry* decreased by 11% over the period 2015-2021, mainly due to the sharp decrease in this indicator in manufacturing, water companies & waste management and construction. In mining & quarrying, this intensity increased by as much as 121% over the period 2015-2021, despite GHG emissions falling by 24% over the same period. The increase in intensity is because in this sector, value added (in constant prices) fell even more sharply than the fall in GHG emissions.

In 2022, the *Climate sector Industry* was the largest consumer of energy, accounting for 32% of total final energy consumption. The sector is followed by domestic transport (24% share) and residential (22% share). Agriculture has an 8% share. In all sectors, final energy consumption decreased over the period 2015-2022, by 10% on average. However, the decline in final energy consumption was weakest in the *Climate sector Industry* at 8%.

Energy mix

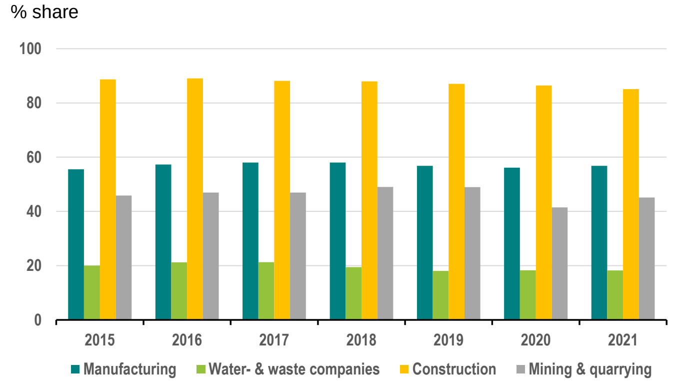
Every year, many sectors are consuming more and more energy from renewable sources. This is a positive trend, but still the *Climate sector Industry's* energy mix is dominated by fossil fuels, especially natural gas and oil (raw materials and products). The vast majority of GHG emissions come from burning these fossil fuels. Reducing (or decarbonising) GHG emissions requires shifting the energy mix from fossil fuels to low-carbon energy sources. The challenge to achieve this is great, as the current energy mix of the *Climate sector Industry* shows. It is clear from the following left-hand figure that the share of renewable energy - despite strong growth in this in recent years - is still low.

Final energy consumption *Climate sector Industry*



Source: CBS, ABN AMRO Group Economics

Share fossil fuels in final energy consumption



Source: CBS, ABN AMRO Group Economics

The flipside of the low share of renewable energy is the burden of a very high share of fossil fuels. However, clear differences can be seen in this by subsector. For the construction sector, the share of fossil fuels is 87% on average, with little variation in this share since 2015. Incidentally, this applies to almost every subsector under the *Climate sector Industry*. The fossil fuel share in manufacturing itself is 57% on average. Here, too, the variation in the share is marginal. In water companies & waste management and in mining & quarrying, the share of fossil fuels in the energy mix decreased somewhat more over the period 2015-2021. But here, too, the pace has proved slow.

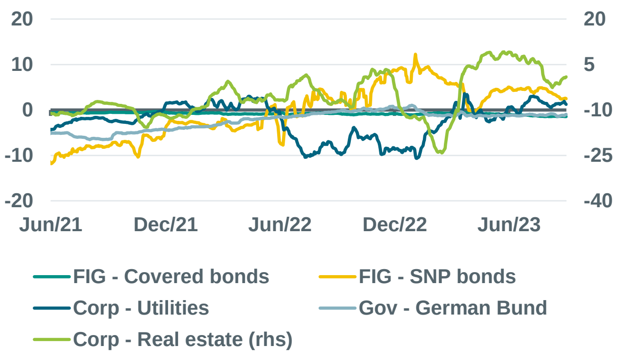
With all available techniques to reduce emissions, the energy mix in many sectors is going to change significantly in the coming decades, in favour of lower-carbon energy carriers. So far, the pace of this transition to more renewable energy carriers is slow. In fact, this also applies to the general greening of the sector. This is not only visible from the table with sustainable indicators presented earlier, but also from structure over time in the energy mix. Since 2010, the fossil energy consumption decreased (coal -8%, oil -8% and gas -16%), while renewable energy increased (+14%). But these changes effected the total energy mix marginally.

To gain some momentum here, some more coercive government policy may help. An example of this is to make it mandatory from 2030 that any new capacity expansions (especially in industry) should only take place with net-zero emission technologies. It could be a similar trajectory as in the built environment. There, from 2026, necessary replacement of central heating boilers can only be done with the installation of a sustainable alternative (such as a heat pump). Such a coercive policy measure is able to bring more momentum to the transition. Furthermore, electrification is at the top of the list in terms of growth potential in the coming years. In recent years, the share of renewable electricity has increased sharply, but this greening is not yet really visible in the energy mix. A major amount of the decarbonisation potential will also depend on the speed with which electricity generation switches from fossil fuels to renewables and the rollout of the distribution network. Eventually, the consumption of natural gas and oil will gradually decline over the next few years, while more use will be made of renewable energy. As such, the sector would slowly but steadily moving towards the set 2050 climate neutral target. However, due to the current slow pace, it is most likely that this target ultimately will not be met.

ESG in figures

ABN AMRO Secondary Greenium Indicator

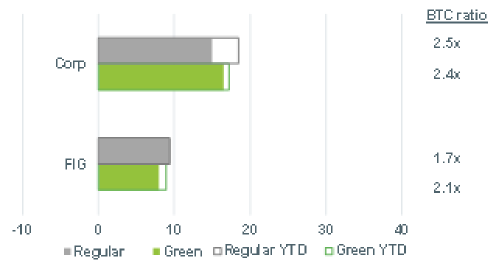
Delta (green I-spread – regular I-spread)



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

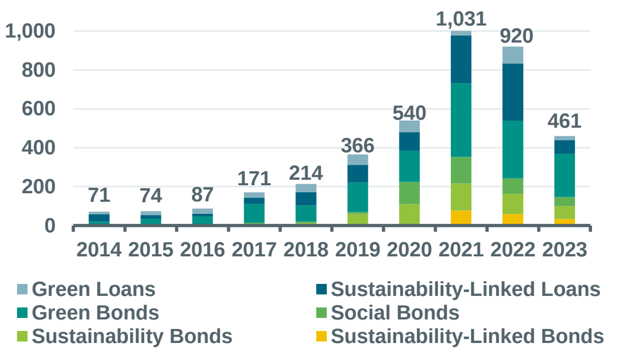
NIP in bps



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

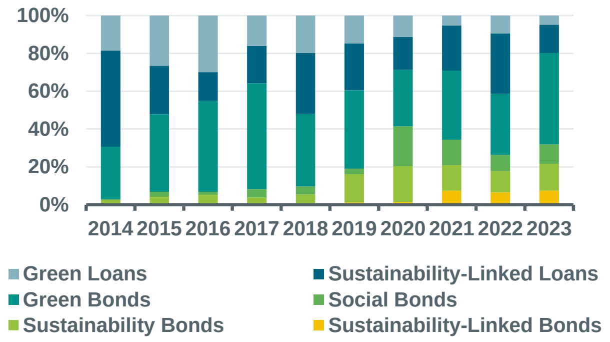
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of sustainable debt by type

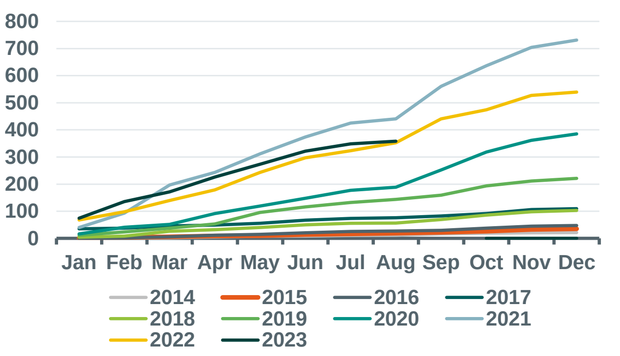
% of total



Source: Bloomberg, ABN AMRO Group Economics

YTD ESG bond issuance

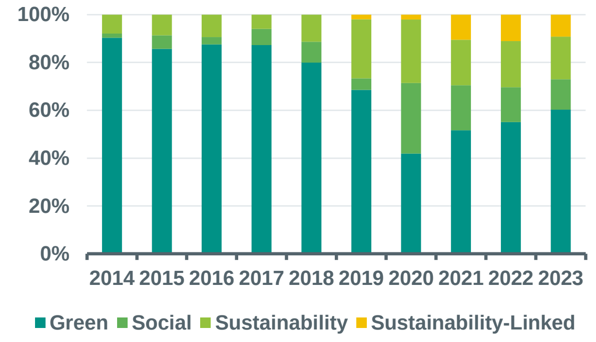
EUR bn (cumulative)



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by type

% of total

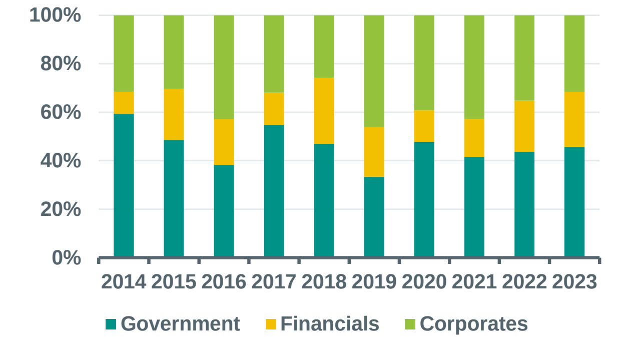


Source: Bloomberg, ABN AMRO Group Economics

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

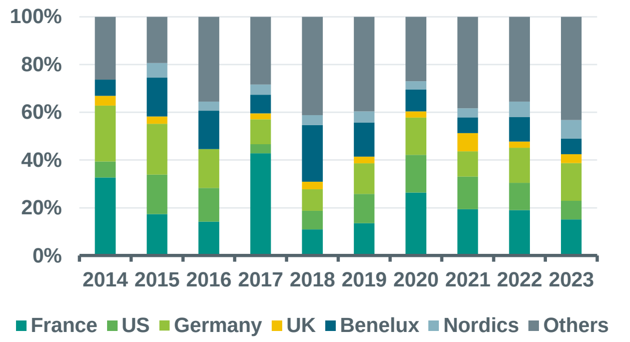
% of total



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by country

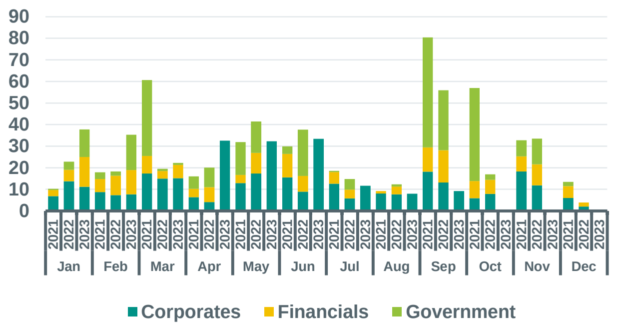
% of total



Source: Bloomberg, ABN AMRO Group Economics

Monthly Green Bonds issuance by sector

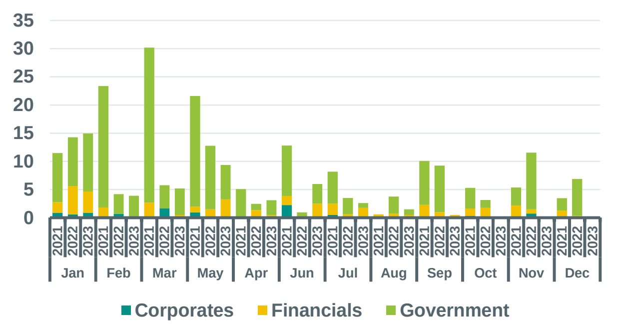
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Social Bonds issuance by sector

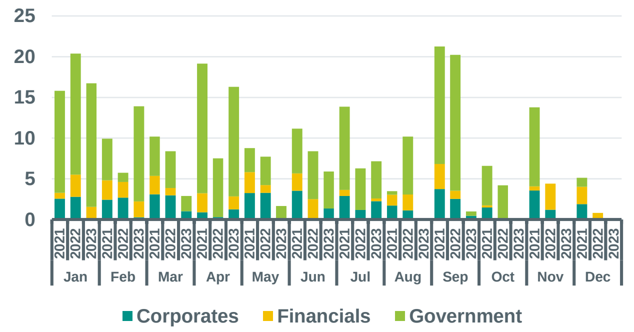
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sustainability Bonds issuance by sector

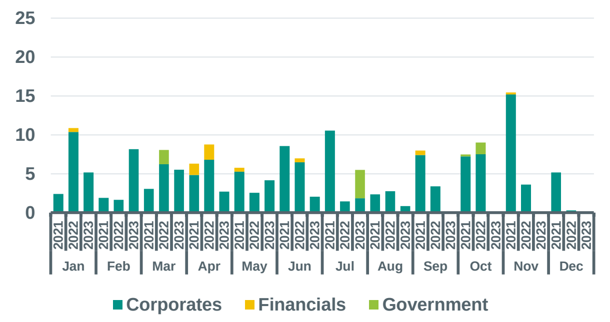
EUR bn



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.

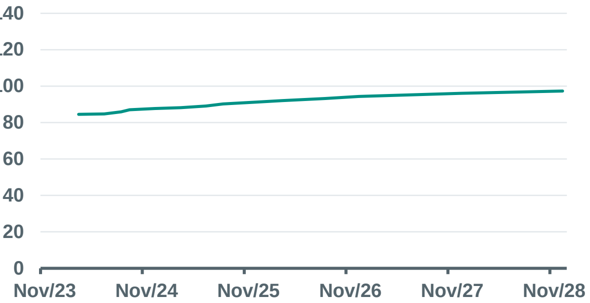
Carbon contract current prices (EU Allowance)

EUR/MT

Source: Bloomberg, ABN AMRO Group Economics

Carbon contract futures curve (EU Allowance)

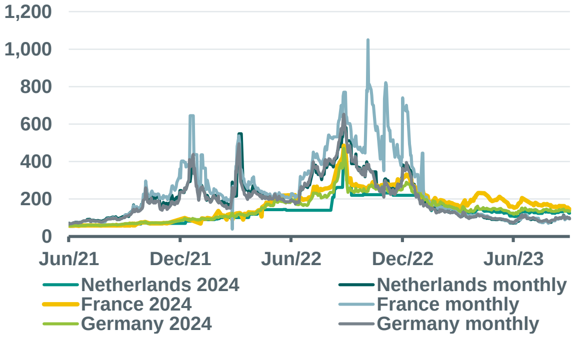
EUR/MT



Source: Bloomberg, ABN AMRO Group Economics

Electricity power prices (monthly & cal+1 contracts)

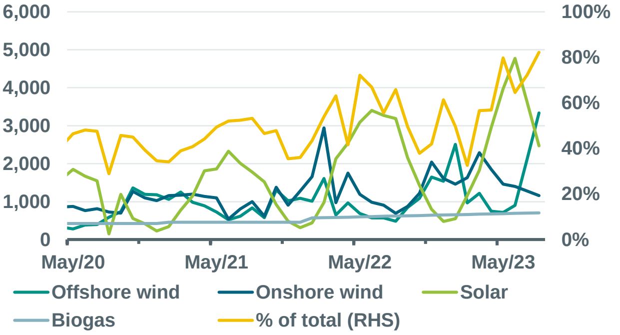
EUR/MWh



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

Electricity generation from renewable sources (NL)

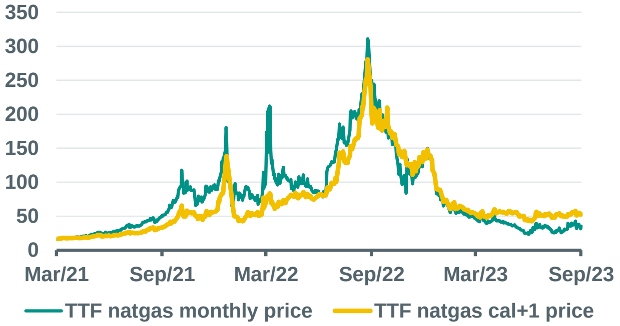
GW % of total



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

TTF Natgas prices

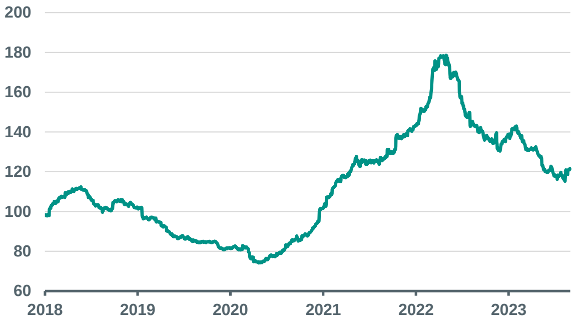
EUR/MWh



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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