NEPP RESULTATBLAD 2/2025

WHAT LIES AHEAD FOR THE EU ETS?

Authors: Lars Zetterberg, IVL Swedish Environmental Research Institute, Milan Elkerbout, Resources for the Future, Washington DC

Introduction

The Fit-for-55 climate package (FF55) has reformed the EU Emissions Trading System (EU ETS). Most importantly, the linear reduction factor (LRF), determining how fast the cap is reduced over time, has been revised. If the new LRF is sustained after 2030, the cap will zero in 2039 instead of in 2058 (for more details, see section 2.1). This has led to an increase of the price of emission allowances which has significantly strengthened the incentives for emission reductions.

However, as we get closer to 2030, concerns have been raised that the allowances supply may not be enough to balance the demand. If we look further ahead, towards 2040, sooner or later allowances will become scarce, since it is likely that there will be residual emissions in for instance the aviation sector. This report presents a set of alternatives to deal with these challenges. We also look at the future need for carbon dioxide removals (CDR) and how to incentivize these in the EU. We also briefly

discuss how the EU has responded to the US Inflation Reduction Act through the EU Net Zero Industrial Act (NZIA).

This policy report has been supported by funds from the NEPP-program (North European Energy Perspectives) and builds, in part, on previous work done within the research program Mistra Carbon Exit.

The reformed EU Emissions Trading System

The Fit-for-55- package entered into force in June 2023 and is a comprehensive package targeting all relevant policy areas. The main elements include (EU Commission, 2023):

- A reformed EU Emission trading system
- A new emission trading system for buildings, road transportation, sometimes referred to as the ETS-2.
- A social climate fund aiming to address the social and distributional impact of ETS-2.
- A Carbon Border Adjustment Mechanism, CBAM.
- Binding targets for emissions and removals from land use, land use change and forestry. The new rules set an increased EU-level target of at least 310 million tons of CO_2 equivalent net removals of greenhouse gases for 2030.

The climate package also includes an update of the Effort sharing regulation, which sets binding annual greenhouse gas emissions targets for member states in sectors that are not covered by the EU ETS. The package also contains a revised renewable energy directive with a target to reach at least 40% renewables by 2030; revised CO_2 emission standards for cars and vans; regulation for alternative fuels infrastructure; a revised energy efficiency directive, revised directive for the energy performance of buildings, a hydrogen market package and a revised energy taxation directive. In the following, we look closer to the EU ETS and carbon removals.

Increased ambition in the EU ETS

The cap trajectory is one of the main determinants of the ETS supply. The much higher linear reduction factor, LRF, (4.3% of 2008- 2012 year's emissions instead of 2.2%) creates a steep downward trajectory for greenhouse gas (GHG) emissions. The new LRF was decided as part of the FF55 package, aiming at reducing emissions in ETS sectors by 62% to the year 2030, compared to 2005. This has led to a significant increase in the price of allowances, exceeding 100 EUR/t in early 2023, although prices have fallen back in 2024 (ICAP, 2024). If not revised again, the LRF will

continue after 2030 and the cap will reach zero in 2039, meaning that there will be no more allowances allocated.

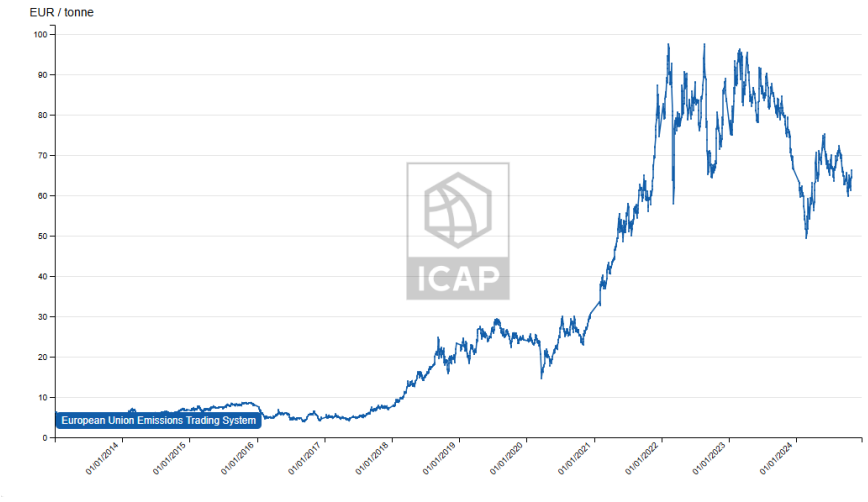

Figure 1. Prices of emissions allowances in the EU Emissions Trading System from 1 January 2013 to 19 December 2024 (ICAP, 2024).

Another key feature of the Fit-for-55-package is the phasing out of free allocation, with the last free allowance to be allocated in the year 2033. The reduction in free allocation is the result of the CBAM, which is being gradually phased in, mirroring the gradual phasing out of free allowances. The phase-out starts slowly, but after Year 2028 it will accelerate rapidly.

ETS-2: A new emission trading system for buildings, road transportation

The Fit-for-55-package includes the implementation of a second ETS (referred to as ETS-2), which targets ground transportation and heating of buildings (EU Parliament and EU Council, 2023). The system will be operational from 2027 onward. Interestingly, by regulating the fuel provider, the new ETS will not only cover the transportation and heating sectors, but all users of fossil fuels, including industrial users in for example the car industry, the food industry, and producers of consumer goods and electronics. The system will also include fuel that is used for installations from sectors covered by the current ETS but where the installations are too small to be included today (e.g., small power- and heat-generating plants). Allowances will be auctioned. The cap will be reduced at a pace of 5.1%, which is faster than for the EU ETS (EU Parliament and EU Council, 2023), but also reflect relatively fewer reductions in ETS-2 sectors to date.

Critical Choices for the EU Climate Policy Architecture

With the current implementation of the Fit-for-55-package, which includes e.g., a strengthening of the EU ETS, the introduction of the CBAM, and the introduction of a new emissions trading system for transports and heating, stakeholders are showing increasing attention on how these instruments will function in the longer term, toward 2030 and beyond.

Will EU ETS Supply and Liquidity Be Constrained by 2030?

In 2030, as the power sector is already phasing out fossil fuels and expanding renewables at a significant pace, emissions reductions from the power sector may be somewhat exhausted and insufficient to maintain emissions levels below the (reduced) cap (banked allowances notwithstanding). Therefore, to meet EU goals, GHG emissions from mainly energy-intensive industries also need to decline rapidly. Emissions from aviation and shipping will also need to be reduced, but they correspond to a relatively smaller share of EU ETS than industrial emissions. Ideally, emission reductions in industry are achieved by substituting low-carbon technologies for inefficient carbon-intensive ones and not by reducing industrial output. Given long lead times, it is essential that industrial transformation is already underway by 2030.

Slow progress on the deployment and scale-up of low-carbon technologies in energy intensive industries could result in slower emissions reductions and trigger a rapid increase in ETS prices. Depending on the general economic conditions in Europe, this may lead to a desire among stakeholders to expand the supply of allowances in the system (or, alternatively, to mitigate the impact of high carbon prices). A short-term option to increase liquidity would be to merge the EU ETS with the new emissions trading system for heating and transport fuels (ETS-2). This would increase the availability of allowances and potential opportunities for emissions reductions, which could reduce price volatility (significant price variations). However, there's a flip side of the coin. If emissions in the ETS-2 are reduced at a slower pace than the LRF, this could ultimately worsen the liquidity issue, as the demand for allowances from participants of the ETS-2 would infringe on the allowance supply of the EU ETS. Successful implementation of national emissions reduction policies for the building and transportation sectors would therefore be even more important under a merged ETS system.

Endgame of the EU ETS

Although merging the two emissions trading systems may provide liquidity in the shorter term, sooner or later the cap will be reduced to very low levels. With the current reduction pace of 4.4 percent per year, the cap will reach zero by 2039, which means that the last emissions allowance will be issued that year. Even if banked allowances will still be available, the ETS supply will be a lot tighter than today. As we get closer to the year with zero allocation, residual emissions will be very expensive and/or technically difficult to abate. In addition, the implementation of carbon capture and storage to tackle emissions from lingering fossil fuel use, the application of which is foreseen to mitigate process emissions from industries (e.g., the cement industry), will not eliminate emissions due to the capture rates potentially being (well) less than 100 percent. According to the EU Commission's impact assessment, the aviation and shipping sectors are expected to continue to emit GHGs well into the future (EU Commission, 2024a). As the supply of allowances approaches zero, the reduced supply may, in part, be counterbalanced by significant volumes of unused allowances and by the market stability reserve (which holds a limited volume of allowances that can be made available). Sooner or later, however, the supply of allowances will be exhausted (Pahle et al, 2024).

The EU ETS could develop in several ways toward 2040 and after:

One option is that the cap is not reduced to zero, but to a level that corresponds to what is deemed technically/economically possible for the emissions sources in the system. There is no assigned year for allocation ending. A difficulty with this approach is to determine an appropriate size for the cap and devise ways to update it as new technologies that decrease emissions emerge. As we approach 2050, when the European Union is committed to reach net-zero GHG emissions, remaining emissions in the EU ETS need to be offset by negative emissions.

Another option is to sustain the current linear reduction factor until the cap reaches zero. Instead of issuing new allowances, participants are offered the opportunity to use carbon removal credits (CRCs, credited by the new EU mechanism—see the section below) to offset residual emissions. However, to avoid the risk of overuse of credits, the volumes and types of CRCs could be restricted. Likewise, credits generated under Article 6 of the Paris Agreement[1] could be allowed into the EU ETS, but this will require the European Council to support no longer having a domestic-only climate target.

[1] Resulting from GHG reductions in countries outside of the EU.

A **third option** would be to retire the EU ETS and replace it with regulation that limits emissions to low levels, for instance by implementing industrial emission standards. As with the first option, any residual emissions in the EU ETS from 2050 and forward will need to be offset by negative emissions.

One may also envisage a combination of the three options, for instance increasing the cap (option 1) and introducing industrial emission standards (option 3). The final outcome is likely to be a result of political negotiations.

The EU Commission and EU Council hints of what may lie ahead

Discussions have started regarding a framework for the year 2040 (EU Commission, 2024b). It will then be the new EU Commission's (operative in 2024-2029) responsibility to present a legislative proposal that includes the 2040 target in the European Climate Law. In a communication in February 2024 the EU Commission recommended a target of 90% net GHG emissions reduction compared to 1990 levels. The target was based on an assessment of the impact on costs and emissions for different ambition levels (80% to 95%). The impact assessment (assuming a shadow carbon price of €240- €290) showed that the level of remaining GHG emissions in 2040 will be 850 MtCO2e (EU Commission, 2024a). This can be compared to 3 138 MtCO2e in 2022 (European Environment Agency, 2024).

In December 2024, the EU council debated the 2040 targets where several member states were in favor of a target of 90% net GHG emissions. France has explicitly called for separate targets for gross emissions reductions and carbon removals, citing "uncertainty" in the evolution of carbon sinks as the main reason (Carbon Gap, 2024).

If the target for the EU ETS is set to -90% by 2040 (instead of 100 % reduction by 2039) this would require an adjustment of the LRF to less than 4.4 % per year. Reducing the LRF is likely to put a downward pressure on the carbon price which may delay implementation of low carbon technologies. But one could also argue that absolute zero emissions is not possible by 2040 and that some sort of action is needed, either in the form of allowing for a small emissions cap in 2040 or the inclusion of credits.

Carbon Removals—How to Create Incentives?

According to the EU Commission's impact assessment, residual emissions in 2040 may be as high as 850 $MtCO_{2e}$ for the whole EU economy, to be compared to 3 138 $MtCO_{2e}$ in 2022. To reach the EU's climate target of -90 percent net reductions by 2040 and net zero emissions in 2050, a significant amount of carbon removals will have to be produced. In April

2024, the European Parliament adopted a provisional agreement on the Carbon removals and Carbon Farming (CRCF) Regulation (European Parliament and Council of the European Union, 2024). In this context the term "carbon removals" refers to capturing CO_2, directly from the atmosphere and from biogenic emission sources, before storing it in reservoirs such as geological formations, forests, soil, or products for the long term. The term "carbon farming" refers to practices implemented by farmers and foresters to enhance carbon sequestration and storage in forests and soils, as well as to reduce GHG emissions from soils. The CRCF Regulation mandates third-party verification and the publication of certification-related information in a European Union–wide registry and aims to streamline certification processes, making them cost-effective yet robust. It also introduces group certification, easing the burden for small farmers and foresters.

While the CRCF regulation provides a provisionary certification framework, currently almost no incentives exist for creating negative emissions beyond voluntary climate action. The exceptions are the newly implemented state support systems for BECCS in Sweden and Denmark (Zetterberg and Möllersten, 2024). The EU does not (yet) mandate either member states or companies to achieve certain CO_2 removal targets. We see the following three potential models for creating incentives and funding for bioenergy with carbon capture and storage (BECCS) and direct air carbon capture and storage (DACCS) that can be used for EU climate targets (Zetterberg, Johnsson and Möllersten, 2021).

The first model would be the establishment of an EU central system for carbon removals, mainly BECCS and DACCS, with specific targets. Funding could, for instance, come from the central EU budget (originating from the Member States) or from the Innovation Fund (originating from sales of EU ETS allowances).

The second model would be a quota obligation imposed on GHG-emitting companies to purchase CRCs corresponding to their GHG emissions. It is not obvious for which sectors and emitters a quota obligation system would be an efficient policy instrument. In the longer term, it would be logical to apply the quota obligation system toward sectors with residual emissions, such as those linked to diffuse emissions from industry, agriculture, shipping, and aviation. The advantage of a quota approach is that it reduces costs for the EU member states (compared to the first model presented), which could translate into increased public acceptance.

The third model would be to allow participants of the EU ETS to use CRCs (for instance from BECCS or DACCS) for compliance. A risk

with allowing credits in the EU ETS is that it can lead to mitigation deterrence – that companies buy credits instead of reducing their emissions. Therefore, it will be important to ensure that credits are only used when emissions reductions are highly difficult technically or very expensive.

In 2026, the EU Commission will provide a review of the EU ETS and suggest how carbon removals shall be reported and used so they do not replace emission reductions.

Assignment of responsibility for achieving negative emissions to the Member States.

The three models described above are models implemented at the EU level. Alternatively, the responsibility for implementing negative emissions could be foisted on the Member States. It would then be up to each Member State to implement appropriate CDR programs to reach their targets (for instance, by applying Model 1 or Model 2, as described above). Such domestic CDR programs are already underway. For instance, Sweden is currently implementing a support program for BECCS, funded by the Government of Sweden. The Member States could alternatively impose a national quota obligation program on sectors that have residual emissions, as described above. Distributing CDR efforts across Member States, similar to the Effort Sharing Regulation, would require some kind of distribution key. Effort sharing in relation to CDR can be done following different principles, for instance:

A. Based on residual emissions. Each Member State would be required to produce or purchase CDR outcomes that correspond to some share of their residual emissions. This target will be increased over time. The sum of these efforts will correspond to the volume of CDRs that the EU will need to reach its overall net-GHG target for each given year.

B. Based on differentiated capabilities. Each Member State would be required to produce CDR outcomes based on their technical potential and financial capability (i.e., relative GDP per capita). Furthermore, the sum of these efforts will correspond to the volume of CDRs that the EU needs for each given year. This option corresponds to how the Effort Sharing framework has operated since Year 2013 to share the burden of non-ETS emissions reductions.

Flexibility could be provided by allowing Member States to trade CDR outcomes, so that Member States with surplus CDR outcomes can sell them to Member States that have a shortage. This flexibility would decrease the

overall costs and increase the effectiveness of the system. Effort sharing is likely to prove contentious, as it will have significant implications for how the costs for CDR are distributed across Member States. Therefore, effort sharing will be subject to political negotiations.

EU response to the US Inflation Reduction Act

With the Inflation Reduction Act (IRA) in the United States and the carbon border adjustment mechanism established by the European Union, in recent years ambitious yet contentious climate policies have been passed on both sides of the Atlantic. Each has spurred the other to consider not only the impact of these policies themselves but also whether they can inspire further policy innovation. A description of the IRA and how the EU so far has responded to it is presented in the policy report *Transatlantic Cues: How the United States and European Union Influence Each Other's Climate Policies* (Elkerbout et al 2024). The following sections present a short excerpt from the report.

The US Inflation Reduction Act

The IRA provides clean energy tax credits until US electricity sector emissions fall to 20 percent of 2022 levels. Other provisions of the IRA include subsidies for non-emitting light-duty vehicles and substantial incentives for electrification of water heaters and HVAC systems.

Given the outcome of the US elections 2024 with a new Trump administration taking the helm in January 2025, the future of the IRA may be uncertain. However, the IRA has become popular, both among US industries and among some republicans. An interesting observation is that republican-controlled areas have captured the lion's share of clean technology investment. By August 2023, more than 80 percent of the investment since passage of the IRA in large-scale clean energy and semiconductor manufacturing was destined for Republican districts, promising creation of more than 100,000 jobs (Financial Times 2023). Republican states such as Texas, Oklahoma, and Florida are also top states for clean energy deployment. Having unleashed these economic interests in Republican states, could be a restraint on a Trump administration wholly overturning the IRA's provisions.

Europe Responds: The Net-Zero Industry Act

The Net-Zero Industry Act (NZIA) was adopted by the EU's Council of Ministers on May 27, 2024, and has been referred to as EU's response to

the US Inflation Reduction Act (Net Zero Industry Act 2023). Notably, prior to implementing the NZIA, the EU focused on subsidizing innovation rather than technology deployment, whereas the IRA more strongly emphasizes deployment. The NZIA marks a shift from the EU's previous focus in two ways that appear to respond to the IRA: (1) a shift in emphasis from supporting early-stage innovation to a focus on technologies that are closer to commercialization, and (2) an acceleration of the market penetration of specific strategic net-zero technologies[2]. Importantly, the NZIA objective is not for the EU to financially support strategic technologies; such support is expected to be set up through national policies by the member states and/or from funds such as the Innovation Fund. Rather, the objective is to speed up the transition and facilitate investment conditions by simplifying the approval process for strategic projects (permit granting), improving access to markets for strategic technology products (particularly in public procurement or renewable energy auctions), increasing workforce skills related to strategic technologies, and implementing the Net-Zero Europe Platform, which coordinates the efforts by member states under the NZIA. Progress will be measured by achieving manufacturing capacity for the identified net-zero technologies, to cover 40 percent of the EU's deployment requirements. Additionally, the NZIA sets a goal to boost the EU's global production share of these technologies to 15 percent by 2040. NZIA also establishes a target for an annual carbon dioxide injection capacity of at least 50 million tons in geological storage sites within the EU by 2030.

[2] The strategic "net-zero technologies" (as of the NZIA proposal 2023/0081) includes renewable energy technologies; electricity and heat storage technologies; heat pumps; grid technologies; renewable fuels of non-biological origin technologies; sustainable alternative fuels technologies; electrolyzers and fuel cells; advanced technologies to produce energy from nuclear processes with minimal waste from the fuel cycle, small modular reactors, and related best-in-class fuels; carbon capture, utilization, and storage technologies; and energy system–related energy efficiency technologies. "Technologies" here refers to the final products, specific components, and specific machinery primarily used to produce those products. They shall have reached a technology readiness level of at least eight, which is the penultimate stage before commercial market readiness.

REFERENCES

Carbon Gap, 2024. https://carbongap.org/environment-council-debate-on-2040-targets-support-for-90-net-target-but-not-mention-of-separate-targets-for-carbon-removal/). Downloaded 19 Dec 2024.

Elkerbout, M., Burtraw, D., Löfgren, Å., Zetterberg, L. 2024. Transatlantic Cues: How the United States and European Union Influence Each Other's Climate Policies. RFF report 24-19. https://www.rff.org/publications/reports/transatlantic-cues-how-the-united-states-and-european-union-influence-each-others-climate-policies.

European Commission, 2023. https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55

EU Parliament and EU Council, 2023. DIRECTIVE (EU) 2023/959 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system, Official Journal of the European Union, 16.5.2023 L130/134.

EU Commission, 2024a. COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Part 1 Accompanying the document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Securing our future Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society. Strasbourg, 6.2.2024. SWD (2024) 63 final.

EU Commission, 2024b. COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Securing our future Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society. Strasbourg, 6.2.2024. COM (2024) 63 final.

European Environment Agency, 2024. EEA greenhouse gases — data viewer. https://www.eea.europa.eu/en/analysis/maps-and-charts/greenhouse-gases-viewer-data-viewers. Published 15 Apr 2024Modified 13 Aug 2024. Downloaded 27 Dec 2024.

Financial Times. 2023. Republican districts dominate US clean technology investment boom. Aug 13, 2023. https://www.ft.com/content/06fcd3dd-9c39-48d3-bb08-6d75d34b5ed1.

ICAP, 2024. https://icapcarbonaction.com/en/ets-prices, Downloaded 2024-12-19.

Pahle, Michael and Quemin, Simon and Osorio, Sebastian and Günther, Claudia and Pietzcker, Robert, The Emerging Endgame: The EU ETS on the Road Towards Climate Neutrality (April 30, 2024). Available at SSRN: https://ssrn.com/abstract=4373443 or http://dx.doi.org/10.2139/ssrn.4373443

Zetterberg L, Johnsson F and Möllersten K, 2021. Incentivizing BECCS—A Swedish Case Study. Front. Clim. 3:685227. doi: 10.3389/fclim.2021.685227.

Zetterberg and Möllersten, 2024. Towards Net Zero Emissions – Creating Incentives for BECCS and DACCS. European Liberal Forum EUPF, liberalforum.eu. Nov 2024.

KONTAKT:

Lars Zetterberg, IVL Swedish Environmental Research Institute

NEPP

North European Energy Perspectives, Nepp, is a multidisciplinary research programme. The purpose of Nepp is to show how the energy systems in Sweden, the Nordics, and Northern Europe, can achieve balanced and sustainable development paths and contribute to the green transition of society as a whole.

The programme functions as a research cluster, where researchers from different organisations and universities conduct studies, that takes as starting point the challenges facing society in achieving the transition. Also, Nepp is an arena for dialogue, co-creation, and a holistic approach for the energy sector and energy research.

The research company Energiforsk is the host of Nepp and responsible for the programme's overall direction. Project leader is the consultancy and research company Profu.

Energiforsk Profu nepp