



The Revision of the European Union Emissions Trading System Directive: Assessing Cap and Market Stability Reserve Reform Options

Study for the
Air Pollution and Climate Secretariat (AirClim)
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Summary

The European Union Emissions Trading System (EU ETS) is a central element of EU climate policy. The successful reform of the EU ETS is thus crucial for the implementation of the objectives of the European Green Deal. Reforms are required in the following four aspects of the EU ETS. The first aspect is that the cap of the EU ETS is a key element of the climate policy architecture which has a strong impact on the design of other commitment mechanisms (e.g. the Effort Sharing Regulation) if the emission reduction targets that are binding under EU and international law are to be achieved. Secondly, in order to achieve the targets set with the EU ETS cap under real-world conditions, the EU ETS must be designed as an incentive instrument in such a way that the cap-based targets for 2030 can also be effectively achieved. Thirdly, the definition of the EU ETS cap via the Linear Reduction Factor (LRF) is also an informational instrument that sends a clear signal to the market about the time frame in which climate neutrality is to be achieved. Fourthly, the EU ETS is also an important instrument for generating financial resources for the transition to a decarbonised society and economy and its accompanying measures. Against this background, the upcoming reform of the EU ETS will require adjustments on various levels.

The cap of the EU ETS will have to be adjusted to the new targets for 2030 and 2050. Any delay with a view to the foreseen implementation in 2024 should be urgently avoided because it would increase the cumulative emissions that would be made possible under the EU ETS. The cap adjustment proposed by the European Commission's Fit for 55 package implies a net-zero emission target for the EU ETS-regulated emissions by 2040 if the Linear Reduction Factor (LRF) is extrapolated for the period beyond 2030. The analysis of more stringent caps shows the implications of net-zero targets for the mid-2030s, i.e. the need for much higher rebasing levels and/or increased LRFs (up to 450 million European Union Allowances (EUAs) compared to 117 million EUAs in the current legislative proposals by the European Commission) and/or increasing the LRF to 4.4% or 4.6%.

However, in view of the large surpluses of emission allowances in the market and the huge uncertainties about the baseline emissions trends and the market behaviour of specific market participants (hedging providers, long-term banking by industry), limiting the reform to the cap adjustment will lead neither to a robust framework for the EU ETS, nor to the achievement of the emission targets for 2030. Thus, the cap adjustments have to be combined with a further reform of the Market Stability Reserve (MSR) of the EU ETS as a high priority because the withholding and cancellation mechanisms of MSR have an impact on the overall amount of allowances that is available for compliance purposes. For robust achievement of the EU's emission reduction targets, the necessary parameterization of the MSR needs to go beyond the recent legislative proposals by the Commission. An important measure for strengthening the MSR mechanism and thus the EU ETS in general would be to adjust the MSR thresholds over time (e.g. parallel to the contraction of the cap or even more ambitiously adjusting them to zero in 2030).

The concept of the MSR and in particular its thresholds is, however, based on very specific assumptions with a view to specific market participants who could create a demand for allowances that are either not used for compliance purposes (hedging) or are held back for compliance usage in the period after 2030. These assumptions depend closely

on economic core beliefs and are not yet sufficiently backed by empirical evidence. Therefore, the analysis and market monitoring in this regard should be significantly strengthened in order to underpin the decision related to the parametrization of the MSR much more robustly than is the case today.

The modelling exercises show that an isolated analysis of a few reform options for the cap and for the MSR can easily lead to less robust results in view of the different uncertainties. The integrated analysis of the largest possible number of options and their combinations (e.g. with a view to baselines, caps, MSR design, demand for hedging and/or long-term banking) as well as the relevant uncertainties is an important prerequisite for a sufficiently robust assessment of the upcoming reforms.

Zusammenfassung

Das Emissionshandelssystem der Europäischen Union (*European Union Emissions Trading System* – EU ETS) ist ein zentrales Element der EU-Klimapolitik. Eine erfolgreiche Reform des EU-ETS ist daher entscheidend für die Umsetzung der Ziele des European Green Deals. Entsprechende Anpassungen sind vor allem in vier Bereichen des EU ETS erforderlich. Erstens bildet die *Cap* des EU ETS ein Schlüsselement für die klimapolitische Architektur der EU, das einen starken Einfluss auf die Ausgestaltung anderer Verpflichtungsmechanismen der EU-Klimapolitik (z.B. die EU-Klimaschutzverordnung, *Effort Sharing Regulation* – ESR), wenn die nach EU- und internationalem Recht verbindlichen Emissionsreduktionsziele erreicht werden sollen. Zweitens muss das EU ETS als ökonomisches Anreizinstrument so gestaltet werden, dass die mit der *Cap* vorgegebenen Emissionsziele für 2030 auch unter realweltlichen Bedingungen tatsächlich erreicht werden können. Drittens bildet das EU ETS mit der Festlegung der *Cap* über den Linearen Reduktionsfaktor (LRF) auch ein informationelles Instrument, mit dem ein klares Signal in den Markt gegeben wird, in welchem Zeitrahmen das Ziel der Klimaneutralität erreicht werden soll. Viertens bildet das EU ETS auch einen wichtigen Mechanismus, mit dem finanzielle Mittel für den Übergang zu einer dekarbonisierten Gesellschaft und Wirtschaft und den entsprechenden Flankierungsmaßnahmen zu generieren. Vor diesem Hintergrund wird die anstehende Reform des EU ETS Anpassungen auf verschiedenen Ebenen erforderlich machen.

Die *Cap* des EU ETS muss an die neuen Ziele für 2030 und 2050 angepasst werden. Mit Blick auf die vorgesehene Umsetzung der Reformen im Jahr 2024 sollte jegliche Verzögerung dringend vermieden werden, da sie die im Rahmen des EU ETS möglichen kumulativen Emissionen erhöhen würde. Aus der im Fit-for-55-Paket der Europäischen Kommission vorgeschlagene Anpassung des *Caps* ergibt sich ein Netto-Null-Emissionsziel für die im Rahmen des EU ETS regulierten Emissionen bis zum Jahr 2040, wenn der Lineare Reduktionsfaktor (LRF) für den Zeitraum nach 2030 fortgeschrieben wird. Aus entsprechenden Klimaneutralitätszielen für die Mitte der 2030er Jahre ergibt sich die Notwendigkeit wesentlich stärkerer Maßnahmen zur einmaligen Verminderung der *Cap* (*Rebasing*) und/oder höherer LRFs, d.h. ein *Rebasing* von bis zu 450 Mio. Emissionszertifikaten (*European Union Allowances* – EUA) gegenüber 117 Mio. EUAs in den aktuellen Legislativvorschlägen der Europäischen Kommission und/oder die Erhöhung des LRFs auf 4,4% oder 4,6%.

Angesichts der großen Überschüsse an Emissionszertifikaten auf dem Markt und der großen Unsicherheiten über die Entwicklung der *Baseline*-Emissionen und das Marktverhalten spezifischer Marktteilnehmer (Anbieter von Absicherungs- (*Hedging*-) Produkten, langfristiges Banking der Industrie) wird eine Beschränkung der Reform auf die Anpassung der *Caps* jedoch weder zu einem robusten Rahmen für das EU ETS noch zur Erreichung der Emissionsziele für 2030 führen. Daher müssen die Anpassungen der *Caps* hoch prioritär mit einer weiteren Reform der Marktstabilitätsreserve (MSR) des EU ETS kombiniert werden, da die MSR über die Marktentnahme- und Lösungsmechanismen erhebliche Effekte für die zur Abdeckung von Emissionen verfügbare Mengen von Emissionszertifikaten hat. Um die Emissionsminderungsziele der EU zuverlässig zu erreichen, wird die Parametrisierung der MSR notwendigerweise über die jüngsten Legislativvorschläge der Kommission hinausgehen müssen. Eine wichtige Maßnahme zur

Stärkung des MSR-Mechanismus und damit des EU ETS im Allgemeinen wäre die Anpassung der MSR-Schwellenwerte im Zeitverlauf (z. B. parallel zur Verringerung der *Cap* oder mit einem noch ambitionierten Ansatz ihre Anpassung auf Null im Jahr 2030).

Das Konzept der MSR und insbesondere ihre Schwellenwerte beruhen auf sehr spezifischen Annahmen zum Verhalten spezifischer Marktteilnehmer, über die eine Nachfrage nach Emissionszertifikaten entstehen kann, die entweder nicht für die Abdeckung von Emissionen verwendet (*Hedging*) oder für die Zeit nach 2030 zurückgehalten werden. Diese Annahmen hängen stark von ökonomischen Grundüberzeugungen ab und sind noch nicht ausreichend durch empirische Belege gestützt. Daher sollten die Analyse und die Marktbeobachtung in dieser Hinsicht erheblich verstärkt werden, um die Entscheidung über die Parametrisierung der MSR wesentlich solider untermauern zu können, als dies heute der Fall ist.

Die Modellanalysen zeigen, dass eine isolierte Analyse einiger weniger Reformoptionen für die Obergrenze und die MSR angesichts der verschiedenen Unsicherheiten leicht zu wenig robusten Ergebnissen führen kann. Die integrierte Analyse einer größtmöglichen Anzahl von Optionen und deren Kombinationen (z.B. mit Blick auf *Baselines*, *Caps*, MSR-Ausgestaltung, Nachfrage mit Blick auf *Hedging*-Verwendungen und/oder langfristiges *Banking*) sowie der entsprechenden Unsicherheiten bildet eine wichtige Voraussetzung für eine hinreichend robuste Bewertung der anstehenden Reformen.

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1. Introduction

In the Nationally Determined Contribution (NDC) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in December 2020 and the European Climate Law approved in June 2021, the European Union (EU) committed under European and international law to reducing greenhouse gas emissions of the 27 Member States (EU 27) by 55% for the period of 1990 to 2030 (CEC 2020b; EP; EC 2021). Within the framework of the European Green Deal (EC 2019), the European Union has set itself the goal of becoming climate-neutral by 2050 and has notified the UNFCCC Secretariat of this (CEC 2020a).

From four different perspectives, the adjustment of the European Union Emissions Trading System (EU ETS) plays a key role in the implementation of this overarching emission reduction commitment in the EU's climate protection architecture. These are:

- The EU ETS is one of the overarching pillars of the EU's climate policy architecture for achieving the 2030 emission reduction target. The cap of the EU ETS for 2030 creates a reference point for the necessary ambition levels of the Effort Sharing Regulation (ESR), which is the complementary commitment mechanism to the EU ETS.
- As a carbon pricing mechanism, the EU ETS creates incentives for changing operational, investment and decommissioning decisions by the regulated entities.
- The EU ETS with its cap design, based on a Linear Reduction Factor which goes beyond the time horizon of 2030, is also an important informational instrument that provides a clear and accountable signal to the regulated entities on the long-term trajectory of the emission reduction requirements.
- The EU ETS also creates revenues that can be used to accelerate the transformation of the energy and industrial system and provide the necessary financing for climate and energy-related purposes, e.g. investments in clean technologies.

The specification of the different EU ETS provisions needs to reflect these four perspectives and their interactions:

- If the cap does not deliver the necessary emission reductions (e.g. due to a surplus of allowances in the system), the legally binding EU emission reduction targets cannot be reached.
- If the contraction of the cap is not consistent with the long-term targets, the signals to the regulated entities will be misleading.
- If there is not a carefully balanced approach between auctioning of allowances, free allocation and carbon border adjustment mechanisms, the necessary revenues from the EU ETS for innovation or clean technologies could not be reached. These issues are not further discussed in this paper.

Against this background, it is important to design the different features of the EU ETS from an integrated perspective that takes careful account of the different dimensions and functions of the system.

The EU ETS instrument regulates approx. 36% of the total greenhouse gas emissions of the EU 27.¹ According to the most recent analyses, the EU ETS will have to deliver the greater part of the total emission reductions that shall be achieved by 2030 (EC 2021a; EC 2021c) due to emission reduction potentials, their costs and the structure of the related capital stocks.

Launched in 2005, the EU ETS has faced a multitude of challenges in recent years and has been adjusted several times to the changing macroeconomic and regulatory environment and to correct some implementation failures. In particular, the changes made with the structural reform of the EU ETS in 2018 have significantly strengthened the role of this trading system as an effective emission reduction mechanism at least for the power sector in many EU member states. However, with these structural reforms, the EU ETS has also become significantly more complex as a whole range of interactions come into play for the various provisions.

Experience gathered in recent years with the EU ETS and with the reform process has also shown that the effectiveness of the individual mechanisms and their interactions depend to a large extent on the macroeconomic, regulatory and energy market environment. In addition to other policy mechanisms beyond carbon pricing (e.g. on energy efficiency or renewable energies), these factors are reflected in the baseline emission trends that create the starting point for any analysis of the EU ETS outcomes.

Furthermore, the role of market participants who use allowances for purposes other than compliance (hedging providers) or who hold allowances for long-term banking leads to additional uncertainties as to whether or not the different provisions will contribute to achieving the emission reduction targets with the lowest uncertainties possible (in the following we refer to this as “robust outcomes”).

The main objective of this study is to assess as reliably as possible whether the emission reduction target for 2030 can be achieved or exceeded, taking into account the corresponding uncertainties. The analysis is built on a previous modelling exercise carried out for different options for cap and Market Stability Reserve (MSR) provisions (Oeko-Institut 2021). For the modelling, version 2 of Öko-Institut's MSRCalc-dyn model was used. This model maps the EU ETS cap and MSR provisions in great detail and allows assessment of a wide range of variants and their combinations with a view to the supply of the EU ETS market as well as their impact emission trajectories.

The remainder of this study is organized as follows. Chapter 2 discusses a range of baseline emission trends. These can differ considerably, especially with regard to the companion policies and the recovery from the Covid-19 pandemic, which represent a central uncertainty with regard to the impact of the different reform options. Chapter 3.1 discusses the current legislative proposals for adjusting the cap of the EU ETS in the context of the new emission reduction target of 55% for the total greenhouse gas emissions of the EU 27. On this basis, chapter 3.2 examines the changes to the Market Stability Reserve (MSR) that were proposed and analyses them with regard to the uncertainties of market participants who may use emission allowances for purposes other than compliance (hedging providers) or who hold allowances for long-term banking. In an additional step, a change of MSR provisions was analysed that goes beyond the recent legislative proposals with regard to the thresholds of the MSR. In chapter 4 options for a

¹ These numbers refer to the last pre-pandemic year 2019 and the total greenhouse gas emissions of the EU 27 without sources and sinks from land use, land use change and forestry (LULUCF).

more stringent design of the EU ETS provisions for the cap (chapter 4.1) as well as the MSR (chapter 4.2) are analysed and discussed. In chapter 0, key conclusions from the structural and numerical analysis are drawn.

Due to the important role of detailed quantitative analysis in this study, all numerical results of the modelling are documented in the annex.

Finally, it should be noted that further reforms of the EU ETS, – e.g. with regard to the introduction of a floor price or the modernisation or abolishing of carbon leakage protection mechanisms – are not further analysed in this study, but nevertheless remain on the reform agenda.

2. Baselines

A key determinant for assessing the upcoming reforms of the EU ETS in the context of the European Green Deal is the path of baseline emissions. The analyses presented here are based on the European Commission's 2020 projections for the impact assessments for the Fit for 55 legislative package.²

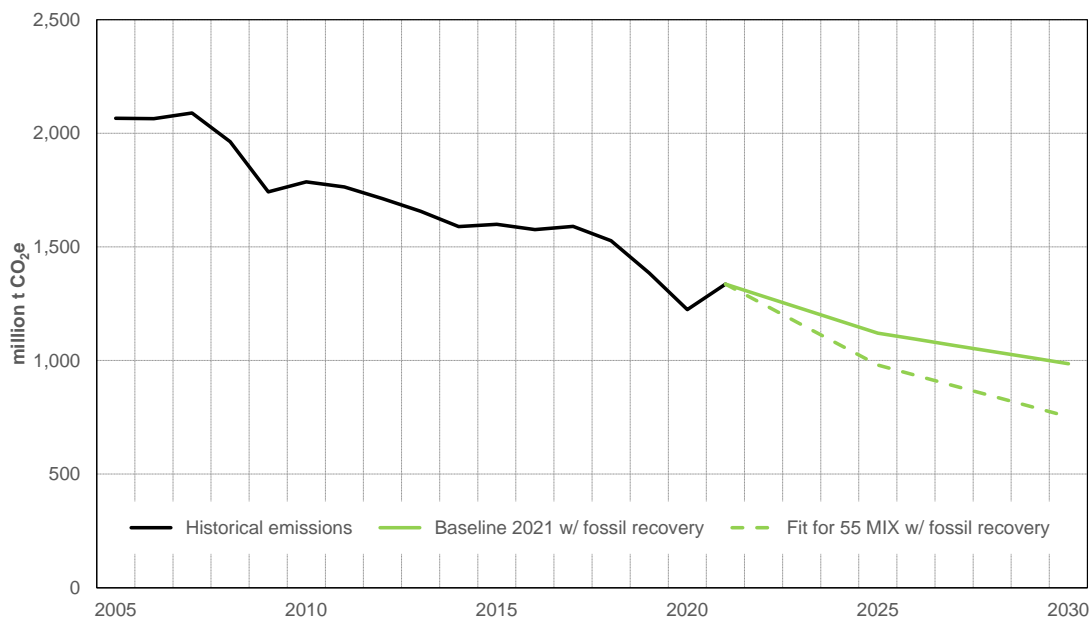
- The first relevant projection here is the baseline projection (BSL 2021), which reflects neither the reform of the EU ETS, nor the broad range of other companion instruments proposed in the Fit for 55 package (Figure 2-1). It includes the policies and measures adopted in the context of the previous climate and energy policy goals. Compared to the 1990 emission levels, a reduction in total greenhouse gas emissions (excluding LULUCF) of almost 44% is achieved in 2030. This goes beyond the existing emission reduction target of 40% and is primarily a result of additional policies to support energy efficiency and accelerate the roll-out of renewable energies. The share of renewable energies in gross final energy demand reaches 33% and primary energy savings amount to 33%. For the EU ETS, this modelling by the European Commission results in an allowance price of 30 €/EUA (at constant 2015 prices and for the underlying macroeconomic and energy market environment) in 2030. For the stationary installations regulated by the EU ETS in the EU 27, this scenario corresponds to an emission level of 986 Mt CO₂e for 2030 (-53% compared to 2005).³
- For the lower bound projection, the Fit for 55 MIX scenario was used (Figure 2-1). This scenario includes the full range of policies and measures proposed in the Fit for 55 package. These policies and measures range from a reform of the EU ETS to many support mechanisms for energy efficiency, electrification and the use of renewable energies. A reduction in total greenhouse gas emissions (excluding LULUCF) of almost 53% is achieved for the period from 1990 to 2030. The share of renewable energies in the gross final energy demand reaches 38% and primary energy savings amount to 39%. In the EU ETS, an allowance price of 48 €/EUA (at constant 2015 prices and for the underlying fuel

² https://energy.ec.europa.eu/data-and-analysis/energy-modelling/policy-scenarios-delivering-european-green-deal_en

³ A higher ambition level for emission reductions from the EU ETS-regulated installations will lead to higher prices. The recently observed price levels for EU ETS allowances (approx. 80 €/t CO₂) seem to anticipate the upcoming reform of the EU ETS and reflect the current market environment (large spreads between coal and natural gas prices and as a result the need for higher EUA prices).

prices assumptions) is reached in 2030. For the stationary installations regulated by the EU ETS in the EU 27, an emission level of 753 Mt CO₂e is achieved for 2030 (-63.5% compared to 2005).

Figure 2-1: Historical emissions and different baseline trends for stationary EU ETS installations in the EU 27, 2005-2030



Source: Öko-Institut

For the historical data, the reported verified emissions of EU ETS installations were used for the period from 2005 to 2020. Emission data for 2021 are estimated based on the emission trend of the installations having already reported data in April 2022 for the year 2021 and on additional gap filling by Öko-Institut. Based on this methodology, the EU ETS-regulated emissions for stationary sources in the EU 27 increased from 2020 to 2021 by 9.15% or 112 Mt CO₂e. This is in line with the trends of Eurostat’s emission data for 2021 (Figure 2-2).

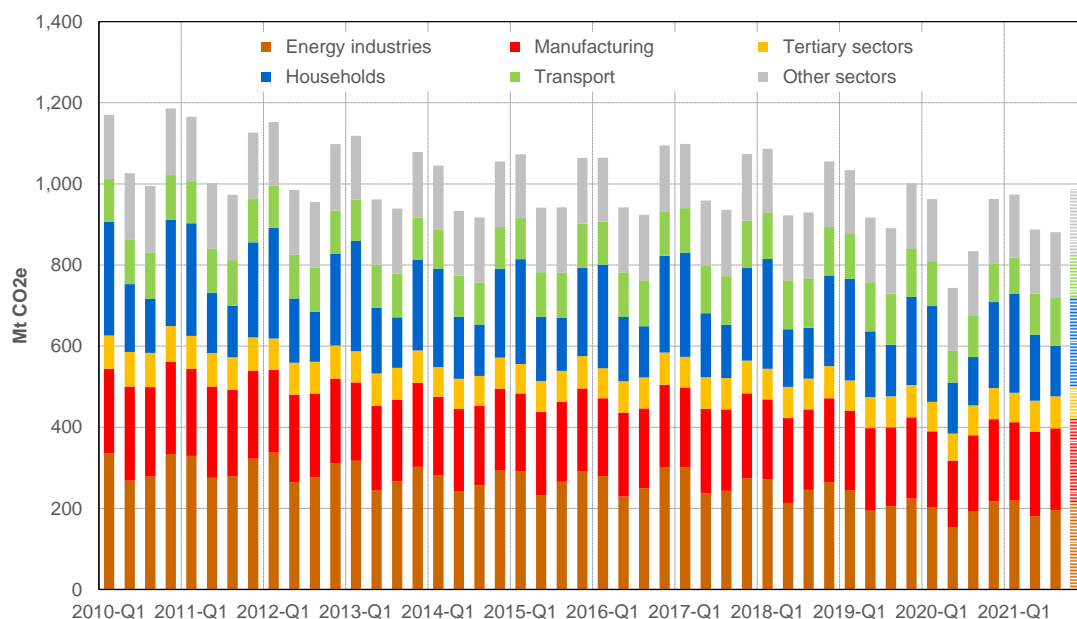
The emission trends for stationary EU ETS installations in Norway, Iceland and Liechtenstein start at a level of 20 Mt CO₂ in 2021 and decrease to approx. 10 Mt CO₂ in 2030. Given the relatively low emission levels for these countries and in order to decrease the complexity of the modelling exercise, no alternative scenarios were taken into account for these non-EU countries.

The proposal for the next revision of the EU ETS directive also contains some provisions which lead to more significant interactions between the EU ETS segment for stationary installations and the segments for aviation and navigation. With respect to these segments, the following assumptions were used⁴:

⁴ These assumptions were derived from the Impact Assessments for the proposals in the Fit for 55 legislative package from the European Commission (EC 2021a; EC 2021b).

- The EU ETS-regulated emissions from aviation amount to 32 Mt CO₂ in 2021, increase to 42 Mt CO₂ in 2022 and grow to 46 Mt CO₂ in 2025 and to 52 Mt CO₂ in 2030.
- The projection for emissions from navigation in the EU are estimated at a level of 87 Mt CO₂ in 2024, for 2030 the emission level is 81 Mt CO₂. The scope of this estimate is based on the Commission proposal, i.e. all intra-EU shipping, all emissions at berth and 50% of emission on routes to and from third countries.

Figure 2-2: Quarterly greenhouse gas emissions for the EU 27 by sector, 2010 Q1-2021 Q4



Source: Eurostat, Öko-Institut calculations and estimates

This range of baseline scenario assumptions builds the basis for the numerical and sensitivity analysis presented in the following chapters.

The implications of Russia's invasion of Ukraine on future baseline emission trends are extremely uncertain (e.g. with a view to fossil fuel supplies and prices or the macroeconomic environment). However, the range of baselines used for the analysis in this study probably also covers the potential effects of the changing geopolitical environment.

3. The Commission proposal for the reform of the cap and the Market Stability Reserve

3.1. Adjusting the cap of the EU ETS

The current cap of the EU ETS and the determinants of this cap were derived in the context of the previous EU climate protection targets (-40% for the 1990-2030 period). For the commitments made with the European Climate Law, the cap of the EU ETS will have to be significantly adjusted in view of the prominent role of emissions from stationary installations regulated by the EU ETS.

Under the current rules, the only determinant for the cap is the Linear Reduction Factor (LRF), which represents an annual contraction of the cap based on the reference level of the average total quantity of allowances issued annually in the period from 2008 to 2012. The LRF was set originally at a level of 1.74%; with the 2018 revision of the EU ETS directive, it was increased to 2.2% from 2021 onwards. The LRF is a long-term contraction mechanism for the cap:

- The LRF of 1.74% represents an annual contraction of the cap (based on the 2008/2012 reference level for the EU 27) amounting to 34 million allowances annually; the EU ETS cap for stationary installations would have led to a net zero emission level by 2068.
- The LRF of 2.2% represents an annual contraction of the cap amounting to 43 million allowances; the net zero level for the stationary installations would have to be met in 2058 with the increase of the LRF to 2.2% from 2021 onwards.

The Commission proposal for the revision of the EU ETS directive broadens the determinants for the contraction of this cap:

- The LRF shall be increased to a level of 4.2% from 2024 onwards, this represents an annual contraction of the cap of 82 million allowances.
- In addition to this linear contraction a one-off decrease of the cap (so-called rebasing) shall take place in 2024, which would reduce the cap by 117 million allowances.
- With this adjustment of the cap the stationary installations regulated by the EU ETS would need to reach the total net-zero emission level in 2040.⁵

Under the current Commission proposal, the total number of allowances supplied to the EU ETS would amount to 11.865 billion allowances for the period from 2021 to 2030 (Table 3-1).

The cap for shipping in the EU shall also be reduced by a LRF of 4.2% from 2024 onwards; the same also applies for aviation in the EU. The reference levels for shipping and aviation do, however, differ from the those for the stationary installations:

- For aviation in the EU, the reference level for the LRF is the allocation to the aviation sector in 2020 for 2021 to 2023 and the allocation in 2023 for 2024 onwards.

⁵ The current specification of the cap (Linear Reduction Factor of 2.2% and no rebasing) implies a net-zero emission level in 2058 for the case of an unchanged Linear Reduction Factor for the period beyond 2030.

- For shipping in the EU, the reference level is the average emission level from 2018 and 2019.

For the EU ETS overall, the total number of allowances to be made available to the market amounts to 12.519 billion allowances for the period from 2021 to 2030 (Table 3-1).

Table 3-1: Adjustments for the Linear Reduction Factor, rebasing and the caps for the EU ETS, 2021-2030

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
EU ETS stationary installations										
Linear Reduction Factor										
COM proposal	2.2%	2.2%	2.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Delay 1 year	2.2%	2.2%	2.2%	2.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
million EUA										
Rebasing										
COM proposal	-	-	-	117	-	-	-	-	-	-
Delay 1 year	-	-	-	-	156	-	-	-	-	-
Cap										
COM proposal	1,572	1,529	1,486	1,286	1,204	1,122	1,040	958	876	794
Delay 1 year	1,572	1,529	1,486	1,443	1,204	1,122	1,040	958	876	794
Cumulative supply EU ETS stationary 2021-2030										
COM proposal										11,865
Delay 1 year										12,021
Shipping EU										
Cap										
COM proposal	-	-	-	75	71	67	64	60	56	52
Aviation EU-EFTA										
Cap										
COM proposal	25	24	23	22	21	20	19	18	18	17
Total cap										
COM proposal	1,596	1,553	1,509	1,384	1,297	1,210	1,123	1,036	949	862
Delay 1 year	1,596	1,553	1,509	1,540	1,297	1,210	1,123	1,036	949	862
Cumulative supply EU ETS 2021-2030										
COM proposal										12,519
Delay 1 year										12,675

Source: Öko-Institut

The time frame for implementing the revised provisions for the EU ETS is ambitious. Table 3-1 presents a sensitivity analysis for an implementation delay of one year. Even if the rebasing were increased to 156 million allowances in this case,⁶ the total number of available allowances would increase by more than 1%.

For the stationary installations regulated by the EU ETS, a cap of 794 million allowances represents an emissions reduction of 62% compared to 2005 levels.

It should be noted, however, that the LRF-driven steady contraction of the cap does not lead necessarily to a comparatively steady inflow of allowances to the market. Above all, the free allocations are set uniformly for the individual years in each of the two sub-

⁶ The rebasing shall bring the level of the annual cap on a trajectory that would be equivalent to a linear contraction of the cap from the year in which the new LRF is applied for the first time.

periods 2021-2025 and 2026-2030. Furthermore, the allowance auctions for specific reasons or specific purposes are not necessarily distributed evenly over all years of the period of 2021-2030.

For this reason, the assessment of the allowance supply should focus less on individual years but rather on the total number of allowances made available to the market over the entire period.

3.2. Reforming the Market Stability Reserve

The Market Stability Reserve (MSR) of the EU ETS is, to date, the central mechanism for addressing the challenge of surplus allowances in the system (which come about for various reasons, e.g. use of CDM/JI credits, economic and financial crisis, etc.). The introduction of the MSR was decided in October 2015 and revised in 2018 to make it more effective to tackle the supply-demand imbalance in the system. It became operational in January 2019. The basic mechanisms of the MSR in its initial form are as follows:

- If the surplus of allowances in the market (Total Number of Allowances in Circulation – TNAC) exceeds a specific threshold, a certain share of this surplus is transferred to the MSR (intake rate) and the number is deducted from the planned auctions. Technically, this threshold is implemented indirectly, based on a minimum quantity of allowances that can be transferred to the MSR. This minimum quantity and the intake rate are used to calculate the threshold for the surplus, above which allowances are absorbed from the market via the MSR. In the original version of the MSR rules, the minimum quantity was 100 million allowances and the intake rate was 12%, with the result that the MSR intake mechanism would apply when a surplus of 833 million allowances is reached ($100/0.12=833$). With the 2018 revision of the MSR rules, both values were doubled for a limited period (until 2023), resulting in the same threshold ($200/0.24=833$).
- If the surplus of allowances in the market falls below a specific level, a certain amount of allowances is made available to the market again each year by expanding the corresponding auctions. The threshold for the release of allowances from the MSR is currently a TNAC of 400 million allowances; if the surplus falls below 400 million allowances, 100 million allowances from the MSR are released for additional auctions each year. The 2018 revision of the MSR provisions doubled this outflow rate for the period to 2023.
- The MSR has a cancellation mechanism⁷ which ensures that from 2023 the number of allowances held in the MSR is limited to the level of the previous year's allowance auctions. Hence, the amount of allowances exceeding this auctioning level is cancelled. Thus the MSR impacts the total number of allowances that is available for compliance purposes and, as a consequence, also impacts the emission budget and the cap of the EU ETS.⁸

⁷ The legal text of the MSR decision does not use the term “cancellation” as it is used for other provisions in the EU ETS directive. In this paper, the term “cancellation” is, however, used synonymously with provisions such as ‘shall no longer be valid’ in the MSR decision.

⁸ Voluntary allowance cancellations by the member states (e.g. in the context of coal phase-out policies) would have a comparable effect.

With the Commission proposal for the revision of the EU ETS, the different MSR provisions would change as follows:

- The methodology for calculating the TNAC is changed from 2024 onwards. Under the new provisions, the net demand from the aviation segment of the EU ETS is considered in the TNAC but only the net demand that occurs from 2024 onwards.
- The intake rate of 24% shall also apply from 2024 onwards; the return to a 12% intake rate was cancelled.
- The MSR intake and release thresholds shall not be changed; they remain at 833 and 400 million allowances respectively.
- The annual MSR intake is limited to such a level that the TNAC cannot fall below the upper MSR intake threshold of 833 million allowances.
- The MSR outflow rate (in case the TNAC falls below the lower MSR threshold) shall be maintained at 200 million allowances from 2024 onwards.
- The cancellation provisions shall be changed: the maximum number of valid allowances in the MSR is limited to 400 million allowances; all other allowances shall be cancelled.

The general concept of the MSR is based on the assumption that there is a demand for emission allowances by (financial) market participants who provide hedging products primarily for the electricity market. If these market players offer contracts for future deliveries for allowances, buying allowances in primary auctions or on the spot market when the hedge is sold and banking them to safeguard these deliveries is a straight forward approach and currently widely used (but nevertheless not without alternative, see below).

Because of these market players and the respective assumptions about the hedging needs, the intake and outflow thresholds for MSR were set to 833 and 400 million EUAs. This reflects the assumption that the demand for hedging and/or long-term banking stays in this range. However, this assumption can also be disputed. It is based on the core belief that an emissions trading system can only operate sufficiently well if the number of allowances available to the market significantly exceeds the amount of allowances needed for compliance if there is significant demand for hedging products in the sectors regulated by the ETS, i.e. the power sector. In other words: a significant surplus of allowances would be needed for a well-functioning market. The first question here is whether the providers of hedging products, for their part, can also hedge in ways other than by purchasing and holding emission allowances (e.g. by hedging coal-gas price spreads which are one of the determinants of allowance prices). It should also be noted that in the course of an ever greater emission reduction in the electricity sector and the gradual decrease of base-load and medium-load electricity generation, the (hypothetical) demand for emission allowances in the context of hedging transactions would also fall significantly over time. With a view to the cap trajectory described in chapter 3.1, a hedging demand of 833 million EUAs seems not to be consistent with a total cap of 862 million EUAs for 2030.

In addition to the demand for hedging, some industries are pursuing the strategy of acquiring allowances and banking them for the longer term when the fresh supply of allowances will be more and more restricted. There is a high level of uncertainty about the extent to which this approach is used and whether or not high allowance prices could

create incentives to liquidate banked allowances to get additional liquidity in the balance sheets of these industrial enterprises.

Furthermore, it should be noted that the TNAC does not represent the full amount of available allowances. The recent TNAC calculation approach does not reflect

- any net demand for allowances (allocation minus emissions) for the aviation segment of the EU ETS that occurs before 2024 (which will reach significant levels);
- any outflow for the Effort Sharing flexibility mechanism⁹ (which is of less significance); or
- any effects that may result from linking to Switzerland's ETS (which is also of less significance).

For the year 2021 this leads to a situation in which the TNAC overestimates the surplus that could potentially be used for compliance by approx. 14%.¹⁰ In the upcoming years this share will increase. As a consequence, the assessment of MSR provision must not only reflect the TNAC and its trigger effects for intake and outflow to or from the MSR but also the level of surplus allowances that could effectively be available to the market.

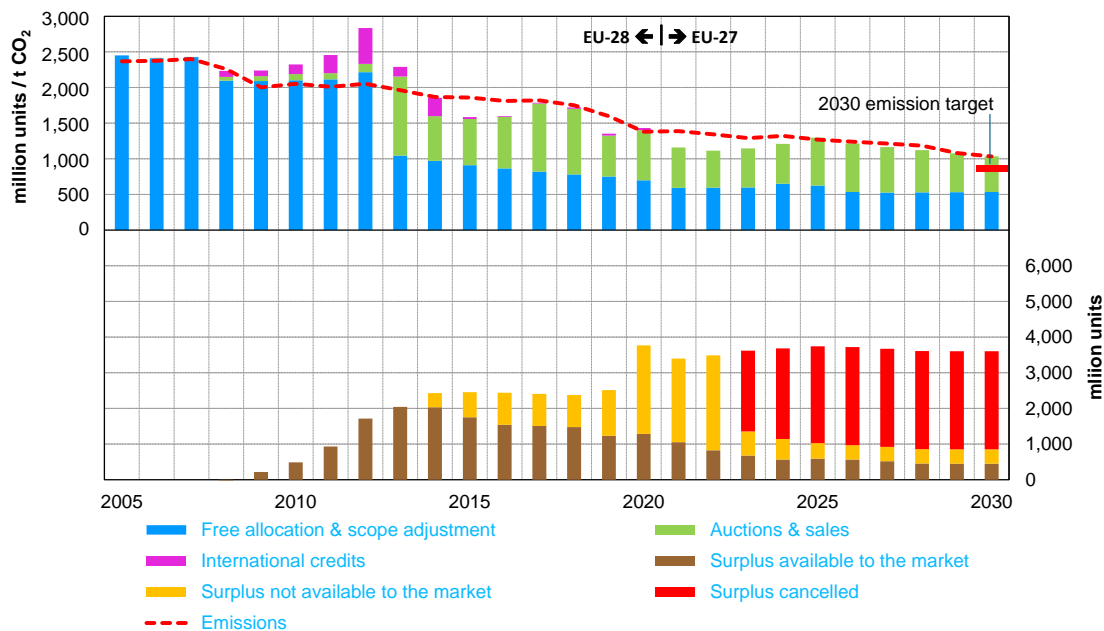
Figure 3-1 shows the development of emissions and allocation (in the upper part of the graph) and the allowances available to the market, those held in the MSR and the allowances cancellations in the MSR (in the lower part of the graph). The BSL 2021 scenario is used and it is assumed that the LRF is adjusted in 2024 (combined with rebasing according to the recent legislative proposal). Furthermore, an effective demand of 450 million EUAs for hedging purposes and long-term banking is assumed by 2030.¹¹

⁹ Some EU member states can use EU ETS allowances to comply with their effort sharing obligations (EP; EC 2018; EC 2021d).

¹⁰ However, from the overarching perspective of environmental integrity, the overestimation of the actual surplus by the TNAC is not necessarily a problem. Allowances from the stationary segment are exported to the aviation segment. In order to maintain environmental integrity, this export should not change the functioning of the MSR and the total number of allowances available (otherwise the total number of allowances would increase). Against this background, it is appropriate not to take into account the net-export to the aviation segment for the MSR mechanism from an environmental integrity perspective.

¹¹ The target scenarios for the Fit for 55 modelling exercises show emission levels of approx. 450 Mt CO₂ for the energy industries.

Figure 3-1: Emissions, market supply, surplus allowances available to the market, in the MSR and cancelled for the BSL 2021 baseline under the Commission proposals for cap and MSR rules, demand of 450 million EUAs for energy sector hedging and industrial long-term banking, 2005-2030

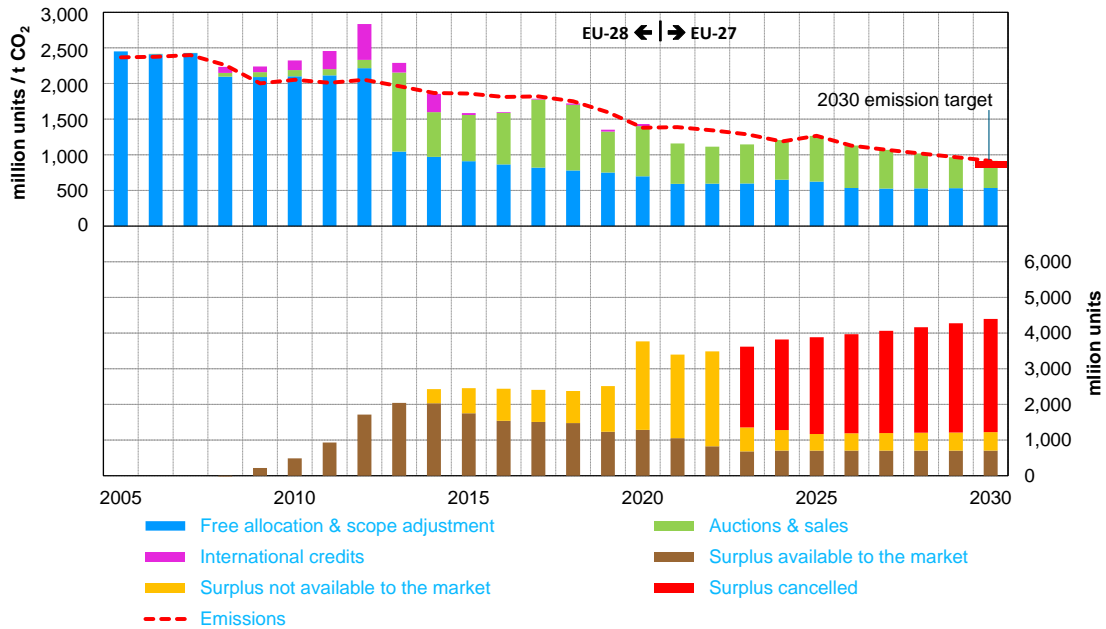


Note: The upper panel shows annual values, the lower panel cumulative amounts.
 Source: Öko-Institut

In this case, the number of allowances available to the market will not push down the emissions by 2030 to a level that is consistent with the emission target of 862 Mt CO₂e. The emissions would exceed the target level by approx. 20%. With a view to the surplus in the market, this scenario leads to the following results:

- The intake to the MSR would decrease from 324 million allowances in 2022 to 36 million allowances in 2025; from 2026 onwards no further intake would occur;
- There would be no outflow from the MSR in the period from 2021 to 2030;
- After a major cancellation in the MSR in 2023 (approx. 2.27 billion allowances), the annual cancellations would decrease rapidly to 35 million allowances by 2026; for the years beyond 2026 no further cancellation would occur;
- The number of allowances held in the MSR would stay at a level of 400 million allowances from 2026 onwards.

Figure 3-2: Emissions, market supply, surplus allowances available to the market, in the MSR and cancelled for the BSL 2021 baseline under the Commission proposals for cap and MSR rules, demand of 700 million EUAs for energy sector hedging and industrial long-term banking, 2005-2030



Note: The upper panel shows annual values, the lower panel cumulative amounts.
 Source: Öko-Institut

If the demand for hedging or long-term industrial banking increased from 450 to 700 million EUAs, the modelling of emissions and allowances leads to the patterns that are shown in Figure 3-2. The lower availability of allowances from the surplus for compliance purposes leads to lower emissions in 2030. However, the total emission target is still exceeded by approx. 6% in this case. With a view to the surplus in the market, this scenario leads to the following results:

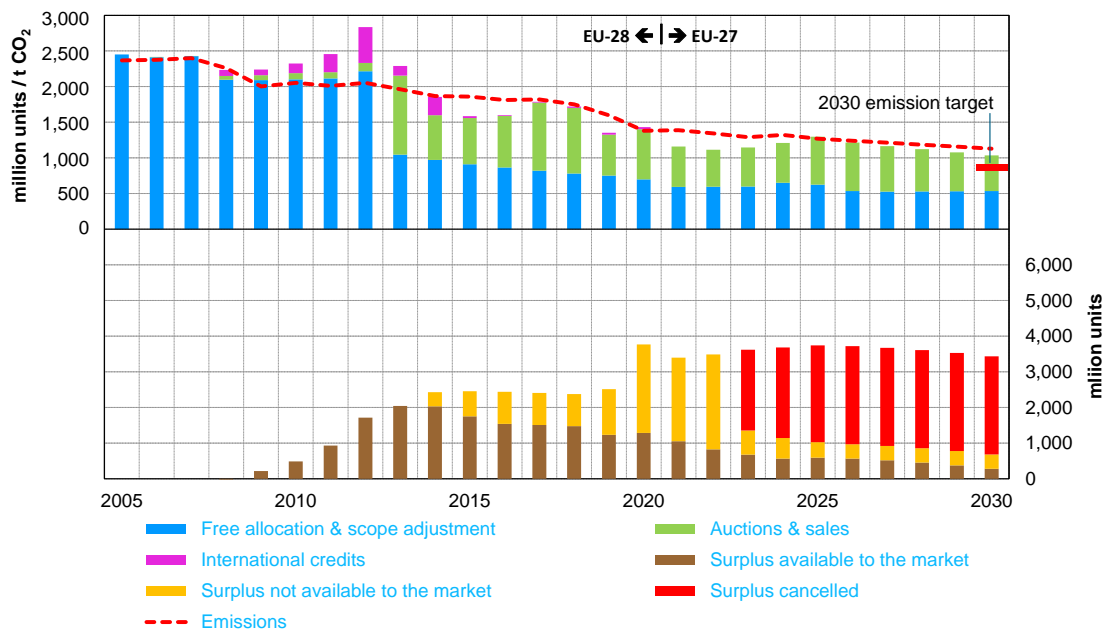
- The intake to the MSR would decrease from 324 million allowances in 2022 to 65 million allowances in 2025; from 2026 the intake would increase stepwise to 118 million EUAs in 2030;
- There would be no outflow from the MSR in the period from 2021 to 2030;
- After a major cancellation in the MSR in 2023 (approx. 2.27 billion allowances), the annual cancellations would decrease rapidly to 65 million in 2026 and stay in the range of 86 to 110 million EUAs in the years up to 2030.

The analysis of more options of surplus availability shows that the emission reduction target for 2030 is met when a share of approx. 750 million allowances is not available to the market for compliance purposes due to hedging needs and long-term banking by the industry.¹² For higher assumptions on the demand for hedging and long-term banking

¹² When higher demands for hedging and/or long-term banking decrease emissions due to the lower availability of allowances for compliances, the TNAC increases; more allowances can be absorbed by the MSR and potentially cancelled within the MSR.

the emission targets are overachieved (for a non-availability level of 800 million allowance e.g. by 5%).

Figure 3-3: Emissions, market supply, surplus allowances available to the market, in the MSR cancelled for the BSL 2021 baseline under the Commission proposals for cap and MSR rules, no demand for energy sector hedging or industrial long-term banking, 2005-2030



Note: The upper panel shows annual values, the lower panel cumulative amounts.

Source: Öko-Institut

The highest emission levels (or the lowest emission abatement) result from the assumption that there is no need for holding allowances by energy sector hedging providers and no long-term banking by industrial operators of stationary installations under the EU ETS occurs (Figure 3-3).

In this case, the number of allowances available to the market will not push down the emissions by 2030 to a level that is consistent to the emission target of 862 Mt CO₂e. The emissions would exceed the target level by approx. 31%. With a view to the surplus in the market, this scenario leads to the following results, which are the same than for the case shown in Figure 3-1:

- The intake to the MSR would decrease from 324 million EUAs in 2022 to 35 million EUAs in 2025; from 2026 onwards no further intake would occur;
- There would be no outflow from the MSR in the period from 2021 to 2030;
- After a major cancellation in the MSR in 2023 (approx. 2.27 billion allowances), the annual cancellations would decrease rapidly to 35 million EUAs by 2026; for the years beyond 2026 no further cancellation would occur;

- The number of allowances held in the MSR would stay at a level of 400 million EUAs from 2026 onwards.

Table 3-2: Allowance supply, emissions, surplus, TNAC, MSR holdings and invalidation of allowances in the MSR for the BSL 2021 baseline, the Commission proposals for cap and MSR rules and different assumptions for the demand for hedging purposes and/or long-term banking, 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	770	770	9,976	10,361	850	1,115	664	3,978
800	816	816	10,290	10,726	800	1,065	618	3,709
750	866	866	10,607	11,092	750	1,015	568	3,443
700	916	916	10,924	11,459	700	965	518	3,176
650	966	966	11,177	11,762	650	915	468	2,973
600	1,016	1,016	11,415	12,051	600	865	418	2,784
550	1,034	1,034	11,466	12,151	550	815	400	2,752
500	1,034	1,034	11,466	12,201	500	765	400	2,752
450	1,034	1,034	11,466	12,251	450	715	400	2,752
400	1,034	1,034	11,466	12,301	400	665	400	2,752
350	1,034	1,059	11,466	12,351	350	615	400	2,752
300	1,034	1,109	11,466	12,401	300	565	400	2,752
250	1,034	1,129	11,466	12,422	280	544	400	2,752
200	1,034	1,129	11,466	12,422	280	544	400	2,752
150	1,034	1,129	11,466	12,422	280	544	400	2,752
100	1,034	1,129	11,466	12,422	280	544	400	2,752
50	1,034	1,129	11,466	12,422	280	544	400	2,752
0	1,034	1,129	11,466	12,422	280	544	400	2,752

Source: Öko-Institut

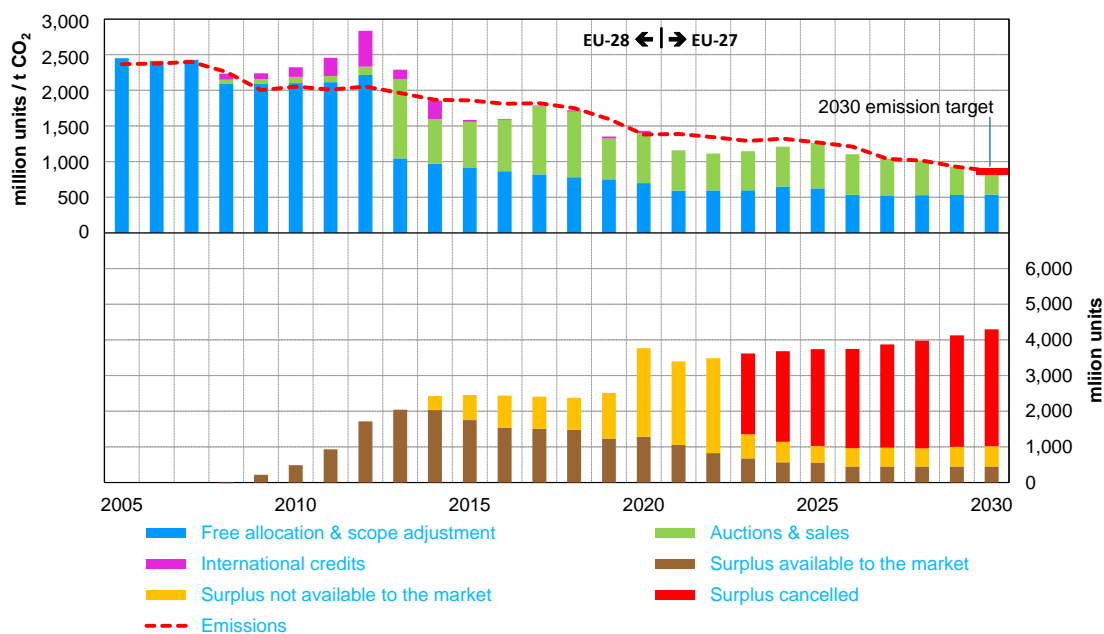
Table 3-2 provides an overview of 18 model runs for different assumptions on the use of allowances for purposes other than compliance (hedging, long-term banking). All calculations are based on the combination of the BSL 2021 baseline on the one hand and on the recent Commission proposals for the cap and MSR reform on the other hand. A comparison of the different model runs suggests some key findings:

- The emission reduction target for 2030 is only met under the proposed cap and MSR provision if 750 million EUAs or more are not available for compliance purposes due to hedging and/or long-term banking (indicated by the upper coloured bars);
- The total supply of allowances to the market in 2030 (and so the level of invalidations) does not change if 550 million EUAs or less are used for other purposes than compliance (indicated by the middle coloured bars);
- The total supply of allowances and the total emissions for the period from 2021 to 2030 is not affected by a scarcity of allowances if 250 million EUAs or less are used for hedging and/or long-term banking (indicated by the lower coloured bars).

Uncertainties about the behaviour of the various market players (hedging providers, the approaches of industry to long-term banking or long-term speculation) thus result in crucial uncertainties regarding the achievement of the emission reduction targets.

The most significant mechanism for removing some of these uncertainties would be to adjust the threshold levels that trigger the intake or outflow of allowances to or from the MSR.

Figure 3-4: Emissions, market supply, surplus allowances available to the market, in the MSR and cancelled for the BSL 2021 baseline under the Commission proposal for the cap and an adjustment of MSR triggers parallel to the cap, demand of 450 million EUAs for energy sector hedging and industrial long-term banking, 2005-2030



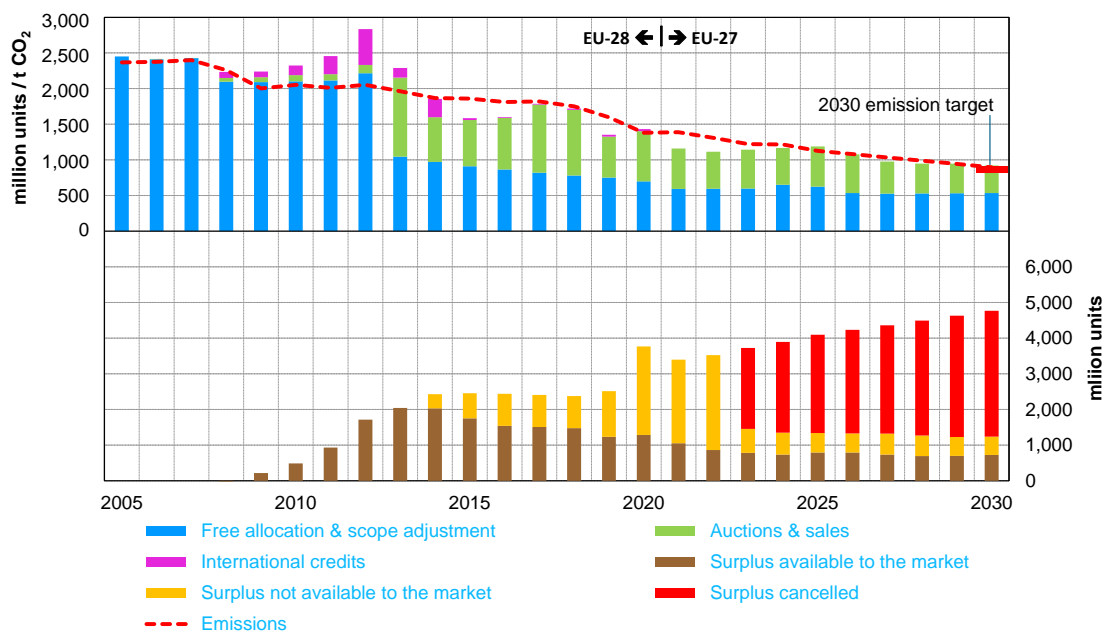
Note: The upper panel shows annual values, the lower panel cumulative amounts.
 Source: Öko-Institut

Figure 3-4 shows the result of a modelling run which was parameterized in the same way as the one shown in Figure 3-1, with the exception that the MSR intake and outflow thresholds have been adjusted parallel to the cap (based on the 2021 ratio). Lowering the thresholds for the MSR over time leads to higher MSR intakes, a decrease of the number of allowances that can be used for compliance and eventually to more invalidations within the MSR. Thus, the outcome in terms of meeting the emission reduction target for 2030 is much more robust. The target level of 862 million t CO₂e is exceeded only by 0.3% compared to 20% in the case shown in Figure 3-1.¹³

¹³ The results of all model runs for the adjusted MSR threshold values are shown in Table A- 1.

A more stringent decrease of the MSR thresholds in the period from 2021 to 2030 would further increase the robustness of the emission reduction outcomes (see chapter 4.2).

Figure 3-5: Emissions, market supply, surplus allowances available to the market, in the MSR and cancelled for the Fit for 55 MIX base-line under the Commission proposals for cap and MSR rules, no demand for energy sector hedging or industrial long-term banking, 2005-2030



Note: The upper panel shows annual values, the lower panel cumulative amounts.
 Source: Öko-Institut

If the Fit for 55 MIX scenario is assumed as a baseline, the MSR in the parameterization of the Commission proposal does not affect significantly the emission trajectory (Figure 3-5). Even in the case of no demand for hedging and/or long-term banking, the emissions would exceed the target level for 2030 by approx. 4% only. The MSR and its parameterization would only make a minor difference in this case¹⁴:

- The intake to the MSR would decrease stepwise and without major discontinuities from 325 million EUAs in 2022 to 122 million EUAs in 2030;
- There would be no outflow from the MSR in the period from 2021 to 2030;
- After a major cancellation in the MSR in 2023 (approx. 2.27 billion allowances), annual cancellations would decrease from an invalidation of 276 million EUAs in 2024 to 130 million EUAs in 2030;

¹⁴ The results for all model runs for the BSL 2021 and the Fit for 55 MIX baselines are shown in the Annex.

- The number of allowances held in the MSR would be in a range of 512 to 676 million allowances in the period from 2023 to 2030.¹⁵

Against this background, it becomes clear that the adjustment of the factors determining the cap as proposed by the European Commission in the course of a reform of the EU ETS will not be sufficient on its own to achieve the emission targets for 2030 with the necessary robustness. The effective emission reduction depends significantly on assumptions (or even core beliefs) with a view to hedging strategies in the energy sector and on long-term banking of industrial operators of EU ETS-regulated stationary installations. Basing the parameterization of the MSR on assumptions that do not reflect the emerging real world situation could lead to failures with a view to the targeted emission reductions.

A reform of the MSR and its parameters beyond the recent legislative proposal should thus become an important element of the upcoming revision.

Last but not least, it should be emphasized that the specification of the baseline has a decisive influence on the emission reduction results and on the robustness with regard to the action strategies of specific market participants. The more pronounced the emission reduction contributions of complementary policies are, the more the ETS-specific uncertainties can be limited.

4. More stringent options for the reform of the cap and the Market Stability Reserve

4.1. Adjusting the cap of the EU ETS

In addition to the European Commission's proposals for adjusting the LRF to 4.2% and a one-time rebasing of 117 million EUAs (here referred to as "Commission proposal"), a number of (significantly more far-reaching) options for setting the cap from 2024 were examined. The following combinations for the adjustment of the Linear Reduction Factor and rebasing were considered:

- an increase in the Linear Reduction Factor to 4.6% and a rebasing of 250 million EUAs (cap reform option 2);
- an increase in the Linear Reduction Factor to 4.4% and a rebasing of 350 million EUAs (cap reform option 3);
- an increase in the Linear Reduction Factor to 4.2%, unchanged from the Commission's proposal, and a rebasing of 450 million EUAs (cap reform option 4).

¹⁵ On the one hand, all allowances that exceed the level of 400 EUAs would be invalidated; on the other hand, each year an inflow from 112 million EUAs (2030) to 276 million EUAs (2023) would occur.

Table 4-1: Adjustments for the Linear Reduction Factor, rebasing and the caps for the EU ETS, 2021-2030

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
EU ETS stationary installations										
Linear Reduction Factor										
COM proposal	2.2%	2.2%	2.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Reform option 2	2.2%	2.2%	2.2%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%
Reform option 3	2.2%	2.2%	2.2%	4.4%	4.4%	4.4%	4.4%	4.4%	4.4%	4.4%
Reform option 4*	2.2%	2.2%	2.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
million EUA										
Rebasing										
COM proposal	-	-	-	117	-	-	-	-	-	-
Reform option 2	-	-	-	250	-	-	-	-	-	-
Reform option 3	-	-	-	350	-	-	-	-	-	-
Reform option 4	-	-	-	450	-	-	-	-	-	-
Cap										
COM proposal	1,572	1,529	1,486	1,286	1,204	1,122	1,040	958	876	794
Reform option 2	1,572	1,529	1,486	1,146	1,056	966	876	786	696	606
Reform option 3	1,572	1,529	1,486	1,050	964	878	792	706	620	534
Reform option 4	1,572	1,529	1,486	953	871	789	707	625	543	461
Cumulative supply EU ETS stationary 2021-2030										
COM proposal										11,865
Reform option 2										10,717
Reform option 3										10,127
Reform option 4										9,536
Total cap**										
COM proposal	1,596	1,553	1,509	1,384	1,297	1,210	1,123	1,036	949	862
Reform option 2	1,596	1,553	1,509	1,243	1,148	1,054	959	864	770	675
Reform option 3	1,596	1,553	1,509	1,147	1,056	965	875	784	693	602
Reform option 4	1,596	1,553	1,509	1,051	964	877	790	703	617	530
Cumulative supply EU ETS 2021-2030										
COM proposal										12,519
Reform option 2										11,371
Reform option 3										10,780
Reform option 4										10,190

Notes: * Reform option 4 is identical to the COM proposal for the LRF. - ** Caps for EU shipping and EU/EFTA aviation for all options according to the COM proposal.

Source: Öko-Institut

The implications of these three additional cap variants and the Commission proposal for the cap adjustment are summarized in Table 4-1:

- For the cap reform option 4 with the strongest rebasing (450 Mt EUA), the target level for total emissions regulated by the EU ETS falls to 530 Mt CO₂ in 2030. This corresponds to an emission reduction for the stationary sector¹⁶ for the period from 2005 to 2030 of approx. 78% which is an increase by approx. 15.5 percentage points compared to the Commission's proposal.
- For the cap reform option 3 with a rebasing of 350 million EUAs, the target level for emissions in 2030 is reduced to 602 Mt CO₂. For stationary installations reg-

¹⁶ Since the regulatory scope of the EU ETS has been expanded over time to include aviation and shipping, such a reference to historical emission levels is only meaningful for stationary installations as only here consistently comparable historical data are available.

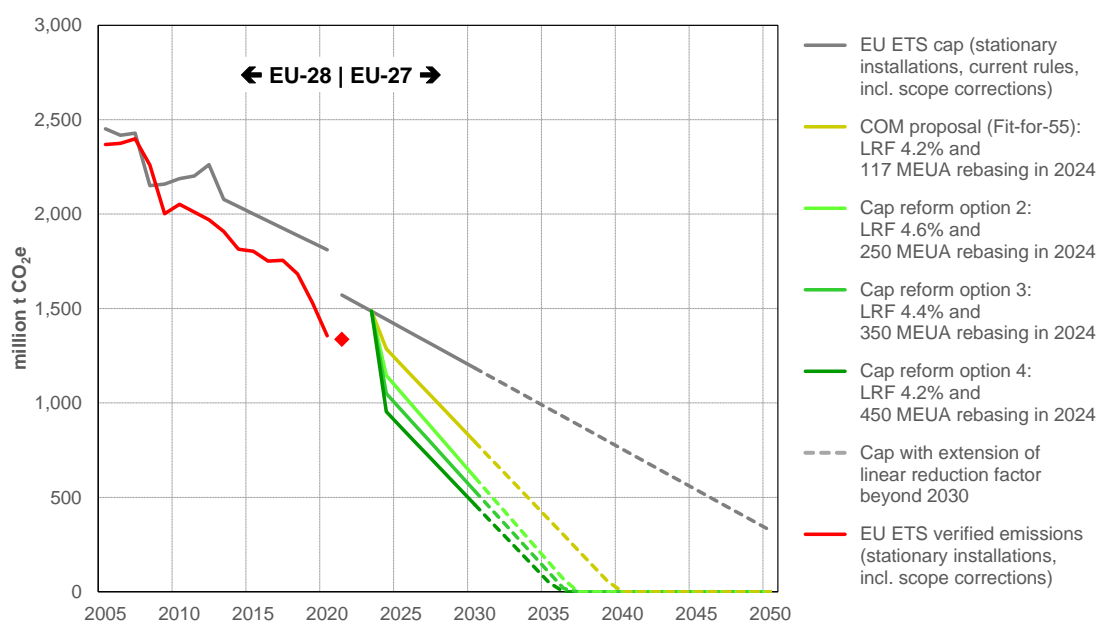
ulated by the EU ETS, this corresponds to an additional emission reduction obligation of approx. 12 percentage points for the period from 2005 to 2030 or a total emission reduction of 75% compared to the 2005 emission levels.

- For the cap reform option 2 with a rebasing of 250 million EUAs, the target level for emissions in 2030 is reduced to 675 Mt CO₂. In the stationary sector, the emission reduction target for the period of 2005 to 2030 would be increased by about 9 percentage points to 71.5% (compared to the Commission’s proposal).

With a view to the new emission allowances available in the period of 2021 to 2030 according to the cap trajectories, the following patterns emerge:

- For the cap reform option 4 with a rebasing of 450 million EUAs, the total number of available emission allowances decreases by 19% compared to the Commission proposal. This value is significantly higher than the difference for the annual target level in 2030 (-42%).
- For the cap reform option 3 with a rebasing of 350 million EUAs, the total number of available emission allowances is 14% lower than for the Commission proposal. Here, too, there is a clear difference for the target level of annual emissions for 2030 (-33%).
- For the cap reform option 2 with a rebasing of 250 million EUAs, about 9% fewer emission allowances are available for the total period than in the Commission proposal. Here, too, the difference in the annual target for the 2030 is significantly higher (approx. 23.5%).

Figure 4-1: Long-term implications of Linear Reduction Factor adjustment and rebasing options for stationary installations, 2005-2050



Source: Öko-Institut

Figure 4-1 also shows the development of the cap for the time horizon after 2030. In the event that the Linear Reduction Factor specified in the various options is continued unchanged after 2030, the alternative variants to the Commission proposal already have to reach an emission level of net-zero for the years 2036 and 2037.

For all presented reform options beyond the Commission proposal, in-depth and bottom-up modelling exercises do not yet exist. Preliminary estimates suggest, however, that coal-based electricity generation would have to be completely phased out by 2030; the additional electricity generation demand would have to be largely met by CO₂-neutral generation options, and a very significant share of industrial emissions would have to be avoided, e.g. through a transformation to hydrogen-based technologies.

4.2. Reforming the Market Stability Reserve

As already shown in chapter 3.2, the trigger parameters of the MSR for intake and release of allowances have a significant influence on the development of the emissions regulated by the EU ETS. Therefore, further options for this parameter were analyzed. In addition to the Commission proposal with unchanged thresholds of 833 and 400 million EUAs respectively, these further options are

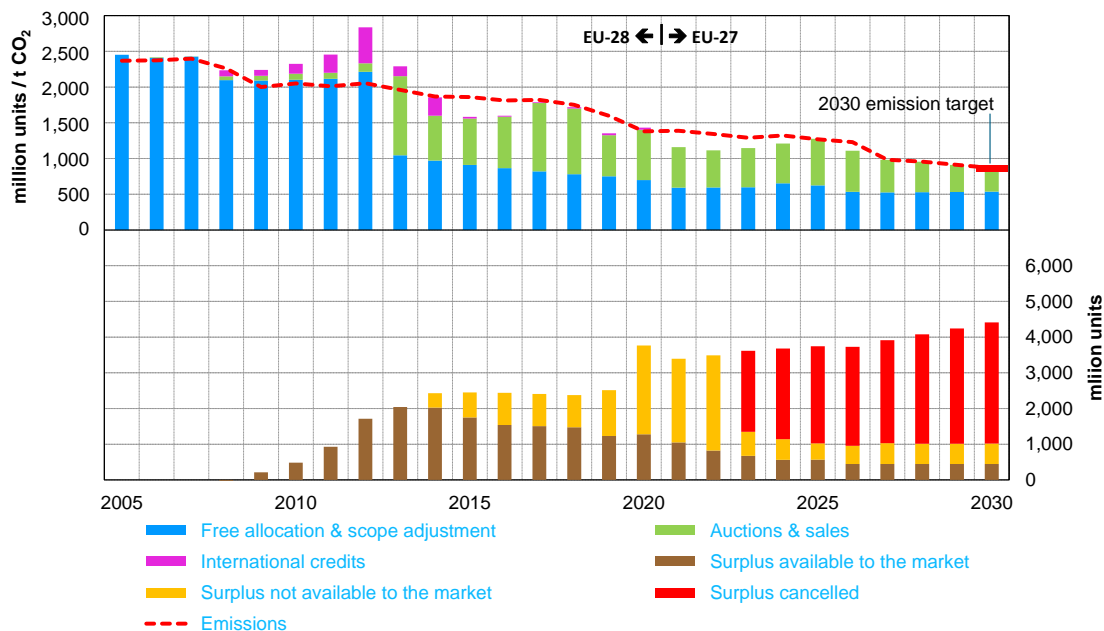
- the adjustment of the intake and release thresholds in parallel with the development of the cap (MSR reform option B);
- the linear reduction of the intake and release thresholds to zero by 2030 (MSR reform option C).

Figure 4-2 shows the development of available emission allowances, emissions and the development of MSR for the MSR reform option C. With the very significant adjustments of the thresholds for the MSR intake and with a demand of 450 million EUAs for hedging and long-term banking purposes, scarcity signals arise that lead to emission levels from 2027 onwards that no longer exceed the value of the new emission allowances brought to the market in the respective years (annual caps). The 2030 emissions target is robustly reached under these conditions.

- The intake to the MSR would decrease stepwise and without major discontinuities from 324 million EUAs in 2022 to 56 million EUAs in 2025 and increase to levels between 164 to 182 million EUAs annually;
- There would be no outflow from the MSR in the period from 2021 to 2030;
- After a major cancellation in the MSR in 2023 (approx. 2.27 billion allowances) annual cancellations steadily decrease from 273 million EUAs in 2024 to 56 million EUAs in 2026 and increase afterwards to levels around 170 million EUAs up to 2030;
- The number of allowances held in the MSR would be in a range between 568 and 673 million allowances in the period from 2023 to 2030.

From 2026 onwards, the remaining surplus that is available to the market equals the level of 450 million EUAs that is assumed for the demand for hedging and long-term banking.

Figure 4-2: Emissions, market supply, surplus allowances available to the market, in the MSR and cancelled for the BSL 2021 baseline under the Commission proposals for cap rules and a decrease of the MSR thresholds to zero in 2030 (MSR reform option C), demand of 450 million EUAs for energy sector hedging and industrial long-term banking, 2005-2030



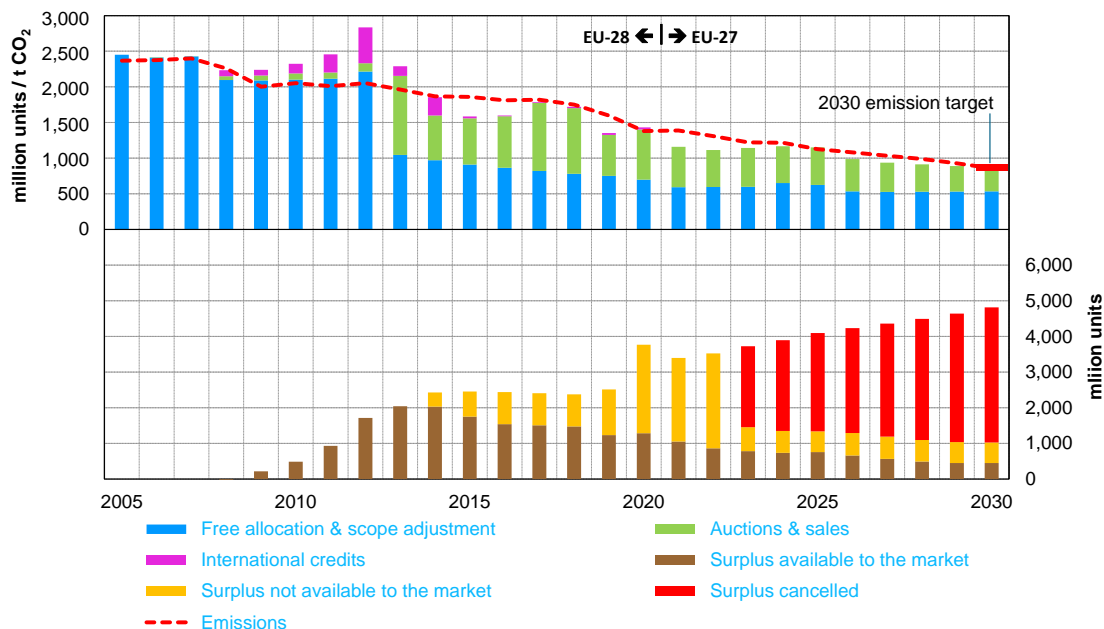
Note: The upper panel shows annual values, the lower panel cumulative amounts.

Source: Öko-Institut

A comparable situation also arises for the Fit for 55 MIX baseline (Figure 4-3). Here, the emission trajectory is somewhat more even, the annual target for 2030 is also achieved, and the deletions in the MSR increase by approx. 400 million EUAs.

From 2029 onwards, the remaining surplus that is available to the market equals the level of 450 million EUAs that is assumed for the demand for hedging and long-term banking.

Figure 4-3: Emissions, market supply, surplus allowances available to the market, in the MSR and cancelled for the Fit for 55 MIX base-line under the Commission proposals for cap rules and a decrease of the MSR thresholds to zero in 2030 (MSR reform option C), demand of 450 million EUAs for energy sector hedging and industrial long-term banking, 2005-2030



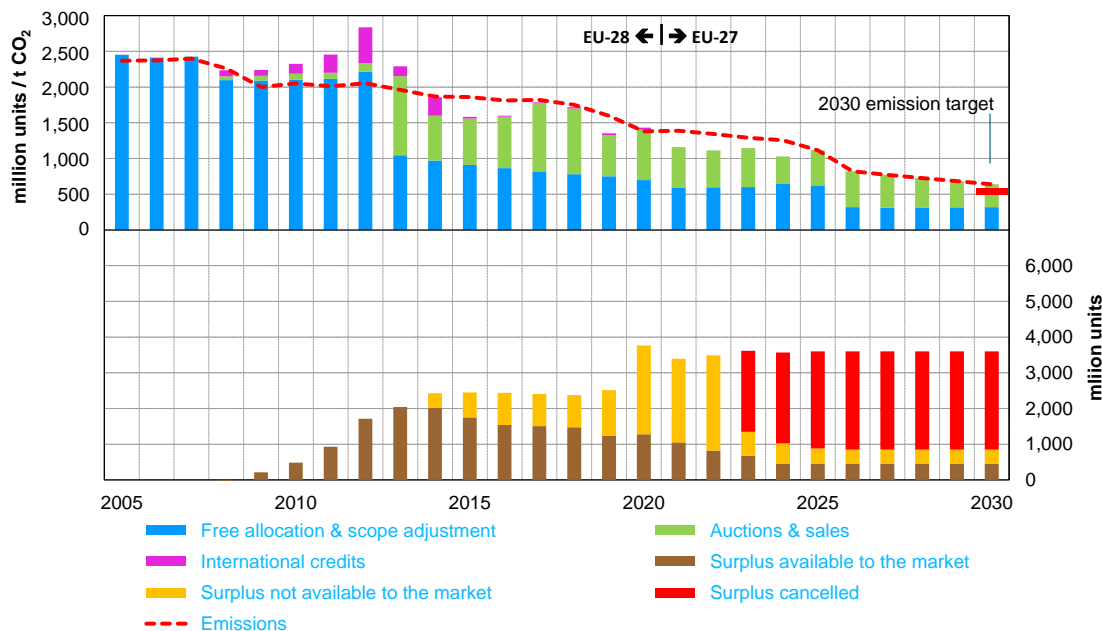
Note: The upper panel shows annual values, the lower panel cumulative amounts.

Source: Öko-Institut

In the case of a clearly more ambitious cap (cap reform option 4 with a rebasing of 450 million EUAs and LRF of 4.2%) and the MSR reform option C, Figure 4-4 shows that the target for 2020 set by the very ambitious cap is exceeded by about 20%. The emission target of the Commission proposal, however, is overachieved by about a quarter.

Due to the hugely reduced inflow of emission allowances, the number of allowances deleted in the MSR drops significantly. However, variations in the thresholds for the MSR lead only to very small changes to the total number of invalidations of less than 100 million EUAs.

Figure 4-4: Emissions, market supply, surplus allowances available to the market, in the MSR and cancelled for the BSL 2021 baseline under a cap based on a LRF of 4.2% and a rebasing of 450 million EUAs (cap reform option 4) and the Commission proposal for MSR rules, demand of 450 million EUAs for energy sector hedging and industrial long-term banking, 2005-2030



Note: The upper panel shows annual values, the lower panel cumulative amounts.

Source: Öko-Institut

A systematic comparison of the different cap and MSR reform options on the one hand and the different assumptions for the need for emission allowances for hedging or long-term banking on the other hand leads to the following results (Table 4-2):

- The assumptions on the demand for emission allowances for hedging or long-term banking are a decisive factor in the effective achievement of the emission reduction targets for 2030. If this demand falls to values significantly below 500 million EUAs, the targets according to the Commission proposal for 2030 cannot be achieved if the thresholds for the MSR intake are also set according to the Commission proposal.
- Adjusting the threshold parameters for the MSR can limit these uncertainties considerably and lead to significant emission reductions. The corresponding differences between the Commission proposal and the MSR reform options B and C (adjustment parallel to the cap and reduction to zero by 2030) are significant. There are also significant differences between the MSR reform options B and C if a relatively low demand for hedging and long-term banking is assumed.
- Very ambitious adjustments of the cap reduce the effective emissions very significantly even in the case that the MSR parameters are not adjusted. More ambitious caps combined with more stringent MSR reforms will enable additional emission reductions at a reasonable scale.

- The impact of baseline differences on the effective emission trends is significant. However, with higher cap ambition levels, more stringent adjustments of MSR thresholds and increasing demands for hedging and long-term banking, the impact of baseline assumptions on the 2030 emission levels decreases.

Table 4-2: Effective emissions for different cap and MSR reform options, baselines and assumptions on the demand for hedging and long-term banking, 2030

		Baselines									
		BSL 2021					Fit for 55 MIX				
		Hedging/banking needs									
		700	500	400	300	100	700	500	400	300	100
		million t CO ₂									
Cap: COM Proposal											
MSR thresholds	COM proposal (Fit-for-55)	916	1,034	1,034	1,109	1,129	896	896	896	896	896
	Decrease parallel to cap*	806	854	887	976	1,034	806	854	896	896	896
	Decrease to zero by 2030**	806	854	878	902	950	806	854	896	896	896
Cap reform option 2: LRF 4.6%, 250 million EUA rebasing											
MSR thresholds	COM proposal (Fit-for-55)	709	827	827	827	827	709	827	827	865	894
	Decrease parallel to cap*	599	647	671	695	827	599	647	671	695	827
	Decrease to zero by 2030**	599	647	671	695	743	599	647	671	695	743
Cap reform option 3: LRF 4.4%, 350 million EUA rebasing											
MSR thresholds	COM proposal (Fit-for-55)	615	734	734	734	734	615	734	734	734	779
	Decrease parallel to cap*	505	553	577	601	724	505	553	577	601	724
	Decrease to zero by 2030**	505	553	577	601	649	505	553	577	601	649
Cap reform option 4: LRF 4.2%, 450 million EUA rebasing											
MSR thresholds	COM proposal (Fit-for-55)	522	640	640	640	640	522	640	640	640	640
	Decrease parallel to cap*	412	460	484	508	606	412	460	484	508	606
	Decrease to zero by 2030**	412	460	484	508	556	412	460	484	508	556

Note: Coloured cells mark the cases in which the emission targets defined by the respective caps for 2030 are achieved. - * MSR reform option B. - ** MSR reform option C.

Source: Öko-Institut

For very many combinations of cap and MSR reform options, the emission reduction targets set by the cap can be achieved if a demand for hedging or long-term banking of approx. 450 million EUAs or more are assumed and the MSR thresholds are adjusted at least in parallel with the cap.

Table 4-3: Cumulative emissions for different cap and MSR reform options, baselines and assumptions on the demand for hedging and long-term banking, 2021-2030

		Baselines									
		BSL 2021					Fit for 55 MIX				
		Hedging/banking needs									
		700	500	400	300	100	700	500	400	300	100
		billion t CO ₂									
Cap: COM Proposal											
MSR thresholds	COM proposal (Fit-for-55)	11.46	12.20	12.30	12.40	12.42	11.08	11.09	11.09	11.09	11.09
	Decrease parallel to cap*	10.80	11.40	11.72	12.03	12.30	10.67	10.98	11.09	11.09	11.09
	Decrease to zero by 2030**	10.82	11.35	11.52	11.68	11.98	10.67	10.98	11.09	11.09	11.09
Cap reform option 2: LRF 4.6%, 250 million EUA rebasing											
MSR thresholds	COM proposal (Fit-for-55)	10.31	11.05	11.15	11.25	11.85	10.20	10.84	10.94	11.04	11.07
	Decrease parallel to cap*	9.65	10.19	10.50	10.81	11.29	9.55	9.94	10.15	10.41	10.86
	Decrease to zero by 2030**	9.67	10.33	10.57	10.82	11.27	9.56	9.98	10.16	10.32	10.68
Cap reform option 3: LRF 4.4%, 350 million EUA rebasing											
MSR thresholds	COM proposal (Fit-for-55)	9.72	10.46	10.56	10.66	11.26	9.61	10.35	10.45	10.55	10.95
	Decrease parallel to cap*	9.06	9.54	9.84	10.18	10.74	8.96	9.38	9.56	9.81	10.37
	Decrease to zero by 2030**	9.08	9.74	10.02	10.30	10.75	8.97	9.48	9.66	9.91	10.34
Cap reform option 4: LRF 4.2%, 450 million EUA rebasing											
MSR thresholds	COM proposal (Fit-for-55)	9.13	9.87	9.97	10.07	10.67	9.02	9.76	9.86	9.96	10.56
	Decrease parallel to cap*	8.47	8.93	9.20	9.49	10.13	8.37	8.81	9.01	9.20	9.78
	Decrease to zero by 2030**	8.49	9.15	9.43	9.71	10.16	8.38	8.98	9.20	9.45	9.90

Note: Coloured cells mark the cases in which the emission targets defined by the respective caps for 2030 are achieved. - * MSR reform option B. - ** MSR reform option C.

Source: Öko-Institut

However, both the adjustments to the cap and the MSR parameters mainly affect the emission levels towards the end of the 2020s. The cumulative emissions for the period of 2021 to 2030 are predominantly below the comparative values for the amounts of new emission allowances brought to the market in this period, especially for the less ambitious caps (Table 4-3).

With adjustments to key MSR parameters (intake and release thresholds), cumulative emissions can also be reduced by up to 7%, depending on baselines, caps and demand for hedging or long-term banking.

5. Conclusions

The EU ETS is an important incentive mechanism for emission reduction in the energy sector and energy-intensive industries is also a crucial element of the climate policy architecture of the EU. Thus, the reform of the EU ETS is a crucial element to fulfilling the European Green Deal goals and will require reforms on different levels.

First of all, the cap of the EU ETS will have to be adjusted to the new targets for 2030 and 2050. The climate impact of this reform will significantly depend on the timing of the implementation of the reform. Any delay with a view to the foreseen implementation in 2024 should be avoided because it would increase the cumulative emissions that would be made possible under the EU ETS.

The adjustment of the Linear Reduction Factor from 2.2% to 4.2% as one of the key parameter reforms for the cap also has long-term effects. The proposed cap adjustment implies a net-zero emission target for the EU ETS-regulated emissions by 2040 if the LRF is extrapolated for the period after 2030. The analysis of more stringent caps shows the implications of net-zero targets for the mid-2030s, i.e. the need for much higher re-basing levels (up to 450 million EUAs compared to 117 million EUAs in the current legislative proposals) and/or increasing the LRF to 4.4 or 4.6%.

However, in view of the large surpluses of emission allowances in the market and the significant uncertainties about the development of baseline emissions and the market behaviour of specific market participants (hedging providers, long-term banking by industry), limiting the reform to the cap adjustment will lead neither to a robust framework for the EU ETS, nor to a robust achievement of the emission targets for 2030.

Thus, the cap adjustments should be combined with a further reform of the Market Stability Reserve (MSR) of the EU ETS as a high priority and with a parameterization that goes beyond the current legislative proposals by the European Commission. Adjusting the MSR thresholds over time (e.g. parallel to the contraction of the cap or, even more ambitiously, setting it to zero in 2030) would be an important measure for strengthening the MSR mechanism.

The concept of the MSR and its parameterization is, however, based on very specific assumptions with a view to specific market participants who could create a demand for allowances that are either not used for compliance purposes (hedging) or are held back for compliance usage in the period after 2030. These assumptions depend closely on economic core beliefs and are not backed sufficiently enough by empirical evidence. Therefore, the analysis and market monitoring in this regard should be significantly strengthened to enable a much more robust estimation of the effects caused by the MSR.

Finally, the modelling exercises show that an isolated analysis of a few reform options for the cap on the one hand and for the MSR on the other hand can easily lead to less robust results in view of the different uncertainties. The integrated analysis of the largest possible number of options and their combinations is an important prerequisite for a sufficiently robust assessment of the upcoming reforms.

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Annex

Table A- 1: Allowance supply, emissions, surplus, TNAC, MSR holdings and invalidation of allowances in the MSR for the BSL 2021 baseline and the Commission proposals for cap and MSR reform and different assumptions for the demand for hedging purposes and/or long-term banking, 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
	850	770	9,976	10,361	850	1,115	664	3,978
	800	816	10,290	10,726	800	1,065	618	3,709
	750	866	10,607	11,092	750	1,015	568	3,443
	700	916	10,924	11,459	700	965	518	3,176
	650	966	11,177	11,762	650	915	468	2,973
	600	1,016	11,415	12,051	600	865	418	2,784
	550	1,034	11,466	12,151	550	815	400	2,752
	500	1,034	11,466	12,201	500	765	400	2,752
	450	1,034	11,466	12,251	450	715	400	2,752
	400	1,034	11,466	12,301	400	665	400	2,752
	350	1,034	11,466	12,351	350	615	400	2,752
	300	1,034	11,466	12,401	300	565	400	2,752
	250	1,034	11,466	12,422	280	544	400	2,752
	200	1,034	11,466	12,422	280	544	400	2,752
	150	1,034	11,466	12,422	280	544	400	2,752
	100	1,034	11,466	12,422	280	544	400	2,752
	50	1,034	11,466	12,422	280	544	400	2,752
	0	1,034	11,466	12,422	280	544	400	2,752

Source: Öko-Institut

Note:

The coloured bars in the column for 2030 emission levels indicate that the 2030 emission meet or fall below the target of the respective cap for 2030 (with a tolerance of 3%).

In the column for the 2030 surplus, the coloured bars indicate that the surplus of allowances in the market exceeds the assumption for the (non-compliance) demand from hedging and long-term banking in 2030.

In the column for invalidations in the period from 2021 to 2030, the coloured bars indicate from which level of assumptions for the demand for hedging and long-term banking the total number of invalidations in the MSR is no longer affected.

Table A- 2: ... for the COM cap reform proposal and a MSR threshold adjustment parallel to the cap (MSR reform option B), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	770	770	9,923	10,308	850	1,115	664	4,031
800	782	782	10,039	10,474	800	1,065	652	3,926
750	794	794	10,153	10,638	750	1,015	640	3,824
700	806	806	10,267	10,802	700	965	628	3,722
650	818	818	10,358	10,943	650	915	616	3,644
600	830	830	10,471	11,106	600	865	604	3,542
550	842	842	10,591	11,276	550	815	592	3,435
500	854	854	10,669	11,404	500	765	580	3,369
450	866	866	10,773	11,558	450	715	568	3,277
400	887	887	10,883	11,718	400	665	546	3,189
350	926	926	10,988	11,873	350	615	508	3,122
300	976	976	11,094	12,029	300	565	458	3,066
250	1,020	1,020	11,151	12,137	250	515	414	3,052
200	1,034	1,034	11,166	12,201	200	465	400	3,052
150	1,034	1,034	11,166	12,251	150	415	400	3,052
100	1,034	1,034	11,166	12,301	100	365	400	3,052
50	1,034	1,059	11,166	12,351	50	315	400	3,052
0	1,034	1,109	11,166	12,401	0	265	400	3,052

Source: Öko-Institut

Table A- 3: ... for the COM cap reform proposal and a MSR threshold decrease to zero in 2030 (MSR reform option C), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	770	770	9,923	10,308	850	1,115	664	4,031
800	782	782	10,039	10,474	800	1,065	652	3,926
750	794	794	10,153	10,638	750	1,015	640	3,824
700	806	806	10,285	10,820	700	965	628	3,705
650	818	818	10,390	10,975	650	915	616	3,612
600	830	830	10,492	11,127	600	865	604	3,522
550	842	842	10,577	11,262	550	815	592	3,449
500	854	854	10,617	11,352	500	765	580	3,421
450	866	866	10,657	11,442	450	715	568	3,393
400	878	878	10,688	11,523	400	665	556	3,374
350	890	890	10,716	11,601	350	615	544	3,358
300	902	902	10,744	11,679	300	565	532	3,342
250	914	914	10,772	11,757	250	515	520	3,326
200	926	926	10,813	11,848	200	465	508	3,297
150	938	938	10,829	11,914	150	415	496	3,293
100	950	950	10,845	11,980	100	365	484	3,289
50	969	969	10,872	12,057	50	315	465	3,281
0	1,001	1,001	10,918	12,154	0	265	433	3,267

Source: Öko-Institut

Table A- 4: ... for the cap reform option 2 (LRF 4.6%, rebasing 250 million EUAs) and the COM proposal for the MSR reform, 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	563	563	8,828	9,213	850	1,115	664	3,978
800	609	609	9,142	9,578	800	1,065	618	3,709
750	659	659	9,459	9,944	750	1,015	568	3,443
700	709	709	9,776	10,311	700	965	518	3,176
650	759	759	10,046	10,631	650	915	468	2,956
600	809	809	10,287	10,923	600	865	418	2,765
550	827	827	10,318	11,004	550	815	400	2,752
500	827	827	10,318	11,054	500	765	400	2,752
450	827	827	10,318	11,104	450	715	400	2,752
400	827	827	10,318	11,154	400	665	400	2,752
350	827	827	10,318	11,204	350	615	400	2,752
300	827	827	10,318	11,254	300	565	400	2,752
250	827	827	10,318	11,304	250	515	400	2,752
200	827	827	10,318	11,354	200	465	400	2,752
150	827	827	10,718	11,804	150	415	0	2,752
100	827	827	10,718	11,854	100	365	0	2,752
50	827	827	10,718	11,904	50	315	0	2,752
0	827	827	10,718	11,954	0	265	0	2,752

Source: Öko-Institut

Table A- 5: ... for the cap reform option 2 (LRF 4.6%, rebasing 250 million EUAs) and a MSR threshold adjustment parallel to the cap (MSR reform option B), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	563	563	8,775	9,160	850	1,115	664	4,031
800	575	575	8,891	9,327	800	1,065	652	3,926
750	587	587	9,005	9,491	750	1,015	640	3,824
700	599	599	9,119	9,655	700	965	628	3,722
650	611	611	9,187	9,772	650	915	616	3,667
600	623	623	9,251	9,886	600	865	604	3,615
550	635	635	9,339	10,025	550	815	592	3,538
500	647	647	9,450	10,185	500	765	580	3,440
450	659	659	9,552	10,337	450	715	568	3,350
400	671	671	9,667	10,503	400	665	556	3,246
350	683	683	9,761	10,646	350	615	544	3,165
300	695	695	9,877	10,812	300	565	532	3,061
250	732	732	10,001	10,986	250	515	495	2,974
200	777	777	10,089	11,124	200	465	451	2,931
150	815	815	10,137	11,223	150	415	413	2,920
100	827	827	10,150	11,285	100	365	400	2,920
50	827	827	10,150	11,335	50	315	400	2,920
0	827	827	10,150	11,385	0	265	400	2,920

Source: Öko-Institut

Table A- 6: ... for the cap reform option 2 (LRF 4.6%, rebasing 250 million EUAs) and a MSR threshold a MSR threshold decrease to zero in 2030 (MSR reform option C), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	563	563	8,775	9,160	850	1,115	664	4,031
800	575	575	8,891	9,327	800	1,065	652	3,926
750	587	587	9,005	9,491	750	1,015	640	3,824
700	599	599	9,137	9,672	700	965	628	3,705
650	611	611	9,242	9,827	650	915	616	3,612
600	623	623	9,344	9,979	600	865	604	3,522
550	635	635	9,452	10,138	550	815	592	3,425
500	647	647	9,592	10,328	500	765	580	3,297
450	659	659	9,685	10,470	450	715	568	3,217
400	671	671	9,737	10,572	400	665	556	3,177
350	683	683	9,810	10,695	350	615	544	3,116
300	695	695	9,888	10,823	300	565	532	3,050
250	707	707	9,966	10,951	250	515	520	2,984
200	719	719	10,023	11,058	200	465	508	2,939
150	731	731	10,089	11,174	150	415	496	2,885
100	743	743	10,138	11,274	100	365	484	2,848
50	762	762	10,165	11,351	50	315	465	2,840
0	800	800	10,219	11,455	0	265	428	2,823

Source: Öko-Institut

Table A- 7: ... for the cap reform option 3 (LRF 4.4%, rebasing 350 million EUAs) and the COM proposal for the MSR reform, 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	469	469	8,238	8,623	850	1,115	664	3,978
800	515	515	8,552	8,987	800	1,065	618	3,709
750	565	565	8,869	9,354	750	1,015	568	3,443
700	615	615	9,185	9,721	700	965	518	3,176
650	665	665	9,455	10,041	650	915	468	2,956
600	715	715	9,697	10,332	600	865	418	2,765
550	734	734	9,728	10,413	550	815	400	2,752
500	734	734	9,728	10,463	500	765	400	2,752
450	734	734	9,728	10,513	450	715	400	2,752
400	734	734	9,728	10,563	400	665	400	2,752
350	734	734	9,728	10,613	350	615	400	2,752
300	734	734	9,728	10,663	300	565	400	2,752
250	734	734	9,728	10,713	250	515	400	2,752
200	734	734	9,728	10,763	200	465	400	2,752
150	734	734	10,128	11,213	150	415	0	2,752
100	734	734	10,128	11,263	100	365	0	2,752
50	734	734	10,128	11,313	50	315	0	2,752
0	734	734	10,128	11,363	0	265	0	2,752

Source: Öko-Institut

Table A- 8: ... for the cap reform option 3 (LRF 4.4%, rebasing 350 million EUAs) and a MSR threshold adjustment parallel to the cap (MSR reform option B), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	469	469	8,185	8,570	850	1,115	664	4,031
800	481	481	8,301	8,736	800	1,065	652	3,926
750	493	493	8,415	8,900	750	1,015	640	3,824
700	505	505	8,529	9,064	700	965	628	3,722
650	517	517	8,596	9,181	650	915	616	3,667
600	529	529	8,660	9,295	600	865	604	3,615
550	541	541	8,724	9,409	550	815	592	3,563
500	553	553	8,800	9,535	500	765	580	3,499
450	565	565	8,902	9,687	450	715	568	3,409
400	577	577	9,002	9,838	400	665	556	3,321
350	589	589	9,115	10,000	350	615	544	3,221
300	601	601	9,245	10,180	300	565	532	3,102
250	613	613	9,361	10,346	250	515	520	2,998
200	647	647	9,477	10,513	200	465	486	2,916
150	691	691	9,559	10,644	150	415	442	2,878
100	724	724	9,600	10,736	100	365	409	2,870
50	734	734	9,610	10,795	50	315	400	2,870
0	734	734	9,610	10,845	0	265	400	2,870

Source: Öko-Institut

Table A- 9: ... for the cap reform option 3 (LRF 4.4%, rebasing 350 million EUAs) and a MSR threshold decrease to zero in 2030 (MSR reform option C), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	469	469	8,185	8,570	850	1,115	664	4,031
800	481	481	8,301	8,736	800	1,065	652	3,926
750	493	493	8,415	8,900	750	1,015	640	3,824
700	505	505	8,546	9,081	700	965	628	3,705
650	517	517	8,652	9,237	650	915	616	3,612
600	529	529	8,754	9,389	600	865	604	3,522
550	541	541	8,862	9,547	550	815	592	3,425
500	553	553	9,002	9,737	500	765	580	3,297
450	565	565	9,094	9,880	450	715	568	3,217
400	577	577	9,184	10,020	400	665	556	3,139
350	589	589	9,287	10,172	350	615	544	3,048
300	601	601	9,365	10,300	300	565	532	2,982
250	613	613	9,443	10,428	250	515	520	2,916
200	625	625	9,500	10,535	200	465	508	2,871
150	637	637	9,566	10,651	150	415	496	2,817
100	649	649	9,616	10,751	100	365	484	2,780
50	669	669	9,643	10,828	50	315	465	2,772
0	706	706	9,697	10,932	0	265	428	2,755

Source: Öko-Institut

Table A- 10: ... for the cap reform option 4 (LRF 4.6%, rebasing 250 million EUAs) and the COM proposal for the MSR reform, 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	376	376	7,647	8,032	850	1,115	664	3,978
800	422	422	7,961	8,397	800	1,065	618	3,709
750	472	472	8,278	8,763	750	1,015	568	3,443
700	522	522	8,595	9,130	700	965	518	3,176
650	572	572	8,865	9,450	650	915	468	2,956
600	622	622	9,106	9,741	600	865	418	2,765
550	640	640	9,137	9,822	550	815	400	2,752
500	640	640	9,137	9,872	500	765	400	2,752
450	640	640	9,137	9,922	450	715	400	2,752
400	640	640	9,137	9,972	400	665	400	2,752
350	640	640	9,137	10,022	350	615	400	2,752
300	640	640	9,137	10,072	300	565	400	2,752
250	640	640	9,137	10,122	250	515	400	2,752
200	640	640	9,137	10,172	200	465	400	2,752
150	640	640	9,537	10,622	150	415	0	2,752
100	640	640	9,537	10,672	100	365	0	2,752
50	640	640	9,537	10,722	50	315	0	2,752
0	640	640	9,537	10,772	0	265	0	2,752

Source: Öko-Institut

Table A- 11: ... for the cap reform option 4 (LRF 4.6%, rebasing 250 million EUAs) and a MSR threshold adjustment parallel to the cap (MSR reform option B), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	376	376	7,594	7,979	850	1,115	664	4,031
800	388	388	7,710	8,146	800	1,065	652	3,926
750	400	400	7,824	8,310	750	1,015	640	3,824
700	412	412	7,938	8,474	700	965	628	3,722
650	424	424	8,006	8,591	650	915	616	3,667
600	436	436	8,070	8,705	600	865	604	3,615
550	448	448	8,134	8,819	550	815	592	3,563
500	460	460	8,198	8,933	500	765	580	3,511
450	472	472	8,262	9,047	450	715	568	3,459
400	484	484	8,362	9,198	400	665	556	3,370
350	496	496	8,453	9,338	350	615	544	3,292
300	508	508	8,556	9,491	300	565	532	3,200
250	520	520	8,686	9,671	250	515	520	3,083
200	532	532	8,815	9,850	200	465	508	2,966
150	563	563	8,924	10,009	150	415	477	2,888
100	606	606	8,999	10,134	100	365	434	2,856
50	634	634	9,033	10,218	50	315	406	2,850
0	640	640	9,039	10,274	0	265	400	2,850

Source: Öko-Institut

Table A- 12: ... for the cap reform option 4 (LRF 4.6%, rebasing 250 million EUAs) and a MSR threshold decrease to zero in 2030 (MSR reform option C), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	million EUA	million EUA	Mt CO ₂ e	million EUA			million EUA
850	376	376	7,594	7,979	850	1,115	664	4,031
800	388	388	7,710	8,146	800	1,065	652	3,926
750	400	400	7,824	8,310	750	1,015	640	3,824
700	412	412	7,956	8,491	700	965	628	3,705
650	424	424	8,061	8,646	650	915	616	3,612
600	436	436	8,163	8,798	600	865	604	3,522
550	448	448	8,271	8,957	550	815	592	3,425
500	460	460	8,411	9,147	500	765	580	3,297
450	472	472	8,504	9,289	450	715	568	3,217
400	484	484	8,594	9,429	400	665	556	3,139
350	496	496	8,697	9,582	350	615	544	3,048
300	508	508	8,775	9,710	300	565	532	2,982
250	520	520	8,853	9,838	250	515	520	2,916
200	532	532	8,909	9,945	200	465	508	2,871
150	544	544	8,975	10,061	150	415	496	2,817
100	556	556	9,025	10,160	100	365	484	2,780
50	575	575	9,052	10,237	50	315	465	2,772
0	612	612	9,106	10,341	0	265	428	2,755

Source: Öko-Institut

Table A- 13: Allowance supply, emissions, surplus, TNAC, MSR holdings and invalidation of allowances in the MSR for the Fit for 55 MIX baseline and the Commission proposals for cap and MSR reform and different assumptions for the demand for hedging purposes and/or long-term banking, 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	million EUA	million EUA	Mt CO ₂ e	million EUA			million EUA
850	770	770	9,970	10,355	850	1,115	664	3,984
800	816	816	10,243	10,678	800	1,065	618	3,757
750	866	866	10,456	10,942	750	1,015	568	3,593
700	915	896	10,566	11,080	721	986	519	3,533
650	922	896	10,575	11,088	723	987	512	3,530
600	922	896	10,575	11,088	723	987	512	3,530
550	922	896	10,575	11,088	723	987	512	3,530
500	922	896	10,575	11,088	723	987	512	3,530
450	922	896	10,575	11,088	723	987	512	3,530
400	922	896	10,575	11,088	723	987	512	3,530
350	922	896	10,575	11,088	723	987	512	3,530
300	922	896	10,575	11,088	723	987	512	3,530
250	922	896	10,575	11,088	723	987	512	3,530
200	922	896	10,575	11,088	723	987	512	3,530
150	922	896	10,575	11,088	723	987	512	3,530
100	922	896	10,575	11,088	723	987	512	3,530
50	922	896	10,575	11,088	723	987	512	3,530
0	922	896	10,575	11,088	723	987	512	3,530

Source: Öko-Institut

Table A- 14: ... for the COM cap reform proposal and a MSR threshold adjustment parallel to the cap (MSR reform option B), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	770	770	9,917	10,302	850	1,115	664	4,037
800	782	782	10,026	10,461	800	1,065	652	3,939
750	794	794	10,090	10,575	750	1,015	640	3,888
700	806	806	10,138	10,674	700	965	628	3,851
650	818	818	10,176	10,761	650	915	616	3,826
600	830	830	10,204	10,839	600	865	604	3,810
550	842	842	10,229	10,914	550	815	592	3,797
500	854	854	10,245	10,980	500	765	580	3,793
450	860	860	10,252	11,037	450	715	574	3,792
400	861	896	10,253	11,088	400	665	573	3,792
350	861	896	10,253	11,088	400	665	573	3,792
300	861	896	10,253	11,088	400	665	573	3,792
250	861	896	10,253	11,088	400	665	573	3,792
200	861	896	10,253	11,088	400	665	573	3,792
150	861	896	10,253	11,088	400	665	573	3,792
100	861	896	10,253	11,088	400	665	573	3,792
50	861	896	10,253	11,088	400	665	573	3,792
0	861	896	10,253	11,088	400	665	573	3,792

Source: Öko-Institut

Table A- 15: ... for the COM cap reform proposal and a MSR threshold decrease to zero in 2030 (MSR reform option C), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	770	770	9,917	10,302	850	1,115	664	4,037
800	782	782	10,026	10,461	800	1,065	652	3,939
750	794	794	10,090	10,575	750	1,015	640	3,888
700	806	806	10,138	10,674	700	965	628	3,851
650	818	818	10,176	10,761	650	915	616	3,826
600	830	830	10,204	10,839	600	865	604	3,810
550	842	842	10,229	10,914	550	815	592	3,797
500	854	854	10,245	10,980	500	765	580	3,793
450	860	860	10,252	11,037	450	715	574	3,792
400	861	896	10,253	11,088	400	665	573	3,792
350	861	896	10,253	11,088	400	665	573	3,792
300	861	896	10,253	11,088	400	665	573	3,792
250	861	896	10,253	11,088	400	665	573	3,792
200	861	896	10,253	11,088	400	665	573	3,792
150	861	896	10,253	11,088	400	665	573	3,792
100	861	896	10,253	11,088	400	665	573	3,792
50	861	896	10,253	11,088	400	665	573	3,792
0	861	896	10,253	11,088	400	665	573	3,792

Source: Öko-Institut

Table A- 16: ... for the cap reform option 2 (LRF 4.6%, rebasing 250 million EUAs) and the COM proposal for the MSR reform, 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	563	563	8,822	9,207	850	1,115	664	3,984
800	609	609	9,134	9,569	800	1,065	618	3,718
750	659	659	9,401	9,886	750	1,015	568	3,501
700	709	709	9,668	10,203	700	965	518	3,284
650	759	759	9,912	10,497	650	915	468	3,090
600	809	809	10,078	10,713	600	865	418	2,974
550	827	827	10,109	10,794	550	815	400	2,961
500	827	827	10,109	10,844	500	765	400	2,961
450	827	827	10,109	10,894	450	715	400	2,961
400	827	827	10,109	10,944	400	665	400	2,961
350	827	827	10,109	10,994	350	615	400	2,961
300	827	865	10,109	11,044	300	565	400	2,961
250	827	894	10,109	11,073	271	536	400	2,961
200	827	894	10,109	11,073	271	536	400	2,961
150	827	894	10,109	11,073	271	536	400	2,961
100	827	894	10,109	11,073	271	536	400	2,961
50	827	894	10,109	11,073	271	536	400	2,961
0	827	894	10,109	11,073	271	536	400	2,961

Source: Öko-Institut

Table A- 17: ... for the cap reform option 2 (LRF 4.6%, rebasing 250 million EUAs) and a MSR threshold adjustment parallel to the cap (MSR reform option B), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	563	563	8,769	9,154	850	1,115	664	4,037
800	575	575	8,883	9,318	800	1,065	652	3,935
750	587	587	8,947	9,433	750	1,015	640	3,883
700	599	599	9,011	9,547	700	965	628	3,831
650	611	611	9,074	9,659	650	915	616	3,780
600	623	623	9,123	9,759	600	865	604	3,742
550	635	635	9,163	9,849	550	815	592	3,714
500	647	647	9,203	9,939	500	765	580	3,686
450	659	659	9,243	10,029	450	715	568	3,658
400	671	671	9,314	10,150	400	665	556	3,599
350	683	683	9,408	10,293	350	615	544	3,518
300	695	695	9,474	10,409	300	565	532	3,464
250	732	732	9,577	10,563	250	515	495	3,398
200	777	777	9,665	10,700	200	465	451	3,355
150	815	815	9,714	10,799	150	415	413	3,344
100	827	827	9,726	10,861	100	365	400	3,344
50	827	827	9,726	10,911	50	315	400	3,344
0	827	827	9,726	10,961	0	265	400	3,344

Source: Öko-Institut

Table A- 18: ... for the cap reform option 2 (LRF 4.6%, rebasing 250 million EUAs) and a MSR threshold decrease to zero in 2030 (MSR reform option C), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	563	563	8,769	9,154	850	1,115	664	4,037
800	575	575	8,883	9,318	800	1,065	652	3,935
750	587	587	8,947	9,433	750	1,015	640	3,883
700	599	599	9,029	9,564	700	965	628	3,813
650	611	611	9,124	9,709	650	915	616	3,730
600	623	623	9,169	9,805	600	865	604	3,696
550	635	635	9,209	9,895	550	815	592	3,668
500	647	647	9,249	9,985	500	765	580	3,640
450	659	659	9,289	10,075	450	715	568	3,612
400	671	671	9,329	10,165	400	665	556	3,584
350	683	683	9,358	10,243	350	615	544	3,568
300	695	695	9,386	10,321	300	565	532	3,552
250	707	707	9,414	10,399	250	515	520	3,536
200	719	719	9,464	10,499	200	465	508	3,498
150	731	731	9,529	10,615	150	415	496	3,444
100	743	743	9,545	10,681	100	365	484	3,440
50	762	762	9,572	10,758	50	315	465	3,433
0	800	800	9,626	10,862	0	265	428	3,416

Source: Öko-Institut

Table A- 19: ... for the cap reform option 3 (LRF 4.4%, rebasing 350 million EUAs) and the COM proposal for the MSR reform, 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	469	469	8,231	8,617	850	1,115	664	3,984
800	515	515	8,544	8,979	800	1,065	618	3,718
750	565	565	8,811	9,296	750	1,015	568	3,501
700	615	615	9,077	9,613	700	965	518	3,284
650	665	665	9,344	9,929	650	915	468	3,067
600	715	715	9,585	10,221	600	865	418	2,876
550	734	734	9,616	10,302	550	815	400	2,863
500	734	734	9,616	10,352	500	765	400	2,863
450	734	734	9,616	10,402	450	715	400	2,863
400	734	734	9,616	10,452	400	665	400	2,863
350	734	734	9,616	10,502	350	615	400	2,863
300	734	734	9,616	10,552	300	565	400	2,863
250	734	734	9,616	10,602	250	515	400	2,863
200	734	734	9,616	10,652	200	465	400	2,863
150	734	774	9,816	10,902	150	415	200	2,863
100	734	779	9,816	10,952	100	365	200	2,863
50	734	829	9,816	11,002	50	315	200	2,863
0	734	879	9,816	11,052	0	265	200	2,863

Source: Öko-Institut

Table A- 20: ... for the cap reform option 3 (LRF 4.4%, rebasing 350 million EUAs) and a MSR threshold adjustment parallel to the cap (MSR reform option B), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	469	469	8,178	8,564	850	1,115	664	4,037
800	481	481	8,292	8,728	800	1,065	652	3,935
750	493	493	8,357	8,842	750	1,015	640	3,883
700	505	505	8,421	8,956	700	965	628	3,831
650	517	517	8,485	9,070	650	915	616	3,779
600	529	529	8,547	9,182	600	865	604	3,728
550	541	541	8,599	9,284	550	815	592	3,688
500	553	553	8,648	9,383	500	765	580	3,651
450	565	565	8,688	9,473	450	715	568	3,623
400	577	577	8,728	9,563	400	665	556	3,595
350	589	589	8,790	9,675	350	615	544	3,545
300	601	601	8,877	9,812	300	565	532	3,470
250	613	613	8,993	9,978	250	515	520	3,366
200	647	647	9,109	10,145	200	465	486	3,284
150	691	691	9,191	10,276	150	415	442	3,246
100	724	724	9,232	10,367	100	365	409	3,238
50	734	734	9,242	10,427	50	315	400	3,238
0	734	734	9,242	10,477	0	265	400	3,238

Source: Öko-Institut

Table A- 21: ... for the cap reform option 3 (LRF 4.4%, rebasing 350 million EUAs) and a MSR threshold decrease to zero in 2030 (MSR reform option C), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	469	469	8,178	8,564	850	1,115	664	4,037
800	481	481	8,292	8,728	800	1,065	652	3,935
750	493	493	8,357	8,842	750	1,015	640	3,883
700	505	505	8,438	8,973	700	965	628	3,813
650	517	517	8,540	9,125	650	915	616	3,723
600	529	529	8,636	9,271	600	865	604	3,639
550	541	541	8,694	9,379	550	815	592	3,593
500	553	553	8,740	9,476	500	765	580	3,559
450	565	565	8,780	9,566	450	715	568	3,531
400	577	577	8,820	9,656	400	665	556	3,503
350	589	589	8,894	9,779	350	615	544	3,442
300	601	601	8,972	9,907	300	565	532	3,376
250	613	613	9,040	10,025	250	515	520	3,320
200	625	625	9,090	10,125	200	465	508	3,282
150	637	637	9,156	10,241	150	415	496	3,228
100	649	649	9,205	10,341	100	365	484	3,190
50	669	669	9,232	10,418	50	315	465	3,182
0	706	706	9,286	10,522	0	265	428	3,166

Source: Öko-Institut

Table A- 22: ... for the cap reform option 4 (LRF 4.2%, rebasing 450 million EUAs) and the COM proposal for the MSR reform, 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	376	376	7,641	8,026	850	1,115	664	3,984
800	422	422	7,953	8,388	800	1,065	618	3,718
750	472	472	8,220	8,705	750	1,015	568	3,501
700	522	522	8,487	9,022	700	965	518	3,284
650	572	572	8,753	9,339	650	915	468	3,067
600	622	622	8,995	9,630	600	865	418	2,876
550	640	640	9,026	9,711	550	815	400	2,863
500	640	640	9,026	9,761	500	765	400	2,863
450	640	640	9,026	9,811	450	715	400	2,863
400	640	640	9,026	9,861	400	665	400	2,863
350	640	640	9,026	9,911	350	615	400	2,863
300	640	640	9,026	9,961	300	565	400	2,863
250	640	640	9,026	10,011	250	515	400	2,863
200	640	640	9,026	10,061	200	465	400	2,863
150	640	640	9,426	10,511	150	415	0	2,863
100	640	640	9,426	10,561	100	365	0	2,863
50	640	640	9,426	10,611	50	315	0	2,863
0	640	640	9,426	10,661	0	265	0	2,863

Source: Öko-Institut

Table A- 23: ... for the cap reform option 4 (LRF 4.2%, rebasing 450 million EUAs) and a MSR threshold adjustment parallel to the cap (MSR reform option B), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	376	376	7,588	7,973	850	1,115	664	4,037
800	388	388	7,702	8,137	800	1,065	652	3,935
750	400	400	7,766	8,251	750	1,015	640	3,883
700	412	412	7,830	8,365	700	965	628	3,831
650	424	424	7,894	8,479	650	915	616	3,779
600	436	436	7,958	8,593	600	865	604	3,727
550	448	448	8,021	8,706	550	815	592	3,676
500	460	460	8,073	8,808	500	765	580	3,636
450	472	472	8,125	8,910	450	715	568	3,596
400	484	484	8,172	9,008	400	665	556	3,560
350	496	496	8,212	9,098	350	615	544	3,532
300	508	508	8,266	9,201	300	565	532	3,491
250	520	520	8,346	9,331	250	515	520	3,423
200	532	532	8,462	9,497	200	465	508	3,319
150	563	563	8,570	9,656	150	415	477	3,241
100	606	606	8,646	9,781	100	365	434	3,209
50	634	634	8,680	9,865	50	315	406	3,203
0	640	640	8,686	9,921	0	265	400	3,203

Source: Öko-Institut

Table A- 24: ... for the cap reform option 4 (LRF 4.2%, rebasing 450 million EUAs) and a MSR threshold decrease to zero in 2030 (MSR reform option C), 2021-2030

Demand for hedging and long-term banking industry	2030		2021-2030		2030			2021-2030
	Supply	Emissions	Supply	Emissions	Surplus	TNAC	MSR	Invalidation
	million EUA	Mt CO ₂ e	million EUA	Mt CO ₂ e	million EUA			million EUA
850	376	376	7,588	7,973	850	1,115	664	4,037
800	388	388	7,702	8,137	800	1,065	652	3,935
750	400	400	7,766	8,251	750	1,015	640	3,883
700	412	412	7,848	8,383	700	965	628	3,813
650	424	424	7,950	8,535	650	915	616	3,723
600	436	436	8,052	8,687	600	865	604	3,633
550	448	448	8,154	8,840	550	815	592	3,542
500	460	460	8,244	8,980	500	765	580	3,464
450	472	472	8,323	9,108	450	715	568	3,398
400	484	484	8,363	9,198	400	665	556	3,370
350	496	496	8,436	9,321	350	615	544	3,309
300	508	508	8,514	9,449	300	565	532	3,243
250	520	520	8,592	9,577	250	515	520	3,177
200	532	532	8,649	9,684	200	465	508	3,132
150	544	544	8,715	9,800	150	415	496	3,078
100	556	556	8,764	9,900	100	365	484	3,040
50	575	575	8,791	9,977	50	315	465	3,033
0	612	612	8,845	10,081	0	265	428	3,016

Source: Öko-Institut