THE EU ETS IN NUMBERS

A COMPONENTISED RECONSTRUCTION OF THE CAP, 2008–2025

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ABSTRACT

The European Union Emissions Trading System (EU ETS) is often summarised as a steadily declining cap on greenhouse-gas emissions. The reality is more textured. Over 18 years the cap has been re-anchored twice, adjusted by linear reduction factors of three different magnitudes, and reshaped by mechanisms including NER 300 monetisation, back-loading, the Market Stability Reserve, maritime inclusion, and the United Kingdom's exit. This paper traces those movements year by year, naming each component with reference to the primary Commission documents that define it. The reading guide is a single figure that plots the componentised cap against the European Environment Agency's reported allocations, making the cap's full 18-year shape visible in one frame.

The motivation is forward modelling: scenario projections of the cap, the Market Stability Reserve, and auction revenues can only be built on top of a model of what the cap actually *was*. Constructing that model requires reconciling data from several independent sources — annual Commission carbon-market reports, technical Staff Working Documents, the European Environment Agency's registry data, and the individual legal instruments that authorise each mechanism. No single source publishes the whole picture.

Scope of this draft. The figure and analysis in this version cover the stationary and maritime scope of the EU ETS (`stationary_maritime` in our data model). Aviation is part of the same trading system but is reported separately and has its own structural features — provisional 2012 inclusion, the stop-the-clock derogation, free-allocation phase-out 2024–2026, the Sustainable Aviation Fuel reserve — that warrant their own walk-through. A future working paper will extend the figure and the narrative to include aviation, giving the full ETS-1 view that forward modelling ultimately needs. Until then, the figure here should be read as the stationary + maritime cap, with aviation as a parallel and structurally smaller track that will be addressed separately.

1. THE CAP MOST PEOPLE DESCRIBE

A typical explanation of the EU ETS cap runs as follows. From 2013, the cap is set at an EU-wide level and reduced each year by a fixed percentage — the Linear Reduction Factor (LRF) — which was 1.74 % a year from 2013, rose to 2.2 % from 2021, and rose again to 4.3 % from 2024 as part of the Fit for 55 package. The cap declines smoothly toward climate-neutrality by 2050.

This is true, but partial. The smooth-decline picture omits at least nine material mechanisms that have moved the cap year by year:

- The 2008–2012 cap was set not by an EU-wide rule but by 27 National Allocation Plans (NAPs); it had no LRF and, in practice, *rose* over the phase.
- The NER 300 fund monetised 300 million allowances in two tranches in 2013 and 2014.
- Back-loading withdrew 900 million allowances from auctions over 2014–2016.
- The Market Stability Reserve has withdrawn allowances from circulation each year since 2019.
- The 2020 figures in EEA's registry include retroactive allocations from earlier years — 48 Mt of UK 2019 free allocation released after the Withdrawal Agreement was settled, plus end-of-Phase-3 closure-related reconciliations — that conceptually belong to earlier years.
- Phase 4 reset the cap downwards to a new anchor in 2021.
- The United Kingdom left the system at the end of 2020.
- Several Phase 4 fund pools (Innovation Fund, Modernisation Fund, Phase 4 NER, RRF/REPowerEU, Social Climate Fund, aviation SAF reserve) draw from the cap and auction it on their own multi-year schedules.
- The 2024 reform rebased the cap down by 90 million allowances, added 78 million for maritime inclusion, and replaced the old LRF with a steeper one.

Each of these has primary-source documentation in the form of a Directive, a Decision, a Communication, or a Staff Working Document; each has a measurable effect; and each is needed if the cap is to add up. The next sections walk through them in order, anchored to a single figure that places all of them together.

2. THE CAP THAT ACTUALLY WAS

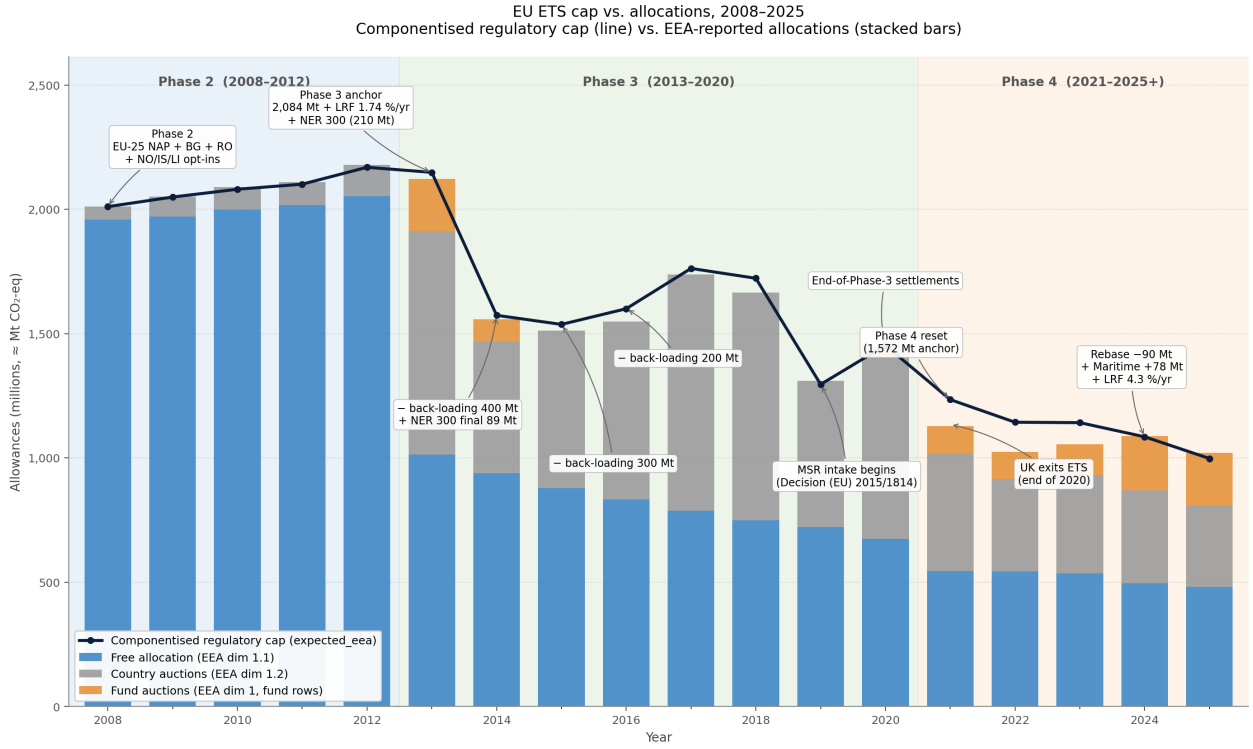

Figure 1. EU ETS cap vs. allocations, 2008–2025. Componentised regulatory cap (line) vs. EEA-reported allocations (stacked bars).

Reading the figure. The line is the *componentised regulatory cap* — the EU-wide cap reconstructed year by year from its constituent components. The stacked bars are the allocations reported by the *European Environment Agency (EEA)*: free allocation to installations (blue), allowances auctioned by Member States (grey), and allowances auctioned by funds such as the Innovation Fund, the Modernisation Fund, and the EIB-managed NER 300 sales (orange). The background shading marks the three phases. The visible gap between the line and the top of each bar is the *residual* — the part of the cap not yet accounted for in registry data — and is discussed in §6.

The figure covers the *stationary and maritime* scope of the EU ETS. Aviation is excluded from this draft — it has its own cap series, its own structural mechanisms, and is published separately from the stationary registry data we use here. The combined-ETS-1 view that includes aviation is the subject of a future working paper; see the abstract for a brief preview of what aviation adds. The y-axis is in millions of allowances, which under EU ETS accounting is equivalent to millions of tonnes of CO_2-equivalent (one allowance = one tonne CO_2eq surrender entitlement).

The next three sections walk through the figure phase by phase.

3. PHASE 2 (2008–2012): THE NAP REGIME

Phase 2 of the EU ETS was governed by National Allocation Plans: each Member State submitted a five-year cap and per-installation allocation schedule to the Commission, which was reviewed and (often) reduced. The EU-wide cap for Phase 2 was the sum of the 27 NAPs (plus the two opting-in non-EU EEA states — Norway, Iceland, Liechtenstein — that joined the system from 2008). There was no Linear Reduction Factor; there was no requirement for annual issuance to follow any downward trajectory; and each NAP included a New Entrants Reserve (NER) — a pool of allowances set aside specifically for installations that came online or expanded capacity during the phase.

The line on Figure 1 rises slightly across Phase 2, from about 2,011 Mt in 2008 to 2,169 Mt in 2012. This is genuine, not an artefact. Three effects combine to produce the rise:

- NER drawdowns: new installations entering the system each year drew allowances from their Member State's NER. As more installations accumulated, year-on-year NER issuance grew, and the final-year drawdown cluster (installations that had banked NER entitlements drawing them down before the phase closed) shows in the +62 Mt step between 2011 and 2012.
- NAP revisions: Estonia and Poland (among others) successfully challenged the Commission's reduction of their proposed NAPs at the General Court in 2009. The resulting upward revisions are baked into the EEA-reported issuance series.
- The EEA-EFTA opt-ins: Norway, Iceland, and Liechtenstein joined the system in 2008 via EEA Joint Committee decisions; their contributions are small but visible.

A methodological caveat that the figure does not show: the Phase 2 cap line is built from EEA-reported "actually issued" totals rather than from per-MS NAP Commission Decisions. Substituting the latter is a potential refinement; until then, the Phase 2 cap line and the Phase 2 bar tops should be expected to track each other closely because both derive from the same EEA aggregate.

The rising Phase 2 cap is one of the historically important features of the ETS. It is also the reason the system was redesigned: the NAP regime, combined with the 2008 financial crisis, produced a structural surplus that subsequent Phase 3 mechanisms (back-loading, the MSR) were designed to address.

Primary sources: Directive 2003/87/EC (the framework directive establishing the ETS); EEA Joint Committee Decisions extending the system to Norway, Iceland, and Liechtenstein from 2008; per-MS Commission Decisions on each Phase 2 NAP.

4. PHASE 3 (2013–2020): A HARMONISED CAP WITH INTERVENTIONS

Phase 3 replaced 27 NAPs with a single EU-wide cap, set at a constant anchor and reduced by an LRF of 1.74 % each year. The anchor and the LRF together define the year-by-year cap budget. But the actual issuance schedule was modified by several Commission interventions: NER 300 monetisation, back-loading, and the Market Stability Reserve. The final-year (2020) figure also reflects a data-convention quirk that materially changes its registry total.

4.1 The Phase 3 anchor and the LRF

Phase 3's anchor was 2,084,301,856 allowances, set under Article 9 of the revised ETS Directive (Directive 2009/29/EC, the 2009 amendment to 2003/87/EC). The annual cap was the anchor minus a cumulative reduction of 1.74 % × the anchor per year, equating to exactly 36,266,852 allowances of reduction per year. The line on Figure 1 shows this as a smooth decline from 2013 to 2020, modulated by the interventions below.

The drop from the rising 2012 level (~2,169 Mt) to the Phase 3 anchor in 2013 (~2,084 Mt) marks the regime change from 27 negotiated caps to a single legally-defined cap. The visually larger drop in the chart, however, is the one between 2013 and 2014: that step combines back-loading (§4.3) and the first NER 300 tranche (§4.2) on top of the LRF, totalling roughly 500 Mt of reduction in effective issuance.

4.2 NER 300

The New Entrants Reserve 300 (NER 300) was a carve-out of 300 million allowances from the Phase 3 reserve, established under Article 10a(8) of the revised ETS Directive and Decision 2010/670/EU. Its purpose was to fund demonstration projects in renewable-energy and carbon-capture technologies.

"Monetisation" in this context means the conversion of the allowances into cash by selling them on the market. Rather than handing the 300 million allowances directly to project beneficiaries, the Commission set them aside in a reserve and appointed the European Investment Bank to sell them on the secondary market through a structured tranche programme. The proceeds — paid in euros — then funded the project grants. The mechanism therefore turns allowances (which only have value to ETS-covered installations) into a general-purpose funding stream usable by any innovation project. It is a distinct concept from the regular Member State auctioning programme: NER 300 sales were managed centrally by the EIB to fund a specific EU-level mechanism, whereas Member State auctions feed national treasuries.

The EIB monetised the allowances in two tranches: about 210 million in 2013 and about 89 million in 2014, raising roughly €2.1 billion at the prevailing EUA prices. The proceeds funded 38 projects.

NER 300 is a *one-time inflow* in the model: it adds to the year's expected EEA total (and shows up as orange fund-auction bars in 2013 and 2014 on Figure 1) but is not part of the structural cap. It is the direct predecessor of today's Innovation Fund, which operates on the same monetisation principle at larger scale.

4.3 Back-loading

By 2013, EUA prices had collapsed under the combined weight of the Phase 2 surplus, the 2008 financial crisis, and a faster-than-expected uptake of renewable-energy incentives. The Commission introduced back-loading as a short-term price-support measure: 900 million allowances were withheld from the auction schedule over 2014–2016 (400, 300, and 200 Mt respectively), to be released back to the market later. The legal basis was Decision 1359/2013/EU, amending Annex 1 of Directive 2003/87/EC to clarify the provisions on auction timing.

The three notches in the Figure 1 cap line in 2014, 2015, and 2016 are the back-loading withdrawals. The released allowances were eventually absorbed by the Market Stability Reserve when it became operational, so the "release later" half of back-loading never literally happened — they were re-routed to the MSR.

4.4 The Market Stability Reserve

The Market Stability Reserve (MSR) is the EU ETS's structural oversupply-correction mechanism. It was established by Decision (EU) 2015/1814 and became operational on 1 January 2019. The MSR observes the *total number of allowances in circulation* (TNAC), published annually by the Commission in a Communication, and withdraws a fixed fraction of any surplus from upcoming auctions, accumulating allowances in the reserve. When the surplus falls below a lower threshold, allowances are released back to the market.

In practice, the MSR has been withdrawing allowances every year since operations began. Strictly speaking the MSR does not change the *statutory* cap; it changes the *auction supply* by diverting allowances from the auctioning calendar into the reserve. In Figure 1 the MSR appears as a reduction to the effective issuance path because that is the quantity that reconciles against the registry-reported total. Throughout this paper, "the cap" therefore refers to the cap available to the market in each year rather than the cap-as-legislated.

A subtle but important detail: the MSR's reporting period is 1 September to 31 August (rather than the calendar year), to align with the publication cadence of the previous-year TNAC. Our model attributes MSR intake to calendar years using an 8/12 + 4/12 weighted split between the two overlapping reporting periods, with the per-Member-State year-by-year figures sourced from technical Staff Working Documents (SWD(2021) 308, SWD(2023) 346, SWD(2024) 264, SWD(2025) 388).

4.5 The 2020 registry cut-off

The 2020 figure in EEA's registry data is the first full registry-based extract of an end-of-Phase-3 year, and it carries a structural surplus of roughly 190 Mt against the cap budget less MSR intake. Under footnote 29 of COM(2021) 962, the 2019 and 2020 columns are both registry-derived with a 30 June + 1 year cut-off, so the surplus is not a cut-off-date asymmetry between the two years. Two specific mechanisms account for the bulk of the surplus. First, footnote 31 of COM(2021) 962 discloses that 48 Mt of UK 2019 free allocation, suspended in 2019 under the safeguard measures associated with the United Kingdom's withdrawal, was released into the 2020 registry column once the Withdrawal Agreement was settled. Second, end-of-Phase-3 closure-related recoveries, partial-cessation adjustments, and NER pool reconciliations that span 2013–2020 are formally settled in the registry in the final year of the phase rather than being attributed back to the year they conceptually relate to.

The model treats the combined surplus as a reporting-timing adjustment rather than as a structural increase in the cap. We represent it through a `phase3_closures_recovered_2020` reconciliation component, derived from COM(2021) 962's discussion of end-of-phase closure mechanics and from the UK-specific disclosure in footnote 31. The component should be read as a modelling device used to align registry totals with the underlying cap structure, not as a separate regulatory allowance budget. With it included, the line and bar reconcile at 2020; without it, the 2020 residual would be visibly positive.

Primary sources for Phase 3: Directive 2003/87/EC as amended by Directive 2009/29/EC (Phase 3 anchor + 1.74 % LRF); Decision 2010/670/EU (NER 300); Decision 1359/2013/EU (back-loading); Decision (EU) 2015/1814 (MSR); COM(2021) 962 (carbon-market report for 2020); SWD(2021) 308, SWD(2023) 346, SWD(2024) 264, SWD(2025) 388 (per-Member-State MSR intake).

5. PHASE 4 (2021–2025+): STRUCTURAL REFORM

Phase 4 begins with a substantially lower cap. Directive (EU) 2018/410 amended the ETS Directive to set a new anchor of 1,571,583,007 allowances and to raise the LRF from 1.74 % to 2.2 %, effective from 2021. The cap line on Figure 1 drops from the end of Phase 3 (~1,287 Mt in 2020 after MSR intake) to the new Phase 4 starting level. The Fit for 55 package (Directive (EU) 2023/959) reformed the cap again, with rebases and sector additions taking effect from 2024.

5.1 The Phase 4 anchor and Brexit

Two unrelated events coincide at the boundary between Phase 3 and Phase 4 on 1 January 2021. The first is the structural cap reset: the Phase 4 anchor, fixed by Decision (EU) 2020/1722, sets the EU-wide cap budget at the new lower level, and the new 2.2 % LRF begins. The second is the United Kingdom's exit from the EU ETS: the transitional period ended on 31 December 2020, after which UK installations are no longer in the system. The figure annotates both at year 2021; the Phase 4 anchor explains the drop in the cap *line*, while Brexit explains the drop in the *bar* (the UK's free allocation and auctioned volume disappear from the country-rows total).

The visual effect is that 2021 looks like a particularly sharp year-on-year drop, with two distinct mechanisms layered on top of each other. Untangling them is part of the reason a componentised model is useful. Note that Brexit does *not* alter the EU-27 Phase 4 cap-setting formula itself: the 1,571.6 Mt anchor and the 2.2 % LRF were determined independently of UK membership. The UK exit affects the registry-side total (free allocation and auctions in UK installations cease) but not the regulatory cap budget.

5.2 Phase 4 fund pools

A meaningful share of the Phase 4 cap is set aside into multi-year pools that auction allowances on their own schedules rather than evenly across the phase. The pools relevant to the stationary + maritime scope of this paper are:

- Innovation Fund (Article 10a(8)): 450 million allowances over 2020–2030, raised to 575 million by Directive (EU) 2023/959. Funds innovation in low-carbon technologies, building on the NER 300 precedent.
- Modernisation Fund (Article 10d): approximately 700 million allowances over Phase 4, including the Article 10c carryover from Phase 3, funding modernisation of energy systems in lower-income Member States.
- Phase 4 New Entrants Reserve (Article 10a(7)): 331.3 million allowances pooled for new entrants and capacity expansions, of which 200 million was contributed by the MSR and 131.3 million carried forward from unallocated Phase 3 allowances.
- RRF / REPowerEU programme (Decision (EU) 2023/435): 250 million allowances auctioned 2023–2026 to fund the EU's energy-security and decarbonisation response to the 2022 energy crisis (200 million from the MSR, 50 million from the Innovation Fund).
- Social Climate Fund (Article 10a(8b) and Article 30d(3)): 50 million ETS-1 allowances plus 150 million ETS-2 allowances, frontloaded from 2026 to capitalise the Fund before ETS-2 begins.

An aviation-specific Sustainable Aviation Fuel reserve (20 million allowances over 2024–2030) also draws on the Phase 4 cap but, like aviation more broadly, sits outside the stationary + maritime scope of this paper and is covered in the future aviation extension.

These pools each receive allowances from the cap budget and auction them over multi-year schedules determined by Commission decisions and (for the Modernisation Fund) Investment Committee approvals. The fund auctions visible in the orange segments of Figure 1 from 2020 onwards are this activity.

The year-by-year *intake* leg of these flows — how many allowances each pool received from the cap in each calendar year — is not published in any Commission document we have located. Only the *auction* leg (volumes actually sold to market) is reported, and it appears in the fund-row aggregates of EEA's data. This is the main reason the residual gap in Figure 1 is materially larger in 2021–2023 than in other Phase 4 years; see §6.

5.3 The 2024 rebase, maritime inclusion, and the new LRF

Directive (EU) 2023/959 (the Fit for 55 ETS revision) introduced three simultaneous changes effective from 2024:

- A rebase of the cap downward by 90 million allowances as a one-off step-down to align the cap with the EU's new −62 % emissions reduction target by 2030 (versus 2005). Decision (EU) 2023/1575 sets the amount.
- Maritime transport inclusion: the cap is *expanded* by 78.4 million allowances to accommodate the inclusion of shipping emissions for vessels of ≥ 5,000 gross tonnage on intra-EEA routes. The 78.4 Mt is the *cap adjustment* — the additional allowance budget made available to cover the new sector — and should not be read as 2024 maritime emissions, which are a separate (and lower) figure. The maritime inclusion phases in at 40 % of emissions in 2024, 70 % in 2025, and 100 % in 2026.
- A new LRF of 4.3 %, replacing the Phase 4 2.2 % factor from 2024 onward, with a further increase to 4.4 % programmed from 2028.

The combined effect in 2024 is a step-down in the cap line (rebase plus new LRF) that is partially offset by the maritime expansion. The figure annotates the cluster at year 2024.

Primary sources for Phase 4: Directive (EU) 2018/410 (Phase 4 anchor, 2.2 % LRF, MSR amendments); Decision (EU) 2020/1722 (cap-setting decision for 2021); Directive (EU) 2023/959 (Fit for 55 ETS revision, 4.3 % LRF, fund pool top-ups, ETS-2 establishment); Decision (EU) 2023/1575 (cap revision for 2024, including rebase and maritime addition); Decision (EU) 2023/435 (RRF / REPowerEU); COM(2024) 538 and SWD(2024) 264 (carbon-market report for 2023); SWD(2025) 388 (technical SWD for 2024).

6. READING THE GAP

Reading the residuals teaches us what the cap model can and cannot close from public data. The visible gap between the cap line and the top of each stacked bar is the *residual* — the portion of the cap budget not yet accounted for in the EEA's registry data for that year. The pattern of residuals across the 18 years is therefore not a chart imperfection but the analytical result of the reconciliation exercise: it tells us where the public record is complete and where it is not.

For 2008–2012, the gap is essentially zero. Phase 2 is bounded by the same EEA aggregate that produces the cap line, so the two are tautologically close. The eventual substitution of per-MS NAP Commission Decisions as the cap source will create a proper residual for Phase 2 that exposes NER drawdown timing.

For 2013–2018, the gap is small and negative: the bar tops are 1–3 % below the cap line. This is the *Cross-Sectoral Correction Factor* (CSCF) — a uniform haircut applied by the Commission under Article 10a(5) of the ETS Directive when verified historical activity levels exceeded the industrial free-allocation ceiling. CSCF rounding noise is the dominant explanation for the small Phase 3 residuals.

For 2019, the gap is small and positive (about +1 %): the residue after the MSR calendar-year attribution fix has been applied.

For 2020, the gap closes to zero once the end-of-Phase-3 reconciliation discussed in §4.5 (UK 2019 free allocation release plus closure-related recoveries) is added as an inflow.

For 2021–2023, the gap is materially negative (−8 % to −10 %). This is the *cap-to-pool timing opacity*: allowances allocated from the cap to the Phase 4 fund pools (Innovation Fund, Modernisation Fund, Phase 4 NER, RRF/REPowerEU, Social Climate Fund) in year T but auctioned by the pools in year T+1 or later. The pool *intakes* are not published in any Commission document we have located, only the pool *auctions*. The residuals reflect a specific opacity about *when* allowances move between cap, pools, and market — not about what the pools do with the proceeds, which is well-disclosed.

For 2024, the gap closes via the *closures-corrections* series from COM(2024) 538 Table 3, which records partial cessations, surrenders, and late-issuance adjustments.

For 2025, the gap is small and positive (about +2 %), consistent with slow-pool auctioning catching up on holdback from 2021–2023.

In summary: 15 of 18 years reconcile to within ±3 %; the three remaining material years (2021–2023) sit at the limit of what public Commission data allows us to close. Closing further would require Registry-internal cap-to-pool stock-and-flow accounting that we have not been able to source from any Commission publication.

7. WHY THIS MATTERS FOR FORWARD MODELLING

A back-of-the-envelope projection that takes "cap × (1 − LRF)" forward misses the 80 Mt that the Innovation Fund draws from the cap in any given year, the further fund-pool draws, the maritime ramp-up, the new LRF schedule from 2028, the MSR's intake-or-release rule conditional on TNAC, the Phase 4 NER's project-decision-driven drawdown rate, and the ETS-2 launch in 2027. Each of these is a non-LRF mechanism, and each is material at the 50–250 Mt/yr scale. Without them, a forward projection is wrong by hundreds of millions of allowances per year by 2030.

The componentised view in this paper is what the forward modelling builds on. Each component in the model has the structure (year, kind, value, source document) needed to extend into a counterfactual or projection scenario by editing or adding components without disturbing the rest.

Two follow-ups are on the work programme. First, a later working paper will integrate aviation into the same figure: a slightly lifted cap line summing stationary + maritime + aviation, a fourth bar segment for aviation allocations, and a parallel walk-through of the aviation-specific mechanisms (provisional 2012 inclusion, stop-the-clock, the SAF reserve, the 2024–2026 free-allocation phase-out). Aviation is small in magnitude — typically 30–80 Mt/yr against ~1,500–2,000 Mt for stationary — but indispensable for forward modelling because EUAs and EUAAs became fungible in 2024. Second, a separate methodology paper will document the forward-projection framework and the scenario-comparison logic that uses this componentised cap as its base.

8. SOURCES AND RECONCILIATION

Constructing the cap line in Figure 1 required reconciling data from five independent sources, each of which publishes a partial view:

- The legal instruments: the Directives, Regulations, and Decisions that authorise each mechanism — Directive 2003/87/EC and its amendments, Decision 2010/670/EU (NER 300), Decision 1359/2013/EU (back-loading), Decision (EU) 2015/1814 (MSR), Directive (EU) 2018/410 (Phase 4 + 2.2 % LRF), Decision (EU) 2020/1722 (Phase 4 anchor), Decision (EU) 2023/435 (RRF/REPowerEU), Directive (EU) 2023/959 (Fit for 55), Decision (EU) 2023/1575 (2024 cap revision). These provide the structural numbers (anchor, LRF, rebase amounts) but not the year-by-year operational figures.
- Commission Communications and Reports (COM documents): the annual carbon-market reports published each November, which set out the state of the system and disclose figures such as closure adjustments, free-allocation volumes, and the MSR's annual decision.
- Staff Working Documents (SWD documents): the technical appendices to the carbon-market reports, which carry per-Member-State breakdowns needed for the MSR calendar-year attribution and for the closures-corrections series.
- Commission Communications on the Total Number of Allowances in Circulation (C(YYYY) NNN): the annual TNAC communications, which govern the MSR's intake or release decision for the upcoming twelve months from 1 September.
- The European Environment Agency's ETS data viewer: the installation-level and country-level allocation and auction data, which is the source of truth for what was actually issued.

Each of these is necessary; none is sufficient. The annual COM and SWD reports describe what was done; the legal instruments describe what was authorised; the EEA data describes what showed up in the registry. The componentised cap reconciles all three. The reconciliation surface — the Check B residual visible as the gap on Figure 1 — is the test that the reconciliation has been done well; the remaining residuals are where the public data does not allow a clean close.

The reconciliation work itself uses a per-component, per-year, per-source-document attribution structure that we will describe in a separate methodology paper once we have a longer monitoring period to report on its behaviour over time.

APPENDIX A · SOURCES AND CITATION TAGS

Documents referenced in the text, in the order they appear:

Framework

- Directive 2003/87/EC: ETS framework directive.
- Directive 2009/29/EC: 2009 amendment establishing the harmonised Phase 3 cap, LRF, and free-allocation rules.

Phase 2 and EEA-EFTA

- EEA Joint Committee Decisions extending the ETS to Norway, Iceland, and Liechtenstein from 2008.
- Per-MS Commission Decisions on 2008–2012 NAPs (not individually cited; pending integration in a later revision).

Phase 3 mechanisms

- Decision 2010/670/EU: NER 300 demonstration-project funding scheme.
- Decision 1359/2013/EU: back-loading legal basis.
- Decision (EU) 2015/1814: Market Stability Reserve.

Phase 4 cap setting

- Directive (EU) 2018/410: Phase 4 anchor, 2.2 % LRF, MSR amendments.
- Decision (EU) 2020/1722: Phase 4 cap-setting for 2021.
- Decision (EU) 2023/435: RRF / REPowerEU.
- Directive (EU) 2023/959: Fit for 55 ETS revision (4.3 % LRF, fund pool top-ups, ETS-2 establishment, Social Climate Fund).
- Decision (EU) 2023/1575: cap revision for 2024 (rebase + maritime).

Carbon-market reports (COM)

- COM(2021) 962 final: carbon-market report for 2020 (includes the Registry cut-off footnote that underlies the 2020 inflow).
- COM(2024) 538 final: carbon-market report for 2023 (includes the closures-corrections table that underlies the 2024 inflow).
- Earlier years' COM reports (2012, 2015, 2017–2019, 2022–2025) used for cross-referencing.

Staff Working Documents (SWD)

- SWD(2021) 308: technical SWD for 2020 (calendar-year MSR per-MS for 2019–2021).
- SWD(2023) 346: technical SWD for 2022 (MSR per-MS for 2021–2023).
- SWD(2024) 264: technical SWD for 2023.
- SWD(2025) 388: technical SWD for 2024 (authoritative for 2025 MSR intake).

TNAC Communications (C(YYYY))

- Annual Commission Communications on the Total Number of Allowances in Circulation, mid-May each year, governing the MSR intake/release decision for September(T)–August(T+1).

EEA data

- European Environment Agency, *EU Emissions Trading System (ETS) data viewer*, eea.europa.eu.

APPENDIX B · COMPONENT SUMMARY

For reference, the components plotted as the regulatory cap line in Figure 1, grouped by phase. Each component has a `kind` (additive / subtractive / one-time / external adjustment) that determines its sign contribution to the year's expected total.

COMPONENT	PHASE	KIND	SOURCE
`eu25_nap_aggregate`	2 (2008–12)	cap_additive	EEA dim 1 (provisional — to be replaced by per-MS NAP Decisions)
`bg_nap` , `ro_nap`	2	cap_additive	EEA dim 1 (provisional)
`no_opt_in` , `is_opt_in` , `li_opt_in`	2	cap_additive	EEA dim 1 (provisional)
`phase3_anchor`	3 (2013–20)	cap_additive	Directive 2009/29/EC
`lrf_reduction`	3	cap_subtractive	Directive 2009/29/EC (1.74 %)
`ner300_monetised`	3 (2013, 2014)	one_time_monetisation	Decision 2010/670/EU; COM(2021) 962
`back_loading_withdrawal`	3 (2014–16)	external_adjustment	Decision 1359/2013/EU
`msr_intake`	3, 4	external_adjustment	Decision (EU) 2015/1814; SWD per-MS series
`phase3_ner_setaside`	3	external_adjustment	COM(2021) 962
`phase3_closures_unallocated`	3	external_adjustment	COM(2021) 962

COMPONENT	PHASE	KIND	SOURCE
phase3_closures_recovered_2020	3 (2020)	reserve_drawdown	COM(2021) 962 fn 29
phase4_anchor	4 (2021+)	cap_additive	Decision (EU) 2020/1722
lrf_2018_410	4 (2021–23)	cap_subtractive	Directive (EU) 2018/410 (2.2 %)
lrf_2023_959	4 (2024+)	cap_subtractive	Directive (EU) 2023/959 (4.3 %)
rebase_2024	4 (2024+)	cap_subtractive	Decision (EU) 2023/1575
maritime_inclusion_2024	4 (2024+)	cap_additive	Decision (EU) 2023/1575
phase4_closures_corrections	4 (2021+)	external_adjustment	COM(2024) 538 Table 3

End of v0.2 draft. Comments and edits welcome.