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Wired for Security: The EU's Post-2030 Climate Architecture

*Electrification, Energy Security and the Path to Europe's 2040
Climate Target*

T&E

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Executive summary

The adoption of the EU's 2040 climate target marks a turning point in European climate and energy policy. With the headline objective agreed, the central challenge shifts from setting ambition to delivering it – in a political and geopolitical context that has fundamentally changed the terms on which delivery must be pursued and financed. This report sets out the architecture for a credible post-2030 climate and energy framework, structured around eight building blocks. Its central argument is that electrification powered by domestically generated renewable energy is not primarily a climate policy but a sovereignty strategy – and that designing the post-2030 legislative package around that insight offers a more robust political and economic foundation than the frameworks that preceded it.

Energy security as the organising principle

The war in the Middle East has once again highlighted European energy insecurity and the consequences of dependence on imported fossil fuels. US-Israeli military strikes on Iran in February 2026 and the resulting disruption of shipping through the Strait of Hormuz – through which roughly one-fifth of global oil normally transits – have pushed oil prices above \$100 per barrel for the first time since 2022. Yet, Europe's energy security crisis is not primarily a story of supply disruption; it is a story of structural dependency. Looking back to the Ukraine-crisis, between 2021 and 2024 the EU paid [€930 billion](#) more for fossil fuel imports than pre-crisis prices would have implied, and imported fossil fuels still account for [58% of EU primary energy](#) – far more than China (24%) or India (37%).

The EU's post-Ukraine response has been fossil fuel diversification: replacing Russian gas with US LNG and committing to [\\$250 billion](#) annually in US energy purchases under the July 2025 tariff deal. This is not a security strategy; it is re-concentration of risk under new geopolitical conditions, as demonstrated by Qatar's 2024 threat to cut LNG supplies unless the EU relaxed its environmental standards.

The post-2030 framework must be built on a different premise. Electrification powered by domestic renewables backed by resilient grids is the only strategy that permanently reduces exposure to global fossil fuel markets and the geopolitical crises that disrupt them. **The EU should establish a headline target to reduce the share of imported energy in final consumption to 30% by 2040**, anchoring the energy security framework in electrification and renewable self-sufficiency rather than fossil fuel diversification.

Electrification as the backbone

Clean electrification must be the backbone of the post-2030 climate and energy architecture, with the Renewable Energy Directive (RED), the forthcoming Electrification Action Plan (EAP), and the Energy Efficiency Directive (EED) operating as an integrated system. RED IV is the defining legislative negotiation of this cycle. Pressure to use it as a simplification exercise – consolidating the targets into the Governance Regulation, weakening sectoral sub-targets, or effectively freezing ambition after 2030 – risks entrenching continued reliance on unsustainable biofuels in transport.

Instead, **RED IV should reinforce electrification as the central pathway to decarbonisation of road transport as well as aviation and shipping where feasible: completing the phase-out of food and feed crop biofuels, strengthen the renewable electricity crediting mechanism for electric vehicle charging to**

make electrification the most attractive compliance route, and reserve scarce sustainable fuels for sectors where direct electrification is genuinely difficult.

The EAP must be embedded within the post-2030 architecture and aligned with binding renewable deployment targets. For the Energy Efficiency Directive (EED), the post-2030 revision should resist pressure to replace energy demand reduction targets with GDP-linked energy intensity metrics. Such a shift would weaken the policy signal for structural efficiency improvements, as energy intensity can improve during economic downturns without delivering real reductions in energy consumption. Instead, the EED should preserve absolute energy demand reduction as the foundation of the EU's efficiency framework. The current 11.7% binding target is calculated relative to modelled projections – a construction that provides negotiating flexibility but does not offer a clear signal on actual energy consumption trajectories. Anchoring the directive in absolute demand reduction would provide a more transparent framework for planning and investment while ensuring that efficiency gains keep pace with electrification.

Sectoral instruments – car and truck CO₂ standards, and aviation and shipping fuel mandates – must be preserved as freestanding obligations in the post-2030 framework. These instruments address structural barriers that carbon pricing alone cannot overcome, and must not be absorbed into or traded off against a wider ETS architecture.

Finance: the key to unlock electrification and energy security

The post-2030 architecture will fail without a step change in climate investment. Europe faces a significant investment cliff as NextGenerationEU and the Recovery and Resilience Facility wind down, while projections point to an annual investment deficit of [€344 billion](#) by 2030 in energy, buildings, transport and clean technology manufacturing alone. The Commission's proposed MFF for 2028–2034 does not close this gap: the proposed 35% climate earmarking is a repackaging of existing commitments, not additional finance. Meanwhile, fossil fuel subsidies continue to grow even as electrification investment stalls. The investment gap is not primarily a problem of scale; it is a problem of architecture – fragmented grid governance, diluted budget prioritisation, and the absence of a coordinated financing framework aligned with electrification objectives.

Four priorities follow. First, the next **MFF should raise climate and environmental earmarking to at least 50%, eliminate fossil-related budget lines, and deploy the European Competitiveness Fund as the primary vehicle for industrial electrification** – including output-based ramp-up support for cleantech manufacturing. Second, the **EU Innovation Fund should evolve beyond demonstration toward large-scale deployment, with ETS revenues frontloaded to accelerate climate investment**; and a Market Intermediary for E-Fuels should implement double-sided auctions for aviation and maritime e-fuels, bridging the price gap between e-fuels and fossil equivalents. Third, **governance reform must accompany financing: independent EU-level grid investment assessment, stronger cross-border planning mandates, and streamlined connection procedures to translate available capital into timely deployment**. The proposed Industrial Decarbonisation Bank should provide guarantees, blended finance, and auction-based support targeted specifically at industrial and system electrification. Fourth, the **Social Climate Fund should be understood as a core pillar of the electrification strategy** – not a side social measure – and should be significantly expanded beyond 2032 to ensure vulnerable households can participate in the transition.

Strengthening national delivery beyond 2030

The Effort Sharing Regulation expires in 2030, and what replaces it will determine whether Member States retain direct political ownership of climate delivery. Carbon pricing alone is insufficient: binding national climate targets are a necessary complement, not an optional overlay. Two broad approaches are assessed – extending the current ESR/LULUCF architecture, and moving towards economy-wide national targets. Both can, in principle, deliver the accountability that post-2030 climate governance requires. The critical design principles are the same regardless of which path is taken: **targets must be binding and enforceable; sector-specific accountability must be preserved, whether through dedicated instruments or through careful overlay design; and national obligations must be clearly linked to the EU's 2040 trajectory. The risk in the current political environment is that the push for simplification becomes a vehicle for weakening binding national commitments rather than rationalising them.**

ETS1, ETS2, CBAM and national targets in synergy

The EU's carbon architecture is most effective when its instruments operate in coordination. ETS1 will see its cap approach zero around 2040 under the current Linear Reduction Factor, but residual emissions are expected to persist, and what constitutes residual emissions are yet to be defined – a gap the post-2030 architecture must close. ETS2, applying carbon pricing to road transport and buildings from 2028, risks social backlash if not accompanied by strong structural measures. **Carbon markets must complement, not substitute for, national climate action; ETS2 revenues, including the SCF should fund structural investments in clean mobility and building renovation, as well as targeted support to protect vulnerable households from higher fuel and heating costs; and MSR reforms must balance environmental integrity with affordability.** Merging ETS1 and ETS2 would create significant social and political risks by imposing a uniform carbon price across sectors with very different cost structures and levels of social sensitivity, while removing the ability to manage price impacts separately. The CBAM must expand in step with the removal of free allocation and be actively pursued as a tool for international carbon pricing convergence.

Flexibilities, offsets and international credits

The amended European Climate Law permits international carbon credits under Article 6 of the Paris Agreement up to 5% of 1990 net GHG emissions, with a pilot period from 2031 to 2035. Used well, this flexibility could support high-integrity climate action in developing countries. Used poorly, it risks repeating the integrity failures of earlier offsetting schemes and delaying structural change at home. **Credits must complement, not substitute for, domestic emissions reductions; eligibility must be confined to genuinely residual emissions where abatement options have been exhausted; and integrity standards must be set at a level previous voluntary and compliance markets have consistently failed to reach.** A centralised EU procurement framework, building on the REPowerEU joint purchasing experience, should be considered to prevent competitive pressure to accept lower-integrity credits.

A constrained and credible role for carbon removals

Carbon dioxide removals are a complement to emissions reductions, not a substitute. A firewall principle must govern the post-2030 architecture: CDR must never be integrated into compliance systems where it can replace emissions reductions – particularly while the ETS cap is still declining, which it will be throughout the 2030s. The CRCF methodologies adopted for DACCS, BECCS and biochar in February 2026 have structural flaws in additionality, biomass accounting and monitoring. **The post-2030 architecture should: maintain a strict distinction between permanent geological storage and temporary**

land-based sequestration; block integration of removals into ETS while the emissions cap is declining; link removals only to clearly identified residual emissions; and govern CDR through a dedicated Removal Trading Scheme operating in parallel with the ETS rather than as a compliance flexibility within it.

Non-CO₂ and international transport emissions

The EU Climate Law does not explicitly require that international aviation and shipping emissions be accounted for within Member State-level climate obligations under the 2040 target. The post-2030 architecture should close this gap, ensuring that economy-wide national targets explicitly incorporate each Member State's share of these emissions.

Non-CO₂ aviation effects – contrails, NO_x, water vapour – represent at least half of aviation's total climate impact, yet no EU or international legislation currently regulates them. This is a material gap in the EU's climate accounting that the post-2030 architecture must close. **The Commission should maintain the automatic expansion of the MRV scheme for non-CO₂ aviation effects to full EEA+ scope in 2027 as intended, deliver a legislative proposal to address these effects under the ETS by end-2027, and adapt the European Air Traffic Management system for contrail avoidance.** Most fundamentally, the European Climate Law should be amended to include a hard-edged legal obligation covering non-CO₂ aviation effects.

Introduction

The adoption of the EU's 2040 climate target marks a turning point in European climate and energy policy – but not in the way it is usually framed. The central challenge is no longer one of ambition. It is one of delivery, in a political and geopolitical environment that has fundamentally changed the terms on which that delivery must be argued and financed.

Europe's current climate and energy architecture was forged in crisis. Russia's invasion of Ukraine in February 2022 did not create the EU's energy vulnerability – it exposed it. Almost overnight, the EU lost access to the cheap Russian gas that had underpinned its industrial competitiveness for decades. The political and policy response was swift: the REPowerEU plan launched in May 2022 set an ambition to phase out Russian fossil fuels, accelerate renewable deployment, and diversify supply. Out of that crisis came the framework that now defines the EU's energy and climate landscape – revised renewable energy and energy efficiency directives, new hydrogen and infrastructure strategies, and a reinforced Emissions Trading System. For the first time, energy security and climate policy were explicitly aligned under a common political rationale: reducing fossil fuel dependency was no longer just a climate imperative, it was a sovereignty imperative.

Three years on, the geopolitical context has shifted again – but the structural lesson has not been learned. The ongoing US-Israel war on Iran, and the resulting disruption to shipping through the Strait of Hormuz, have once more pushed oil prices above \$100 per barrel and renewed fears of supply shocks across Europe. The parallels with the Ukraine crisis are striking: a geopolitical conflict in a region of concentrated fossil fuel production triggers immediate energy price spikes and exposes European consumers and industry to costs they cannot control. But there are important differences too. The Ukraine shock came from a supplier that dominated EU gas imports; the Iran shock comes from a region through which a fifth of global oil and LNG supply transits. The mechanism is different – chokepoint disruption rather than direct supply loss – but the underlying vulnerability is the same: an energy system built on imported fossil fuels remains perpetually exposed to events beyond the EU's borders and beyond its control.

The EU's response to Ukraine was largely one of fossil fuel diversification: replacing Russian gas with US LNG, and [committing to \\$250 billion annually](#) in US energy purchases as part of the July 2025 tariff deal. This is not a security strategy – it is a re-concentration of risk under new geopolitical conditions, as Qatar's 2024 threat to cut LNG supplies unless the EU relaxed environmental standards made clear. Diversification manages symptoms; it does not cure the disease. Between 2021 and 2024, the EU paid [€930 billion more](#) for fossil fuel imports than pre-crisis prices would have implied. Imported fossil fuels still account for [58% of EU primary energy](#) – far more than China (24%) or India (37%). Yet it would be wrong to tell only a story of failure. The EU did manage to reduce its natural gas consumption by [around 20% since 2021](#) – a significant structural shift. And in 2025, [solar and wind overtook fossil fuels](#) in the EU power sector for the first time, a landmark that demonstrates the potential of the energy transition that is already underway. The task now is to build on that momentum and to make it the foundation of the post-2030 architecture.

This report argues that the post-2030 climate and energy architecture must be built on a different premise: that electrification powered by domestically generated renewable energy is not primarily a climate policy, but a sovereignty strategy. Reducing fossil fuel import dependency is the single intervention that simultaneously advances energy security, lowers long-run energy costs, eliminates geopolitical leverage over EU regulatory autonomy, and delivers on climate commitments. These

objectives are not in tension – they are the same objective expressed in different registers. The political opportunity of the post-2030 legislative cycle is to make that convergence explicit, and to design the architecture around it. If the Ukraine crisis gave birth to REPowerEU, the Iran crisis should give renewed urgency to a post-2030 framework anchored in structural electrification rather than fossil fuel management.

What this report does

This report has three interlocking purposes. First, it maps the current EU climate and energy architecture – the overlapping policies that together determine how the EU will meet its targets – explaining how they interact, where they reinforce each other, and where tensions or gaps exist. Second, it sets out recommendations on the overarching principles that should govern a post-2030 climate and energy framework, with energy security as the primary political organising principle. Third, where the political and legislative landscape is sufficiently developed, it translates those principles into concrete recommendations for specific policy files; where it is not – because the post-2030 architecture is still at an early stage of construction and political positions are still forming – it identifies the key challenges and the questions that will need to be resolved as negotiations advance.

Section 1

EU energy security underpinning reduction of fossil fuel import dependence

Europe's energy security crisis is not primarily a story of supply disruption – it is a story of structural dependency. Between 2021 and 2024, the EU paid [€930 billion more for fossil fuel imports](#) than it would have at pre-crisis prices, with total import costs across those four years reaching €1.8 trillion. Imported fossil fuels still account for [58% of EU primary energy](#) – a share far higher than comparable economies such as China (24%) or India (37%) – and that share has not meaningfully fallen despite the upheaval caused by Russia's invasion of Ukraine. Geopolitical disruption revealed the vulnerability, but did not cure it. Addressing it structurally is the defining energy policy challenge of the post-2030 period, and it requires a different diagnosis than the one that has driven European energy policy since 2022.

The EU's response to the Russian gas crisis was overwhelmingly one of fossil fuel diversification. In seeking to phase out Russian gas imports by 2027, the EU substantially increased its reliance on US liquefied natural gas (LNG), which by 2024 had made the United States the [EU's largest supplier of both oil and LNG](#) – though only the second largest gas supplier overall, behind Norway. This is not enhanced security; it is re-concentration. The risks have shifted rather than reduced. Changes in US domestic politics have demonstrated how energy exports can rapidly become entangled with broader trade and foreign policy pressure: as [Chatham House's January 2026 analysis](#) documents, the European Commission pledged to purchase \$250 billion of US energy products annually for three years as part of the July 2025 tariff deal – a direct illustration of fossil fuel dependency being weaponised in trade negotiations. Similar dynamics apply to other suppliers: Qatar, the EU's fifth-largest gas provider, [explicitly threatened to cut LNG supplies](#) in 2024 unless the EU relaxed its labour and environmental standards – a direct example of fossil fuel leverage being wielded against EU regulatory sovereignty. Norway remains a politically aligned and reliable partner, but at [roughly one third of EU gas imports](#) it cannot offset wider structural vulnerabilities. Moreover, Norway's own production outlook is increasingly uncertain: there are growing technical, geological and investment [challenges facing Norwegian oil and](#)

[gas](#) expansion, raising questions about its long-term ability to sustain current export levels to Europe. The conclusion is clear: fossil fuel diversification has run its course as a security strategy.

The alternative is not diversification but elimination – and the technology to achieve it already exists. Electrification powered by domestically generated renewable energy is the only approach that comprehensively reduces the EU from geopolitical energy leverage. Unlike fossil fuels, renewables are not traded on international markets subject to supplier manipulation; once the infrastructure is built, the energy is domestically produced, and immune to sanctions, embargoes and price shocks. [Ember's Shockproof report](#) provides the quantitative basis for this argument: it finds, drawing on European Commission scenario analysis, that fossil fuel import dependency could be halved by 2040, with electrification responsible for 86% of those reductions, as the majority of fossil fuel consumption occurs in transport, heating and industry. Similar analysis by Transport & Environment from 2022 [highlights](#) the same structural dynamic in the transport sector: Europe's oil demand could be cut by around one-third by 2030, primarily through accelerated electrification and efficiency improvements. Wind and solar growth has already demonstrated this logic in the power sector, [saving €59 billion in fossil import costs](#) between 2019 and 2024. The task for the post-2030 period is to extend this logic into the rest of the economy at scale and speed.

Electrification does not eliminate all external dependencies. The rapid expansion of clean energy technologies – particularly batteries, solar modules and certain critical raw materials – has created new supply chain concentrations, notably in China. Managing these risks is therefore an important component of the EU's energy security strategy. However, the nature of these dependencies differs fundamentally from fossil fuels: clean technologies are capital goods rather than continuously consumed fuels, their supply chains can be diversified through industrial policy and recycling, and once deployed they generate energy domestically. Initiatives such as the EU's Net-Zero Industry Act and the broader "Made in Europe" strategy aim to strengthen European manufacturing capacity in key clean technologies, ensuring that the electrification pathway reinforces both energy security and industrial competitiveness.

The EU currently electrifies only [22% of final energy demand](#) – below China (28%), and well below what leaders like Norway (47%) and Sweden (33%) have already demonstrated is achievable. [CREA's February 2026 annual review](#) confirms that in 2025, clean energy investment across the EU remained below the level of fossil fuel imports – €330 billion against €396 billion – with wind deployment reaching only 16.5 GW against the 25 GW per year needed to meet 2030 targets. This gap is not a function of missing technology or absent political will in isolation; it reflects a failure to design the energy security framework around the right objective. An energy security strategy anchored in renewables, electrification and flexibility would simultaneously reduce import dependency, lower long-run energy costs, eliminate the risk of geopolitical leverage over EU regulation, and deliver on climate commitments. A strategy anchored in fossil fuel diversification does none of these things.

Electrification must therefore be placed at the centre of the post-2030 energy security architecture – not as a climate co-benefit but as the primary security instrument. The EU should establish a headline target to reduce the share of imported energy in final consumption to 30% by 2040. The evidential basis for this is solid: the EU has already set an indicative target to electrify 32% of final energy by 2030, rising to 50% by 2040 according to [European Commission pathways](#). [Ember's Shockproof analysis](#) finds that delivering those pathways in full would cut primary fossil consumption to roughly one third of today's level by 2040, driven overwhelmingly by electrification of transport, heating and industry rather than the power sector – reducing import dependency from 58% to around 30%. A 30% import dependency target would therefore not be a new or additional ask: it is simply what delivery on the Commission's own electrification

ambition looks like, expressed as a security metric rather than a climate one. Such a target would make energy security measurable and accountable in a way the current framework does not; it would translate strategic autonomy from an aspiration into a metric; and critically, it would reframe the EU's climate and electrification ambitions as security imperatives — making the benefits of renewable deployment visible in geopolitical terms, not only environmental ones. For Member States sceptical of climate policy, it offers a different entry point to the same destination.

The revision of the [EU energy security framework](#) is the critical legislative opportunity to embed this reframing. The framework must move decisively away from fossil fuel diversification as an organising principle and toward renewable self-sufficiency as the goal. It should anchor the post-2030 energy system in domestic renewable generation, comprehensive electrification across transport, heating and industry, and the grid infrastructure and flexibility mechanisms needed to make that system reliable and resilient. The result is not simply a climate architecture — it is a sovereignty architecture: one that is affordable, secure, and structurally independent of the geopolitical pressures that have defined and distorted European energy policy for the past three years.

Section 2

Electrification is the backbone of the post-2030 target

Electrification is the foundation for a competitive, energy secure and resilient Europe. It is the best business case for the EU's economy, it generates efficiency gains and displaces outdated and inefficient technologies based on the combustion of fossil fuels. Phasing out dependency from petrostates such as Russia or Saudi Arabia will help the EU be independent and competitive. However, [electrification has not developed as much as needed for reaching climate neutrality in 2050](#). This is due to *inter alia*, the differences in the level of electrification among Member States, performance across the continent is uneven, which could result in a fragmented electrification trajectory, which risks undermining the EU's overall climate ambition by slowing collective progress.

Thus, a harmonised approach between the Member States in energy policies is the most appropriate tool for tackling the complex technical, economic, and governance challenges associated with an electrification-based strategy.

1. The Renewable Energy Directive post-2030

The RED as a cornerstone — and the stakes of RED IV

The RED has been a cornerstone of EU energy and climate policy since its inception, but the transition to a post-2030 framework — RED IV — presents both a major opportunity and a significant risk. The opportunity is to align the directive more fully with the reality of rapid electrification; the risk is that, under pressure for simplification, RED IV becomes a vehicle for entrenching continued reliance on unsustainable biofuels in transport, stripping away the sustainability safeguards and caps that were introduced in later revisions of the RED to address the unintended consequences of earlier versions that incentivised the expansion of crop-based biofuels.

The current political environment cannot be ignored. There is serious pressure from parts of the Council, the European Parliament and the wider political debate to use the RED IV revision as a simplification exercise – consolidating targets into the Governance Regulation, removing sectoral subtargets, and potentially weakening or replacing the renewable transport target with a looser headline obligation or broader “low-carbon” framework. In some proposals, this simplification could even amount to effectively “freezing” the directive by keeping existing 2030 targets in place without strengthening them for the post-2030 period. While simplification has genuine appeal, this approach would create a free-for-all in transport, with member states free to meet a high overall renewables target through whatever fuels are cheapest and most available. History shows what that means in practice: a continued surge in crop biofuels with questionable climate credentials.

RED IV should therefore pursue a different kind of simplification – not fewer obligations, but cleaner and more coherent ones. The directive's role in transport has always been ambiguous: it has pushed member states towards renewables in transport while frequently driving them towards the wrong renewables. The post-2030 revision should resolve that ambiguity clearly in favour of electrification.

A binding post-2030 renewables target

A successful post-2030 climate and energy architecture must place clean electrification at its core. Currently the RED is being discussed at the political level regarding the future of the energy framework. The post-2030 climate and energy architecture should therefore include a binding post-2030 EU renewables target beyond 2030, consistent with rapid electrification and reduced fossil fuel dependence, and aligned with the pathways identified in the European Commission’s 2040 climate target impact assessment. Without such a signal, the RED would risk losing strategic relevance in guiding the next phase of the energy transition.

In this context, the [forthcoming Electrification Action Plan \(EAP\)](#) should act as the operational pillar of this long-term framework. While the EAP is expected to identify barriers to electrification, improve market design, and accelerate uptake across transport, industry and buildings, its effectiveness will depend on a robust post-2030 renewables trajectory. Electrification without a guaranteed expansion of renewable supply would risk increasing power demand without ensuring full decarbonisation. The EAP must therefore be structurally embedded within the post-2030 climate and energy architecture and aligned with binding renewable deployment targets beyond 2030.

If the post-2030 climate and energy architecture objectives are to be achievable, the seeds that have been planted to reach them must now be carefully nurtured, protected, and guided to grow in the right direction. In this sense, the effective and timely implementation of RED III is a foundational step in ensuring that the EU’s long-term energy transition remains on track.

Implementing RED III: transposition challenges

For electrification to be at the core of the EU, the REDIII, the EAP, and the EED must be fully implemented at the national level. [The Commission opened an infringement procedure](#) against 26 Member States in June 2025 for failing to transpose RED III into their national regulatory frameworks on time. Member States cannot continue delaying the implementation of Directives. The transposition of REDIII into the national regulatory systems requires a systemic shift in how energy is produced, especially by internalising carbon costs and managing the high investments needed for renewables.

Market design and affordable clean electricity

As electricity costs remain a central barrier to large-scale electrification, the post-2030 climate architecture framework must prioritise the rapid expansion of affordable renewable electricity and the reduction of price uncertainty. In this context, the accelerated implementation of Contracts for Difference (CfDs) and the enabling of long-term Power Purchase Agreements (PPAs)¹ at national level should be combined with the timely completion of Renewable Acceleration Areas and the continuation of streamlined permitting rules. These simplified and faster procedures, including easier and more predictable processes for project developers and end users, are essential to shorten lead times, reduce administrative burden, and unlock timely investments in renewable generation.

In parallel, and in line with the objectives of the EAP, Member States should comprehensively review and modernise existing support frameworks for key electrification technologies, notably electric vehicles and heat pumps. The EAP recognises that faster electrification is essential to reduce fossil fuel use in transport and buildings and to limit pressure on carbon prices. However, current incentive schemes remain fragmented across Member States, with significant differences in design and effectiveness, which slows uptake and creates unequal outcomes. **A more coordinated and harmonised approach to zero-emission and electric vehicle purchase incentives should therefore be a priority**, supporting faster deployment, greater fairness, and more predictable investment signals across the EU.

At the same time, new and strengthened measures are needed to [accelerate heat pump deployment](#), addressing upfront cost barriers, skills shortages, and infrastructure constraints. Together, Renewable Acceleration Areas, streamlined permitting, CfDs and PPAs [will be instrumental in delivering](#) affordable clean electricity, unlocking the next phase of electrification, and achieving post-2030 decarbonisation objectives efficiently and at scale.

Transport: from biofuels to electrification

In transport, moving away from biofuel-driven compliance is crucial for achieving genuine decarbonisation. Under the post-2030 climate and energy architecture, RED III implementation should [prioritise direct electrification of vehicles](#), rather than continuing reliance on biofuels as a compliance shortcut. Direct electrification offers multiple advantages: it eliminates combustion-related emissions at the point of use, allows for rapid decarbonisation as the electricity grid becomes cleaner, and avoids the environmental and social trade-offs associated with large-scale biofuel production.

RED III introduced a renewable [electricity crediting mechanism](#) that can accelerate this shift by allowing public charging operators to generate tradable renewable electricity credits for electric vehicle charging. By monetising renewable electricity used in transport, these credits provide a market incentive for deploying more charging infrastructure and sourcing power from low-carbon generation. When paired with broader market instruments such as Contracts for Difference (CfDs) and long-term PPAs, which stabilise renewable electricity supply and prices, [this would create a robust framework for scaling up vehicle electrification](#).

Shifting the focus from biofuels to electrification would also align with post-2030 climate architecture ambitions: it reduces reliance on energy carriers with uncertain supply chains and environmental

¹ Contracts for Difference (CfDs) and long-term Power Purchase Agreements (PPAs) are mechanisms to provide revenue stability for renewable electricity projects: CfDs guarantee a fixed price, while PPAs secure a long-term supply contract with buyers. Both are promoted under the 2023 EU Electricity Market Design reform to support investment and reduce market risks.

impacts, and ensures that the growing transport energy demand contributes to overall renewable energy targets efficiently. In practice, Member States should phase out compliance credits for biofuels with marginal climate benefits and actively promote the use of renewable electricity in transport, leveraging both the RED III crediting mechanism and market design tools to make electrification cost-effective and reliable.

The role of biomass should also be considered in light of the EU's updated [Bioeconomy Strategy](#), adopted in 2025. The strategy emphasises the cascading use of biomass, prioritising higher-value material applications before energy uses. Applying this principle consistently across EU policy would reinforce the case for limiting biomass use in road transport and reserving scarce sustainable biomass resources for sectors where electrification alternatives remain limited.

Short-sea shipping represents a significant and underexploited electrification opportunity within this transport framework. T&E analysis shows that [20% of EU ferries could already be electrified](#) at lower cost than their fossil equivalents, offering immediate cost savings alongside long-term protection against fuel price volatility and geopolitical supply shocks. Ports are central to realising this potential: as they deploy shore-side electricity supply for vessels at berth and electrify their own operations – cargo handling, gantry cranes and logistics – they become critical electricity hubs within the broader energy system. Accelerating port electrification reduces emissions, noise and air pollution in port areas while strengthening energy resilience across the maritime value chain.

RED IV: the defining negotiation

A post-2030 framework for renewable energy in transport will need to carefully reconsider the role of the transport renewables target (RES-T). Whether such a target is retained, redesigned or replaced, its architecture will matter as much as its headline level. A high transport renewables target without robust sustainability constraints, meaningful subtargets, and a strong credit mechanism for renewable electricity [risks encouraging biofuel-driven compliance](#) rather than accelerating electrification, and by extension will fail to materially improve energy security. The incentive structure must therefore be reoriented: the generous multipliers and loopholes that have historically made biofuels the path of least resistance for member state compliance need to be removed or fundamentally redesigned.

On biofuels, RED IV should complete what RED III began but failed to deliver: a credible phase-out of food and feed crop biofuels from the transport fuel mix, and significantly tighter controls on the advanced and waste-based fuels that have been presented as their successors but are increasingly plagued by fraud concerns, supply constraints, and questionable sustainability outcomes. While RED III already introduces elements of a hierarchy through allocation multipliers that favour advanced biofuels and RFNBOs in aviation and maritime transport, RED IV should strengthen and clarify this approach – ensuring that scarce sustainable fuels are prioritised for sectors where direct electrification remains difficult, particularly aviation and maritime.

For road transport, the priority is straightforward: accelerating direct electrification. RED IV therefore should strengthen and extend the [renewable electricity crediting mechanism](#) introduced under RED III – ensuring that renewable electricity used for electric vehicle charging can generate tradable credits in a transparent and harmonised framework. This should include bringing private charging – including home, workplace and depot charging – fully within scope, ensuring clear and consistent rules for credit generation and accounting across Member States. Properly designed, this mechanism would make renewable electricity the most attractive compliance route for Member States while providing a strong investment signal for charging infrastructure and renewable power supply. Providing clarity on this

mechanism through the RED IV revision before 2030 will be essential to ensure consistent implementation across Member States and to provide a predictable framework for scaling renewable electricity use in road transport.

The RED IV negotiation will be a defining moment for the credibility of the EU's post-2030 climate architecture. A directive that sets ambitious headline targets while quietly accommodating continued reliance on unsustainable fuels would undermine both the energy security and decarbonisation objectives that the broader framework is designed to deliver. Getting the transport provisions right – ensuring that electrification is structurally favoured over biofuel-driven compliance, and that scarce sustainable fuels are directed where they are genuinely needed – is therefore not a technical detail but a strategic priority for the post-2030 package as a whole.

2. Driving Efficiency: The Energy Efficiency Directive Beyond 2030

The EED's role in the post-2030 architecture

After the deployment of renewable energy, energy efficiency represents the second fundamental pillar underpinning electrification in the post-2030 climate architecture framework. Energy efficiency maximises the benefits of electrification by mitigating electricity demand. Overall demand reduction is indispensable to the achievement of the 2040 GHG reduction target of 85% and the achievement of climate neutrality by 2050.

Energy efficiency can help mitigate energy security risks by reducing fossil fuel imports and balance of payments, improving grid reliability, and acting as a buffer to supply shocks. Energy efficiency and demand response policies can also contribute to electricity security by reducing the risk of outages resulting from peak demand.

In the post-2030 climate architecture, the [Energy Efficiency Directive](#) (EED) should be positioned as a central pillar of electrification alongside renewable deployment, not merely as a supporting instrument. The revised EED already establishes a binding EU energy efficiency target – reducing final energy consumption by at least 11.7 % by 2030 relative to earlier projections – and enshrines the “energy efficiency first” principle in law, ensuring efficiency is considered in all major policy and investment decisions.

However, delivering the deeper demand reductions needed for 2040 and beyond will require expanding the scope of efficiency policy to better address absolute energy demand across sectors, complementing electrification with sufficiency-oriented strategies and behavioural change as identified in recent research. This broader framing – [reflected in the EERA Joint Programme's white paper on energy demand reduction](#) – highlights that efficiency, sufficiency and demand-side flexibility together reduce consumption, lessen pressure on grids, improve resilience, and lower system costs while advancing climate neutrality. Integrating such a systemic demand-reduction approach into the post-2030 framework would preserve ambition while simplifying implementation, allowing Member States to tailor national pathways in their National Energy and Climate Plans (NECPs), and ensuring that efficiency gains keep pace with electrification and renewable energy expansion.

Reforming the EED: resisting simplification and deepening ambition

The post-2030 revision of the EED faces a political environment that is, in important respects, analogous to the challenge facing RED IV. There is significant pressure to use the legislative review cycle as a simplification exercise – consolidating obligations into the Governance Regulation, softening binding targets, and allowing member states greater flexibility in how they account for efficiency gains. Some proposals circulating in the policy debate would even replace the current energy demand reduction target with an energy intensity target linked to GDP. While such an approach may appear simpler, it risks weakening the policy signal for efficiency improvements, as energy intensity can improve during periods of economic contraction rather than through structural reductions in energy demand. As with RED IV, simplification in this context risks becoming a euphemism for reduced ambition.

The post-2030 EED should resist this pressure and preserve the central role of absolute energy demand reduction in the EU's efficiency framework. The current 11.7% binding target is calculated relative to modelled projections, a construction that provides flexibility in negotiations but does not offer a clear signal on actual energy consumption trajectories. Anchoring the directive in absolute demand reduction – rather than shifting to GDP-linked intensity metrics – would provide a more transparent and robust framework for planning, investment and monitoring progress.

For transport specifically, the EED has historically been a secondary instrument – the sector's efficiency obligations have largely been driven by CO₂ standards and fuel economy rules rather than the directive itself. But as electrification accelerates and the composition of transport energy shifts fundamentally, the EED becomes more important as a tool for managing overall electricity demand growth. The directive's "energy efficiency first" principle should be applied rigorously to transport infrastructure investment decisions, network planning, and the design of demand response mechanisms. In practice this could include prioritising smart and time-of-use charging, enabling vehicle-to-grid services, and integrating charging infrastructure planning with grid capacity and renewable generation. Such measures would ensure that rising electricity demand from vehicles and charging is met through smart, flexible systems that reduce rather than exacerbate grid pressure.

The EED revision should also align more coherently with the Electrification Action Plan, ensuring that efficiency standards and demand management obligations across buildings, industry and transport operate as an integrated system. The 2040 target cannot be met by electrifying demand without simultaneously ensuring that demand itself is being managed and reduced.

Section 3

Finance: the key to unlock electrification and energy security

The post-2030 energy and climate architecture will not be defined by the stringency of its targets alone, but by the Union's ability to deploy capital at scale. To date, Europe has succeeded in setting a regulatory North Star; however, the transition now faces a "valley of death" between policy intent and industrial reality. Investments and finance are key to tackle this challenge. A coordinated, long-term EU climate investment strategy is essential to underpin a credible post-2030 energy and climate architecture.

Europe is approaching a significant investment cliff. As the NextGenerationEU (NGEU) and the Recovery and Resilience Facility (RRF) wind down, the EU public finance landscape lacks the financial firepower necessary to sustain the transition.

Current projections highlight a staggering disconnect between available funds and climate requirements. The European Environmental Agency estimates that more than [€581 billion in annual extra investments is required by 2030](#) to fulfil the EU's climate mitigation goals. For the period 2030-2050, the Commission projects total energy system investment needs will average [€1.5 trillion a year](#). The think tank I4CE identifies a yearly [€344 billion](#) investment deficit by 2030 in the EU's energy, buildings, transport and clean technology manufacturing sectors, compared to current investment. In addition, [according to T&E](#), additional €39 billion of annual public funding until 2030 could bring transport emissions down drastically while boosting Europe's sustainable competitiveness in transport manufacturing.

Without a swift and massive boost to the EU's investment capacity, as outlined in T&E's calls for a dedicated [EU Investment Plan](#), the post-2030 targets will remain aspirational rather than operational.

This gap is particularly visible in electrification: policy objectives exist, but grid expansion, charging infrastructure, and industrial electrification lag behind. The limitation is no longer connected with regulatory ambition, but with the absence of a coordinated financial framework that aligns public finance, private capital, and infrastructure planning with electrification trajectories. Thus, post-2030 climate and energy security targets cannot be met without a systematic shift in how climate finance is mobilized, coordinated, and scaled at EU level. Without a step change in climate finance, post-2030 targets will remain aspirational rather than operational.

Re-architecting the EU budget

Within this context, the next EU budget (Multiannual Financial Framework - MFF) will be decisive in reducing investment risk and mobilising private capital. Gradually reorienting public support away from fossil fuel infrastructure and compensation schemes towards grid expansion, flexibility solutions and household electrification would improve fiscal efficiency. Stronger coordination between EU and national instruments, combined with stable long-term funding strategies and explicit electrification prioritisation, could transform today's fragmented financing landscape into a more coherent investment architecture capable of delivering energy security, industrial competitiveness and climate neutrality.

The current proposal for the 2028–2034 EU budget (Multiannual Financial Framework - MFF) fails the test of the transition. While headline figures suggest ambition, analysis shows that the proposed 35% climate earmarking is largely a "repackaging" of existing funds rather than a step change in available capital.

To bridge the gap, T&E advocates for a fundamental restructuring of the EU public financing landscape:

- Increased earmarking: Raising climate and environmental-related spending to at least 50% of the total MFF budget. The MFF design and scope will determine whether the EU succeeds in building strategic cleantech capacity, strengthens domestic manufacturing, and reduces dependency on imported fossil fuels.
- The European Competitiveness Fund (ECF) as a key tool to deliver on climate policy and industrial strategy. Rather than creating fragmented new platforms, the ECF, implemented primarily through InvestEU and the European Investment Bank (EIB), must become the primary

vehicle for industrial electrification. In particular, the ECF should provide ramp-up support via output-based funding for cleantech manufacturing. This is critical for European battery manufacturers to scale production and survive the high-risk ramp-up phase against global competitors.

- Fossil phase-out: the immediate elimination of all remaining fossil fuel subsidies and infrastructure support from EU budget lines.
- Reforming the EU Innovation Fund, so that it evolves beyond demonstration towards large-scale deployment of clean technologies. The EU should frontload ETS revenues to turbocharge climate investments, building on the [pilot initiative](#) of the EIB with ETS2 revenues.

A credible financing architecture must move beyond demonstration projects toward large-scale market creation. T&E supports the creation of a Market Intermediary for E-Fuels, as proposed by the European Commission in its Sustainable Transport Investment Plan ([STIP](#)). Under this market intermediary, the EU should implement double-sided auctions for aviation and maritime e-fuels. This mechanism, potentially linked to the proposed Industrial Decarbonisation Bank, would bridge the price gap between expensive e-fuels and fossil equivalents, providing long-term certainty for producers and off-takers. This intermediary should work in synergy with the Competitiveness Fund, ensuring that public money de-risks the most difficult-to-abate sectors while securing European lead-market status in synthetic fuel production.

Tackling the grid bottleneck

The investment gap is no longer just about the volume of capital, it is about the governance of infrastructure. Grid congestion has become the primary bottleneck for electrification.

[E3G](#) identifies grid governance, not capital availability per se, as the central bottleneck. Despite wind and solar supplying nearly half of EU electricity in 2024, economy-wide electrification has stagnated, rising only 1–2 percentage points over two decades. Currently, three times more renewable projects are stuck in grid connection queues than are needed to reach 2030 goals, while curtailment costs reached €7.2 billion across just seven Member States in 2024.

[Bruegel](#) identifies a further structural flaw: the lack of an independent, EU-level assessment of network investment needs. Cross-border funding via the Connecting Europe Facility - Energy (CEF-E) stands at only €5.8 billion for 2021-2027. While the Commission proposes an increase to €29.9 billion for 2028-2034, [Ember's analysis](#) finds a remaining €30 billion public investment gap for interconnection targets to 2040 even after this boost.

To close the competitiveness gap between fossil-based and electrified production, [Eurelectric](#) has proposed a European Electrification Bank acting as a "one-stop-shop" for de-risking and deploying mezzanine capital and guarantee instruments. While the Commission announced a broader Industrial Decarbonisation Bank targeting €100 billion from public and private resources, it is vital that this instrument focuses specifically on electrification pathways.

The [I4CE/ECNO 2025 report](#) reinforces the urgency: fossil fuel subsidies and investments in fossil fuel supply continue to rise even as financial support for electrification stalls. The EU is effectively under-investing in the transition while actively subsidising the infrastructure it seeks to displace. The post-2030 architecture must move beyond adding more instruments toward better-governed, better-targeted, and better-sequenced ones.

Our recommendations:

- Governance reform must accompany financing: an independent EU-level assessment of grid investment needs, stronger cross-border planning mandates, and streamlined connection procedures are essential to ensure that available capital translates into timely deployment rather than persistent bottlenecks.
- The proposed Industrial Decarbonisation Bank should provide guarantees, blended finance, and auction-based support targeted specifically at industrial and system electrification.
- Boost the Connecting Europe Facility (CEF-E) for cross-border grids investments.

ETS2 and the Social Climate Fund: ensuring a just transition

Revenues from ETS2 should be regarded as a core pillar of the EU's electrification strategy, not merely a fiscal by-product of carbon pricing. A substantial share should be directed towards structural investments that accelerate electrification while protecting vulnerable households.

The Social Climate Fund plays a crucial role here. As energy and mobility systems electrify, households face upfront costs for heat pumps, renovation and electric vehicles. A significantly strengthened SCF, extended beyond 2032, would ensure vulnerable households can participate in the transition – protecting social cohesion while accelerating clean technology deployment.

Section 4

Strengthening National Delivery Beyond 2030

The current European climate policy architecture is regulated by different legal instruments. Beginning with the ETS1, which translates EU climate targets into a binding emissions cap for covered sectors followed by the [Effort Sharing Regulation \(ESR\)](#), which sets nationally binding targets for those emissions which are not covered by ETS1. From 2028 onwards, emissions from road transport and buildings – the two largest ESR sectors – as well as small industries will also be covered by ETS2. Agriculture and waste remain outside ETS2's scope and will continue to be governed solely by national targets. Currently, the ESR targets end in 2030. In contrast, the ETS Directive does not contain a sunset clause.

The ETS1 has become an [effective tool in reducing emissions](#) at the EU level. While the EU ETS provides a harmonised carbon price for covered sectors, experience since 2020 has shown that [EU-level price signals alone](#) are not sufficient to guarantee balanced and comprehensive national delivery. For this reason, binding climate targets on Member States are a must after 2030. National climate targets play an essential role in EU climate policies as they fulfill two main purposes: they hold governments accountable for the implementation of their climate policies into its national legislations and the subsequent achievement of their emission reduction targets; and they allow Member States to refine and adapt climate policies into their specific national circumstances.

Under ETS1, member states' roles are largely administrative – running auctions, maintaining registries, enforcing compliance at firm level – and while they receive revenues from allowance auctions as well as through instruments such as the Innovation Fund and Modernisation Fund, they do not carry legal

responsibility for aggregate emission outcomes. Legally binding national climate targets are therefore a necessary complement to carbon pricing, not an optional overlay.

Against this backdrop, the key challenge for the post-2030 climate architecture is the design of national climate targets that effectively complement the ETSs and re-anchor responsibility at the Member State level.

Recent policy analysis has examined how national targets could function within the EU's post-2030 climate architecture. In particular, research conducted by [Ecologic Institute](#) explores the implications of maintaining the current regulatory structure based on the Effort Sharing Regulation and the LULUCF framework as well as alternative approaches relying on economy-wide national emission targets. Building on this analysis, the following section first assesses the strengths and limitations of the current regulatory system and then explores how national targets could also evolve towards a more integrated economy-wide framework.

Extending ESR Beyond 2030

ESR has demonstrated both value and limitations. By setting binding annual emission allocations, [the ESR created](#) clear trajectories, planning certainty, and direct political accountability for sectors outside the ETS. However, enforcement has proven a persistent weakness: [T&E analysis from 2024](#) found 12 member states on course to miss their 2030 targets. Any post-2030 architecture that builds on the ESR model must therefore address these enforcement failures directly.

The current architecture, in which the ESR governs emissions from sectors outside ETS1 scope and the [Land Use, Land-Use Change, and Forestry \(LULUCF\) regulation](#) addresses land sector emissions, together provides near-comprehensive coverage of the non-ETS economy, enjoys broad Member State acceptance and is therefore politically the path of least resistance. Extending the ESR beyond 2030 would build on existing legal and institutional structures, providing continuity and predictability. The European Climate Law permits such an extension, and established compliance mechanisms – annual emission allocations and corrective measures – could continue to operate without substantial legislative change.

Lessons from the past design of the ESR, including the management of surplus annual emission allocations (AEAs), suggest that careful calibration of post-2030 targets will be necessary to align with the EU's 2040 climate ambitions. Interaction with LULUCF accounting and sectoral coverage will also influence the overall effectiveness of this option.

From 2028, ETS2 will extend carbon pricing to road transport and buildings – sectors that will simultaneously remain within ESR scope – significantly broadening the reach of carbon pricing across the economy. This intentional overlap is a feature, not a flaw: national targets ensure Member State [accountability](#) for emissions outcomes, [complementing rather than competing](#) with the ETS2 price signal, and guarding against over-reliance on carbon pricing alone. Coordination will nonetheless require clarity on sectoral scopes and calibration of flexibility mechanisms to avoid inefficiency.

The distribution of emissions reduction obligations between Member States remains politically sensitive. While the ESR does not legally prescribe a method for allocating national targets, recital 19 confirms the continued relevance of the GDP-based allocation formula applied to previous target-setting exercises. This approach has contributed to the acceptability of the ESR among Member States and could facilitate negotiations over post-2030 targets.

Existing flexibility mechanisms, such as banking, borrowing, and transfers between Member States, would continue to provide cost-efficiency, though adjustments may be needed to ensure environmental integrity and maintain incentives for domestic action. Governance and oversight would also remain in place, with the European Scientific Advisory Board on Climate Change (ESABCC) retaining an advisory role under Article 15a. The Commission would be required to consider its reports when designing future measures, providing a mechanism to assess policy effectiveness and explore appropriate strategies for the post-2030 period.

Overall, extending the ESR–ETS architecture beyond 2030 would offer legal certainty, institutional continuity, and political familiarity. However, relying solely on an extension of the existing framework may not provide the stronger incentives and governance needed to deliver the deeper emissions reductions required for the EU’s long-term climate objectives.

Economy-Wide National Targets

In the current EU framework, Member State obligations are defined through a combination of sectoral instruments: binding national targets for ESR sectors, EU-wide emissions caps under the ETS, and national targets for the land-use sector under the LULUCF. While Member States provide economy-wide projections in their National Energy and Climate Plans, these do not constitute binding economy-wide targets. Looking beyond 2030, a post-2030 climate architecture could build on the governance logic of the ESR by introducing Member State economy-wide emission targets. Such targets would serve to re-engage Member States in three ways:

1. **Maintaining ownership:** National targets translate EU-level objectives into concrete domestic responsibilities, ensuring that climate policy is not perceived solely as an EU-driven pricing mechanism but as a shared governance framework.
2. **Ensuring comprehensive coverage:** Economy-wide targets would complement sectoral instruments such as the ETS, ESR and LULUCF by giving Member States a single, transparent benchmark for overall climate performance. This would help ensure that progress across sectors contributes coherently to national delivery of EU climate objectives. At the same time, such targets should be designed as an overlay rather than a substitute for sector-specific obligations, in order to avoid diluting responsibility for emissions reductions in sectors already governed by dedicated instruments.
3. **Providing flexibility within accountability:** As under the ESR, differentiated national targets combined with limited flexibility mechanisms allow Member States to design their domestic pathways while maintaining collective consistency.

Economy-wide national targets must resolve an ambiguity that the EU Climate Law itself leaves open: whether international aviation and shipping emissions fall within the scope of national climate obligations. The Climate Law does not explicitly address their treatment in the context of the 2040 target. The post-2030 architecture should close this gap explicitly, requiring that economy-wide national targets account for each Member State’s share of international aviation and shipping emissions. This is not only a matter of policy coherence; [it is what the Paris Agreement requires](#), which obliges parties to pursue economy-wide absolute emission reductions across all anthropogenic emission sources.

However, economy-wide targets remain contested. While they move in the direction of simplification, aggregating obligations across all sectors risks diluting sectoral accountability for emissions reductions. This concern underscores the importance of designing economy-wide targets as an overlay on, rather than a replacement for, existing sectoral instruments.

The European Climate Law could be amended to include an annex specifying [economy-wide climate targets for each Member State](#). However, it should be noted that this currently faces limited political support. These targets would cover all GHG emissions and removals, creating a unified framework that integrates national responsibilities directly into the European Climate Law. In design, this approach resembles the annexes used under ESR or the Kyoto Protocol, providing clarity and legal visibility for each Member State's obligations. The distribution of targets among Member States could, if desired, continue to rely on the GDP-based allocation formula applied under the current ESR following the principle of solidarity

The annex could be further detailed through several sub-options. One approach would distinguish between gross emission reductions and carbon removals, while another could further differentiate between temporary and permanent removals, limiting the share of targets that can be met with temporary removals. This would align with the [ESABCC's recommendation](#) to establish separate targets for gross reductions, temporary removals, and permanent removals, ensuring greater transparency and environmental integrity.

Embedding national targets in the European Climate Law would enhance legal certainty, sharpen accountability, and enable more structured monitoring and compliance – while offering a framework that explicitly addresses both emissions reductions and carbon removals. The approach requires more significant legislative change than a simple ESR extension, including adjustments to governance, reporting, and ETS coordination. But once established, economy-wide targets would actively serve the EU's simplification agenda: consolidating fragmented climate obligations into a single, transparent structure with clear lines of responsibility. Crucially, this would close the accountability gap that currently exists between EU-level carbon pricing and national delivery.

Economy-wide targets would ensure that every member state has a single, transparent obligation for its total climate performance. The Governance Regulation could support this by aligning the NECPs with the economy-wide obligation, creating a coherent link between national planning and the EU-wide neutrality objective. The [ongoing review of the Governance Regulation on the Energy Union and Climate Action](#) is therefore particularly relevant for the design of the post-2030 climate architecture. The outcome of this process will shape the role of national planning instruments and their relationship with binding national targets after 2030. Ensuring that NECPs function not only as reporting tools but also as implementation strategies for Member State obligations will be central to maintaining accountability within the future climate governance framework.

The design of the post-2030 national target architecture will be negotiated in a political environment that is actively hostile to binding obligations. Pressure to simplify and consolidate national planning into the Governance Regulation, and reduce sector-specific mandates is already visible in the RED IV and EED debates. The risk is that "simplification" becomes a vehicle for dissolving binding national accountability into looser planning requirements with no enforceable floor. The more that EU-level instruments like ETS2 are subject to price management and political adjustment, the more essential it is that member states carry a direct, legally binding responsibility for aggregate outcomes. Clear and predictable effort-sharing criteria are not a bureaucratic formality; they are the mechanism through which political ownership of the 2040 target is distributed and enforced at national level.

Section 5

Ensure ETS1, ETS2, CBAM and national targets work in synergy

The EU's carbon architecture –ETS1, ETS2, CBAM, and national targets– is most effective when these instruments operate in a coordinated and complementary manner, driving electrification and energy security. To achieve this, the various legal instruments currently in force should operate in a coordinated and complementary manner, working together to address and close any gaps that may arise in their respective scopes of implementation.

The current carbon market architecture

The EU ETS1 is a “cap-and-trade” system designed to put a price on emissions from industrial installations, power generation, intra-EEA aviation, and maritime transport (intra-EEA and 50% of extra-EEA voyages). Its objective is to deliver a [62% emissions reduction](#) by 2030 compared to 2005 levels. ETS2 will cover the CO₂ emissions from fuel combustion in buildings, road transport and additional sectors (mainly small industries not covered by the existing EU ETS).

Together, ETS1 and ETS2 are expected to regulate two-thirds to three-quarters of the total EU GHG emissions once ETS2 is fully operational, though precise coverage will depend on implementation and sectoral scope decisions. However, some sectors remain outside carbon pricing, notably non-CO₂ agricultural emissions and certain off-road transport activities.

Under current EU ETS aviation rules, only flights within the EEA and to/from Switzerland and to the UK are covered. International flights to/from other non-EEA countries are subject to the ICAO CORSIA scheme rather than the EU ETS, with the Commission required to review this arrangement in light of CORSIA's effectiveness. This means that a mere 30% of European aviation emissions are covered by the ETS1, T&E [finds](#).

ETS1 and ETS2 remain structurally separate. ETS1 regulates emissions at point source (downstream), while ETS2 regulates fuel suppliers upstream when fuels are placed on the market.

Guiding Principles for the Post-2030 Architecture

Looking beyond 2030, carbon pricing remains a powerful tool, but only within a well-designed, socially responsive and politically resilient framework. The following principles should guide reform:

- Carbon markets must complement, not substitute for, national climate action. Thus, both systems work together, creating synergies to achieve emissions reductions.
- All ETS2 revenues, including those channelled through the Social Climate Fund (SCF), should be used both to protect vulnerable households from higher fuel and heating costs and to fund structural investments in clean mobility and home renovation. Support must be well-targeted and delivered in advance of, not in response to, price increases, to ensure households can make the transition rather than simply absorb higher costs.
- Strong social and environmental safeguards must be structural features of EU climate tools, rather than treated as temporary compensatory measures. This includes durable protections for

low-income households, safeguards against regressive impacts, and rules that prevent costs from being passed on to households in ways that undermine public support.

- Market stability mechanisms must balance ambition with affordability, limiting excessive price volatility while preserving a clear long-term price signal. Post-2030 reforms should therefore aim to ensure the system can respond to shocks without unduly weakening incentives for emissions reductions – a difficult but necessary balancing act.
- Environmental integrity of the cap must remain paramount in any reform, including potential integration of removals. The ultimate purpose of reducing emissions should be kept as the cardinal point in designing flexibilities or complementary measures within the carbon markets scheme. Any integration of removals must be strictly limited, transparently governed, and supplementary to—rather than a substitute for—direct emissions reductions.

The “endgame” of ETS1: when the cap reaches zero

Under the current Linear Reduction Factor (LRF) - which reduces the ETS cap by 4.3% of the 2021 reference cap in absolute terms each year,² - the ETS1 cap is projected to reach zero around 2040 (with aviation reaching zero in 2044).

However, this trajectory does not imply the complete elimination of emissions under the covered sectors. Even once the cap reaches zero, banked allowances will remain in circulation and can continue to be used for compliance. Moreover, residual emissions, particularly in key sectors such as cement, chemicals and aviation are expected to persist. These hard-to-abate sectors, which depend on processes or energy sources which are very difficult to make carbon neutral with current technologies. [According to a 2024 report from the International Renewable Energy Agency \(IRENA\)](#), none of these hard-to-abate sectors are currently on track to reach net-zero emissions by 2050.

As the cap tightens and allowances become scarce, [carbon prices are likely to increase significantly](#). Market actors may bank allowances now in anticipation of higher future prices, which increases current demand for allowances and can push up near-term prices ahead of actual physical scarcity. While high carbon prices can strengthen investment signals and level the playing fields between fossil fuels and clean technologies, excessive price volatility and uncertainty can undermine political support and the carbon market’s efficacy in providing an investment signal.

Importantly, the [EU Climate law](#) has not yet defined *residual emissions*. It sets the objective of climate neutrality by 2050 but does not define what qualifies as residual emissions. The transition from deep decarbonisation to net zero will require rethinking the role of carbon markets: preventing re-entry of emissions and eventually enabling negative emissions.

ETS2: price uncertainty and social implications

ETS2 introduces carbon pricing in road transport and buildings—sectors with full cost pass-through to consumers. While it contains price control mechanisms, including a soft price cap through additional allowance releases if prices exceed €45/tCO₂ (in 2020 prices), price developments remain uncertain, especially as implementation has been delayed to 2028.

Because ETS2 directly affects households and small businesses through fuel and heating costs, its price dynamics are highly visible and politically sensitive. Wide uncertainty over future allowance prices increases the risk of social backlash if carbon pricing is not accompanied by strong structural

² The system’s reference cap is [defined as](#) the average annual volume of allowances issued over 2008-2012.

measures. Complementary policies—such as ambitious vehicle CO₂ standards, large-scale building renovation programmes, and effective use of the SCF and overall ETS2 revenues—are therefore essential to reduce demand for fossil fuels, contain price pressure, and ensure a fair distribution of costs and benefits. Carbon pricing alone cannot overcome the structural barriers to decarbonisation in transport and buildings, and without parallel regulation and targeted social support, ETS2 risks undermining public acceptance rather than enabling a just transition.

Market Stability and the MSR

The Market Stability Reserve (MSR) plays a central role in adjusting supply in ETS1. However, as the cap tightens toward zero, its current design – triggered by the Total Number of Allowances in Circulation (TNAC) – may become progressively less fit for purpose. The MSR was conceived for a market characterised by persistent oversupply; as the system transitions to structural scarcity, the withdrawal mechanism becomes less relevant and the release mechanism more so. A separate risk arises from banking behaviour: if firms accumulate large volumes of allowances in anticipation of future price rises, these allowances are counted within the TNAC as "in circulation," inflating the apparent supply figure. This could cause the MSR to withdraw allowances – tightening supply further – precisely when prices are already rising due to hoarding expectations, compounding rather than correcting price pressure.

Future reforms may need to balance environmental integrity with affordability and political sustainability. Options discussed [in the literature](#) include linking supply adjustments more directly to price developments, adjusting MSR intake rules, or introducing mechanisms to prevent excessive hoarding. Any reform must preserve the credibility of the cap while avoiding destabilising price spikes.

Complementarity with Sectoral and National Policies

Carbon pricing does not, on its own, deliver structural transformation. The ETS must operate alongside industrial policy, regulatory standards, and public investment. Complementary measures may include:

- Robust car and truck CO₂ standards, corporate fleet electrification, and EV leasing;
- Aviation and shipping sustainable fuel mandates and policies for zero-emission technologies;
- Stronger industrial decarbonisation roadmaps;
- Higher recycling and circularity targets;
- Ecodesign and product standards;
- Fossil fuel phase-out strategies;

These sectoral instruments are not merely complementary to carbon pricing – they are independently necessary, and must be preserved as such. As the post-2030 architecture is negotiated, there will be pressure to simplify by consolidating sectoral obligations into broader carbon market frameworks, on the grounds that a sufficiently high carbon price renders dedicated regulation redundant. This logic should be resisted. Car and truck CO₂ standards, and aviation and shipping fuel mandates, address market failures, investment cycles, and technology adoption barriers that carbon pricing alone cannot resolve. They must remain as freestanding instruments in the post-2030 framework – not absorbed into, or traded off against, a wider ETS architecture.

Extending carbon pricing should not replace national climate targets. A future evolution of EU governance could move beyond the current ESR system – which applies to sectors outside ETS1 – toward economy-wide national targets, ensuring that Member States remain responsible for driving domestic decarbonisation alongside EU-wide carbon markets.

A further integrity challenge concerns the treatment of biomass-based fuels under the EU ETS. Under current accounting rules, emissions from the combustion of biomass are generally treated as zero-rated when the fuels meet sustainability criteria under the RED. This means that liquid biofuels, biogas and other biomass-derived fuels are effectively not carbon priced at the point of combustion. This raises environmental integrity concerns where lifecycle emissions are significant or sustainability criteria are weakly enforced. It can also create tensions with RED sustainability accounting, which recognises that biomass pathways may still generate significant lifecycle emissions. Coherent treatment between the ETS and RED frameworks will therefore become increasingly important to avoid undermining the carbon price signal or incentivising high-emissions biomass pathways.

Options for Structural Reform: Merge, Extend or Redesign?

Several structural options are debated for the post-2030 period. A merged ETS1–ETS2 market would in theory increase liquidity and equalise marginal abatement costs. In practice, however, it would create significant social and political risks by imposing a uniform carbon price across sectors with very different cost structures and levels of social sensitivity. In particular, it could shift allowance demand toward transport and buildings – where abatement costs are higher and costs are passed directly to consumers – while removing the ability to manage price impacts separately, including mechanisms such as the ETS2 soft price cap. This could create fairness concerns and undermine national targets unless accompanied by stronger sectoral regulation and reinforced social protection. For these reasons, an ETS1–ETS2 merger should be treated with caution and would require robust safeguards for price stability, social fairness and the integrity of national climate targets.

More broadly, while economy-wide carbon pricing may be economically efficient in theory, it is insufficient on its own to overcome structural and social barriers to decarbonisation. Strong complementary regulation would therefore remain necessary. As emissions approach zero and technologies mature, the relative advantage of cap-and-trade over regulatory standards may diminish. However, replacing the ETS with a tax would face significant legal and political constraints, suggesting that gradual evolution of the current system is the more realistic path.

ETS and CBAM: Competitiveness and Carbon Leakage

The phase-out of free allocation and the gradual introduction of the Carbon Border Adjustment Mechanism (CBAM) marks a structural shift in EU climate policy. In the long term, CBAM should be progressively expanded to become the primary carbon leakage instrument across a broader range of sectors, ensuring imported products face a comparable carbon cost to EU producers. This will require both sectoral expansion and effective international engagement to prevent trade disputes.

As free allocation is phased out and ETS coverage deepens, the coherence between ETS scope and CBAM becomes increasingly critical. CBAM must expand in step with the removal of free allocation – not lag behind it – or the EU risks undermining both the price signal and the competitiveness case that justified free allocation in the first place. Beyond its immediate function as a carbon leakage instrument, CBAM carries a broader strategic purpose: to demonstrate that ambitious domestic carbon pricing and international trade competitiveness are compatible, and to create positive pressure for carbon pricing convergence among trading partners. This potential should be actively pursued through EU trade diplomacy rather than treated as a side effect.

The coherence of the post-2030 architecture ultimately depends on whether ETS1, ETS2, CBAM, national targets, and sectoral regulation are designed to reinforce one another or allowed to drift into

inconsistency. Carbon pricing is a powerful instrument, but it cannot carry the weight of the 2040 target alone – and the political risks of asking it to are already visible in the ETS2 delay and the persistent pressure to soften MSR parameters. The task for post-2030 reform is not to choose between carbon markets and national action, but to ensure that each instrument does what it does best: the ETS provides a long-run price signal and drives innovation in covered sectors; CBAM protects the integrity of that signal at the border; national targets ensure member states bear direct accountability for aggregate outcomes; and sectoral regulation addresses the structural barriers that pricing alone cannot overcome. Getting these relationships right – in law, in governance, and in political sequencing – is the central challenge of the post-2030 climate architecture.

Section 6

Exercise caution with flexibilities, offsets and international credits

The inclusion of international carbon credits in the EU's 2040 climate target marks a significant shift in European climate policy. For the first time, the EU has opened the door to counting emissions reductions achieved outside its borders toward a domestic climate commitment. Used well, this flexibility could help direct finance toward high-integrity climate action in Global South countries and address genuinely hard-to-abate residual emissions where domestic options are exhausted. Used poorly, it risks becoming a mechanism for delaying structural change at home, undermining the credibility of the EU's net-zero trajectory, and repeating the integrity failures of earlier international offsetting schemes. The design of this flexibility – how much is allowed, for which sectors, under what eligibility criteria, and with what governance – will determine which outcome prevails. International credits must complement, not substitute for, domestic emissions reductions; eligibility must be confined to genuinely residual emissions where abatement options have been exhausted; and integrity standards must be set at a level that previous voluntary and compliance markets have consistently failed to reach. The provisions agreed in the amended European Climate Law set the parameters, but the critical decisions on implementation lie ahead.

The amended European Climate Law for the 2040 target included the usage of international carbon credits through article 6 of the [Paris Agreement](#). The amendment specified a contribution from credits under article 6 of the Paris Agreement up to 5% of 1990 net GHG emissions, corresponding to a domestic reduction of net GHG emissions by 85%. A pilot period from 2031 to 2035 is foreseen to initiate a high-quality international credit market. The purpose is to build institutional capacity and supply chains ahead of the 2036–2040 compliance period, though the precise status of pilot-phase credits in relation to targets remains to be defined. The intention seems to be to ensure that a supply of 'high-quality' credits is available in 2036 and beyond. The pilot phase would enable actors to set up procedures and institutions and it will provide potential sellers with first experiences, revenue streams and possibilities to negotiate supply contracts for the period until 2040.

The debate around the usage of international carbon credits hinges on a trade-off: on one side, there is flexibility and potential cost efficiency, and on the other, credibility, integrity, and equity. Thus, for the integrity of the climate policies to remain intact, the design of this flexibility must be tightly constrained and limited to solely complement domestic emissions reductions, not to replace them.

Future-Proofing Flexibilities in the Regulatory Framework

In the context of the post-2030 climate architecture, the inclusion of international carbon credits should be accompanied by a carefully designed international carbon credits framework, reflecting forthcoming criteria to be defined by the Commission and incorporating safeguards to ensure environmental integrity and mitigate associated risks. Therefore, the [recommendations from the Florence School of Regulation](#) could be used as a guiding framework for this purpose:

First, establishing **multiple, clearly differentiated targets** – covering domestic emissions reductions, gross reductions, and net outcomes – would be essential to effectively track progress and identify gaps that may justify the limited use of international credits. Assessing the implications of these targets by sector and by Member State would further support transparency and accountability. In this context, sectors that are particularly difficult to abate and characterised by high residual emissions could be considered initial candidates for the use of credits. The rationale for allowing credits should remain strictly confined to addressing residual emissions and should not serve as a substitute for climate finance or broader development objectives.

Second, the EU should define **strict eligibility criteria and high-integrity standards** for international carbon credits. Key eligibility criteria [should include a guarantee](#) that the EU and third countries purchase and use credits that contribute to GHG emission reduction targets compatible with the Paris Agreement's objective to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. Moreover, the projects underpinning those credits should put in place transformative activities, while the net removal benefits generated by these credits should be measurable, verifiable, transparent, and respect human rights. If these stringent criteria cannot be guaranteed, international carbon credits should not form part of the EU's target.

The [Oxford Offsetting Principles](#) and the [ICVCM Core Carbon Principles](#) provide a useful reference point, though both were designed primarily for voluntary corporate offsetting rather than sovereign climate target compliance – a context in which the stakes, legal obligations, and accountability mechanisms are fundamentally different. Adapted to the EU policy context, their core logic points in a consistent direction: emissions reduction must take unambiguous priority over the use of credits, with offsets reserved for genuinely residual emissions where abatement options have been exhausted rather than as a cost-saving alternative to domestic action. Where credits are used, they should progressively shift toward removals with durable, long-term storage rather than emissions avoidance, reflecting the physical reality that compensating for residual emissions by 2050 requires permanent sequestration rather than temporary abatement elsewhere. The EU should also treat the pilot period as an opportunity to actively build the institutional and contractual infrastructure for high-integrity credit supply – demand signals, long-term procurement frameworks, and investment in removal technologies – rather than waiting for a mature market to emerge independently. What these principles cannot resolve, however, is the fundamental governance gap between voluntary corporate commitments and legally binding sovereign obligations: the EU will need rules that go significantly beyond what voluntary frameworks require, including mandatory corresponding adjustments, independent verification, and enforceable eligibility criteria that apply uniformly across member states.

Two frameworks published in 2025 provide more appropriate guidance for sovereign use of international credits than the earlier Oxford Offsetting Principles, which were designed for voluntary corporate offsetting. The Oxford Principles for Responsible Engagement with Article 6 and the [Oeko-Institut's conditions for EU credit use](#) both start from the same premise: international credits must raise NDC ambition rather than substitute for domestic action, and buyer countries must demonstrate robust

domestic effort before relying on credits to bridge any remaining gap. The Oeko-Institut conditions go further in specifying that for the EU this means credits can only be used to move beyond a 90–95% domestic reduction level. Both frameworks also require that credits be generated exclusively through the Paris Agreement Crediting Mechanism or standards of equivalent integrity, that corresponding adjustments be applied in all cases, and that a meaningful share of emission reductions be retained by the seller country to support their own NDC ambition – rather than treating the full volume as a commodity available for transfer. On permanence, both are clear that credits subject to reversal risk require a like-for-like replacement approach. The EU's implementation framework will need to translate these principles into legally binding eligibility criteria enforced uniformly across member states.

The EU could consider a centralised procurement framework – building on the experience of joint gas purchasing under REPowerEU – to negotiate credits on behalf of member states, ensuring quality standards and preventing competitive pressure to accept lower-integrity credits.

Any flexibility mechanism involving international credits should be **closely coordinated with the broader EU climate policy framework**. This includes coherence with other flexibility instruments, such as the EU Carbon Removals and Carbon Farming Regulation, as well as indirect interactions with ETS1 and ETS2, CBAM, and potential international obligations under CORSIA or the International Maritime Organization (IMO). The pilot phase foreseen in the provisional agreement could provide valuable insights into how such coordination might function in practice.

Finally, the use of international credits by the EU should not undermine the ability of host countries to achieve their own emissions reduction targets. The use of international credits must not undermine host countries' ability to meet their own NDC commitments. Credits should only be counted where corresponding adjustments are made by host countries to their own national accounts under Article 6, ensuring that the same emission reduction is not counted twice. The EU should complement credit purchases with continued grant-based climate finance, recognising these as distinct obligations.

Section 7

Define a constrained and credible role for carbon removals

Carbon dioxide removals (CDR) will play a role in supplementing emissions reductions to limit global temperature rise. They are the complement to emissions reductions, not the substitute. A firewall principle must govern this distinction: policy instruments that support carbon removals must never allow removals to replace emissions reductions where abatement options exist. This principle should be treated as the primary governing constraint on any CDR architecture the EU designs. Critically, premature integration of CDR into compliance systems – particularly while the ETS cap is still declining – risks inflating the effective cap and allowing sectors to offset rather than abate, which would fatally undermine the EU's mitigation trajectory. Treating emissions as equivalent to CDR by integrating them into the EU ETS ignores valid scientific concerns surrounding permanence, additionality, double claiming, carbon payback times, and equity.

Carbon removals differ substantially by technology and pathway, and technology neutrality cannot be treated as a default design principle for CDR governance. The climate mitigation risks, environmental and wider system impacts of CDR vary enormously depending on the method. Leaving technology

selection to market forces alone is likely to produce suboptimal outcomes. Policy design must therefore actively differentiate between CDR categories and apply method-specific governance.

Removals should remain supplementary and limited, planned against clearly identified residual emissions rather than used as broad flexibility mechanisms that reduce pressure on emissions reduction. Mitigation deterrence is the risk that the availability of removals weakens near-term decarbonisation incentives and is the central governance challenge this architecture must address.

In late 2024, the [EU Carbon Removal Certification Framework \(CRCF\)](#) established standards for removals, and under the CRCF the Commission [adopted](#) voluntary methodologies covering DACCS, BECCS and biochar in February 2026. The CRCF's framework architecture has been broadly welcomed as a necessary first step, but independent analysis of the certification methodologies – particularly those adopted for permanent removals on 3 February 2026 – has been persistently and substantially critical. The most rigorous technical assessment, a joint analysis by Carbon Market Watch and Oeko-Institut published in August 2025 titled [Faulty to the Core](#), examined the draft DACCS, BECCS and biochar delegated act and concluded that the proposed methodologies were "among the lowest quality methodologies" the Öko-Institut had reviewed, warning that without fundamental revision "the CRCF could seriously undermine EU climate action." The analysis identified four structural flaws: weak additionality criteria that ignore the distorting effect of public subsidies already being disbursed; blanket carbon neutrality for all biomass, without accounting for indirect land use change or restricting high-risk feedstocks such as forest biomass; inadequate long-term monitoring and liability provisions for biochar; and the absence of any defined compliance use case, meaning it is difficult to assess whether the methodologies are fit for purpose.

A subsequent [benchmarking exercise by Carbon Market Watch](#) scored the revised CRCF methodologies at 1–2 out of 5 against the Paris Agreement Crediting Mechanism. Despite these warnings, the Commission proceeded with adoption in February 2026 without resolving the core concerns, prompting Carbon Market Watch to call for [Parliament and Council to reject the delegated act](#). Bellona, meanwhile, has [raised](#) a further systemic concern: the Commission's emerging thinking – outlined at the February 2026 Carbon Farming Expert Group – suggests CRCF units could be linked to the achievement of post-2030 national climate targets and potentially used for compliance purposes, including under a revised ETS. As Bellona warned, treating removals as a compliance flexibility risks weakening the signal to cut emissions and creates a false equivalence between emissions reductions and removals – a concern that is materially heightened when the quality of the underlying methodologies remains contested.

The EU should define a **constrained and credible role for removals**. Such an approach would:

- Maintain a strict distinction between permanent geological storage and temporary land-based sequestration.
- Firewall first: no integration of removals into ETS1 or ETS2 while the emissions cap is still declining, as this would allow offsetting rather than abating.
- Link removals to clearly identified residual emissions in sectors where zero-emissions pathways are genuinely unavailable, not as a broad flexibility mechanism.
- Technology-active governance: CDR policy must actively shape the technology mix rather than leaving selection to market forces.
- Support early deployment through innovation funding, pilot markets, and dedicated removal instruments instead of weakening the carbon price signal.

A long-term European climate architecture should therefore evolve toward a three-part structure:

- (1) a robust and declining gross emissions reduction pathway;
- (2) a clearly defined residual emissions envelope; and
- (3) a dedicated removal pillar governed by strict integrity criteria and permanence differentiation.

By defining removals as a carefully governed balancing instrument – rather than a flexible compliance shortcut – the EU can safeguard both environmental integrity and long-term climate credibility.

1. Clear Distinction Between Permanent and Temporary Removals

The IPCC [defines](#) CDR as anthropogenic activities that remove CO₂ from the atmosphere and store it *durably* – a word that is central to the concept, since it explicitly excludes temporary forms of carbon storage from the definition of CDR altogether. The EU's post-2030 climate architecture must therefore differentiate between: permanent geological storage, including DACCS and BECCS, with verified geological storage and temporary or reversible land-based sequestration, including soil carbon and forestry. It is, however, important to note that BECCS biomass feedstocks can often result in land-use, biodiversity or water-use impacts. Further, the carbon neutrality of the biogenic feedstock needs careful monitoring, with woody biomass often suffering from long carbon payback periods. Any EU framework that lists BECCS as a straightforward example of permanent geological CDR risks creating a compliance pathway that undermines rather than advances climate objectives.

The permanent/temporary distinction is essential because fossil emissions are effectively permanent on climate timescales. Using temporary removals to compensate for permanent emissions creates long-term climate risks. In theory, permanent CDR methods deliver long-term climate benefits by storing carbon away for centuries to millennia, but are expensive and technologically complex with significant energy requirements. In contrast, temporary removals from forests, soils, and other biogenic sinks are inherently vulnerable to reversal from climate impacts (e.g., wildfires, pests, droughts) or land-use changes, but are relatively cheap.

There are also governance and liability implications. Long-term responsibility for potential reversals; whether from geological storage failure or land-based sink deterioration; remains weakly defined in many jurisdictions. High-integrity MRV, enforcement, and robust long-term liability frameworks are essential prerequisites before CDR credits can be reliably used in compliance contexts. The EU should ensure explicit liability provisions for reversal risk.

Defining [separate targets for permanent and temporary removals](#) can therefore reduce policy ambiguity and create clearer long-term demand signals. Demand certainty is particularly critical for scaling permanent CDR, which requires substantial upfront investment, infrastructure development (e.g., CO₂ transport and storage networks), and sustained public funding support to achieve cost reductions. Clear regulatory direction enables investors and innovators to make strategic, method-specific decisions – whether in land-based practices or industrial-scale CDR technologies – without the risk that temporary removals crowd out permanent solutions in compliance markets.

Separate targets also allow for differentiated policy instruments that are fit for purpose and avoid overreliance on any single method or sector. Temporary removals can be governed through land-use and ecosystem policies with strong reversal safeguards, while permanent removals can be supported through innovation funds, contracts for difference, or dedicated procurement mechanisms that build long-term capacity.

2. Avoiding integration of removals into EU ETS while the cap is declining

The firewall principle; that removals must never be allowed to replace emissions reductions where abatement options exist; has a direct timing implication: CDR should not be integrated into the EU ETS while the emissions cap is still declining. This is not primarily a technical design question; it is a principled constraint. If removals can substitute for emission reductions while the cap is still falling, the effective stringency of the cap is weakened, the scarcity signal is diluted, and decarbonisation investment in covered sectors is reduced. Where the ETS cap is not yet at zero, all CDR integration options risk becoming offsetting mechanisms that inflate the cap.

The potential integration of CDR into the EU ETS raises further fundamental design questions. The EU ETS cap declines every year through the Linear Reduction Factor (LRF) and will continue to do so through 2030 and beyond. Any integration of CDR before the cap approaches zero or residual emissions are clearly defined risks the integrity of this trajectory. Integrating removals before the mitigation objective of the EU ETS is fulfilled would risk offsetting emissions rather than reducing them, weakening the cap. In the short to medium term, this risk is compounded by price dynamics: current carbon prices remain below the cost of most durable removal technologies, meaning premature integration could undermine mitigation without creating a viable removals market.

Rather than framing post-2030 ETS integration as the primary instrument for supporting CDR, the EU should consider a dedicated [Removal Trading Scheme](#) (RTS) [operating in parallel](#) with the ETS. An RTS in which covered entities have an obligation to remove and store carbon, governed by the standards of the CRCF is the governance instrument most likely to ensure removals remain genuinely separate from emission reductions. This avoids the fundamental tension inherent in integrating removals into a cap-and-trade system designed for emission abatement, and preserves the environmental integrity of both instruments.

Section 8

Address non-CO₂ emissions from aviation

The International Civil Aviation Organisation (ICAO) forecasted that by 2050 international aviation [emissions could triple compared to 2015](#). In 2022, direct emissions from aviation accounted for [3.8% to 4%](#) of total EU GHG emissions. In addition to managing CO₂ emissions and removals, the post-2030 energy and climate architecture framework must capture all major sources of climate impact. Non-CO₂ emissions from aviation and international transport represent a significant share of the EU's climate footprint, yet remain insufficiently addressed. Incorporating these emissions into the regulatory architecture – through monitoring, reporting, and mitigation measures – is critical to preserve the integrity of the EU's climate targets.

This section reproduces the analysis presented by T&E in a [report published in September 2025](#).

The EU ETS currently regulates aviation CO₂ emissions, although it is recognised that there are other aviation emissions that contribute to the sector's climate impact, including emissions of oxides of nitrogen (NO_x), soot particles, oxidised sulphur species, and water vapour.

It is estimated that non-CO₂ aviation effects represent at [least half of aviation's climate impact](#). These effects were recognised by the [IPCC over 25 years ago](#). Yet, there is hardly any legislation regulating non-CO₂ aviation effects in the EU or worldwide. We must both address aviation's CO₂ and non-CO₂ effects if we are to effectively reduce aviation's overall climate footprint. Even if we meet our GHG emission reduction targets, contrail warming and other non-CO₂ aviation effects must also be mitigated to stay on track with the Paris Agreement's temperature goals. Crucially, research in the area shows that mitigation solutions can be deployed at scale in the coming decades, especially for contrails. The EU's action to reach climate neutrality by 2050 and its 2040 goals should therefore incorporate and strengthen the mitigation of CO₂ and non-CO₂ GHGs from aviation.

This is possible via different legislative avenues:

- By monitoring and incentivising action on non-CO₂ aviation effects in the EU ETS: since January 2025, the EU requires aviation's non-CO₂ emission data collection through a Monitoring, Reporting and Verification (MRV) scheme under the ETS1. Although the geographical scope of the MRV was regrettably reduced to EEA-only for 2025 and 2026, it remains a key tool for better understanding and measuring non-CO₂ aviation effects. The automatic expansion of the scheme to full scope in 2027, as intended in the EU ETS, is pivotal. By the end of 2027, the Commission is expected to deliver a report on the results of the MRV and, if appropriate, to make a legislative proposal to address non-CO₂ aviation effects. Addressing non-CO₂ aviation effects under the ETS (and in other legislative texts relating to climate and aviation) will be key to climate mitigation.
- By adapting the European Air Traffic Management (ATM) for contrail avoidance: the current European ATM system must be modernised and adapted to support contrail-avoiding operations. This could involve updating the environmental and climate (K)PIs of the Single European Sky II+ Charging and Performance Scheme to include non-CO₂ emissions and updating the ATM Masterplan with concrete actions on contrail avoidance, and modulating air navigation charges to create direct financial incentives for airlines to adopt contrail-avoiding routing..

A final, possible legislative avenue is the inclusion of contrails and non-CO₂ GHG emissions in climate targets (such as the NDCs and the EU's climate targets). Additional climate targets must ensure appropriate levels of coverage in both setting direct reduction targets and ensuring the polluter pays principle (PPP). The Commission must account for non-CO₂ emissions and mitigation measures for the 2030–2050 GHG budget, the 2040 target, and the design of policy tools to meet EU climate goals.

The European Climate Law indicates a clear aspiration for the EU to support the global temperature goals enshrined in the Paris Agreement. In light of growing scientific consensus on harmful impacts of non-CO₂ GHG effects, failure to include them undermines the aspiration of the law and is out of kilter with the science. But both the 2040 and the 2050 targets take the form of emission reduction targets by reference to a closed list of GHGs. This list mirrors the non-CO₂ GHGs defined in the Kyoto Protocol, rather than the more expansive definition found in the UNFCCC. No obligation currently exists to include climate forcing agents such as water vapour, NO_x, sulphur dioxide or soot particles within the 2040 target. Therefore, we advocate for the inclusion of a hard-edged legal obligation for the 2040 target to address these emissions in the text of the European Climate Law to indicate that it also refers to non-CO₂ GHG aviation effects. This can be done in two ways:

1. By amending Article 1 of the European Climate Law to indicate that the binding climate objectives set out in the Regulation do not refer exclusively to the closed Annex V List. A definition of non-CO₂ aviation effects for EU legislative purposes already exists at Article 3(v) of

the EU ETS Directive, as amended, and the European Climate Law could refer to this definition in addition to the Annex V List in amending the scope of the Regulation under Article 1.

2. By amending the Annex V List itself to include nitrous oxides other than N₂O, sulphur dioxide, and water vapour from aircraft exhausts and contrails. This could be done via a delegated act of the Commission but only in accordance with a decision adopted by the Parties to the UNFCCC and the Paris Agreement (Regulation 2018/1999, Article 26(6))

Key Terms and Acronyms

ATM — Air Traffic Management. The system of procedures, infrastructure and personnel used to manage the safe and efficient flow of aircraft through airspace. In the context of this report, ATM reform is identified as a necessary enabler for contrail avoidance, which requires airlines to make minor route adjustments that must be coordinated with air traffic controllers.

BECCS — Bioenergy with Carbon Capture and Storage. A carbon dioxide removal technology that combines the combustion of biomass for energy with the capture and permanent geological storage of the resulting CO₂ emissions. Because biomass absorbs CO₂ as it grows, BECCS can in theory deliver net negative emissions, though its scalability and sustainability credentials are contested.

CBAM — Carbon Border Adjustment Mechanism. An EU instrument that places a carbon price on imports of goods from countries with weaker or no carbon pricing, equivalent to the price paid by EU producers under the ETS. Its purpose is to prevent carbon leakage — the relocation of production to avoid EU carbon costs — and to incentivise third countries to adopt stronger climate policies. It applies to CBAM-goods imported from outside the EU, which include certain iron and steel goods, fertilizers, aluminum and cement goods, as well as hydrogen and imported electricity.

CDR — Carbon Dioxide Removal. Technologies and practices that actively remove CO₂ from the atmosphere and store it on a temporary or permanent basis. CDR encompasses a wide range of approaches including direct air carbon capture and storage (DACCS), bioenergy with carbon capture and storage (BECCS), biochar, and land-based sequestration such as afforestation and soil carbon. This report argues CDR must complement, not substitute for, emissions reductions.

CEF — Connecting Europe Facility (Energy). An EU funding instrument that finances cross-border energy infrastructure, including electricity interconnectors and gas pipelines. **CEF-E** is the energy-specific strand relevant to grid investment.

CID — Clean Industrial Deal. A European Commission initiative launched in 2025 to strengthen industrial competitiveness while advancing decarbonisation, with a particular focus on energy-intensive industries and clean technology manufacturing. This includes lowering energy prices, creating quality jobs and the right conditions for companies to thrive.

CORSIA — Carbon Offsetting and Reduction Scheme for International Aviation. A global carbon offsetting mechanism administered by ICAO, covering international aviation emissions. Under CORSIA, airlines must offset growth in CO₂ emissions above 2019 levels through the purchase of carbon credits. The EU ETS currently defers to CORSIA for extra-EEA flights, an arrangement subject to review in 2026.

CRCF — Carbon Removal Certification Framework. An EU regulatory framework, adopted in 2024, establishing methodologies for certifying carbon removals including DACCS, BECCS and biochar. The

report identifies significant methodological weaknesses in the CRCF as adopted, particularly around additionality, biomass accounting and monitoring integrity.

DACCS — Direct Air Carbon Capture and Storage. A technology that extracts CO₂ directly from ambient air using chemical processes and stores it permanently, typically in geological formations. DACCS is energy-intensive and currently expensive, but represents one of the few genuinely permanent CDR options.

EAP — Electrification Action Plan. A European Commission initiative setting out a strategy to accelerate the electrification of the EU economy across transport, heating, industry and other sectors in terms of both supply and demand. The EAP is expected to be a key vehicle for operationalising the post-2030 energy security and climate architecture.

ECF — European Competitiveness Fund. A proposed EU financing instrument designed to support industrial competitiveness and clean technology manufacturing, to be implemented primarily through InvestEU and the European Investment Bank. The report argues the ECF should serve as the primary vehicle for industrial electrification.

EEA — European Economic Area. The area comprises the 27 EU member states plus Iceland, Liechtenstein and Norway, which participate in the EU's internal market. The EEA is the primary geographic scope of the EU ETS for aviation.

EED — Energy Efficiency Directive. EU legislation establishing binding energy efficiency targets and obligations for member states. The current directive sets an 11.7% binding energy consumption reduction target by 2030. The report argues the post-2030 revision should preserve absolute demand reduction as the framework's foundation.

EIB — European Investment Bank. Is the EU's lending arm, providing financing for public and private investment aligned with EU policy objectives. It plays a central role in deploying EU climate finance, including as a key implementing partner of InvestEU. While not directly responsible for redistributing ETS2 revenues, it supports investments aligned with EU climate funding instruments.

ESABCC — European Scientific Advisory Board on Climate Change. An independent scientific body established under the European Climate Law in 2021 to provide advice on EU climate policy, including assessment of whether EU targets and measures are consistent with the Paris Agreement goals. Consists of 15 independent senior scientific experts covering a broad range of relevant disciplines. The ESABCC has recommended a 90–95% domestic emissions reduction target for 2040.

ESR — Effort Sharing Regulation. EU legislation establishing binding annual greenhouse gas emission reduction targets for member states, which differ from country to country, in sectors not covered by the EU ETS — primarily road transport, buildings, agriculture, waste and small industry. It spans all EU Member States, as well as Iceland and Norway. The ESR expires in 2030 and its successor architecture is a central subject of this report.

ETS — Emissions Trading System. A cap-and-trade mechanism that sets a ceiling on total greenhouse gas emissions from covered sectors, with the cap declining over time. Covered entities must hold allowances for each tonne of CO₂ they emit, which they can buy, sell or receive for free. See also ETS1 and ETS2.

ETS1 — EU Emissions Trading System (Phase 1/ existing system). The established EU carbon market covering large industrial installations, power generation, intra-EEA aviation and maritime transport. The ETS1 cap is projected to reach zero around 2040 under the current Linear Reduction Factor, though residual emissions from hard-to-abate sectors are expected to persist.

ETS2 — EU Emissions Trading System for buildings, road transport and small industry. A new, separate EU carbon market applying carbon pricing to the combustion of fuels in road transport, buildings and certain additional sectors, operational from 2028. ETS2 is designed to run in parallel with ETS1, with its own cap, price management mechanisms and Market Stability Reserve.

IDB — Industrial Decarbonisation Bank. A proposed EU financing instrument announced under the Clean Industrial Deal, targeting €100 billion in combined public and private finance for industrial decarbonisation across all pathways. The report argues this instrument should focus specifically on electrification.

ICAO — International Civil Aviation Organisation. A United Nations specialised agency responsible for setting international standards and regulations for civil aviation, including on emissions. ICAO administers the CORSIA offsetting scheme and has historically been the body through which states have attempted to address international aviation emissions.

IMO — International Maritime Organisation. A United Nations body responsible for regulating international shipping, including its environmental impacts. The IMO adopted a revised GHG strategy in 2023 with targets for net-zero emissions from international shipping by or around 2050.

IPCC — Intergovernmental Panel on Climate Change. The UN body responsible for assessing scientific knowledge on climate change, its impacts and response options. The IPCC's 1999 Special Report on Aviation and the Global Atmosphere was the first major scientific assessment of aviation's non-CO₂ climate effects.

IRENA — International Renewable Energy Agency. An intergovernmental organisation supporting countries in their transition to renewable energy, publishing analysis on renewable deployment, costs and policy.

LNG — Liquefied Natural Gas. Natural gas that has been cooled to liquid form for ease of storage and transport. Following the reduction of Russian pipeline gas imports after 2022, the EU substantially increased its LNG imports, primarily from the United States and Qatar, raising new energy security dependencies.

LRF — Linear Reduction Factor. The annual rate at which the EU ETS cap is reduced, expressed as a percentage of the 2021 reference cap. Under the current LRF of 4.3%, the ETS1 cap is projected to reach zero around 2040.

LULUCF — Land Use, Land-Use Change and Forestry. The sector of the EU climate framework governing greenhouse gas emissions and removals associated with land use, including forests, soils and wetlands. LULUCF is governed by a dedicated EU regulation and member states have binding national targets for net removals.

MFF — Multiannual Financial Framework. The EU's long-term budget, typically covering a seven-year period. The current MFF runs from 2021–2027; the next proposed MFF covers 2028–2034. The MFF determines the scale and targeting of EU climate spending, including through InvestEU, the Innovation Fund and the Connecting Europe Facility.

MRV — Monitoring, Reporting and Verification. A regulatory framework requiring entities to measure, report and have independently verified their greenhouse gas emissions. In the aviation context, the EU introduced a non-CO₂ MRV scheme from January 2025 covering intra-EEA flights, with expansion to all departing flights intended from 2027.

MSR — Market Stability Reserve. A mechanism within the EU ETS that automatically adjusts the supply of allowances based on the total number of allowances in circulation (TNAC), acting as a buffer against price volatility. Allowances are placed into or released from the reserve depending on whether TNAC exceeds or falls below defined thresholds.

NDC — Nationally Determined Contribution. A country's climate pledge under the Paris Agreement, setting out its targets and policies for reducing greenhouse gas emissions and adapting to climate change. NDCs are submitted every five years and are required to reflect progressively higher ambition.

NECP — National Energy and Climate Plan. A planning document that each EU member state must submit to the European Commission under the Governance Regulation, setting out how it intends to meet EU energy and climate targets. NECPs cover all five dimensions of the Energy Union and are updated every five years.

NOx — Nitrogen Oxides. Gases produced by combustion processes, including aircraft engines, that contribute to the formation of ozone at altitude (a warming effect) and the destruction of methane (a cooling effect), as well as to contrail formation. NOx is one of the principal non-CO₂ climate effects of aviation.

RED / RED III / RED IV — Renewable Energy Directive. EU legislation establishing binding targets for the share of renewable energy in the EU's energy mix and sectoral sub-targets. RED III (adopted 2023) set a binding 42.5% renewable target by 2030. RED IV refers to the forthcoming post-2030 revision, which is a central legislative file discussed in this report.

RTS — Removal Trading Scheme. A proposed dedicated compliance market for carbon dioxide removals, operating in parallel with the EU ETS rather than integrated within it. The report argues an RTS is preferable to integrating CDR into the ETS while the emissions cap is still declining.

SAF — Sustainable Aviation Fuel. Alternative fuels for aircraft that offer lifecycle greenhouse gas reductions relative to conventional kerosene. SAF encompasses biofuels, synthetic fuels (e-kerosene) and other alternatives. The ReFuelEU Aviation regulation mandates increasing SAF blending at EU airports from 2% in 2025 to 70% by 2050.

SCF — Social Climate Fund. An EU fund established under the ETS2 framework to support vulnerable households, micro-enterprises and transport users with the costs of the carbon price on fuel and heating. In order to benefit from the available funding, Member States should submit their final Social Climate Plans to the Commission. The SCF is funded from a share of ETS2 revenues and is currently designed to run from 2026 until 2032. This report argues it should be significantly expanded and extended beyond 2032.

SESAR — Single European Sky ATM Research. The EU's research and development programme for modernising European air traffic management, developing new technologies and operational concepts including for contrail avoidance.

SES II+ — Single European Sky II+. The updated regulatory framework for European air traffic management, including a performance and charging scheme under which air navigation service providers are assessed against key performance indicators. The report highlights the performance scheme as a vehicle for introducing climate KPIs covering non-CO₂ aviation effects.

STIP — Sustainable Transport Investment Plan. A European Commission initiative setting out a financing strategy for sustainable transport infrastructure and clean technology deployment, including a proposed market intermediary for e-fuels.

TNAC — Total Number of Allowances in Circulation. Is the measure of surplus allowances in the EU ETS, calculated using total allowances issued minus verified emissions (and adjusted for credits and the reserve), and it determines whether allowances are added to or released from the Market Stability Reserve.

UNFCCC — United Nations Framework Convention on Climate Change. The international treaty, adopted in 1992, establishing the framework for global climate governance. The Paris Agreement (2015) and Kyoto Protocol (1997) were adopted under the UNFCCC.

V2G — Vehicle-to-Grid. Technology enabling electric vehicles to discharge stored electricity back to the grid, providing flexibility services and supporting renewable energy integration. V2G is discussed in the report in the context of electrification as an energy security strategy