CARBON3 / WHITE PAPER / 2026

SCOPE 3 STRATEGY / CAPITAL ALLOCATION

When cutting beats buying.

The balance-sheet case for insetting over offsetting.

Most companies treat Scope 3 as an accounting problem. The winners are treating it as a capital-allocation decision. A value-chain simulation across four industries shows why real, in-chain emission cuts are already the cheaper strategy in most sectors, and why offsetting is quietly building a liability that grows every year.

A CARBON3 VALUE-CHAIN SIMULATION

CARBON3.NET
Singapore

IN BRIEF

Two choices that look the same, but aren't. On a net-zero report, offsetting and insetting look identical. They are not. Offsetting keeps emitting as usual and buys carbon credits to cancel it out on paper. Insetting actually cuts the emissions, inside the company's own supply chain.

Cutting in-house is already cheaper. This paper models both, from 2025 to 2050, across four industries: clothing and consumer goods, energy and power, food and farming, and steel. Cutting emissions in-house is already the cheaper option in three of the four today, and it wins in all four once carbon carries any real price.

Offsetting is a growing bill; insetting is an investment. With offsetting the real emissions stay, so the company buys credits again every year, and the bill grows as carbon prices and credit rules tighten. Insetting is a front-loaded investment that keeps paying off: the cheapest cuts come first, and the unit cost falls as low-carbon technology scales.

It comes down to one price. Cutting emissions in-house becomes the cheaper choice once a carbon credit costs more than about $20 a tonne for clothing, $24 for energy, $35 for food, and $72 for steel. On current forward outlooks, high-quality credit prices are heading toward and past those levels.

Figures are outputs of an illustrative value-chain model, not firm-specific data / see the method note on the final page.

THE STRATEGIC QUESTION

The decision hiding inside every net-zero pledge

A large share of the corporate world has now committed to net-zero-aligned targets. Far fewer have confronted the operational question that follows: *how* to hit them. For most companies the honest answer is that the bulk of their emissions are not in their own operations at all. They sit in the supply chain (Scope 3): in the steel, cement, chemicals, feed, fuel and freight they buy. That is exactly where they have the least data and the least control.

Faced with a target and a footprint they only partly control, companies default to one of two strategies. The first is **offsetting**: keep operating as usual and buy carbon credits to close the gap between real emissions and the headline claim. The second is **insetting**: pay for real cuts inside the supply chain, cheapest first, and buy credits only for the stubborn leftover.

On a net-emissions report these two paths can look the same. Physically, they are not. Offsetting does not cut a single tonne inside the company's own supply chain. Insetting does.

> Insetting makes companies more ambitious, more collaborative and more future-proof, because they co-own the cuts in their own supply chain.

THE PHYSICS

Only one strategy actually bends the curve

Start with the physics; the economics follow. With offsetting, the company's real emissions never actually fall. The net-zero claim is met entirely by bought credits, so it must buy more and more of them every year, as the gap between its real emissions and its shrinking target keeps widening. With insetting, real emissions fall at the source, and the leftover credits shrink to a sliver.

Exhibit 1 makes the divergence concrete across all four archetypes. The offsetting line stays pinned to business-as-usual while the shaded credit obligation swells year after year. Only the insetting line actually falls toward the target; a credit purchase only makes it look that way on paper.

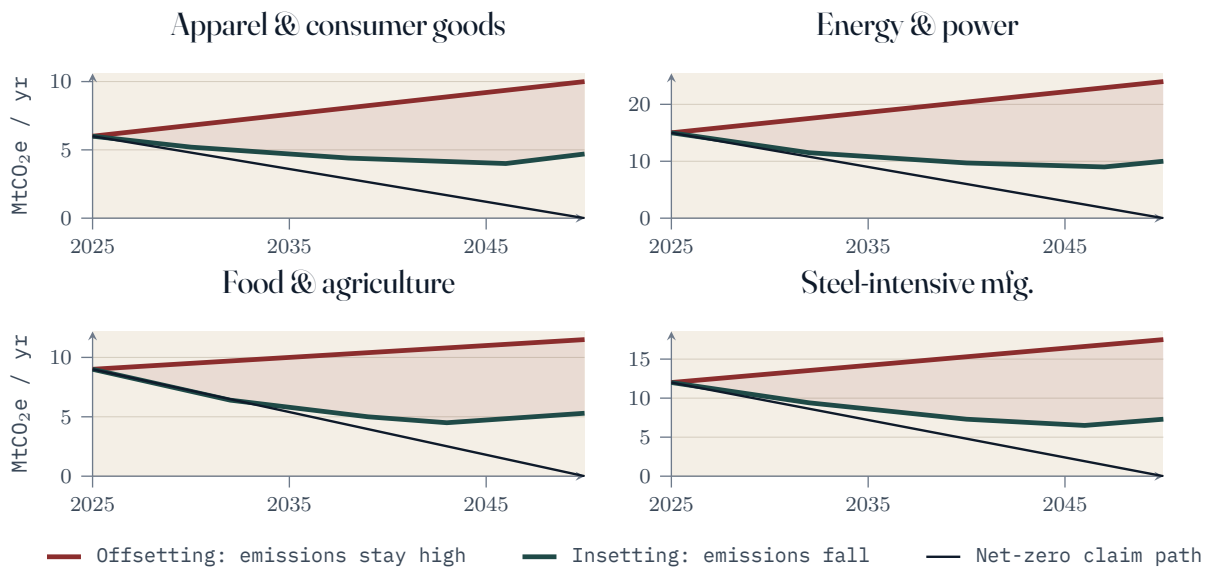

EXHIBIT 1

Real physical emissions under each strategy versus the net-zero claim path, across four value-chain archetypes. Illustrative model output; y-axes differ by sector.

One more thing worth noting for the hardest sectors. Insetting trajectories tick upward again after roughly 2045. That is not a glitch in the model. By then the available cuts run out while the business keeps growing, leaving a small leftover, the residual, that durable carbon-removal credits can fairly cover. This is the proper role of offsets: a mop-up for the residual, not a main strategy.

THE COST VERDICT

Insetting wins in most sectors today, and everywhere with policy

The idea that offsetting is the cheap option turns out to be wrong in most of the economy, and more wrong over time.

With no carbon policy at all, offsetting is cheaper in exactly one industry: steel, where cutting emissions in-house is genuinely expensive and credits are still cheap by comparison. For clothing, energy, and food, insetting is already cheaper on cost alone, before counting a single side benefit.

Once a carbon price lands on the emissions a company still produces, the verdict is clear. Insetting is cheaper in every industry, because the offsetter now pays twice: once for the credits, and again for the carbon price on the emissions it never removed. The gap is widest for energy and power, the biggest footprint, at about $27 billion for offsetting versus about $16 billion for insetting. This “pays twice” logic assumes voluntary credits do not discharge a compliance carbon price such as the EU Emissions Trading System or the Carbon Border Adjustment Mechanism, which matches how those rules work today.

TOTAL ABATEMENT + COMPLIANCE COST, 2025–2050

ARCHETYPE	INSET	OFFSET	INSET+POLICY	OFFSET+POLICY
Apparel & consumer goods	1.6	2.7	6.7	11.2
Energy & power	4.1	6.5	15.9	27.0
Food & agriculture	2.4	3.3	8.6	14.3
Steel-intensive manufacturing	5.8	4.9	13.9	20.6

ILLUSTRATIVE. NET PRESENT VALUE, $BN, ALL 2025-50 COSTS AT A 6% REAL DISCOUNT. LOWER IS CHEAPER.

EACH ARCHETYPE = A 6-15 $MtCO_2e$ SCOPE 3 VALUE CHAIN. INSET WINS EVERY ROW BUT STEEL PRE-POLICY.

Where the money goes shows the deeper problem. Insetting spends mostly on real cuts, then tops up with a few credits. Offsetting makes no real cuts and buys roughly 2.5 to 3.5 times more credits over the period: for energy and power, 297 million tonnes versus 104 million. Every one of those extra credit tonnes is a real emission the company never fixed, fully exposed to the next rise in carbon prices or tightening of the credit rules.

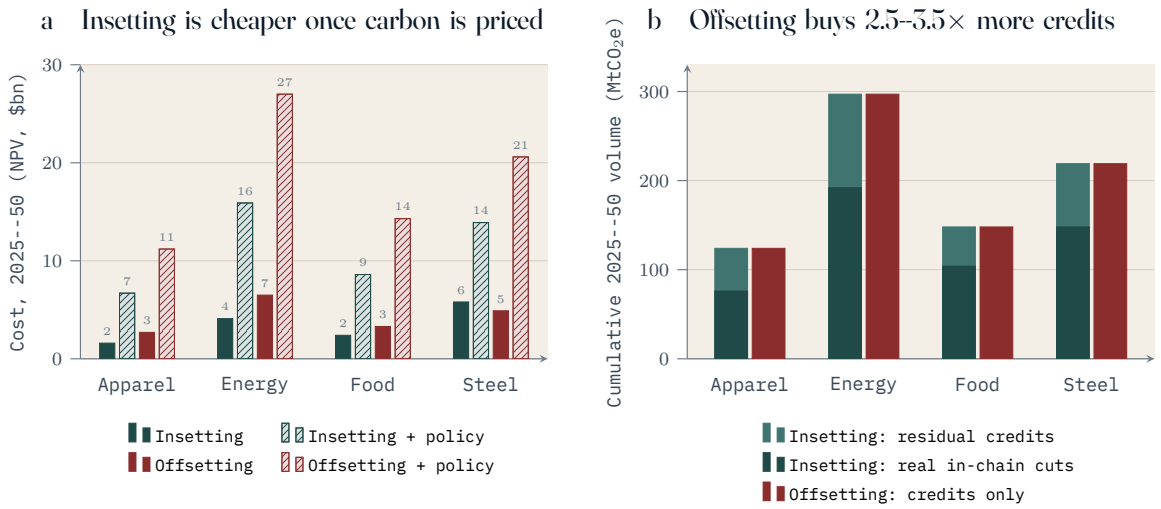

EXHIBIT 2

Left: cost by strategy and policy state per archetype. Right: cumulative abatement composition, showing insetting split into real in-chain cuts plus a residual credit sliver, versus offsetting as credits only. Illustrative model output.

THE NUMBER FOR THE CFO

The single price that settles the decision

For the people who set budgets, the deciding question is not about credit quality. It is one number. **Above what carbon-credit price does cutting emissions in-house become cheaper than buying offsets, even with no carbon policy at all?** That break-even price simply tracks how expensive each industry's own cuts are.

THE BREAK-EVEN CREDIT PRICE — $ / tCO_2e

$20	$24	$35	$72
CLOTHING	ENERGY	FOOD	STEEL

Above each of these prices, cutting emissions in-house is the cheaper choice.

On current forward outlooks for high-quality credits, all four break-evens sit at or below where prices are heading, and all four are far below any real government carbon price. So the case for insetting is being pushed two ways at once: credit prices are rising, and government carbon prices are arriving. What looks like a close call at today's low credit prices becomes the clear winner on any forward view.

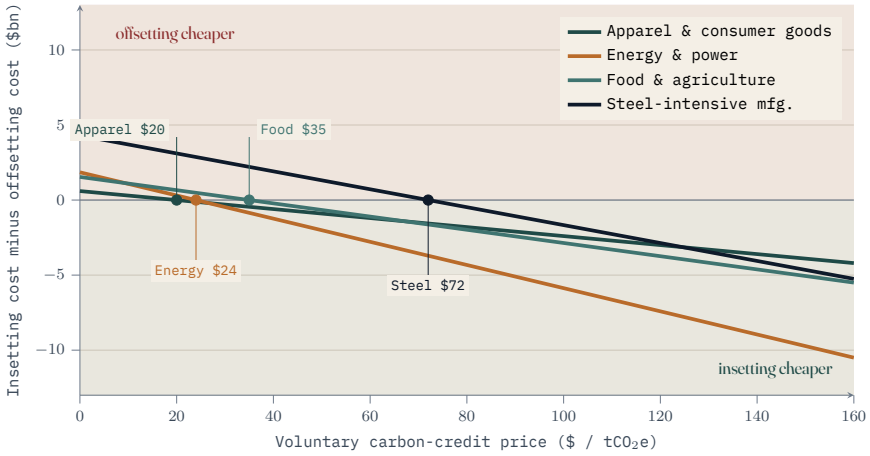

EXHIBIT 3

Cost difference between insetting and offsetting as a function of the voluntary-credit price. Below the line, insetting is cheaper; the break-even rises with the chain's own cost of cutting. Illustrative model output.

THE REFRAME

An accounting entry becomes a balance-sheet position

The most valuable output of this analysis is not a cost table. It is a change in how the choice is classified.

OFFSETTING

= A BILL YOU RENEW EVERY YEAR

It ticks the reported target while the real emissions keep flowing. In doing so it builds up a *future carbon bill* that grows with both the volume of emissions and the price of carbon. In effect it is a liability the company renews every year, and it gets more expensive as rules tighten.

INSETTING

= A CAPITAL INVESTMENT

It turns that open-ended, growing bill into a productive, front-loaded investment. You pay early, it keeps paying back, and the unit cost falls as the technology scales. Outside the most expensive sectors it is already the cheaper option today. With a carbon price, it is cheaper everywhere.

Putting the decision in plain money terms, not climate-policy terms, is what lets a budget-setter act on it. The question stops being “how do we meet the target” and becomes “do we want a growing bill, or an investment that pays back.”

WHAT THE INVESTMENT LOOKS LIKE ON THE GROUND

CLOTHING

A fashion brand pays its garment mills to switch to renewable power and efficient machinery. Cheap cuts, fast payback, and every future collection ships with a lower footprint.

ENERGY & POWER

A utility signs long-term purchase agreements for renewable generation instead of buying credits against its fuel burn. The contract replaces the emission, not the optics.

FOOD

A food company funds its farm suppliers to change fertilizer, feed and manure practices. The cuts land inside its own supply chain, and the farms become cheaper, more resilient suppliers.

STEEL

A carmaker co-funds a supplier’s move to scrap-based or hydrogen-ready steelmaking. Expensive today, which is why steel’s break-even sits at $72, but it locks in green steel before rivals do.

BEYOND THE MODEL

The value the cost model leaves out

The model only counts the cost of cutting carbon and of complying. So it understates insetting, because investing in your own supply chain creates value that never shows up in a carbon account.

FOUR BENEFITS THE MODEL LEAVES OUT

SUPPLIER RESILIENCE

Low-carbon supply usually means working with a more efficient, less exposed supplier. A stronger supply base, carbon aside.

RAW-MATERIAL SECURITY

You lock in scarce low-carbon materials, green steel, aluminium, sustainable fuels, before rivals can contract them.

PROCUREMENT CERTAINTY

Fixed price and fixed carbon hedge two risks at once, turning both into a single known cost.

BETTER FINANCING TERMS

Real, verified cuts can qualify for transition finance and green bonds where they meet taxonomy and verification criteria, and can improve a business unit’s cost of capital. Buying offsets does not.

Every one of these also cuts exposure to future carbon markets, the very exposure that offsetting leaves wide open. None of it is free: insetting demands capital up front, real work with suppliers, and the cost of measuring and verifying the cuts. The point is not that it is easy, but that offsetting leaves the underlying liability untouched while insetting retires it.

> The cheapest way to cut emissions turns out to be the one that also leaves the business more resilient.

MAKING IT REAL

The chain-of-custody question

The usual objection to insetting is practical: a buyer rarely owns the thing that emits. But the accounting to credit a shared-chain cut to the company that paid for it already exists, and already runs in real markets.

Chain-of-custody methods, the accounting rules that decide who gets credit for a cut in a shared supply chain, come in three kinds: physical segregation, mass balance, and book-and-claim. Each lets a cut made at one point in the chain be credited to the company that paid for it; certificates carry the claim. This is not theory. It already runs the low-carbon fuel markets today, under California's Low Carbon Fuel Standard and the EU's FuelEU Maritime rules, both already law, and the same book-and-claim design has been worked out for sustainable aviation fuel. In shipping, aviation and fuels, where the buyer and the actual cut sit in one shared pool, these methods are what make insetting real rather than just an ambition.

A caveat of language, not substance: "insetting" is not yet a formally standardized term under the GHG Protocol or the Science Based Targets initiative, and the Scope 3 accounting treatment of value-chain intervention certificates is still being finalized. The mechanisms below, however, already operate in regulated markets today.

HOW BOOK-AND-CLAIM WORKS

THE SHARED POOL

A low-carbon batch enters a supply chain that many buyers draw from. It then splits in two.

↓ THE MOLECULES

The **physical product** goes to whoever actually uses it, who counts it at ordinary intensity and makes no green claim.

↓ THE CLAIM

The **green attribute**, the verified cut, travels on a certificate to the firm that paid for it. Only that firm claims it.

THE MECHANISM

Chain-of-custody separates the molecule from the claim: the physical product flows to any buyer, who accounts for it at ordinary intensity, while the verified cut, carried by a certificate, is credited to the firm that funded it. Counting each cut once, and only once, is the rule that keeps insetting from sliding into offsetting by another name.

FROM WHY TO HOW

A three-step pathway

For leadership teams ready to act, the implementation sequence is clear.

1. **Map & prioritize.** Map your supply-chain emissions using real supplier data, fill the gaps with estimates, and find the hotspots. Then rank every cut from cheapest to most expensive per tonne (a marginal-abatement-cost curve) and start at the low end.
2. **Contract & finance.** Secure the cuts in-chain through supplier power-purchase agreements, book-and-claim and attribute certificates, and mass-balance chain-of-custody, the contracts that let you pay for a verified cut even when you do not physically own the source. Then fund them as an investment, not a running cost: co-finance with supply-chain partners so no single company carries the whole bill, and de-risk the outlay with transition finance, sustainability-linked loans, or green bonds.
3. **Verify and claim** by measuring and independently checking the real cuts, and use durable carbon-removal credits only for the leftover no lever can reach, inside a proper science-based net-zero claim.

Offsetting comes in only at the last step, and only for the leftover. It never touches the first two, which is exactly where the real cuts and the side benefits come from.

01

Map & prioritize

Measure where your supply-chain emissions come from, then rank the possible fixes from cheapest to most expensive.

→

02

Contract & finance

Sign contracts with suppliers to deliver the cuts, and split the cost with the partners who share the chain.

→

03

Verify & claim

Have the cuts checked by an independent party; buy offset credits only for the small leftover.

What to do now

FOUR MOVES FOR THE CAPITAL-ALLOCATION AGENDA

1 **Treat it as a money decision.** Move the insetting-versus-offsetting choice off the sustainability team's reporting checklist and onto the budget agenda. It is about assets and liabilities, not disclosure.

2 **Work out your own break-even.** The prices here come from reasonable but illustrative assumptions. Plug in your own cost curve, credit-price view, discount rate and policy, so you know which numbers matter before you commit capital.

3 **Go sector by sector.** For lower-cost chains like clothing and many consumer goods, insetting already wins on cost: move now. For the hardest, like steel, the case turns on the coming carbon price and rising credit floor, so build the supplier relationships now, even while the numbers are still close.

4 **Use offsets for the leftover only.** Keep durable carbon-removal credits, the kind a science-based net-zero claim requires, for the residual no lever can reach. Using credits as your main plan is not a saving. It is a bill you are pushing into the future, and it keeps growing.

The companies that get this early will not just report lower emissions. They will own a decarbonization investment that keeps paying back, a stronger supply base, and better financing terms, while their offsetting rivals renew an ever-bigger bill.

> On the ledger the two once looked the same.
>
> On the balance sheet they never were.

ABOUT THIS ANALYSIS

This white paper draws on a value-chain simulation of Scope 3 strategy across four industry archetypes under two policy states. Figures are computed from evidence-anchored but illustrative assumptions and convey the structure of the decision, not authoritative firm-specific values. Carbon-price, credit-price and support assumptions are anchored to existing carbon rules (EU ETS, CBAM, FuelEU Maritime, California LCFS) and to published voluntary-carbon-market outlooks; voluntary credits are assumed not to discharge those compliance obligations, per current rules. Carbon3 builds insetting infrastructure and so has a commercial interest in this conclusion; the model is offered for readers to test against their own inputs, not as independent verification.

CARBON3 The insetting infrastructure for Scope 3. carbon3.net