CHEMICALS & MATERIALS / MID-YEAR OUTLOOK

The Chemicals Industry *2026 Outlook* by C3

Chemical products are present in the overwhelming majority of manufactured goods, and their emissions, approximately 5 to 6% of global CO_2, are inherited by the companies that buy them. The technology to cut those emissions is proven, yet at USD 150 to 500 per tonne it costs far more than any compliance carbon price pays. This report examines why proven abatement remains unfinanced and how value-chain demand can close the gap.

CARBON3 GLOBAL PTE. LTD. / SINGAPORE JULY 2026 / CARBON3.NET

THE ONE-PAGE THESIS

The chemicals sector and the *economics of abatement*.

The chemicals sector accounts for approximately 5 to 6% of global CO_2 emissions and is the largest industrial consumer of energy. Because chemical products sit inside the overwhelming majority of manufactured goods, that carbon flows into nearly every downstream sector as Scope 3, the emissions a company inherits from its suppliers.

The levers able to halve the sector's emissions cost USD 150 to 500 per tonne, while compliance carbon everywhere clears far below that. The consequence is visible in project finance: only around 6% of announced clean-hydrogen capacity has reached final investment decision (FID). Carbon3 closes the gap by routing value-chain demand to the plant. Each third-party verified reduction is allocated pro-rata across the multiple buyers drawing on that plant's output and retired once into each buyer's Scope 3. This mechanism, insetting, finances reductions inside the buyer's own value chain and is distinct from offsetting.

5-6%

OF GLOBAL CO_2 EMISSIONS

The share attributable to the chemicals sector when feedstock-embedded carbon is counted alongside direct and energy emissions.

IEA Chemicals tracking 2024.

$150–500

PER TONNE ABATED

The cost of the abatement levers with meaningful volume, against compliance carbon at approximately EUR 79 (EU ETS) and approximately USD 12 (China).

IEA; MPP; BNEF; ICE.

1 Jan 2026

CBAM DEFINITIVE PERIOD

The EU carbon border charge entered its definitive period with fertilizers and hydrogen in scope from day one.

Reg (EU) 2023/956.

~6%

OF ANNOUNCED CAPACITY AT FID

The share of announced clean-hydrogen production capacity that has reached FID; nearly 60 major projects were cancelled in 2025 alone.

IEA Global Hydrogen Review 2025.

STRUCTURE OF THE ANALYSIS

Contents of *this report*.

PART I

WHERE DOES THE CARBON IN CHEMICALS SIT, AND WHO INHERITS IT?

The *inheritance*.

Chemicals account for approximately 5 to 6% of global CO_2 emissions, embedded in the overwhelming majority of manufactured goods.

The downstream inheritance · Feedstock geography · The 2026 rules · Three sub-industries

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PART II

WHAT CLOSES THE GAP BETWEEN THE COST OF ABATEMENT AND THE PRICE OF CARBON?

The *wedge*.

Abatement costs of USD 150 to 500 per tonne exceed every prevailing compliance carbon price.

Abatement cost vs carbon price · The FID gap · The demand side · Europe restructures · Reduction to Scope 3 claim · The C3 mechanism · Mass-balance precedent · Two deals

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PART III

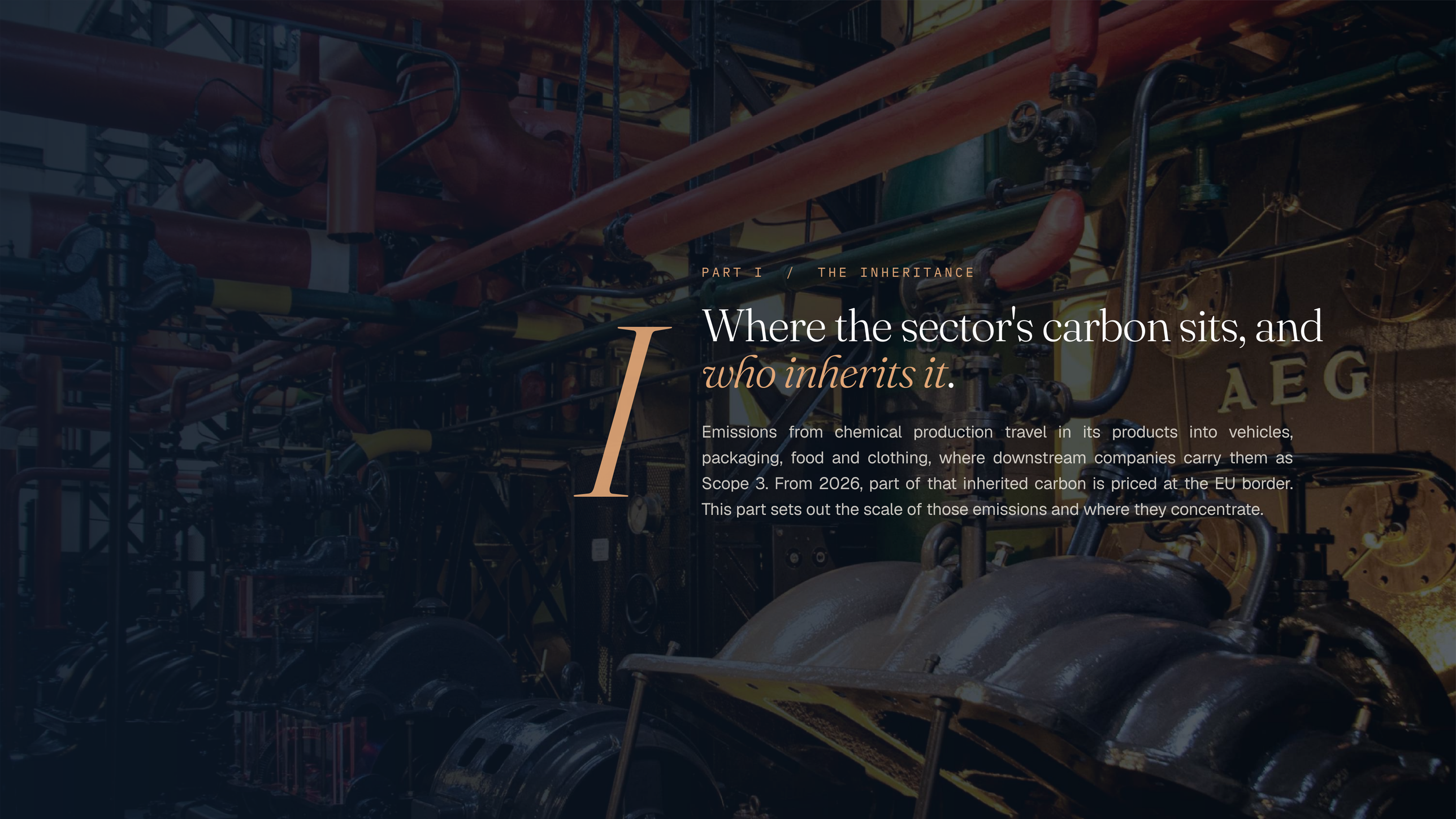
WHAT CONDITIONS MUST HOLD FOR THE SECTOR TO REACH NET ZERO, AND WHERE COULD THE THESIS FAIL?

The *bridge*.

The investment shortfall to 2030 is estimated at USD 850 to 900 billion; the enabling infrastructure is real but late.

CCS infrastructure status · The bridge to 2050 · What could break the thesis · Carbon3 end to end

P. 16–19



PART I / THE INHERITANCE

I

Where the sector's carbon sits, and *who inherits it*.

Emissions from chemical production travel in its products into vehicles, packaging, food and clothing, where downstream companies carry them as Scope 3. From 2026, part of that inherited carbon is priced at the EU border. This part sets out the scale of those emissions and where they concentrate.

WHERE THE EMISSIONS SIT

A sector whose emissions are *reported downstream*.

Chemicals are embedded in the overwhelming majority of manufactured goods. The carbon released in their production flows downstream as Scope 3 into the accounts of the brands and manufacturers that buy them. That inheritance defines both the decarbonization challenge and the commercial opportunity examined in this report.

5–6%

of global CO_2 emissions attributable to the chemicals sector, approximately 2.9 to 3.1 $GtCO_2e$ per year counting Scope 1, Scope 2 and feedstock-embedded carbon

IEA Chemicals tracking 2024; IEA ETP 2024.

The chemicals sector is the largest industrial consumer of energy, accounting for roughly 14% of global oil demand. Its carbon is carried into every downstream value chain: for a typical automotive OEM, upstream Scope 3 exceeds 75% of the corporate footprint, and consumer-goods companies are phasing in supplier carbon-footprint requirements through 2028.

> THE CENTRAL POINT
>
> The physical reduction must be made at the chemical plant, yet the reporting obligation and the commercial value sit with the downstream buyer. Closing the gap between the point of abatement and the point of accountability is the subject of this report.

The sector's emissions concentrate in a few core processes: steam cracking releases approximately 250 $MtCO_2$ per year and ammonia production approximately 450 $MtCO_2$. Current policies leave direct emissions well above the level a 1.5°C pathway requires by 2030.

→ The following pages set out the 2026 regulatory alignment that is beginning to put a price on this inherited carbon.

FEEDSTOCK GEOGRAPHY

Same molecule, *different carbon*.

A tonne of ethylene is chemically identical wherever it is produced, yet its embedded carbon varies by a factor of up to nine depending on feedstock and power. As border pricing extends through supply chains, that spread, not the sector average, will determine market access and margin.

THE LOWEST-CARBON ROUTE · US ETHANE CRACKER, PER TONNE OF ETHYLENE

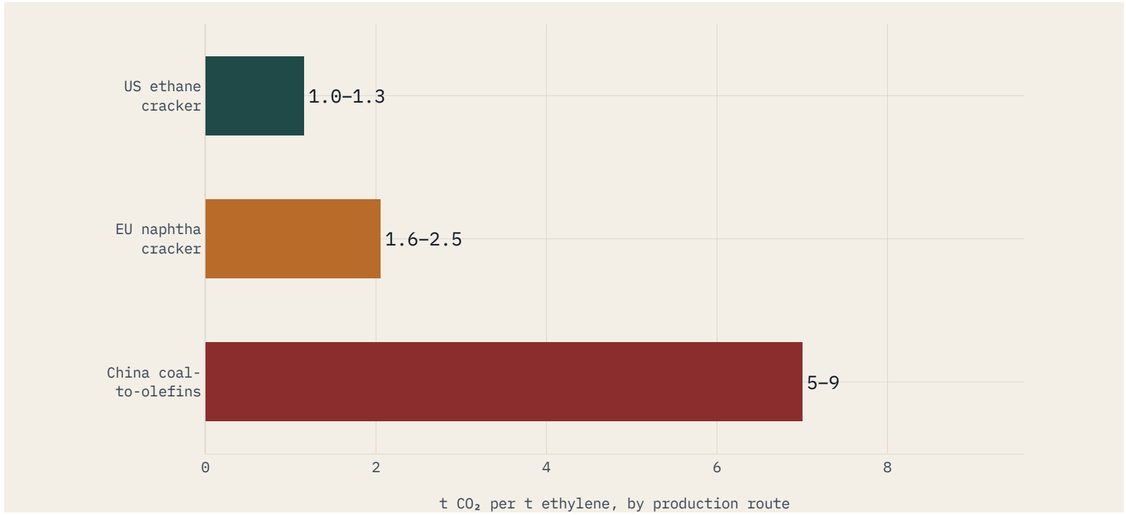
1.0–1.3 tCO_2

THE HIGHEST-CARBON ROUTE · CHINESE COAL-TO-OLEFINS, PER TONNE OF ETHYLENE

***5–9* tCO_2**

The European naphtha cracker sits between the two, at 1.6 to 2.5 tonnes of CO_2 per tonne of ethylene. Europe is therefore exposed on both fronts: its product carries roughly twice the embedded carbon of US ethane-based ethylene, and its production cost runs USD 200 to 380 per tonne above the US before any carbon price. Carbon pricing is more likely to widen that gap than to close it.

ETHYLENE CARBON INTENSITY BY PRODUCTION ROUTE (T CO_2 / T)



China's coal-to-olefins fleet, approximately 25 Mt of capacity, is both a large abatement opportunity and a significant stranded-asset risk as product carbon becomes priced. Europe's exposure is the opposite: a structural cost disadvantage that predates carbon accounting. In both regions, competitive position will be decided route by route, not by the sector average. Sources: IEA; Wood Mackenzie.

THE 2026 RULES

Carbon pricing reaches the *chemicals value chain* in 2026.

Carbon pricing reached the chemicals value chain in 2026. The EU began charging carbon at its border, with fertilizers and hydrogen in scope from day one, and Singapore, Japan, India and the United States all tightened their regimes. For EU chemicals, Cefic estimates compliance costs rising from approximately EUR 4 billion in 2024 to EUR 12 to 14 billion by 2030.

THE BORDER MECHANISM

CBAM enters its definitive period

The EU carbon border charge (CBAM) began its definitive period on 1 January 2026, with fertilizers and hydrogen in scope from day one. Extension to organic chemicals and polymers is under review, effective no earlier than 2027. Imported chemistry in scope now carries a real carbon cost at the EU border.

Reg (EU) 2023/956; EC Simplification Regulation, Oct 2025; ICE, Jul 2026.

THE ASIAN COMPLIANCE MARKETS

Asian carbon markets reach compliance stage

Singapore's carbon tax rose to SGD 45 per tonne on 1 January 2026, Japan's GX-ETS became mandatory in April, and India's compliance targets now cover petrochemicals. China has announced chemicals for its next expansion, around 2027, though its allowance price of approximately USD 12 per tonne remains far below European levels.

NEA Singapore; METI; BEE; ICAP; MEE.

THE US INVESTMENT DEADLINE

A fixed deadline for US clean hydrogen

The OBBBA requires clean-hydrogen projects claiming the 45V credit to begin construction before 1 January 2028. The investment window for US hydrogen-based chemicals is therefore fixed, concentrating final investment decisions (FIDs) into the next two years.

OBBBA, Jul 2025; T.D. 10023.

17 JULY 2026 The EU proposed softening the ETS to 2040: a slower reduction factor (3.7% then 1.7%, from 4.3%), free allocation extended beyond 2030, up to 2% international credits from 2036, and a EUR 100 billion Industrial Decarbonisation Bank. Direction of travel can loosen as well as tighten. *EC COM(2026) 616; IP/26/1596.*

→ These regimes establish where carbon carries a price, but not at what level. The next section compares those prices with the actual cost of abating a tonne in chemicals.

THREE SUB-INDUSTRIES

Three sub-industries, *three different problems*.

Petrochemicals, ammonia and methanol account for the majority of the sector's emissions, yet each presents a distinct problem. Petrochemical carbon is set by feedstock choice; ammonia has proven routes but no funded premium; methanol alone has a paying buyer. Insetting economics therefore differ across the three.

Petrochemicals

THE FEEDSTOCK PROBLEM

Petrochemicals represent the largest share of sectoral emissions, with carbon intensity set by feedstock: ethane crackers emit 1.0 to 1.3 tCO_2 per tonne of ethylene, coal-to-olefins routes 5 to 9. The principal levers, electrified cracking, still at demonstration stage, certified bio-based and recycled feedstock, and CCS, all depend on someone paying the premium.

~250

$MTCO_2/YR$

Ammonia and nitrogen fertilizers

THE FINANCING PROBLEM

Ammonia is the most concentrated single source in chemicals, at approximately 450 $MtCO_2$ per year. The technology question is largely settled, and the first large FIDs exist, led by a USD 4 billion blue-ammonia commitment in Louisiana in 2025. The premium, however, remains unfunded, and fertilizer carbon flows directly into the food system's Scope 3.

USD 4 bn

BLUE-AMMONIA FID

Methanol

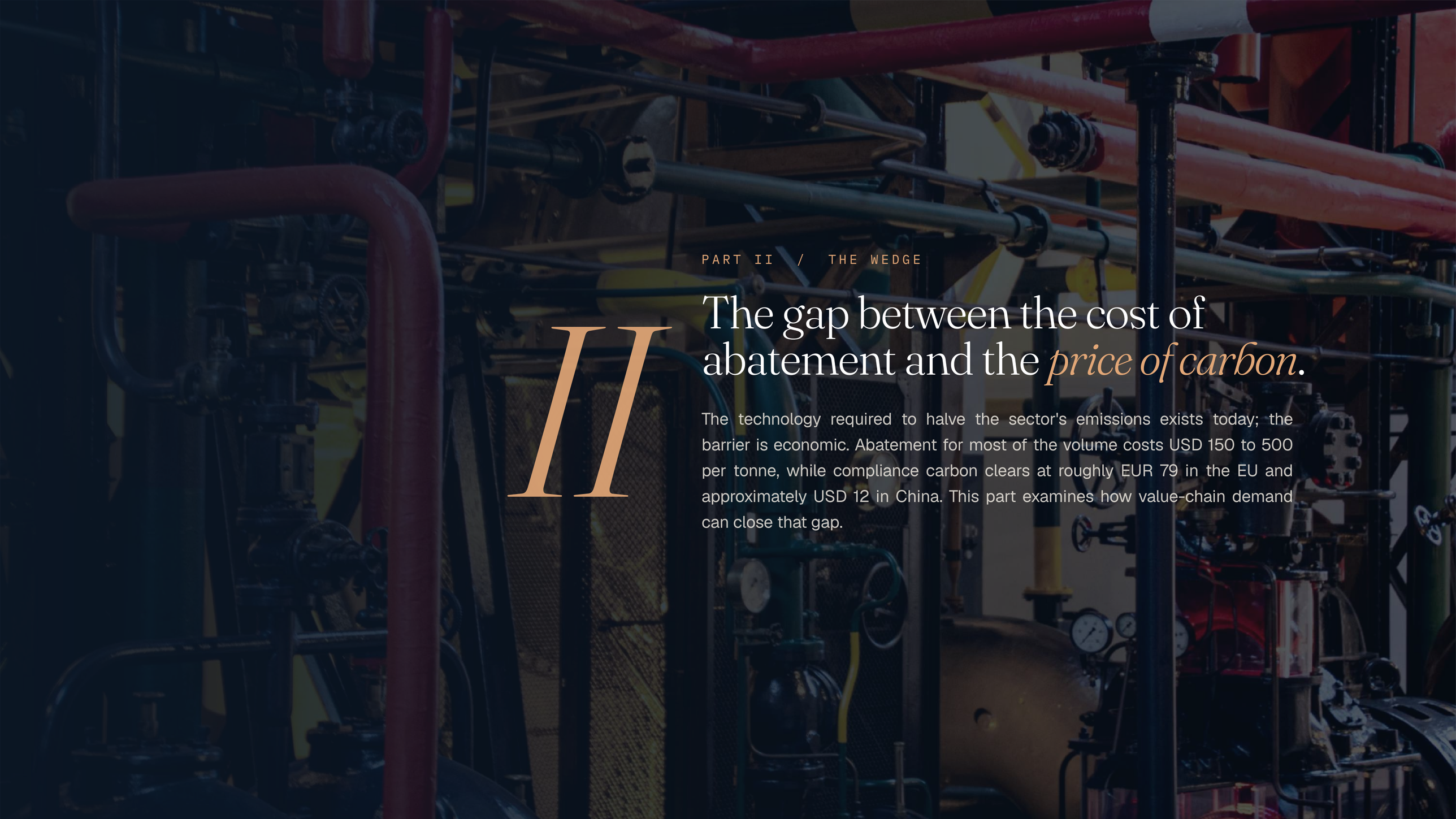
THE PREMIUM PROBLEM

Methanol is the demand-led exception: marine fuel provides a paying buyer, with offtakes from Maersk, Novo Nordisk and Lego. Even so, green methanol carried a premium of USD 350 to 600 per tonne over grey in 2025, and China's coal-based route remains several times more carbon-intensive than gas.

USD 350–600

/T

Sources: IEA, IFA, IRENA, Methanol Institute, BNEF, company disclosures. Two cross-cutting threads, polymers and recycling on one hand and industrial gases on the other, run through all three sub-industries; recycling is examined further in the deal-structure section.



PART II / THE WEDGE

II

The gap between the cost of abatement and the *price of carbon*.

The technology required to halve the sector's emissions exists today; the barrier is economic. Abatement for most of the volume costs USD 150 to 500 per tonne, while compliance carbon clears at roughly EUR 79 in the EU and approximately USD 12 in China. This part examines how value-chain demand can close that gap.

THE PRICE WEDGE

The price wedge: abatement cost versus the *compliance price*.

The cheap levers are small, and the big levers are expensive. The measures able to halve the sector's emissions cost USD 150 to 500 per tonne; carbon prices everywhere clear far below that. The result is simple: the technology exists, and the money to run it does not.

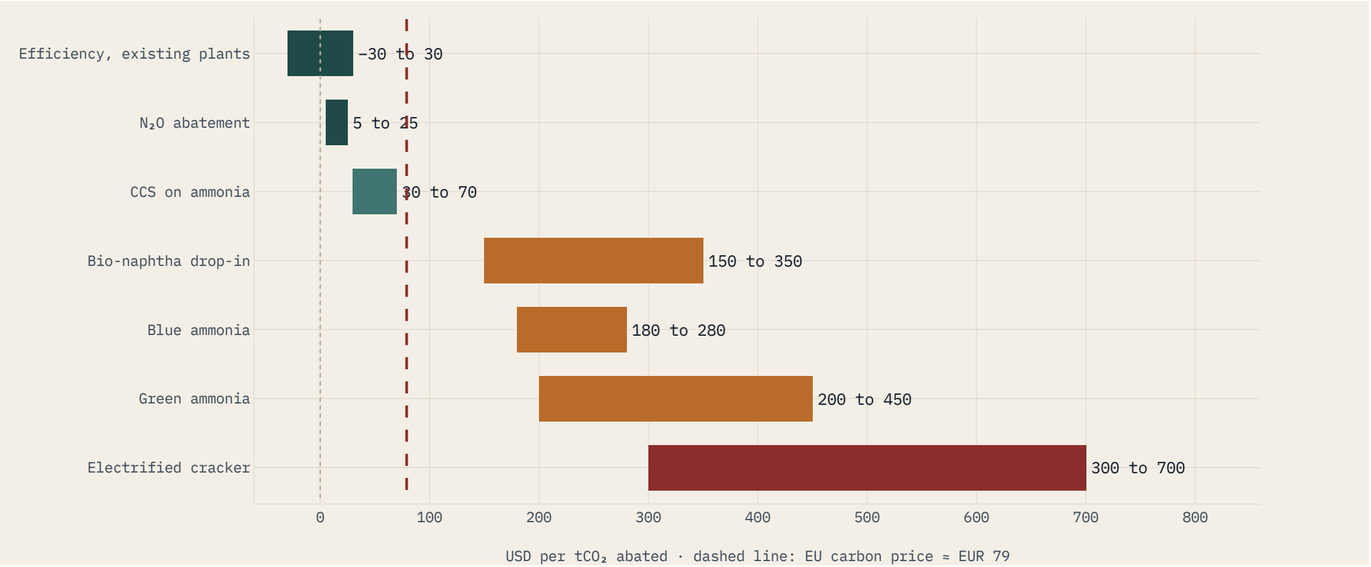
$150–500

per tonne of CO_2 abated · The cost range in which the high-volume abatement levers for chemicals are concentrated

IEA Chemicals Roadmap 2023; MPP Making Net-Zero Chemicals Possible 2023; BNEF.

The gap is a revenue gap, not a technology gap. Compliance carbon clears at roughly EUR 79 per tonne in Europe and approximately USD 12 in China, while the levers with meaningful 2030 volume begin at roughly USD 150 per tonne.

MARGINAL ABATEMENT COST BY LEVER, CHEMICALS (USD / TCO_2)



→ The consequence of this wedge is already visible in the project pipeline, examined on the following page.

THE FID GAP

The gap between announced capacity and *final investment decision*.

The pipeline is not converting. Only ~6% of announced clean-hydrogen capacity has reached a final investment decision, and nearly 60 projects were cancelled in 2025 alone. The reason is consistent: not technology, not capital, but the absence of committed buyers.

~6%

of announced low-emissions hydrogen capacity has reached FID

IEA Global Hydrogen Review 2025.

~60

major clean-hydrogen projects cancelled in 2025 alone, representing more than 4.9 Mtpa of hydrogen

Chemistry World; CIEL.

USD 4 bn

FID taken by CF Industries, Mitsui and JERA in April 2025 on 1.1 Mtpa of blue ammonia in Louisiana

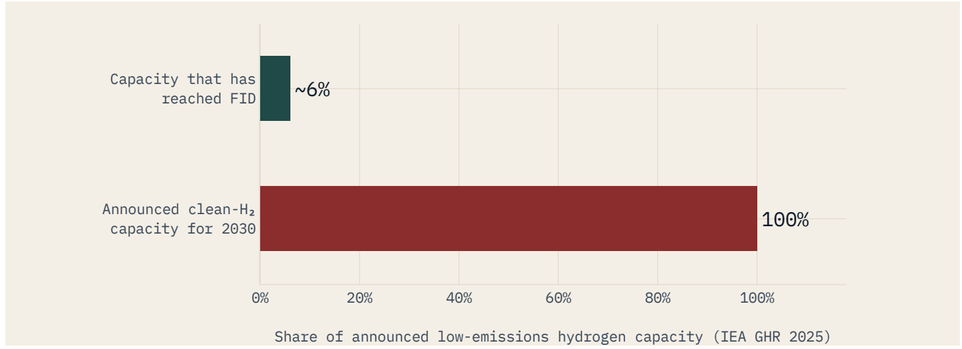
Company disclosures.

~90%

completion of the NEOM green hydrogen project as of April 2026, with first ammonia expected in 2027

Company disclosures.

ANNOUNCED 2030 CLEAN-HYDROGEN CAPACITY VS CAPACITY AT FID



Offtake, not capital, is the binding constraint. The projects that fail lack a creditworthy buyer for the low-carbon premium, not financing or technology. Insetting supplies that missing demand: it aggregates multiple downstream buyers into a bankable commitment against a third-party-verified reduction, with each unit allocated pro-rata across those buyers and retired once.

→ The demand side is beginning to organize; the next slide examines how it is forming.

THE DEMAND SIDE

The demand side for low-carbon chemistry is *forming*.

Willingness to pay for low-carbon chemistry exists, but it remains thin and concentrated. Green methanol carried a premium of approximately USD 350 to 600 per tonne in 2025, paid so far by a handful of committed buyers. The certification infrastructure for such claims, principally ISCC PLUS mass balance, already operates at scale.

350–600

Green methanol premium over conventional product in 2025, USD per tonne

BNEF; company disclosures.

≥45

Kilotonnes of low-carbon methanol sales targeted by Methanex for 2026; offtakers include Maersk and a joint Novo Nordisk and Lego contract

Company disclosures.

6,403

Standalone ISCC PLUS certificates issued; mass balance ties each claim to physical material flow

ISCC, Jan 2022–Mar 2025.

16 of 19

Recent industrial FIDs tracked by MPP that were in fuels and chemicals; RMI launches a collective-procurement pilot in 2026

MPP; RMI.

The mechanism. No single buyer's requirement is sufficient to justify a plant; individual offtakes to date have moved tens of kilotonnes against world-scale needs. Aggregated across the brands and OEMs that share one supply chain, the same demand becomes financeable. C3's multi-buyer allocation does this on the claim side: one verified reduction divided pro rata across the participating buyers, with each unit retired once. Buyer pressure will intensify as consumer-goods companies phase in supplier carbon-footprint requirements over 2026 to 2028.

EUROPE RESTRUCTURES

Europe's restructuring and the *accounting discipline* it requires.

Approximately 37 Mt of EU chemical capacity has closed since 2022, roughly 9% of production, and announced cracker closures run through 2027. The contraction is structural rather than cyclical, and it carries a specific accounting consequence: emissions that fall because plants close are not abatement.

THE MECHANISM

Europe's cost disadvantage is structural. Natural gas prices stand at roughly three times US levels, placing EU ethylene production costs USD 200 to 380 per tonne above the US. Policy responses such as the Clean Industrial Deal ease energy costs and regulatory burden but do not remove the feedstock gap.

THE ACCOUNTING BOUNDARY

A shrinking production base must not be presented as a reduction. Inset baselines therefore separate closure effects from genuine abatement at continuing assets, and are set by accredited third parties such as ISCC, RSB, and ISO 14064-2 verifiers, not by C3 or the producer.

~37 Mt

EU chemical capacity closed since 2022, about 9% of production

Cefic capacity radar; OPIS; company announcements.

~74 %

European chemical plant utilization, with output approximately 10% below pre-crisis levels

Cefic; OPIS.

For downstream buyers, the restructuring means fewer suppliers and a widening spread between certified low-carbon material and commodity product. Insetting through C3 lets those buyers contract for verified reductions at continuing or new-build assets, securing Scope 3 claims that withstand third-party scrutiny.

WHO PAYS, WHO REPORTS

How a verified reduction becomes a *Scope 3 claim*.

A verified reduction passes through four stages between the plant where it occurs and the accounts where it carries value. Carbon3 connects the two, moving revenue from the buyers that hold the Scope 3 obligation to the producers that bear the cost of abatement.

At the plant

The reduction originates in a producer's capital decision: a lower-carbon feedstock, captured process CO_2, or electrified heat. The producer bears the cost before any downstream buyer has paid.

PHYSICAL ABATEMENT

In the product

The lower carbon content follows the material through each processing tier, physically or via mass-balance chain of custody. The reduction is embedded in the product but remains unpriced and unclaimed.

EMBEDDED, UNPRICED

On the books

The reduction surfaces in the buyer's accounts as a lower Scope 3 line or an improved product carbon footprint. The downstream company holds the reporting liability, and therefore the commercial reason to pay for abatement.

LIABILITY AND MOTIVE

Through Carbon3

Buyers fund the reduction as an inset within their own value chain. Once an accredited third party has verified the abatement, Carbon3 allocates it pro-rata across the multiple buyers drawing on that plant's output, each unit retired once against a single Scope 3 claim. Allocating across nested tiers without double-counting is precisely the problem this structure resolves.

ALLOCATED PRO-RATA, RETIRED ONCE

The physical abatement occurs at the plant while the reporting liability rests with the downstream buyer; Carbon3 supplies the contractual mechanism that connects the two.

THE MECHANISM

How the C3 mechanism applies to *chemicals value chains*.

The Carbon3 mechanism separates measurement from monetization. A third party verifies a plant-level reduction; C3 allocates the tonnage pro-rata across the multiple buyers drawing on that plant's output; each unit is retired exactly once into the claiming buyer's Scope 3. In nested chemicals chains, allocation without double-counting is the specific problem the platform resolves.

Verify

An accredited third party, such as ISCC PLUS for mass-balanced feedstock, RSB, an ISO 14064-3 auditor, TUV, or SustainCERT, measures the reduction against a baseline it sets independently and certifies the tonnage. C3 does not perform verification at any stage.

THIRD-PARTY CERTIFIED

Allocate

C3 divides the verified reduction across the downstream buyers pro-rata to the certified volume each draws under an ISCC PLUS mass-balance chain of custody. This is a volume-linked entitlement, not book-and-claim by buyer count. Allocating across nested tiers, cracker to polymer to converter to brand, without double-counting is the demanding step.

MASS-BALANCE, PRO-RATA

Retire

Each unit is retired exactly once on the C3 ledger into the claiming buyer's Scope 3 inventory. A tonne verified at the plant supports one claim, however many tiers separate the asset from the reporting company.

ONE TONNE, ONE CLAIM

THE ACCOUNTING BOUNDARY

An inset finances a real, verified reduction inside the buyer's own value chain. It is not an offset, not an EU ETS allowance or a CBAM certificate, and it satisfies no compliance obligation. Nor does it make a product carbon-neutral; it reduces the reported Scope 3 footprint by the verified tonnage allocated, and no more. The C3 ledger records the allocation and single retirement; it is a proprietary registry, not an independent one such as Verra or Gold Standard, and does not substitute for third-party verification.

PRECEDENT

Mass-balance claims are *established practice*, not a workaround.

The standing objection to any value-chain claim is that it is an offset with extra steps. The answer is precedent. Regulators and standards bodies already accept volume-linked mass-balance and book-and-claim accounting in electricity, aviation fuel and chemical feedstocks. Insetting applies the same audited discipline to carbon reductions in chemicals.

ELECTRICITY · SCOPE 2

The GHG Protocol already allows it

The GHG Protocol Scope 2 Guidance permits a market-based method in which contractual instruments, renewable energy certificates and guarantees of origin, convey a low-carbon attribute to a specific buyer without a dedicated wire. Corporate renewable-electricity claims rest on exactly this basis.

GHG Protocol Scope 2 Guidance, 2015.

AVIATION · SAF

Book-and-claim is recognized in aviation

Sustainable aviation fuel is claimed through book-and-claim, recognized under ICAO CORSIA and certified by RSB and ISCC. A buyer funds and claims the reduction without receiving the physical fuel, and the IATA registry records the transfer so each unit is claimed once.

ICAO CORSIA; RSB; ISCC; IATA SAF registry.

FEEDSTOCK · CHEMICALS

Mass balance is standard in chemicals

ISCC PLUS mass balance is already used across the chemicals industry to attribute bio-based and recycled feedstock to specific output volumes through audited chain of custody. Insetting uses the same certified mechanism to attribute verified carbon reductions.

ISCC PLUS; ISO 22095 chain of custody.

→ The distinction from offsetting holds throughout: each instrument is volume-linked to certified production and retired once, not a free-floating credit. Insetting extends accepted practice rather than inventing a new one.

TWO STRUCTURES

Two *deal structures.*

DEAL 1 · GREEN AMMONIA

Into the fertilizer and food chain

A green-ammonia project of approximately 1 Mtpa, modelled on the ACME Oman and NEOM class of assets, would generate roughly 1.9 $MtCO_2e$ per year of verifiable reductions, entering the food chain as fertilizer on mass balance. At an inset price of USD 110 to 180 per tonne, revenue of approximately USD 265 million per year closes 50 to 60% of the green-to-grey cost gap and de-risks the final investment decision.

Integrity: Reductions would be verified by accredited third parties under ISO 14064-2 with ISCC PLUS mass balance. Carbon3 allocates the verified units pro-rata across the multiple traders and brands drawing on the plant's output; each unit is retired once. One tonne, one claim.

DEAL 2 · ADVANCED RECYCLING

Into the packaging chain

A 200 kt per year pyrolysis plant on Jurong Island would feed a steam cracker on ISCC PLUS mass balance, generating approximately 0.4 to 0.5 $MtCO_2e$ per year of verifiable reductions against a virgin-naphtha baseline. The resin flows through converters to packaging brands, which receive pro-rata Scope 3 allocations through Carbon3. At an inset price of USD 90 to 130 per tonne, revenue of USD 40 to 60 million per year bridges the gap between pyrolysis oil and virgin naphtha.

Integrity: Underwriting must price technology and feedstock risk explicitly; the United States experience, including the Brightmark bankruptcy, shows delivery risk is material. Verification rests with accredited third parties; Carbon3 performs aggregation, allocation, and retirement, and does not verify reductions.

Both structures are illustrative and modelled; they do not represent executed transactions, and all parameters are indicative. Verification of any actual reduction would rest with accredited third parties such as ISCC, RSB, or bodies operating under ISO 14064-2 and 14064-3; Carbon3 does not verify reductions. Inset units are not offsets, not EU ETS allowances, and not CBAM certificates.

PART III / THE RECKONING

III

The enablers, the capital, and *what could break the thesis*.

The enabling infrastructure is arriving later than announced, and the policy floor has shifted since 2025. This part reviews the enablers, the capital requirement to 2050, and the principal risks.

THE ENABLERS

Carbon capture infrastructure is operational but *behind schedule*.

Carbon capture and storage underpins blue ammonia and cracker capture, and its infrastructure is now moving from planning to operation. The assets are real, but each has arrived, or will arrive, later than scheduled. Inset structures built on them must price that delay.

Aug 2025

Northern Lights Phase 1 (1.5 Mtpa) received its first CO_2 cargo, from Heidelberg Materials Brevik

Equinor/TotalEnergies/Shell JV.

≥5 Mtpa

Northern Lights Phase 2 capacity following the March 2025 final investment decision (NOK 7.5 bn)

Equinor/TotalEnergies/Shell JV.

H2 2027

Earliest operations for Porthos in Rotterdam (~2 to 3 Mtpa), currently under construction

Porthos; S&P Global.

USD 85

US 45Q storage credit per tonne, preserved through the 2025 legislation

OBBBA analyses 2025.

The principal constraint. A storage project that slips a year delays every unit written against it; Porthos has already moved to the second half of 2027. Multi-year offtakes with delivery flexibility absorb such a slip. Single-vintage purchases do not.

INFRASTRUCTURE ARRIVING, LATER THAN ANNOUNCED / CHEMICALS 2026

TODAY → 2030 → 2050

The bridge to *2050*: markers, capacity and capital.

The sector needs roughly USD 1.0 trillion of investment by 2030; announced FIDs total USD 110 to 130 billion, a gap of roughly USD 850 to 900 billion. Value-chain buyers can finance a material share of that gap through third-party-verified reductions, allocated pro-rata across multiple buyers and each retired once.

METRIC	TODAY (2025–26)	2030 MARKER	2050 MARKER
Direct CO_2 emissions $GtCO_2$ per year	**1.3 (2023), broadly flat to 2026**	Below 0.85	Net zero
Ammonia production intensity tCO_2 per tonne NH_3	**~2.4 grey-route average**	0.6 to 0.9 (blue, with CCS)	Below 0.1 (green)
Ethylene route mix tCO_2 per tonne ethylene	**Ethane 1.0 to 1.3; naphtha 1.6 to 2.5; coal-to-olefins 5 to 9**	Coal routes declining; certified bio- and recycled naphtha entering	Low-carbon routes predominant
Verified reduction supply Indicative inset-eligible supply, $MtCO_2e$ per year	**~25 to 40 by 2028**	80 to 120	Low-carbon production the sector norm
Compliance price versus abatement cost Per tonne CO_2	**EUA ~EUR 79; China ~USD 12; deep levers USD 150 to 500**	EUA EUR 110 to 140 (BNEF, pre-July 2026); the proposed ETS softening points this lower; still below deep-abatement cost	Compliance prices and abatement costs converge
Investment: need versus committed USD	**FIDs of 110 to 130 bn through 2026**	~1.0 tn needed 2025 to 2030; gap ~850 to 900 bn	4.5 trillion cumulative need to 2050 (MPP)

2030 and 2050 cells are 1.5°C-aligned markers, not forecasts. Direct CO_2 and ammonia intensity: IEA Chemicals tracking 2024 and IEA Ammonia Technology Roadmap. Ethylene route intensities: IEA; Wood Mackenzie. Inset supply: synthesis of IEA, MPP and BNEF. Investment need: MPP, Making Net-Zero Chemicals Possible (2023); carbon price forecast: BNEF, with the proposed EU ETS revision (COM(2026) 616, 17 July 2026) pointing the 2030 allowance path lower. Sources: IEA (2024); MPP (2023); BNEF; Wood Mackenzie; European Commission (2026).

→ The bridge defines the scale of the task; it does not remove the risks. The final section sets out the principal risks and how each is addressed.

THE DISCIPLINE

Principal risks to the *insetting case*.

The insetting case rests on assumptions that can fail: baselines, policy timetables, compliance prices and project delivery. Each risk is identified below alongside the structural feature of the C3 model that addresses it.

ADDITIONALITY

Emissions that fall because plants close are not saleable reductions, and roughly 37 Mt of EU chemical capacity has closed since 2022. Baselines are set by accredited third parties, not by C3 or the producer, and must separate closure from genuine abatement.

POLICY REVERSAL

Policy loosens as well as tightens. On 17 July 2026 the EU proposed softening the ETS itself, a slower reduction factor, extended free allocation and international credits from 2036. This is live evidence, not a hypothetical. Inset structures are built to hold value independently of any policy timetable.

SCOPE 3 STANDARD UNCERTAINTY

The GHG Protocol Scope 3 Standard is under revision through 2025 to 2026, and mass-balance and book-and-claim treatment is among its most contested open questions. Claims are structured to align with the emerging guidance, and this is arguably the largest swing factor for buyer demand.

PRICE AND PREMIUM SOFTNESS

Revenue built on high carbon prices is fragile. The EU allowance trades near EUR 79 per tonne, and green premiums (USD 350 to 600 per tonne for methanol) remain unfunded without paying buyers. Inset contracts are underwritten to survive a sustained soft compliance price.

SBTI AND TARGET VALIDATION

SBTi's treatment of value-chain interventions is itself unsettled and sets a higher bar than GHG Protocol disclosure. Buyers using inset claims toward an SBTi-validated target, rather than voluntary Scope 3 reporting, should confirm eligibility against the current Corporate Net-Zero Standard.

DELIVERY RISK

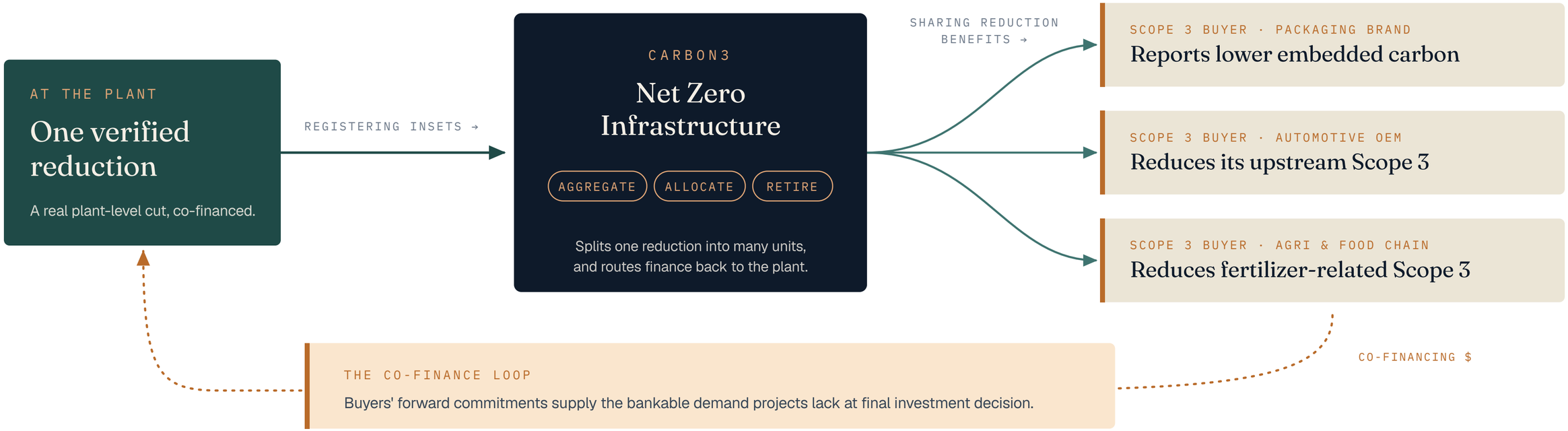
Announced capacity does not reliably become operating capacity. Nearly 60 major clean-hydrogen projects were cancelled in 2025, US chemical recycling has recorded failures, and Porthos will not operate before the second half of 2027. Multi-year, multi-buyer structures with delivery flexibility are the mitigation.

→ These risks are material but can be managed through contract structure. The concluding section sets out the pipeline that remains investable once they are priced in.

HOW CARBON3 WORKS

Carbon3, *end to end.*

The mechanism has three steps. First, an accredited third party verifies a reduction at the plant against an independently set baseline; Carbon3 takes no part in verification. Second, Carbon3 allocates the verified reduction pro-rata to the certified volume each buyer draws under a mass-balance chain of custody, a volume-linked entitlement rather than book-and-claim by buyer count. Third, each unit is retired once on the C3 ledger, a proprietary registry rather than an independent one, into a single buyer's Scope 3 inventory. The multi-year commitments behind these allocations give the producer the bankable demand that stalled FIDs show is otherwise missing.



EACH UNIT IS RETIRED ONCE, ON A SINGLE LEDGER, INTO A SINGLE BUYER'S SCOPE 3 CLAIM.

THE POSITION

The chemicals sector will decarbonize through its *value chain*: the downstream buyers who inherit its emissions supply the revenue that compliance carbon prices do not.

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> *"Reductions are measured at the plant, verified by accredited third parties, allocated by Carbon3 pro rata across the multiple buyers who share them, retired once, and thereby made bankable for the producer."*
>
> — CARBON3, 2026 CHEMICALS OUTLOOK

STAY IN TOUCH

carbon3.net

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WHAT THIS REPORT IS BUILT ON

Sources and *methodology*.

The analysis draws on public data from energy agencies, industry associations and company disclosures, alongside the primary regulatory texts. Policy status is as of July 2026.

REPORTS & DATA CITED

International Energy Agency (IEA) — Chemicals sector tracking; Energy Technology Perspectives 2024; World Energy Outlook 2024; Ammonia Technology Roadmap; Global Hydrogen Review 2025.
IEA.ORG

Cefic — Facts and Figures 2025 (EU turnover, regional shares); Competitiveness Check 2024 (ETS and CBAM compliance-cost projections to 2030).
CEFIC.ORG

Mission Possible Partnership (MPP) — Making Net-Zero Chemicals Possible (2023): transition strategy, capital requirements to 2050, abatement cost estimates.
MISSIONPOSSIBLEPARTNERSHIP.ORG

BloombergNEF (BNEF) — EU allowance price forecasts to 2030; green methanol premium estimates; marginal abatement cost inputs.
ABOUT.BNEF.COM

IRENA and the Methanol Institute — Ammonia production-route carbon intensities (grey, blue, and green); methanol production and route-intensity data.
IRENA.ORG

Commodity and pricing data — Wood Mackenzie (route-level cost benchmarks for olefins); ICE (EU allowance prices); IMARC (regional ethylene pricing); S&P Global and OPIS (project and capacity reporting).
PRICING SERVICES

Company and project disclosures — BASF, CF Industries, NEOM and ACME, Methanex, Northern Lights, and Porthos: investment decisions, project status, and capacity data.
PUBLIC FILINGS

STANDARDS, REGISTRIES & REGULATORS

Verification standards (third party) — ISCC, ISCC EU and ISCC PLUS, RSB, ISO 14064-2 and 14064-3, TUV, SustainCERT. Verification of reductions referenced in this report rests with these bodies, not with Carbon3.

Allocation and reporting frameworks — Buyer claims are structured to align with emerging GHG Protocol Scope 3 guidance, which is itself under revision (2025 to 2026); mass-balance and book-and-claim treatment for Scope 3 remains an open question in that revision. Carbon-market status draws on ICAP and the national administrators (MEE, BEE, METI, NEA).

European Union regulation — CBAM Regulation (EU) 2023/956 and the Simplification Regulation of October 2025; EU ETS Directive (EU) 2023/959; and the proposed 2040-alignment ETS revision, COM(2026) 616 of 17 July 2026.

Other jurisdictions — United States OBBBA provisions on Sections 45V and 45Q; China national ETS; India CCTS; Japan GX-ETS; Singapore carbon tax (NEA).

Market-integrity literature — Guidance on additionality, double-counting and chain-of-custody integrity, including ISCC mass-balance guidance and RMI collective-procurement work.

Methodology · Every figure traces to the cited public sources. Regulatory and price positions reflect July 2026 status. Deal structures are illustrative and modelled, not executed transactions. Verification is performed by accredited third parties. Forward-looking figures are scenario markers, not forecasts.