

The buyer does not exist

Why climate technology is not stuck on engineering but on demand

At a glance

Two branches of climate technology that have nothing to do with each other show exactly the same shape. In carbon removal, one company, Microsoft, accounted for 78.5% of all disclosed contracted tonnes on 13 April 2026, and of the companies that raised private capital 12% have ever had a tonne retired. In hydrogen, the announced production for 2030 shrank in two years from 49 to 27 million tonnes a year, while the firm offtake contracts together cover less than 2 million tonnes: roughly 5% of what the announcements promised. In both cases investment rose while the pipeline shrank, which means that capital is not the bottleneck and neither is engineering. There is no buyer. Since 2026 policy has therefore been shifting from support for producers to the obligation of demand, and the first bill for that only falls in September 2027.

78.5%

Share of one company in all disclosed contracted tonnes of durable carbon removal, position on 13 April 2026 (CDR.fyi)

Foreword

Climate technology is almost always discussed as a technology question. Does the electrolyser work, does the cost curve fall, does the storage hold for a thousand years. This report is about the possibility that those questions are the wrong ones, and that the binding constraint sits somewhere else: on the other side of the transaction, with someone who ought to pay and does not exist.

The occasion is that enough time has meanwhile passed to measure. Climate technology lives off announcements, and an announcement can only be judged once the date in it has passed. For this report it looked at the Global Hydrogen Reviews of the International Energy Agency from 2025 and 2026, at the market reporting of CDR.fyi on durable carbon removal, at the pricing survey of CDR.fyi with OPIS, and at the texts and data of the European carbon border adjustment mechanism. Where a figure comes from a company's own declaration instead of from a measurement, it is said so.

The content applies on 17 July 2026. The figures in this report change every quarter and the most important policy dates lie in 2027.

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01 Two sectors, the same shape

Hydrogen and carbon removal have little in common. The one is a molecule that has been produced industrially for a century and that has to get cleaner; the other is a service that yields nothing physical and that did not exist twenty years ago. The one asks for gigawatts and pipelines; the other asks for biomass, rock or fans. They share no supplier, no standard, no regulator and no customer.

And yet their figures draw the same picture. In both sectors a large number of announcements stands against a small number of delivered units. In both sectors investment has risen over the past two years while the pipeline shrank. And in both sectors the most recent analysis of the sector itself points to the same cause: there are too few parties committing themselves to take the product.

The product is not better for the buyer. It is better for everyone together, and that is a different sentence with different consequences.

That is no coincidence and it is not a conspiracy either. It is what happens with a product that internalises an external cost. An electrolyser makes hydrogen that is more expensive than hydrogen from natural gas; the difference is precisely the avoided emissions. A removed tonne of carbon dioxide yields the buyer nothing except the avoided damage. In both cases the product is not better for the buyer. It is better for everyone together, and that is a different sentence with different consequences.

For a market that means something uncomfortable: there is no natural buyer. Demand has to be made, by a price on the external cost or by an obligation, and until that happens the whole sector hangs on parties that voluntarily pay more than they must. Those can be companies with a climate target, governments with a programme, or one company with a balance sheet and a promise.

The rest of this report puts the two series side by side and then looks at the instrument that ought to solve this in Europe. The order is deliberate: first the figures, then the explanation, then the question of whether policy is moving in the right direction.

Source: International Energy Agency, Global Hydrogen Review 2025 and Global Hydrogen Review 2026 · CDR.fyi, Durable CDR Market Update, presented at Carbon Unbound East Coast, New York, 19 May 2026

02 Hydrogen: from 49 to 27

The International Energy Agency publishes an annual overview of every announced project for low-emissions hydrogen in the world, with potential production in 2030 as the measure. That series is the best available picture of what the sector promises, and it is now falling for the second year in a row. In the Global Hydrogen Review 2024 potential production for 2030 stood

at 49 million tonnes a year. In the 2025 edition it was 37 million tonnes. In the 2026 edition it is 27 million tonnes.

That is almost a halving in two years, and the cause is a combination of cancellations, projects temporarily on hold and delays that push delivery beyond 2030. More than 80% of the fall sits with projects based on electrolysis, so with green hydrogen, where according to the IEA risen capital costs and high electricity prices made the additional cost unfeasible for many developers. The IEA notes that more than 100 gigawatts of announced electrolysis capacity loses every chance of running in 2030 if no investment decision falls before the end of 2027.

What does stand is small and it grows slowly. Committed production rose by 3% to 4.3 million tonnes by 2030, and it can come out above 6 million tonnes if projects with a strong chance of operating before 2030 reach an investment decision in 2026 or 2027. New investment decisions dropped below 0.8 million tonnes a year in 2025, after two years around 1 million tonnes. In the 2025 edition the IEA calculated that projects with an investment decision represented 9% of the whole pipeline to 2030.

The relationship to the existing market puts that in perspective. The world used roughly 100 million tonnes of hydrogen in 2024. Low-emissions hydrogen reached roughly 1 million tonnes in 2025 and thereby stays below 1% of world production, despite a doubling since 2020. Use in refineries and steel plants, the sectors that need it most badly according to every scenario, is almost non-existent.

The temptation to make a story about a burst bubble out of that is large, and the IEA explicitly refuses. It points out that the early phase of a technology usually knows alternating strong and slow periods, that since 2020 more than two hundred production projects have reached an investment decision where at the time there were only a handful of demonstrations, and that the largest electrolyser went from 30 megawatts in 2021 to a 500 megawatt project that was taken into operation in China in 2025. So something is indeed happening. Only not what was promised.

Source: International Energy Agency, Global Hydrogen Review 2026, chapter Production, published June 2026 · International Energy Agency, Global Hydrogen Review 2025, Executive Summary and Five key questions about hydrogen, September 2025 · IEA, Low-emissions hydrogen projects are set to grow strongly despite wave of cancellations and persistent challenges, news item

03 The figure that explains it

One sentence in the Global Hydrogen Review 2025 explains the whole series from the previous part, and it is not in the summary. The cumulative firm offtake agreements for low-emissions hydrogen together amount to less than 2 million tonnes a year. That is roughly 5% of the potential production the announced projects could reach in 2030. The IEA writes itself that uncertainty about demand can endanger the whole sector, because producers need reliable offtakers to justify large investments.

Put that 5% next to what did happen. Capital expenditure on projects for low-emissions hydrogen reached almost 7 billion dollars in 2025, almost a doubling compared with 2024, and it would head towards 10 billion dollars in 2026. Investment in electrolysis overtook investment in carbon capture. Investment therefore rose while the pipeline shrank. That is precisely the pattern you expect when money is not the bottleneck.

The sector could build and could finance. The sector could not sell.

Venture capital saw that before the rest. Venture capital for hydrogen fell in 2025 both in absolute terms and as a share of energy venture capital, from a peak of 13% in 2023 to 4% in 2025. Of that remainder almost a quarter went to aviation. The early financiers stepped out of a sector in which the announced volumes were still impressive, and that is an informative signal.

There is another structural reason underneath. For a large group of projects the matter hangs on export: according to the IEA, 80% of those projects are aimed at export markets. That means the buyer not only has to exist somewhere else, but also needs a port, a ship, a carrier and a price agreement. Each of those links is itself an announcement waiting for a buyer.

The summary of this part fits in one line. The sector could build, the sector could finance, and the sector could not sell. Five per cent coverage is not a setback; it is the evidence that the side of the transaction where the money has to come from was never built.

5%

Share of the announced hydrogen production for 2030 that is covered by firm offtake agreements (IEA, Global Hydrogen Review 2025)

Source: International Energy Agency, Global Hydrogen Review 2025, Five key questions about hydrogen, September 2025 · International Energy Agency, Global Hydrogen Review 2026, Investment and innovation, June 2026

04 Carbon removal: one buyer

Durable carbon removal is a younger market and it is better measured, because CDR.fyi tracks every disclosed transaction. That makes it possible to ask a question that would be impolite in most sectors: who actually buys this.

The answer, as at 13 April 2026, is one company. Microsoft stands at 36,439,157 tonnes, or 78.5% of all disclosed contracted tonnes. Buyers connected to Frontier take 1,841,384 tonnes, or 4.0%. All other buyers together, every company, every government and every airline in the world, take 8,167,880 tonnes, or 17.5%. So far 259 suppliers have sold credit on the voluntary market.

The most recent quarter is at once the best and the clearest. The first quarter of 2026 was the largest ever with 2.3 million contracted tonnes, roughly 560% of the first quarter of 2025. Microsoft led the quarter with one agreement of 1 million tonnes, while more than 113 other buyers together contracted 1.3 million tonnes. That last figure is the third highest non-Microsoft volume ever, and it is built up from more than a hundred parties against one.

There is one figure in the series that sharpens the dependence further. Intermediaries facilitated 74% of the contracted tonnes in that quarter, the highest share in the data of CDR.fyi. A market in which three quarters of the volume runs via intermediaries is not a market in which buyers and sellers find each other.

What this is depends on how you read it, and both readings are defensible. You can say that one company on its own started an industry that would otherwise not exist, and that is true and it deserves credit. You can also say that a sector in which 78.5% of demand sits with one balance sheet is not a market but a client relationship. What you cannot say is that demand is broadly carried.

Source: CDR.fyi, Durable CDR Demand Structure Snapshot, position on 13 April 2026 · CDR.fyi, Q1 2026 market report, published May 2026 · Carbon Herald, report on the CDR.fyi Q1 2026 report, 20 May 2026

05 Contracted is not delivered

Beside the question of who buys stands the question of what has been delivered. That distinction is no detail in this market: a contract for a removal in 2032 and a tonne that is in the ground today sit in different columns and are usually treated in press releases as the same thing.

In December 2025 the market passed 1 million tonnes of cumulative deliveries for the first time. Put that next to the roughly 46 million tonnes that were contracted at that moment. The first quarter of 2026 was the second best quarter ever for both deliveries and retirements, with 145,000 delivered tonnes and slightly more than 100,000 retired tonnes, and deliveries were 67% higher than a year earlier. In that same quarter 2.3 million tonnes were contracted. The ratio between what is promised and what arrives is roughly sixteen to one.

Buyers outside the two largest account for 17% of the contracts and for 94% of the tonnes actually retired.

The sharpest figure about that gap comes from the investment analysis CDR.fyi published on 8 January 2026. Of the companies that raised private capital, roughly 55% have ever sold carbon credit, 24% have ever delivered tonnes, and 12% have ever had tonnes retired. A majority of the financed companies therefore reached commercial traction via the sale of credit; far fewer got to delivery, and one in eight to the act the whole product is about.

There is an inversion in the data that nobody expected. Buyers outside Microsoft and Frontier represent 17% of the contracted tonnes, but 90% of the delivered tonnes and 94% of the retired tonnes. The small buyers therefore get almost all the real tonnes, while the large contracts are promises for the thirties. Whoever looks at the headlines sees the mega transactions. Whoever looks at the registry sees that the tonnes come from somewhere else.

The methods tell the same story from the engineering side. Carbon removal based on biomass accounted in 2025 for 96% of purchase volume and 91% of delivered volume, with BECCS leading on purchases and biochar leading on deliveries. In the first quarter of 2026 biochar accounted for more than nine in ten contracted tonnes and for all five of the largest transactions. The market does not choose the best method. It chooses the method that can produce a tonne today.

Source: CDR.fyi, Investment Landscape in Carbon Removal 2026, 8 January 2026 · CDR.fyi, Durable CDR Market Update, 19 May 2026 · CDR.fyi, Q1 2026 market report, May 2026 · Carbon Herald, CDR In 2025: The Shifts And Strides That Redefined The Sector, 17 December 2025

06 Why price is not the problem

The usual explanation for a market that does not take off is that the product is too expensive. In carbon removal that explanation is testable, because CDR.fyi and OPIS survey buyers and suppliers annually about their price expectations. The outcome of 2026 is more nuanced than the explanation allows.

The gap between what buyers want to pay and what suppliers expect narrowed from an average of 107 dollars per tonne in 2025 to 98 dollars per tonne in 2026. Respondents expect that gap to fall further to roughly 48 dollars per tonne by 2030 across the surveyed market. That is a sign that the market is learning: parties respond to real transactions, to delivery experience and to clearer cost structures per method.

At the same time a figure that served as a reference point for years is falling away. One hundred dollars per tonne was the rule of thumb for where carbon removal ought one day to land. The 2026 survey suggests that durable carbon removal will probably not come out broadly at one hundred dollars by 2030. That does not mean it gets more expensive; it means the market has no single clearing price, but a set of methods with their own cost structures, risks, lead times and supply constraints.

More important for this report: the price gap does not explain the delivery gap. If price were the bottleneck, you would see few contracts and many deliveries on the contracts that exist. You see the opposite: very many contracts and very few deliveries. There are buyers willing to pay; the tonnes simply do not come.

The capital confirms that. According to the same analysis, deployed capital peaked in 2023 and fell back in 2024 and 2025 from unusually high levels, while the number of transactions stayed high. Fewer investors took part per round, which fits what suppliers report themselves: it is difficult to find investors who accept the technical risk and the long horizon of durable carbon removal. The answers also show that many companies raised capital to keep operations going, not to scale up. That is a sector surviving on a market that still has to be made.

Source: CDR.fyi and OPIS, Durable CDR Pricing Survey, published 7 May 2026 · CDR.fyi, Investment Landscape in Carbon Removal 2026, 8 January 2026 · Carbon Herald, New Report Highlights Pricing Gap In Durable Carbon Removal Market, 8 May 2026

07 The demand that has to be made

If the diagnosis holds, then the policy conclusion is unpleasant for a decade of programmes. Government support on the production side finances a supply for which no buyer stands. That yields prototypes, factories and announcements, and it does not yield a market. The IEA drew that conclusion itself in 2026 and now recommends instruments that intervene on the demand side: sectoral quotas that prescribe a mandatory share of low-emissions hydrogen in refining and heavy industry, carbon contracts for difference in which the government tops up the gap between the carbon price and the actual abatement cost, and public purchasing that makes a starting market for green steel and low-emissions cement.

Europe already has such an instrument running, and it works not via the government's wallet but via the border. The carbon border adjustment mechanism, established by regulation (EU) 2023/956, entered its definitive phase on 1 January 2026, after a transitional phase of reporting

that began on 1 October 2023. It puts a carbon price on the embedded emissions of imported goods in six sectors: cement, iron and steel, aluminium, fertilisers, electricity and hydrogen.

The working is precisely the reverse of that of support money. Instead of making the clean option cheaper, it makes the dirty option more expensive, and it does that at import so that a European producer does not lose their market to someone who does not bear the cost. On 7 April 2026 the Commission published the first price for a CBAM certificate: 75.36 euros per tonne of carbon dioxide equivalent. That is the first time a published number stands on the external cost this whole sector is trying to take away.

The scale is moreover not symbolic. Fully phased in, the mechanism will cover more than 50% of the emissions in the sectors covered by the emissions trading system. In December 2025 a package of implementing and delegated acts was added, together with a legislative proposal to widen the scope and to strengthen the framework against circumvention. Chemicals and polymers are being considered for 2027 or 2028.

For a company in this sector that is the first piece of policy in years that sits on the right side of the transaction. A cement producer importing into Europe gets a bill that rises as their emissions rise. That is the definition of a buyer being made instead of hoped for. What is missing is in the next part.

Source: IEA, update to the Global Hydrogen Review, February 2026, on the shift towards demand-side instruments · Regulation (EU) 2023/956 establishing a carbon border adjustment mechanism · European Commission, Directorate-General for Taxation and Customs Union, Carbon Border Adjustment Mechanism, definitive regime from 1 January 2026 · European Commission, first published CBAM certificate price, 7 April 2026 · International Carbon Action Partnership, EU CBAM enters compliance phase and outlines path ahead, January 2026

08 What does not add up yet

Start with the instrument this report has just been enthusiastic about. The border adjustment is real and it is slow. The financial obligation applies to imports from 1 January 2026, but the sale of certificates is postponed to 1 February 2027 and the first declaration with surrender of certificates is only due on 30 September 2027. So there is a published price of 75.36 euros that nobody has paid at this moment. On top of that, the simplification package of October 2025 added an exemption for imports below 50 tonnes and lowered the quarterly obligation from 80% to 50% of the embedded emissions. The phase-out of the free allowances runs to 2034. A buyer who only pays in full in 2034 is a buyer who does not justify an investment decision today.

The second reservation concerns the data on carbon removal. CDR.fyi counts disclosed transactions: public announcements, reports via its own portal and links with service providers. Transactions nobody discloses are not in it. That means the concentration of 78.5% is a concentration in the visible market, and that the real distribution can be broader than the figures show. For the delivery gap that holds less, because a retired credit sits in a registry.

The third is that the IEA agrees with the figures and not with the conclusion, and that it has good grounds for that. Announcements that fall through are normal in every capital cycle, and the early phase of a technology knows alternating strong and slow periods. Since 2020 more than two hundred production projects reached an investment decision where at the time a handful of demonstrations stood. The largest electrolyser grew from 30 megawatts in 2021 to 500

megawatts in 2025. Whoever looks only at the falling pipeline misses that something is really being built meanwhile.

The fourth is that the counter-reading of the Microsoft concentration is stronger than it sounds. One buyer carrying 78.5% of a market is fragile, but they also prove something: if payment is made, delivery follows, and 259 suppliers have been able to sell something that was not a product five years ago. The concentration is a symptom of absent regulation and not of a deficient product. Whoever concludes from that that the engineering does not work is reading the data wrongly.

And the fifth is the most honest limitation of the whole reasoning. The buyer does not exist is a description and not a law of nature. It holds as long as the external cost is not priced, and pricing is a political choice that can turn out differently tomorrow than today. This report can tell you what the figures show on 17 July 2026. It cannot tell you whether a parliament introduces a quota in 2028, and that one decision is worth more to this sector than any cost curve in it.

Source: European Commission, CBAM: definitive period from 1 January 2026, first surrender of certificates on 30 September 2027 · International Carbon Action Partnership, EU adopts simplifications of CBAM rules ahead of the compliance phase starting in 2026 · International Energy Agency, Global Hydrogen Review 2025, Five key questions about hydrogen · CDR.fyi, methodology of the Durable CDR Demand Structure Snapshot, April 2026



About Venture Campus

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SOURCES

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