RESEARCH & PERSPECTIVES

The thinking behind the thesis

Carbon-to-Fuel: Why Utilization Beats Storage

The Economic and Policy Case for Treating Captured CO_2 as a Feedstock for Green Methanol Rather Than a Cost to Bury

Research & Perspectives

The Investment Thesis of the Family Office

2025

Abstract

Every tonne of captured carbon dioxide faces a binary destination: it can be buried, or it can be built into a molecule. This paper sets out why our family office invests behind the second answer. On both economic and policy grounds, we treat captured CO_2 as a feedstock for **green methanol** rather than a cost to sequester. The case rests on four points. First, we contrast the two business models: storage monetises carbon only through subsidy or a carbon price, whereas utilization embeds each tonne in a saleable product with intrinsic market value. Second, we establish green methanol as the natural utilization anchor, a storable liquid that consumes captured CO_2 and green hydrogen and serves as both a marine fuel and the precursor to sustainable aviation fuel. Third, we develop the policy case: the absence of a storage-permanence and liability regime in emerging markets, the exclusion of enhanced oil recovery from credible carbon-removal frameworks, and the industrial-policy pull toward domestic fuel production together favour utilization. Fourth, we give the storage counter-case a fair hearing, acknowledging that permanent sequestration remains indispensable at climate scale and that 2025–2026 policy in the United States reinforced storage economics. We conclude that the two pathways are complements, but that for the investor the feedstock logic dominates: treating CO_2 as an input to green methanol converts a cost centre into a revenue line and positions capital at the head of the clean-fuels value chain. This is the reasoning that guides where we deploy, and it sets up the companion paper on green methanol as the pivot of that economy.

Keywords: *carbon utilization; green methanol; e-methanol; CCU versus CCS; captured CO_2 feedstock; carbon policy; clean-fuels economy*

1. Introduction: Bury It, or Build With It

Carbon capture forces a question that is easy to state and consequential to answer: once the CO_2 is in hand, what do you do with it? The conventional climate answer is to store it, to inject it into deep geological formations and keep it out of the atmosphere permanently. The commercial answer, increasingly, is to use it, to convert it into products that carry economic value. The umbrella term carbon capture, utilization, and storage (CCUS) contains both, but the choice between burying carbon and building with it is the hinge of the entire investment case.

This paper lays out the conviction behind how our family office allocates capital in this space: **captured CO_2 is worth more as a feedstock than as a cost to bury, and green methanol is the destination that proves it.** The claim is economic and strategic rather than absolute. It does not deny that permanent storage is necessary at planetary scale; it holds that, for patient capital seeking durable returns, defensible economics, and a position at the head of the clean-fuels value chain, treating carbon as an input to green methanol beats treating it as a liability to sequester. It is why we invest in capture-to-fuel opportunities rather than in disposal.

The timing is not incidental. The field is scaling fast: industry trackers counted 77 operating CCUS facilities in 2025, a 54% year-on-year rise, with roughly 64 million tonnes per year of capture capacity and dozens more projects under construction. As capture volumes grow, the destination decision, whether to store or to build, increasingly determines whether a project is a subsidised cost or a self-supporting business.

Section 2 contrasts the two business models. Section 3 establishes green methanol as the utilization anchor. Section 4 develops the policy case. Section 5 confronts enhanced oil recovery, the awkward incumbent form of “utilization.” Section 6 gives storage a fair hearing, and Section 7 synthesises the two into the investment posture that follows from them.

2. Two Destinations, Two Business Models

Storage and utilization are not merely technical alternatives; they encode different business models with different revenue logics, risk profiles, and policy dependencies.

Storage treats captured carbon as a liability to be disposed of safely and permanently. Because sequestered CO_2 has no intrinsic market value, its economics depend almost entirely on external support: a carbon price, a compliance obligation, or a direct subsidy such as a sequestration tax credit. Its principal risks are long-tail: leakage, liability over geological timescales, and the monitoring, reporting, and verification (MRV) burden required to prove permanence.

Utilization treats captured carbon as a feedstock, an input to a saleable molecule. Its economics are anchored in product markets rather than in subsidy, and its risks are commercial and near-term (offtake, price, conversion cost) rather than geological and long-tail. Crucially, utilization converts a disposal cost centre into a revenue line, and it does so without requiring a permanence guarantee.

Table 1

Storage Versus Utilization: Contrasting Business Models

Dimension	Geological Storage	Utilization (Carbon-to-Fuel)
Revenue basis	Subsidy / carbon price / mandate	Product sales (fuels, chemicals)
Intrinsic value of CO_2	None (disposal cost)	Feedstock with market value
Principal risk	Leakage, liability, permanence (long-tail)	Offtake, price, conversion cost (near-term)
Regulatory dependency	Storage law, MRV, liability regime	Product standards, fuel mandates
Time to revenue	Long; gated by regulation	Near-term; gated by market

Note. The comparison reflects the position of an investor allocating into the value chain, not a national climate planner. Both pathways can coexist within a portfolio.

3. Why Green Methanol Is the Utilization Anchor

Utilization is only as strong as the product it targets. Among the candidate destinations for captured CO_2 (mineralised aggregates, polymers, chemicals, synthetic fuels), green methanol stands out as the anchor molecule for four reasons: it is a genuine CO_2 sink, it is storable and tradable, it commands a policy-driven premium, and it is the gateway to higher-value fuels.

3.1 A Molecule That Consumes Carbon

E-methanol is produced by combining green hydrogen with captured CO_2, giving it a closed carbon cycle: it re-emits in use only the carbon it consumed in production. The stoichiometry is direct: roughly one tonne of e-methanol requires on the order of 200 kilograms of green hydrogen and about 1.5 tonnes of CO_2. Captured carbon is therefore not incidental to the product; it is a primary raw material, which is precisely why methanol converts a capture liability into a feedstock demand.

3.2 Storable, Tradable, Infrastructure-Compatible

Unlike gaseous hydrogen or cryogenic ammonia, methanol is liquid at ambient conditions and compatible with existing storage and bunkering infrastructure. This makes it the practical storable intermediate of the clean-fuels economy, the link between intermittent renewable power, captured CO_2, and end-use fuels, a theme developed in the companion paper. The trade-off is energy density: methanol requires roughly 2.5 times the storage volume of heavy fuel oil, a manageable penalty relative to the handling complexity of the alternatives.

3.3 A Policy-Driven Price Premium

Green methanol commands a substantial premium over both conventional methanol and marine fuel oil, and that premium is underwritten by policy rather than by intrinsic scarcity. Indicative 2026 production costs run to roughly US$900–1,400 per tonne for advanced bio-methanol and US$1,600–2,400 per tonne for e-methanol, against US$500–800 per tonne for very-low-sulphur fuel oil. The gap is closed not by the market alone but by carbon pricing and fuel mandates, which is why the policy section that follows is not a footnote to the economics but part of the economics.

3.4 The Gateway to Sustainable Aviation Fuel

Methanol is also the precursor to sustainable aviation fuel (SAF) via the methanol-to-jet route, extending the same captured-carbon feedstock from maritime into aviation, the subject of the fourth paper in this series. This gives the carbon-to-methanol pathway an option value that pure storage cannot match: one feedstock, two of the hardest-to-abate transport sectors.

Table 2

Green Methanol Cost Positioning (Indicative, 2026)

Fuel	Indicative Cost (US$/t)	Basis
Very-low-sulphur fuel oil	500–800	Fossil marine benchmark
Advanced bio-methanol	900–1,400	Biomass / biogas route
E-methanol	1,600–2,400	Green H_2 + captured CO_2

Note. Costs are indicative 2026 production estimates and vary by project, feedstock, and power price. The premium over fuel oil is bridged by carbon pricing and fuel mandates.

4. The Policy Case for Feedstock over Burial

The economic case rests on a policy foundation, and three policy realities tilt the ground toward utilization for the commercial actor in emerging markets.

4.1 The Storage-Regulation Gap

Permanent storage requires a legal and institutional apparatus that many markets have not built. In China, which holds an estimated 2,300 gigatonnes of theoretical onshore storage capacity, legal liability chains for stored CO_2 remain unclear, national MRV frameworks are incomplete, and land-use and public-acceptance issues create uncertainty. Analysts consistently conclude that pure CO_2 storage there is constrained by policy and cost in the near term and will remain demonstration-scale. Utilization sidesteps this entire category of risk: building carbon into a fuel requires no permanence guarantee, no century-scale liability, and no geological MRV regime. The regulatory path to revenue is simply shorter.

4.2 Industrial Policy Rewards Domestic Fuel Production

Treating CO_2 as feedstock aligns with reinforcing industrial-policy priorities that burial does not serve. Domestic production of green methanol and downstream e-fuels advances the hydrogen economy, builds competitiveness in clean-technology export markets, and reduces dependence on imported hydrocarbons, an energy-security objective. Where storage is a compliance cost, utilization is an industrial-development lever, and policy frameworks that reward the latter give utilization projects a durability that subsidy-dependent storage lacks.

4.3 Carbon Pricing Underwrites the Premium

Utilization does not escape policy dependence entirely; rather, it depends on the more politically durable instrument. Green methanol's premium is closed by tightening carbon prices and binding fuel mandates, such as EU carbon prices projected toward €150 per tonne by 2030 and escalating maritime and aviation blending obligations. These instruments raise the cost of the fossil baseline rather than subsidising a specific disposal method. As the fossil baseline is penalised, the feedstock economics of green methanol improve automatically, without a dedicated line-item subsidy.

5. The Enhanced Oil Recovery Complication

An honest case for utilization must confront enhanced oil recovery (EOR), which today dominates CO_2 use in both China and the United States. EOR injects CO_2 into oil reservoirs to lift production, storing much of it in the process while generating oil revenue. It is the most commercially proven utilization route, with Sinopec's megatonne-scale Qilu–Shengli project the flagship example, and it is the reason "utilization" and "clean" are not synonyms.

EOR is a problematic form of utilization for a decarbonisation-positioned business, and its weaknesses sharpen the broader argument rather than undermining it. It carries climate-credibility risk, since it extends fossil-fuel production; regulatory risk, as post-2030 policy may restrict it as a qualified pathway; investor-perception risk for ESG-mandated capital; and export-market risk, since the EU Carbon Removal Certification Framework explicitly excludes EOR. The implication is not that utilization fails but that a durable utilization strategy must pivot deliberately away from EOR toward feedstock-for-fuel conversion, the green-methanol end of the spectrum. A representative commitment caps EOR at no more than 40% of utilization volume in 2026–2030, cuts it to 20% by 2030, and phases it out by 2035 in favour of e-fuels, chemicals, and, where viable, storage.

6. The Case for Storage: A Fair Hearing

A fair assessment demands the strongest counter-case. Mainstream climate analysis and recent policy do not support a blanket claim that utilization is superior; on several dimensions storage remains indispensable, and its case strengthened in 2025–2026.

- **Scale.** Utilization markets are small relative to total emissions. Converting CO_2 into fuels and chemicals cannot absorb climate-scale volumes; only geological storage can sequester gigatonnes durably. Analysts frame permanent storage as the dominant destination and utilization as a complementary, economics-enhancing pathway.
- **Permanence.** Utilization in fuels is generally not permanent removal: burning green methanol re-releases its carbon. Unless the carbon is biogenic or atmospheric and the cycle is genuinely closed, utilization recycles rather than removes, whereas storage removes durably.
- **Policy momentum.** The United States' 2025 tax law preserved the 45Q credit at US$85 per tonne for point-source capture and US$180 for direct air capture, and, for the first time, extended the full rate to CO_2 used in EOR: rare bipartisan durability that de-risks storage-linked investment. Europe's Industrial Carbon Management Strategy similarly prioritises transport-and-storage infrastructure.
- **Cost-effectiveness at the margin.** For hard-to-abate point sources, capture-and-store can be a lower-cost abatement route per tonne than building the renewable-power and hydrogen infrastructure that e-methanol requires.

These are serious arguments. They establish that storage and utilization answer different questions, namely durable removal at scale versus commercial value creation, and that a complete national strategy needs both.

7. Synthesis and Recommendations

Reconciling the two cases dissolves the apparent contradiction. At the level of national or planetary climate strategy, storage is indispensable and utilization is complementary. At the level of the investor, particularly one deploying into markets without a storage-linked subsidy, the feedstock logic dominates: building captured CO_2 into green methanol earns product revenue now, avoids an immature storage-liability regime, embeds each tonne in a premium molecule, and opens an option on aviation fuel downstream. The two claims are compatible because they answer different questions, and our capital follows the second.

Our posture is therefore a **utilization-led strategy that preserves an option on storage**, backing the capture, purification, and integration capabilities that serve green-methanol production today and that transfer to storage-and-transport infrastructure as regulatory frameworks mature toward the 2030–2050 window analysts identify as the sector's deployment peak. The principles that guide where we deploy follow:

- **We back feedstock, not waste.** We favour green-methanol conversion that monetises each captured tonne through a premium product and requires no storage-permanence guarantee, over projects whose only revenue is a disposal subsidy.
- **We avoid EOR exposure.** We treat enhanced-oil-recovery revenue as transitional at best, and we underwrite opportunities on their ability to pivot toward climate-aligned utilization, protecting export-market access and the durability of the return.
- **We preserve the storage option.** We back capture, purification, and integration capabilities that serve utilization now and transfer to storage-and-transport infrastructure as legal and MRV frameworks mature, keeping optionality on both sides of the pathway.
- **We position for policy tailwinds.** We anchor our underwriting to durable instruments, namely tightening carbon prices and fuel mandates, rather than to any single disposal subsidy, and we track EU CRCF eligibility and 45Q-style incentives for shifts in the store-versus-build calculus.

If captured carbon is best understood as a feedstock, the next question is what to build with it. The companion paper takes up that thread, arguing that green methanol is not merely one product among many but the pivot of the clean-fuels economy: the storable liquid intermediate that links CO_2 capture, green hydrogen, and aviation-grade fuel at commercial scale.

References

BloombergNEF. (2024). Scaling up hydrogen: The case for low-carbon methanol. https://assets.bbhub.io/media/sites/25/2024/06/BNEF-Methanol-Report_to-publish.pdf

Carbon Herald. (2026, January 27). What's next for carbon capture, utilization & storage (CCUS) in 2026? https://carbonherald.com/whats-next-for-carbon-capture-utilization-storage-ccus-in-2026/

CCUS Xchange. (2026, February 18). CCUS in 2026: From pilot projects to a scalable decarbonization engine. https://ccusxchange.com/ccus-2026-global-outlook-carbon-capture-utilization-storage/

Energy Solutions Intelligence. (2026). Green methanol for shipping 2026: Maersk's bet & supply chain challenges. https://energy-solutions.co/articles/sub/green-methanol-for-shipping-maersk-bet-supply-chain-challenges

Enviliance Asia. (2024). China: Carbon capture, utilization and storage policy trends report. https://enviliance.com/regions/east-asia/cn/cn-ccus

European Commission. (2024). Industrial carbon management strategy. https://energy.ec.europa.eu/

Global CCS Institute. (2025). Global status of CCS 2025. https://www.globalccsinstitute.com/

Global Maritime Forum. (2024). Methanol as a scalable zero-emission fuel. https://globalmaritimeforum.org/insight/methanol-as-a-scalable-zero-emission-fuel/

International Renewable Energy Agency. (2021). Innovation outlook: Renewable methanol. https://www.irena.org/

Oxford Institute for Energy Studies. (2022). Carbon capture, utilization and storage. In Guide to Chinese climate policy. https://chineseclimatepolicy.oxfordenergy.org/

U.S. Internal Revenue Service. (2025). Section 45Q credit for carbon oxide sequestration. https://www.irs.gov/

World Economic Forum. (2025, February 24). E-methanol: The game changer for decarbonizing shipping. https://www.weforum.org/stories/2025/02/emethanol-a-game-changer-for-decarbonizing-shipping/

Zhang, X., et al. (2025). A review of CO_2 capture, utilization and storage in China: Development status, cost limits, and strategic planning. Processes, 13(3), 905. https://www.mdpi.com/2227-9717/13/3/905