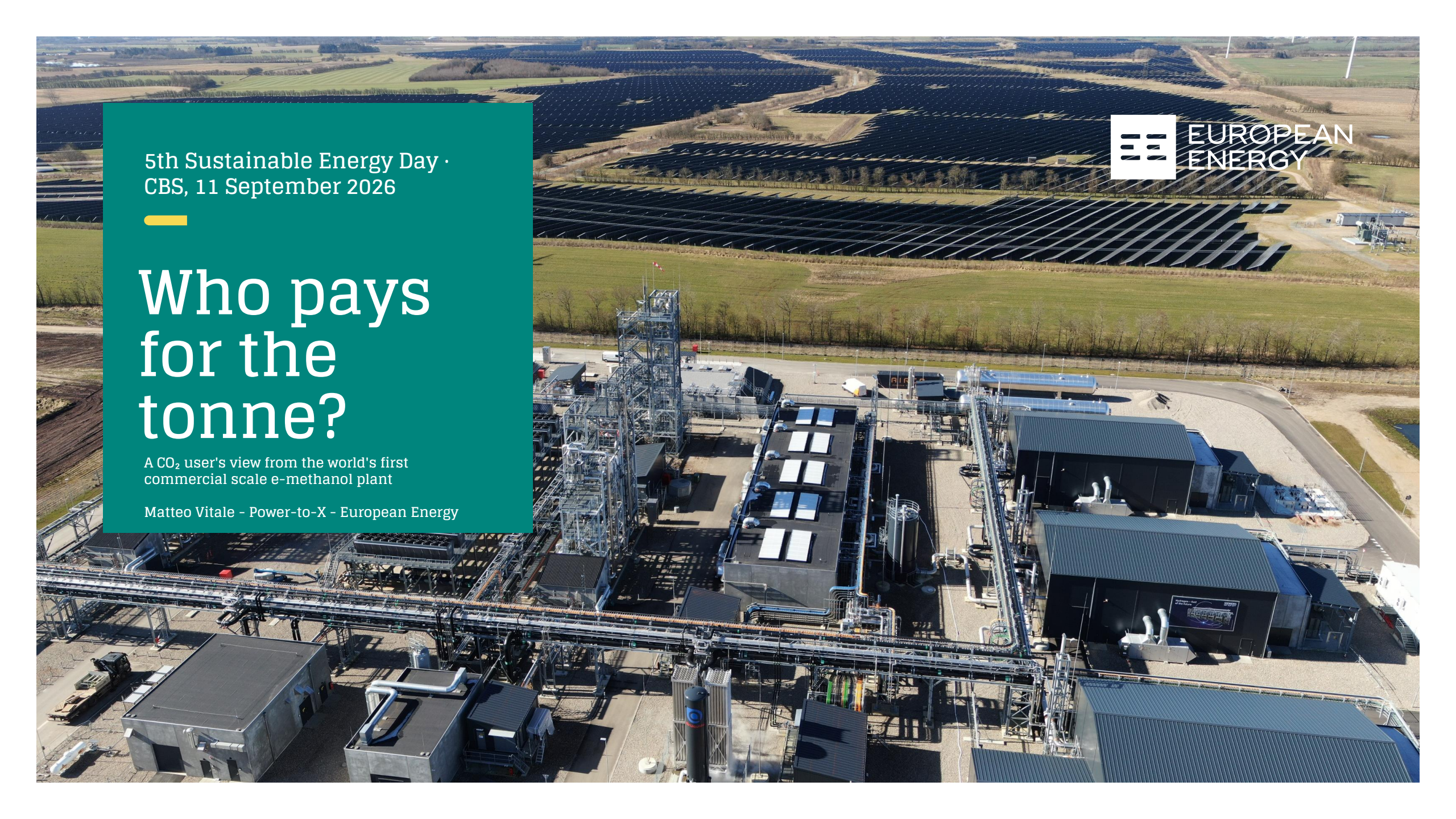




5th Sustainable Energy Day ·
CBS, 11 September 2026



EUROPEAN
ENERGY

Who pays for the tonne?

A CO₂ user's view from the world's first
commercial scale e-methanol plant

Matteo Vitale - Power-to-X - European Energy

The perspective I bring: I spend my week trying to buy CO₂

Power-to-X project development at European Energy - modelling, economics and bankable decisions



12 years bridging technical and commercial work

Aerospace and wind-power engineering background, now working where engineering, economics and finance meet



Power-to-X project development

Green hydrogen and e-methanol projects, from first models to investment decisions



Kassø and Måde

Involved in both Danish Power-to-X plants from development through to operation

So when this room says “there is competition for biogenic CO₂”, I am the side of that competition that has to pay for it.

European Energy: we develop, construct, finance and operate... and we buy CO₂

Founded in Denmark in 2004, active across the renewable value chain



25 markets

Projects across four continents



41 GW pipeline

Around 800 projects in development



4+ GW installed

Built and grid-connected since 2004



900+ employees

Across 29 offices



6 technologies

Wind, solar PV, Power-to-X, battery storage, carbon capture



2 Power-to-X plants operating

Kassø (e-methanol) and Måde (e-hydrogen), both in Denmark

Kassø: commercial scale e-methanol, operating since May 2025

The world's first: it runs on 45,000 tonnes of biogenic CO₂ a year



52 MW PEM electrolyser

304 MW DC co-located solar

ISCC-certified RFNBO — a world first

≥99.85% methanol purity

APPROXIMATE FIGURES PER YEAR OF OPERATION

Biogenic CO₂ from Tønder biogas upgrading	45,000 t
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Renewable electricity co-located solar, grid in low sun hours	360 GWh
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Water local wells	90,000 t
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↓ e-methanol synthesis

e-methanol nameplate capacity 42,000 t	32,000 t
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Hydrogen 52 MW PEM, flexible operation	6,300 t
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Excess heat district heating for up to ~3,300 homes	50 GWh
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1.4 t of biogenic CO₂ per tonne of e-methanol. No CO₂, no product.

Some sectors need molecules, not electrons: the question is whose carbon?

Being honest about what utilisation does, and what it does not do



Molecules, not electrons

Deep-sea shipping, aviation and chemicals need energy dense carbon based molecules for decades yet. Direct electrification does not reach them. The carbon in those molecules is either fossil, or it is recycled.



Use displaces, storage removes

E-methanol releases its carbon again when burnt. The gain is the fossil carbon never extracted: RFNBO fuels must beat the fossil comparator by at least 70%, and Kassø e-methanol delivers around 95%. That is a different job from permanent storage, not a competing one.



The option nobody prices

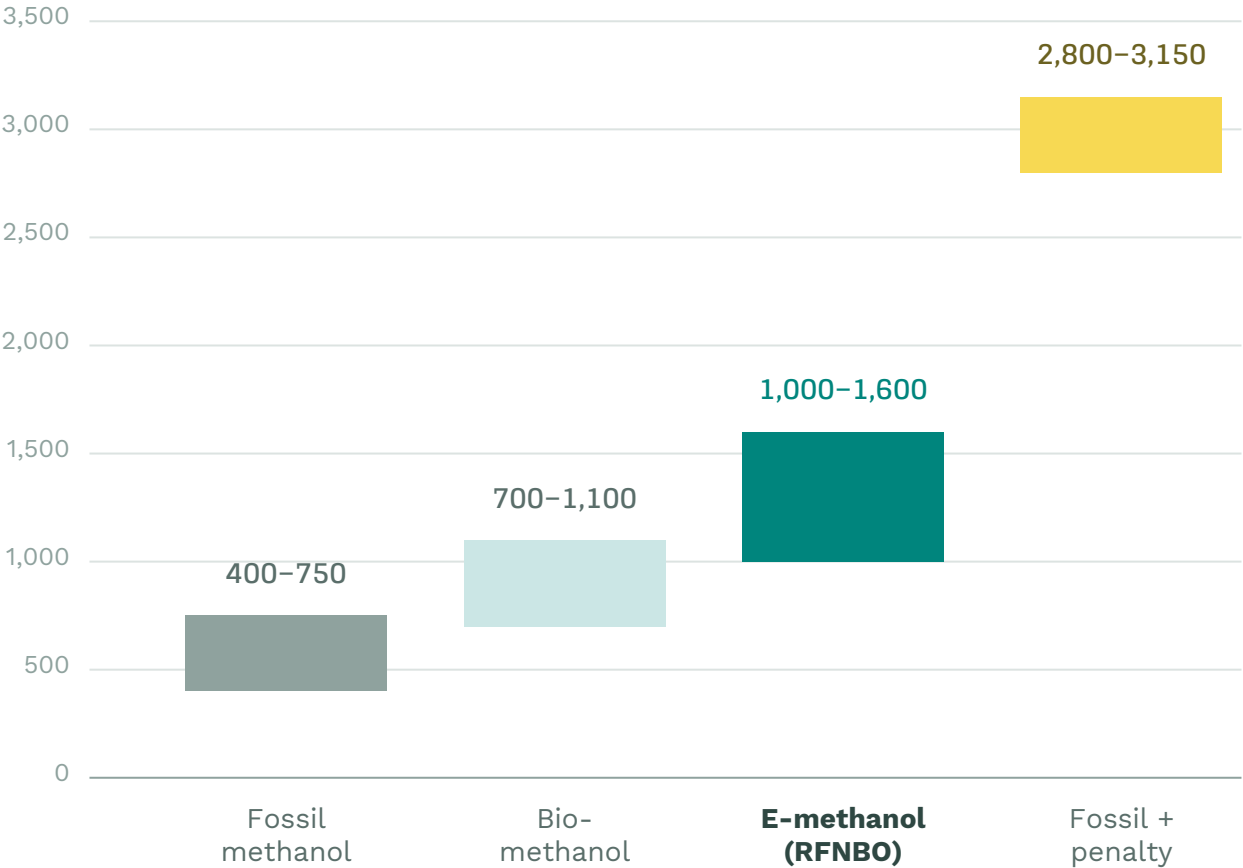
Danish biogas upgrading separates roughly 1.7 Mt of biogenic CO₂ a year. Most of it is vented. Biogenic CO₂ is zero-rated in the EU ETS and sits outside the Danish CO₂ tax, so releasing it costs nothing at all.

Capture, use, storage... and venting. Venting is the incumbent, and it is free.



Our willingness to pay for CO₂ is created by regulation, not by the energy market

Methanol offtake price ranges and the cost of non-compliance, EUR per tonne



WHAT THE PREMIUM IS MADE OF

Energy value €400–750/t
what the molecule is worth as fuel

Green premium €600–850/t
what an offtaker pays on top, today

Value ceiling €2,400/t
what missing the RED III quota costs instead

The energy value alone would never pay for the CO₂.

Everything paid above the fossil price is compliance value and that premium is what funds the CO₂ purchase.

What a CO₂ user actually needs; and what we can pay

The specification behind the purchase order, from the buyer's side of the table

Origin	Documented biogenic. RFNBO eligibility depends on it, and so does the certificate the offtaker pays for
Quality	High purity, consistent. Our product is certified at ≥99.85% purity; the feed has to support that
Volume	~45,000 t/yr for one Kassø. A plant ten times the size needs ~450,000 t/yr
Delivery	Liquefied and delivered to the gate. We buy a molecule, not a project
Contract shape	Our plants follow the power price, not the calendar. We need interruptible or buffered supply; capture plants want baseload take-or-pay
Tenor	Long enough to finance. The asset runs 25 years; fuel offtake rarely exceeds 5–10 years

WHAT WE CAN PAY, UP TO

~€XX /t

for delivered biogenic CO₂, in the right conditions, today

That number is not a negotiating position.

It is what the fuel price, the electricity bill and the plant's economics leave for the carbon. Above it, the project stops being financeable - and the tonne goes somewhere else.

One tonne of biogenic CO₂, three destinations - one guaranteed price

A Danish biogas upgrader separating CO₂ today has three options



VENTED

€0 /t

Biogenic CO₂ is zero-rated in the EU ETS and outside the Danish CO₂ tax. Still the fate of most of the ~1.7 Mt separated in Denmark every year.

The incumbent option, and the cheapest



STORED

DKK 875 /t · 15 years

CCS fund awarded May 2026 (Aalborg Portland, 1.25 Mt/yr) at DKK 874.75/t. Biogenic-only NECCS awards in 2024: DKK 969–2,600/t over 8 years. Paid only once permanent geological storage is documented (as is the CO₂ tax rebate.)

≈ €117/t, state-guaranteed



USED

€0 /t of CO₂

No Danish scheme pays per tonne of CO₂ used. Support goes to the fuel: the PtX tender at DKK 40–67/GJ of hydrogen, the green gas auctions and it never reaches the owner of the carbon.

My bid instead: up to ~€xx/t delivered

Bury a tonne and the state guarantees the price for 15 years. Use a tonne and it is worth whatever a buyer like me can pay. Vent it and it is free.



Four changes that would move carbon towards use

None of them requires spending more money on carbon

1

Price the tonne, not the destination

Pay per tonne of biogenic CO₂ abated, whichever way it goes or keep storage contracts short. The Energy Agency set the NECCS term at 8 years precisely so that “the cheapest biogenic sources are not committed long-term to storage purposes, but can be released for utilization purposes”. That should be the rule.

2

Fix the accounting

Storage scores in the Danish climate account. Utilisation only scores if the fuel is burnt in Denmark, and ships and aircraft leave. As long as that is true, the political incentive will always favour storage (Concito, 2025).

3

Recognise use in its own frame

Utilisation can never be certified as removal: the CRCF requires carbon to stay stored for at least 35 years, so a fuel is excluded by design. Recognition has to come through the fuel rules and the national inventory instead.

4

Contract for a flexible buyer

Allow CO₂ supply terms that fit a plant chasing cheap power; interruptible or buffered volumes, over a tenor long enough to finance.



The carbon is not hiding. The buyer is standing right here.

We will pay up to ~€xx/t for delivered biogenic CO₂, at scale, today. What policy decides is whether that tonne is available to buy, buried or vented.



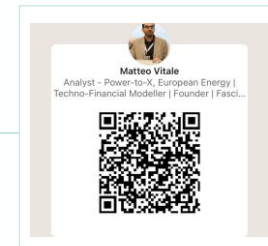
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The counter-argument: “a level playing field would still bury the tonne”

Where the abatement-cost critique is right, and where it misses the point

THE CRITIQUE

“CCU is so expensive that letting it compete for the support would hardly make any difference.”

Concito, April 2025

e-kerosene today DKK 16,000/t

≈ €2,150 — EASA, 10x fossil jet fuel

e-fuels in 2030 DKK 10,000/t

≈ €1,340 — Green Power Denmark

CCS, sustainable < DKK 1,500/t

≈ €200 — Concito's own benchmark

Cost per tonne of CO₂ abated

1

We are not selling the same product

Storage delivers a tonne kept out of the air; we deliver a tonne of fuel deep-sea shipping cannot buy elsewhere. Our comparator is fossil bunker fuel plus the sector penalty.

2

Who pays is not the same either

Storage is paid per tonne by the state; our carbon is paid for by offtakers under RED III. Concito concedes it: the PtX tender price worked only because private players paid a premium.

3

The carbon is the small line in our cost

At €80/t delivered, CO₂ is about €110 of a tonne of e-methanol selling for €1,000–1,600. Electricity and capex set the abatement cost, so the asymmetry is cheap to fix.

4

And most of the tonne is still vented

Denmark separates roughly 1.7 Mt of biogenic CO₂ a year; some 160,000 t/yr is contracted for storage. The fight is over the cheapest streams and the next decade of contracts.

Rank the tonne by climate value if you like — but a vented tonne has no value at all.