



Creating the Market for Clean Carbon

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P2X Solutions

Forerunner in hydrogen and synthetic fuels

- A Finnish company founded in 2020 by experts of the energy market
- Produces and distributes hydrogen and synthetic fuels such as e-methane, e-methanol, and e-ammonia
- Green hydrogen is produced from renewable electricity and water
- P2X Solutions' first 20MW green hydrogen production and e-methane plant was commissioned in Harjavalta in 2025 → H₂ sold e.g. to food industry and mobility and e-methane to German road transportation
- Aiming for 1 GW of hydrogen production capacity by 2030s
- Swiss energy company Alpiq (revenue CHF 8.4 billion in 2023) became the main owner of P2X Solutions in April 2024

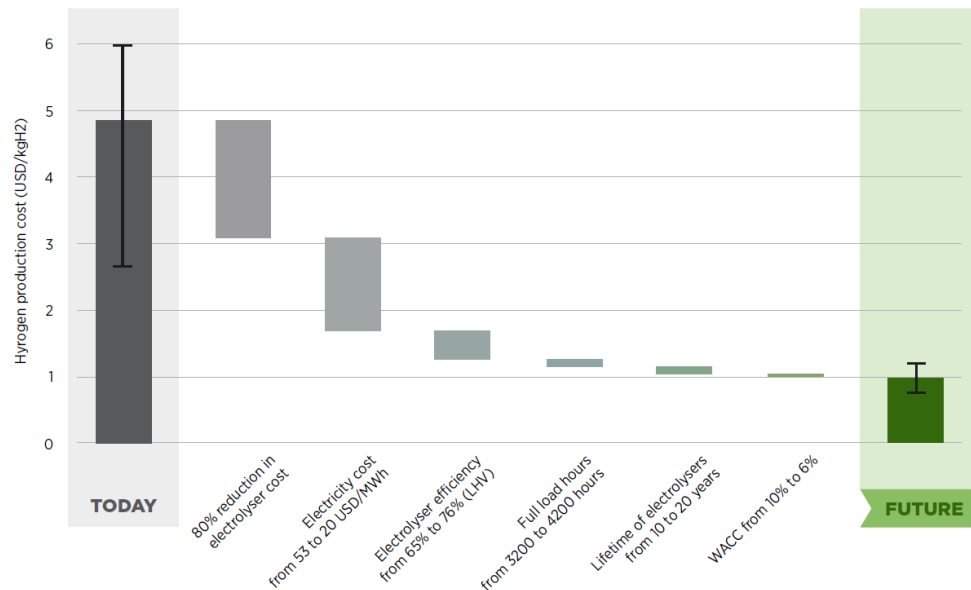
We scale up systematically our production



Hydrogen cost defines the raw material cost – Significant price gap between fossil and renewable

GREEN HYDROGEN COST REDUCTION

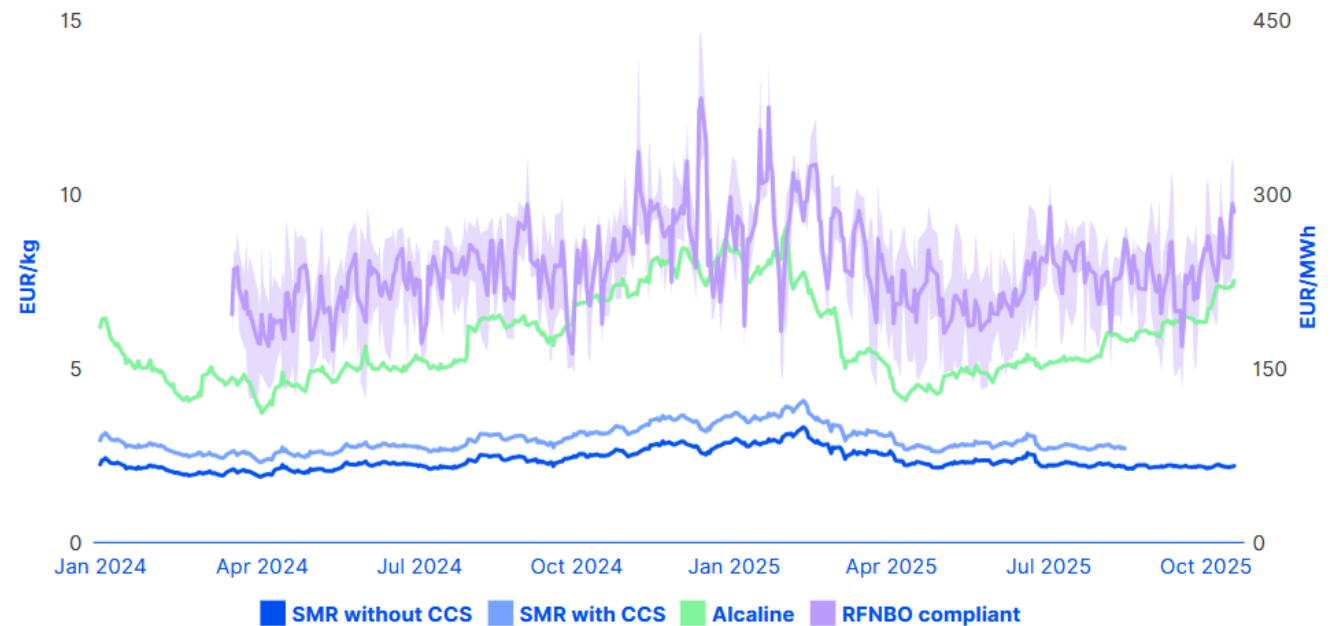
Figure ES1. A combination of cost reductions in electricity and electrolyzers, combined with increased efficiency and operating lifetime, can deliver 80% reduction in hydrogen cost.



Note: 'Today' captures best and average conditions. 'Average' signifies an investment of USD 770/kilowatt (kW), efficiency of 65% (lower heating value – LHV), an electricity price of USD 53/MWh, full load hours of 3200 (onshore wind), and a weighted average cost of capital (WACC) of 10% (relatively high risk). 'Best' signifies investment of USD 130/kW, efficiency of 76% (LHV), electricity price of USD 20/MWh, full load hours of 4200 (onshore wind), and a WACC of 6% (similar to renewable electricity today).

Based on IRENA analysis

Expectation



Source: ACER, based on data from S&B Global Commodity.

Reality

H2 cost will go down but not at a pace expected

Factor	Realistic gain	Structural limitation
Electricity	More wind and solar capacity; higher efficiency; better siting; hybrids; PPA optimisation	Electricity remains an opportunity-cost commodity; profile, grid and firming are not free.
Electrolyser	Mass manufacturing, standardisation, longer stack life, cheaper BoP	The stack is not the whole plant; project-specific BoP, compression, grid connection and EPC remain.
Efficiency	About 55 → 50 kWh/kg is a credible 2030s order of magnitude at BoL	Hydrogen's HHV is 39.4 kWh/kg; losses cannot be driven to zero.
Utilisation rate	Hybrids, storage and flexible operation	Hourly matching, variable generation and continuous off-take pull in different directions.
Financing	Long-term contracts, guarantees, CCfDs and clear regulation lower the WACC	First-of-a-kind plants' technology, completion and demand risk do not disappear with falling CAPEX.

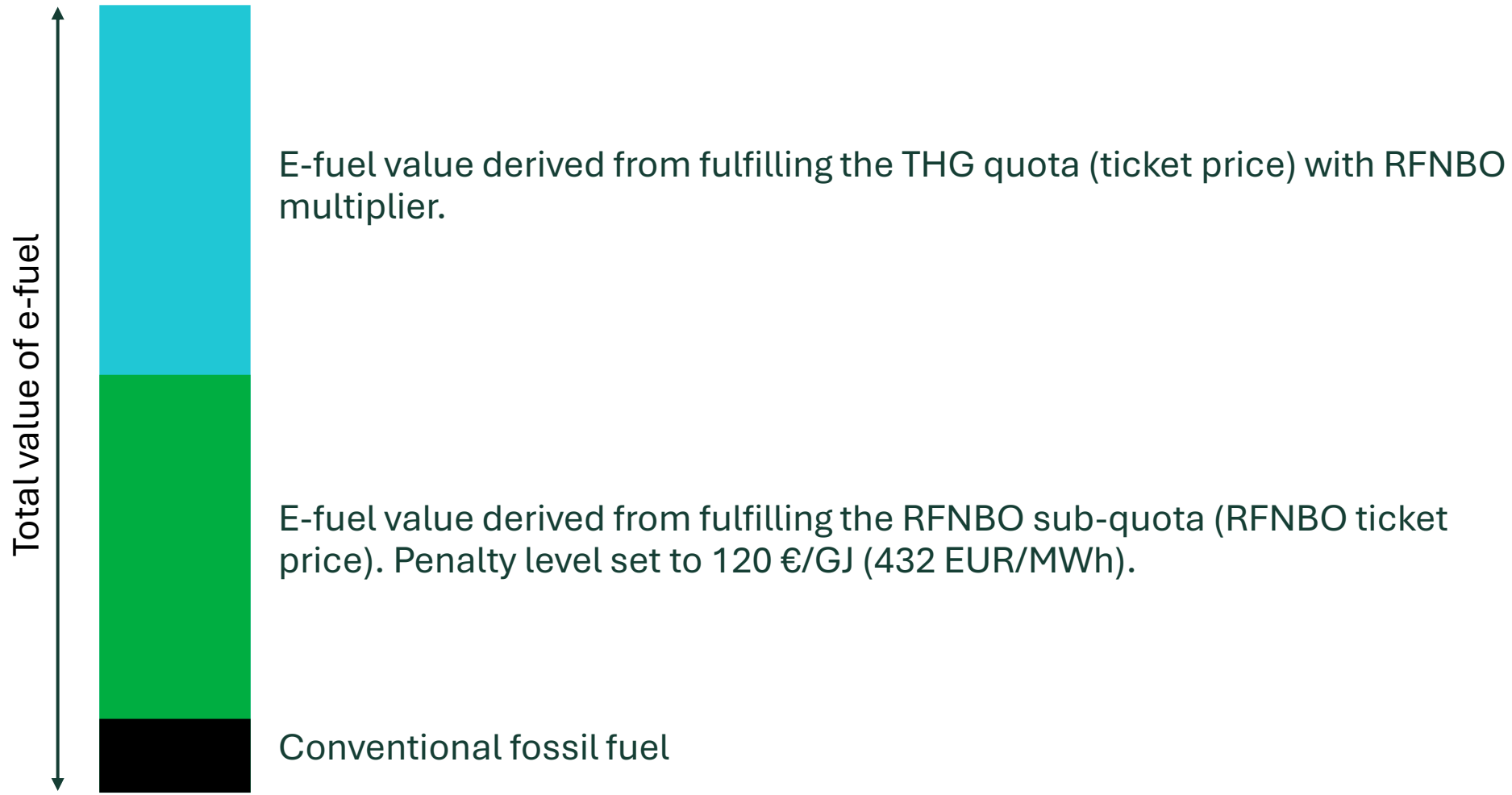
Regulation can create bankable demand

- **Quotas and mandates.** RED III requires RFNBOs to account for at least **42 %** of industrial hydrogen use in 2030 and **60 %** in 2035.
- **Production premium.** The Hydrogen Bank pays a competitively bid, fixed **€/kg premium** for up to ten years of operation.
- **CCfD.** Germany's first climate contracts run for 15 years and are indexed to energy and EUA prices; their purpose is to “balance out additional costs” where a clean process cannot compete with the conventional one.
- **Carbon price and CBAM.** CBAM's definitive phase started on **1 Jan 2026** and covers hydrogen and fertilisers among others; the certificate price tracks the EU ETS auction price.
- **Demand aggregation, labels and long-term offtake agreements.** The IEA recommends combining quotas, mandates and public procurement of low-carbon materials, because “Creating long-term visibility of demand is crucial to stimulate investment.”
- **Public procurement and product standards.** The Commission's proposed Industrial Accelerator Act includes low-carbon and Made-in-EU criteria for public procurement and subsidies.

Road transport sector paving the way for e-fuels

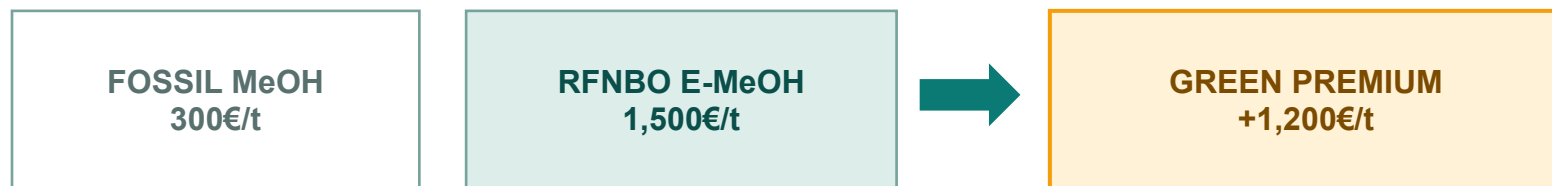
Country	RFNBO sub-target	RFNBO penalty	RFNBO multiplier towards quota	RFNBO sub-target status	Other
Finland	4.0 cal-% in 2030	198 EUR/MWh	No multipliers	Approved & binding	Intermediate RFNBOs limited to 1.0 cal-%
Germany	1.5 cal-% in 2030 10 cal-% in 2040	432 EUR/MWh	3x, decreasing to 1x over 2037-2040	Approved & binding	Third countries must allow onsite inspections
Spain	2.5 cal-% in 2030 11 cal-% in 2040	361 EUR/MWh	No multipliers	Approved & binding	1.0 cal-% of target in 2030 can be met with adv. biofuels
France	1.5 cal-% in 2030 2.0 cal-% in 2035	396 EUR/MWh	No multipliers	Proposal in parliament	Meeting RFNBO sub-target waives the adv. sub-target

E-fuel value determination for German road transport mandate



Small mandates create markets

Example: Polyoxymethylene/acetal (POM) shows demand can scale before product prices move significantly



POM applications: gears · locks · connectors

MANDATES START SMALL
 DE road 0.1% · ES road 0.2% · EU eSAF 1.2% · FI road 1.5%

RFNBO SHARE		€ / t POM	% PRICE	100 g POM
1%	➔	+13€	+0.5%	27.0 → 27.1 ct
5%	➔	+64€	+2.4%	27.0 → 27.6 ct
42% ¹	➔	+538€	+20%	27.0 → 32.4ct

¹ Just an example, RED III 42% is for H2 and not for methanol

² 100 g reference: €0.27 of POM resin before moulding · formula uses 1.067 t MeOH/t POM

Illustrative—not guaranteed. Sources: Andreassen & van Baten, Energy & Fuels (2025); ECB FX 25 Sep 2026; PlasticPortal Sep 2026; IEA, EC, Finnish Government and Spain RD 611/2026

Fuel mandate logic moves upstream

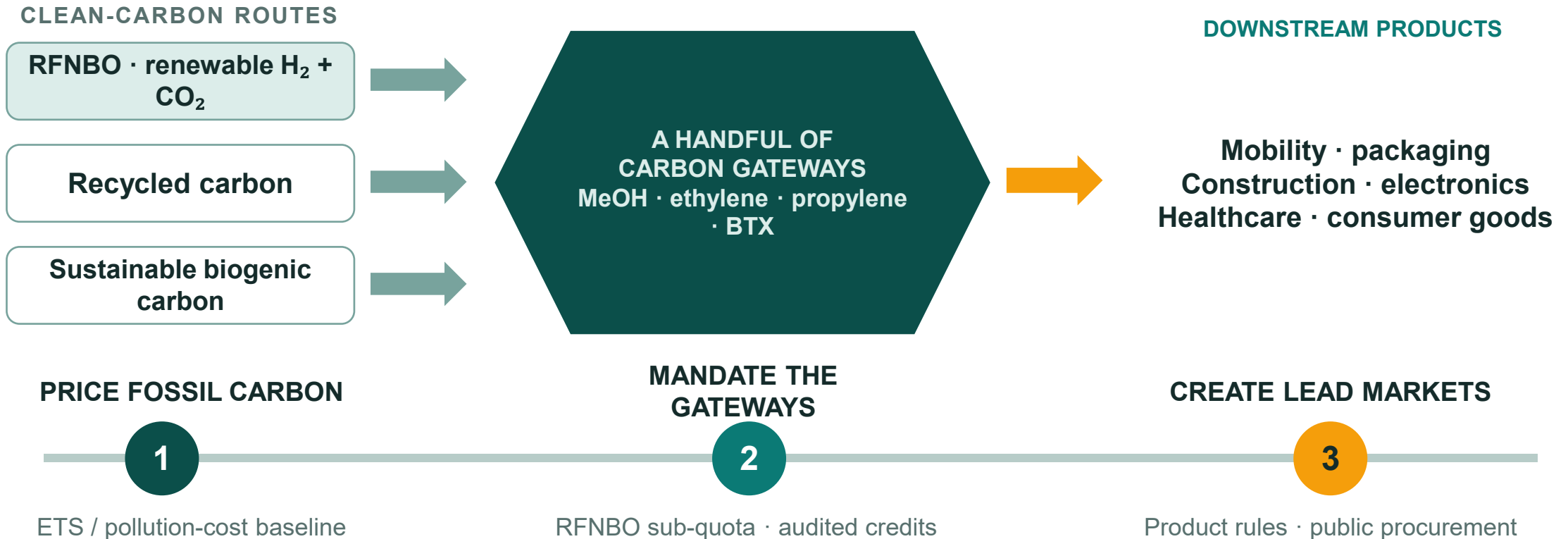
Obligated party: producer / importer / OEM—not the consumer.

- 1 Dedicated RFNBO share
 - 2 Audited credits + mass balance
 - 3 Same rule for imports
- Pattern: PPWR · ELV · ESPR**

PPWR = Packaging and packing waste regulations
 ELV = End-of-life Vehicles Regulation
 ESPR = Ecodesign for Sustainable Product Regulation

Regulate the carbon gateways—not all products

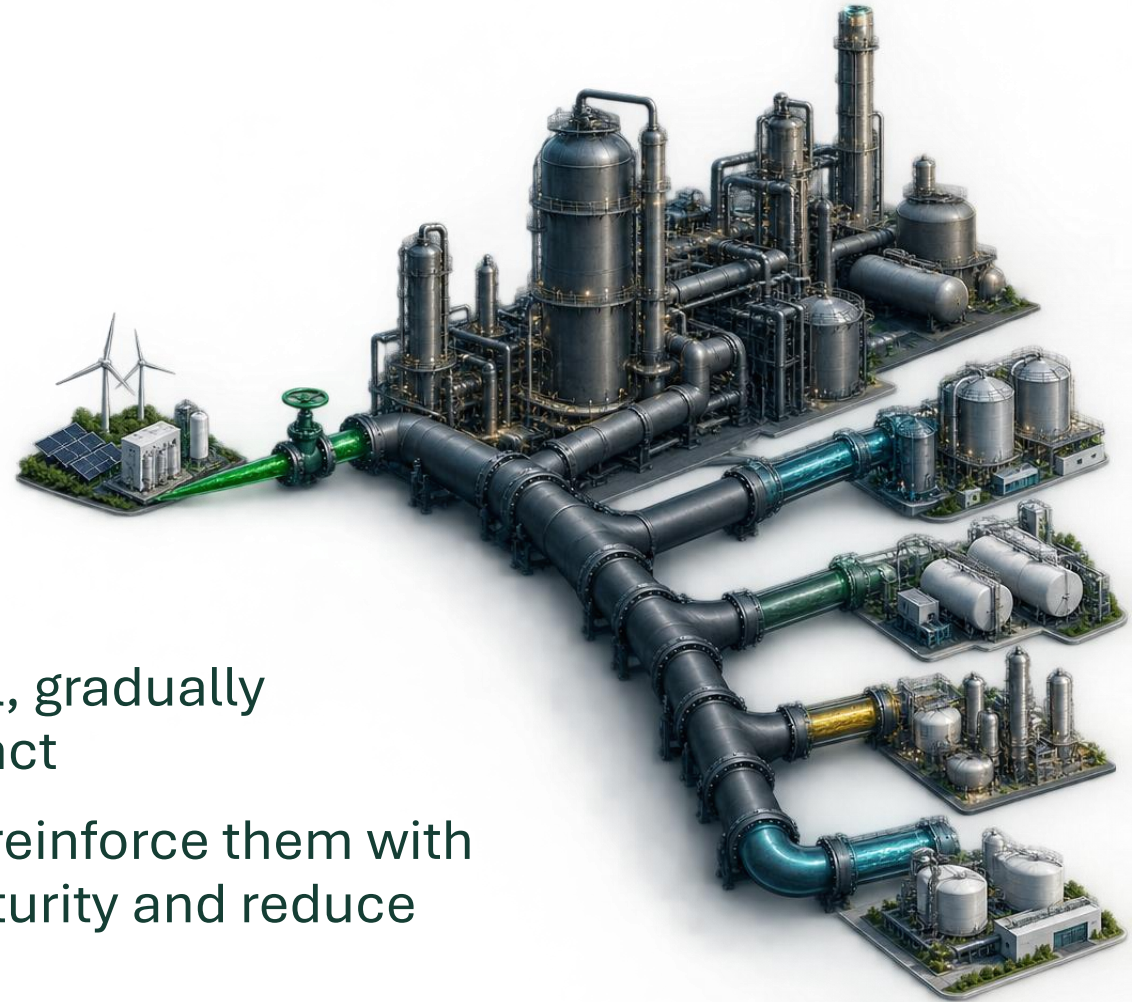
Example with methanol; expand by platform molecule and selected lead market.



Obligate producers and importers at first EU placement—apply the same rule to imports.

Create the market — Don't wait for cost parity

- Renewable hydrogen will remain structurally more expensive than fossil and low-carbon alternatives through the 2030s
- Technology maturity can narrow the gap, but regulation is needed to create predictable, bankable demand
- Transport provides the blueprint: start with small, gradually increasing mandates to limit the initial cost impact
- Place obligations at a few carbon gateways and reinforce them with selected lead markets—scale will then drive maturity and reduce costs



We change the world to become
cleaner - together



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