

Industrial Assets Decarbonization in Repsol

From current operations to new products

November 2026

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Legal disclamer

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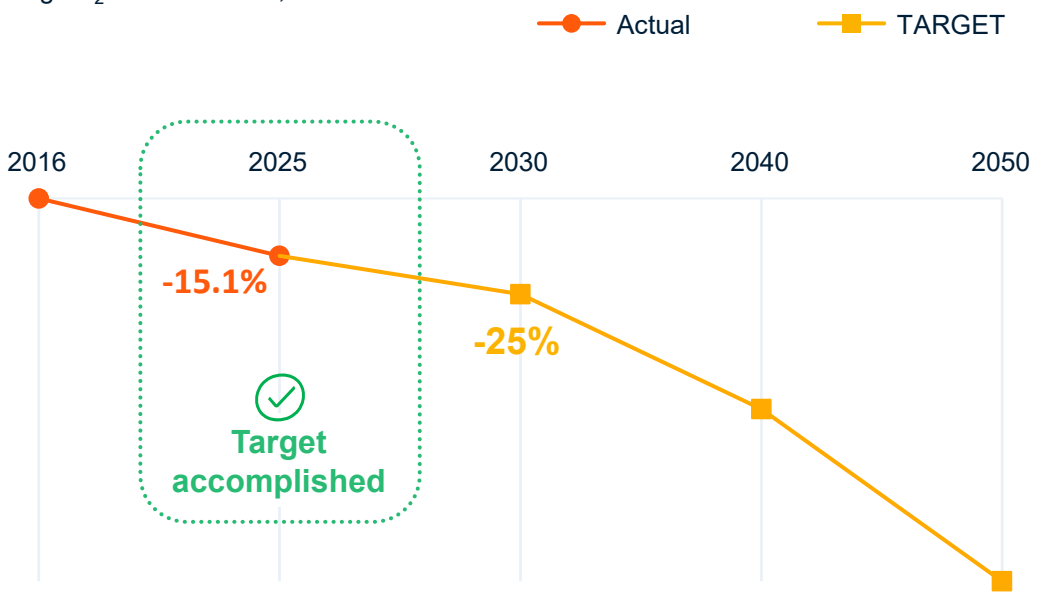
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Net Zero: Complying short term commitments, modulating medium and keeping long term goals

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Carbon intensity indicator reduction targets

gCO_2e/MJ reduction, %

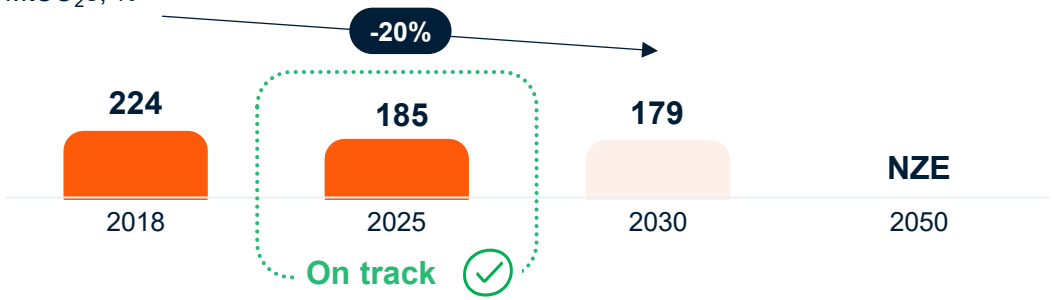


The first company in the industry to announce its **commitment to achieve zero net emissions by 2050c**

In 2025, **low-carbon initiatives accounted for 32%** of total investments, and for the 2026–2030 period, the company plans at least **€11.5 billion** in low-carbon investments.

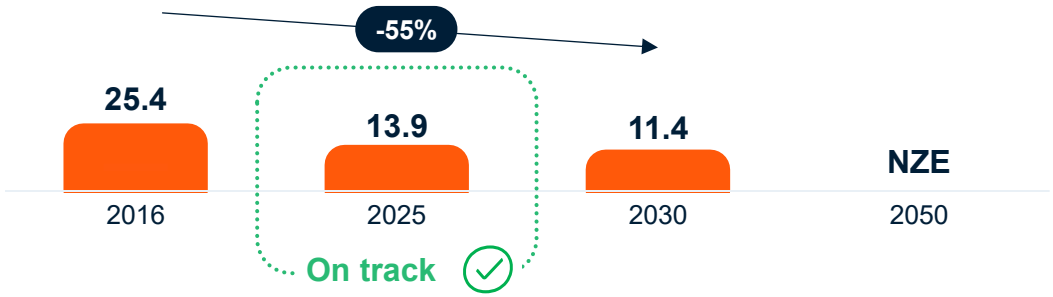
Net zero absolute emissions (Scope 1+2+3) by 2050

$MtCO_2e$, %



Net zero absolute emissions (Scope 1+2) by 2050

$MtCO_2e$, %



	Target 2025	Target 2030
Methane emissions intensity E&P (%)	<0.2% ✓	0.1% NEW
Routine flaring reduction E&P (%)	>50% ✓	Zero
Emissions reduction plan ($MtCO_2e/y$)	>1.5 ✓	1.0 NEW

✓ Target accomplished

Decarbonization of our Assets, direct & indirect emissions (Scope 1+2)

Decarbonization Platforms

Levers to drive industrial decarbonization

Efficiency

The most economical way to reduce CO_2 emissions, although mature processes are likely to reach a performance plateau.

Electrification

Large compressors electrifications & selective heating electrification.

Renewable electricity

Renewable electricity is gaining share in the Spanish power mix and is expected to dominate from 2030. Repsol Industrial to promote self-consumption and PPAs.



Cogeneration

Flexibilization and decarbonization

Green H_2

Green H_2 will gradually replace some of the current production of grey H_2 in Steam Methane Reformers (SMRs).



Waste to Energy (heat)

Renewable steam from biomass, biomethane PPAs and integration of steam with a low carbon footprint from low-carbon processes



CCS (Carbon Capture and Storage)

CO_2 capture is the option to mitigate *hard-to-abate* emissions (fuel gas). Storage is seen as a transitional solution until there is a further development of utilization.

CCU (Carbon Capture and Utilization)

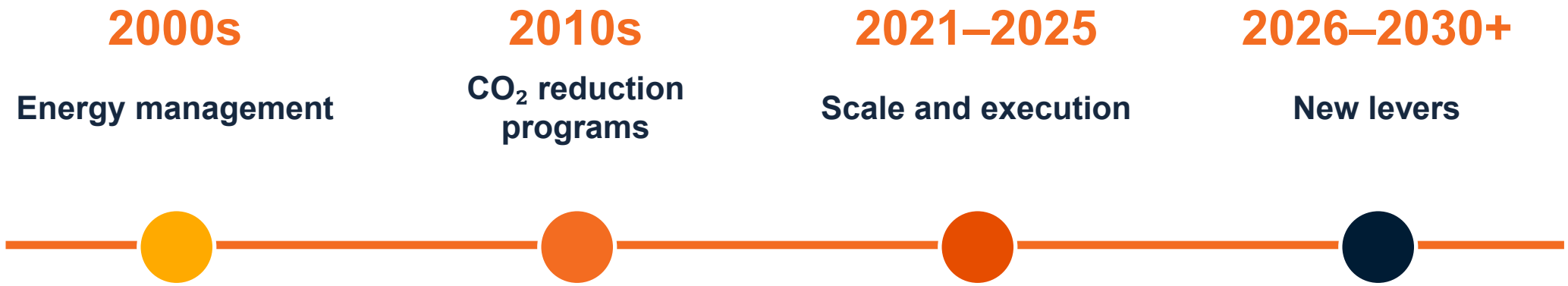
The use of CO_2 is the ultimate solution for *hard-to-abate emissions*. E-fuels will be the pioneering projects in the event of favourable regulation.

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Decarbonization of Repsol’s industrial assets

Over two decades of improving efficiency and reducing emissions

Decarbonization of the Industrial Business has evolved from energy management to the adoption of new technologies.

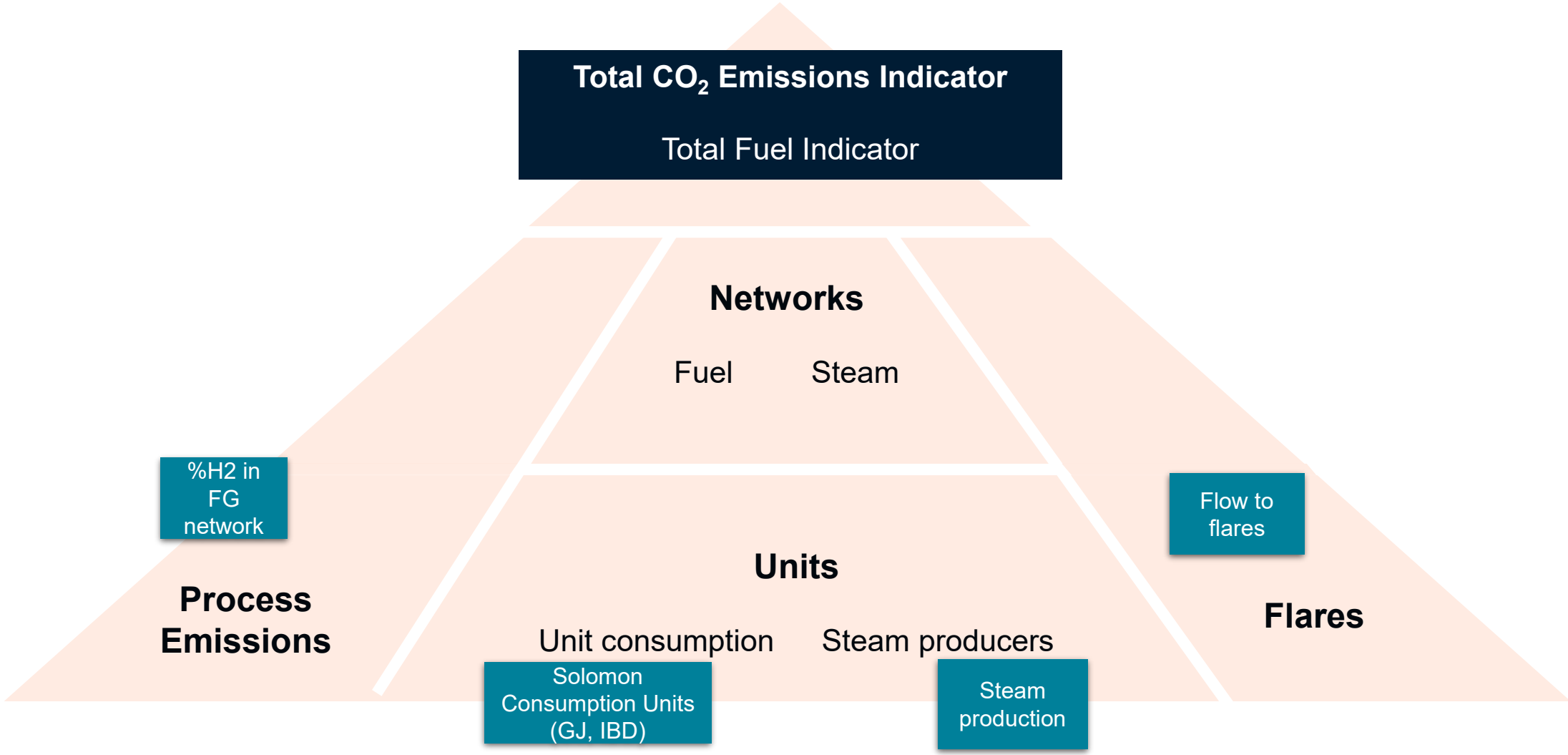


Energy efficiency is the most cost-effective lever, but process maturity progressively reduces the potential for further gains.

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Energy efficiency

Operational Excellence



Electrification options and competitiveness

Electrification of compressors drives and electrification of industrial heat have different efficiency and cost drivers

1 Electrification of large compressor drives

EFFICIENCY-DRIVEN CASE

- Avoiding steam condensation losses improves efficiency
- Lower steam demand can reduce fuel use and CO_2.
- Savings can support a competitive case, subject to the site steam balance and electricity price.

Main driver: avoided inefficiency

2 Electrification of industrial heat

COST & FLEXIBILITY

A Steam generation

Flexible electrification

- **Electric boilers** can replace or complement conventional steam generation.
- **Thermal storage** (thermal batteries) can shift electricity consumption towards lower-price hours.

Value through flexibility

B Process heating

Continuous-load challenge

- In the **e-furnace** or in the **e-cracker,** electricity replaces furnace fuel for continuous heating / cracking.
- Continuous operation is exposed to variable electricity prices; power costs, grid capacity and scale-up can limit competitiveness.

Competitive power required

Efficiency strengthens the compressor business case. Heat electrification requires flexibility or structurally competitive electricity.

Heat cost comparison

Electricity, gas and carbon prices determine the economics of industrial heat

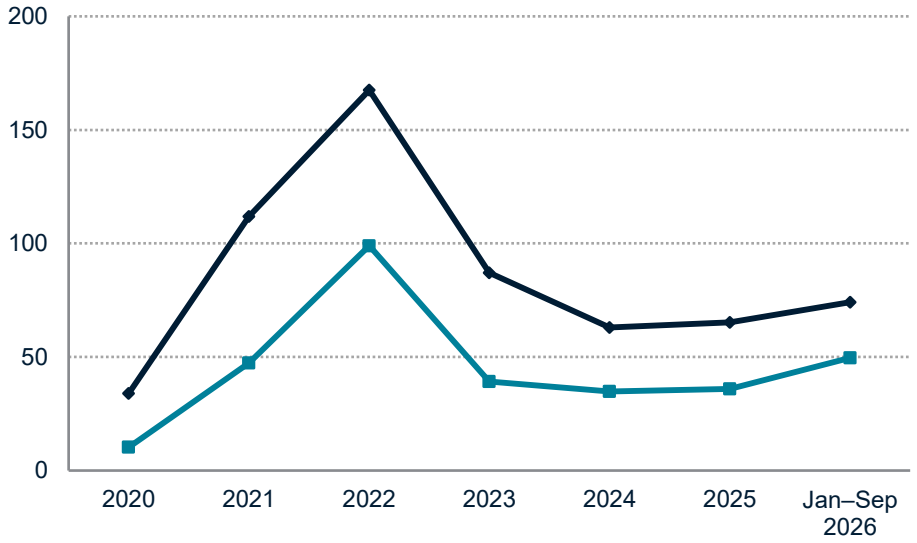
HISTORICAL PRICES THROUGH SEPTEMBER 2026

Electricity & gas: annual averages · CO_2: monthly averages

POWER AND GAS

Electricity **MIBGAS**

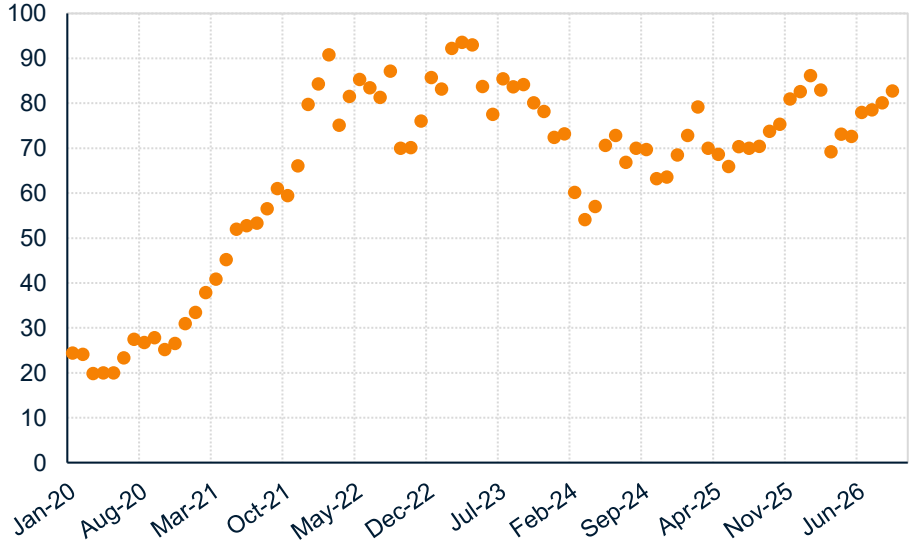
Electricity vs MIBGAS



CARBON

€/tCO₂

EU ETS CO_2



Commodity prices exclude network charges, conversion losses and CAPEX.

USEFUL HEAT COST

Electricity / $\eta_{electric}$ vs **(Gas + CO_2 × emission factor) / η_{gas}**

Sources: OMIE/REE, MIBGAS/CNMC, European Commission (ETS auctions).

Tarragona Cracker electrification

T-91: electric compressor drives and an optimized raw-gas turbine

20 MW
New electric-drive capacity

85 M€
CAPEX

165 $ktCO_2/y$
Expected project reduction

Q2 2027
Planned start-up

T-91 AT THE TARRAGONA COMPLEX



4 MW recycle + 16 MW propylene compressor motors

TECHNICAL SCOPE AND INTEGRATION

01 Recycle and propylene drives

Recycle (4 MW) and propylene (16 MW): high-speed motors with VFDs replace both condensing steam turbines.

02 Optimised raw-gas turbine

New steam turbine with two extractions minimises condensation. Compressor internals reduce required shaft power by 6 MW on the design basis.

03 Ethylene second phase

Electrification planned for 2032, including removal of two condensers and relocation of another.

> 550 GWh/y
ESTIMATED SAVINGS

Lower steam demand and natural-gas generation drive the energy savings;

Sines Cracker electrification

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Electrification of other two compressors drives

17 MW
New electric-drive capacity

50 M€
CAPEX

95 $ktCO_2/y$
Expected project reduction

Q2 2026
Sart-up

SINES STEAM CRACKER



11 MW ethylene + 6 MW propylene compressor motors

TECHNICAL SCOPE AND INTEGRATION

01 Electric motors and VFDs

11 MW ethylene and 6 MW propylene motors equipped with variable-frequency drives.

02 Steam balance and fuel-gas reduction

76 t/h of steam was previously sent to condensation. Lower steam demand reduces fuel-gas firing.

03 Electrical infrastructure

New substation and power cables required to supply the required power to the project

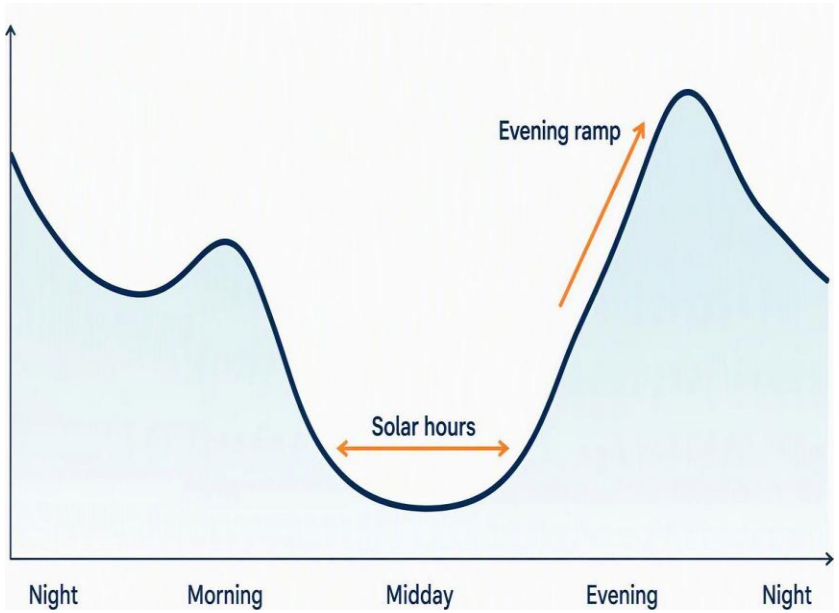
Lower steam demand and natural-gas generation drive the energy savings

Cogeneration flexibility

The challenge: follow sharp pool-price swings while securing steam supply

SPAIN'S 24-HOUR PRICE PROFILE

Illustrative price profile



Minimum and maximum prices for 24/10/2026:

– 0.01 €/MWh
15:00 – 16:00

224.57 €/MWh
20:00 – 21:00

OPERATING CHALLENGE

01 **Fast ramping and deeper turndown**

Adjust power output rapidly as pool prices move.

02 **Continuous steam supply**

Protect the industrial steam balance throughout the cycle.

OPTIONS

- Flexible cogeneration
- Independent steam backup
- Electric boilers and thermal batteries
- Low-carbon steam integration (e.g. biomass boilers)

OPERATING PRINCIPLE

Capture electricity-price value without compromising steam security

Site-specific flexibility assessment required

The role of CCS in hard-to-abate industries

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CCS complements efficiency and electrification where significant residual emissions remain

WHY SOME EMISSIONS ARE HARD TO ABATE

01 Cement and lime

Calcination releases CO_2 from the raw material, even with low-carbon heat.

02 Iron and steel

Combination of process emissions with intensive high temperature heat demand.

03 Chemicals and refining

Carbon-containing feedstocks and integrated fuel gas systems create residual emissions.

THE STEAM CRACKER FUEL-GAS CHALLENGE

01 Fuel gas is a co-product

Steam cracking produces methane and hydrogen alongside the main chemical products.

02 Combustion generates CO_2

Using the carbon-containing fraction for furnace heat releases CO_2 Hydrogen combustion is a no-emissions alternative.

03 Electrification leaves a carbon balance

Changing the heat source does not stop fuel-gas production. Its carbon still needs a route.

CCS can address residual carbon through CAPTURE (pre-combustion, post-combustion, etc.) + TRANSPORT (pipeline, ship, rail / road) + PERMANENT STORAGE (depleted O&G reservoirs, saline aquifers) **to deliver credible net emissions reductions**

CCS: carbon capture and storage

Tarragona Cracker CCS alternatives

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Two possible configurations to address residual fuel-gas emissions, with a common dependence on competitive storage



Pre-combustion capture

Fuel-gas reforming.Hydrogen replaces fuel gas in cracker furnaces.

Post-combustion capture + H_2 firing

Post-combustion capture at the main stack, combined with H_2 firing in the remaining furnaces.

180–200
€/t CO_2

01 STORAGE & PERMITS

TarraCO_2 development, exploration permits and project support condition the 2030+ outlook.

02 PROCESS INTEGRATION

Capture energy demand, furnace conversion and the site hydrogen / steam balance affect net savings.

03 ECONOMICS & DELIVERY

High capital intensity, transport and storage terms, partner alignment and outage planning remain key gates.

Both configurations need competitive storage access and credible net-abatement economics

CO_2 abatement pathways

Technology positioning

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TECHNOLOGY	CURRENT POSITION	PORTFOLIO PRIORITIZATION	
Efficiency & heat recovery	Most economic platform, but mature processes limit further gains.	Prioritise viable projects	DELIVER
Large-machine electrification	Under deployment; high CAPEX and grid capacity are key constraints.	Deliver and verify savings	DELIVER
PV, PPAs & cogeneration flexibility	Returns depend on hourly power prices, load and steam backup.	Select site-specific cases	SELECT
Low-carbon steam & renewable H_2	Biomass, biomethane, electric boilers and H_2 alter the steam balance.	Resolve integration and support needs	INTEGRATE
Electric furnaces	Indicative CO_2 break-even +€150/t.	Technology / economics watch	WATCH
CCS routes	Indicative abatement cost €180–200/tCO_2 (Tarragona site).	Storage-dependent, 2030+	MONITOR
CCU / e-fuels	Technologies under development.	Regulation and market development	MONITOR

Financing: turning ambition into industrial investment

There is no single instrument: each gap requires a tailored response

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Technically viable project → **Bankable project** → **FID** → **Actual emissions reduction**

Reduce the initial investment barrier 1

CAPEX SUPPORT

- Reduces upfront expenditure and technology risk.
- Accelerates first-of-a-kind deployments and enabling infrastructure.

Industrial Decarbonisation PERTE
IDAE programmes · Innovation Fund

Enables the initial investment decision

Bridge the gap during operation 2

OPEX SUPPORT

- Electrification may continue to face higher operating costs.
- CCfDs provide visibility and offset the cost gap versus the fossil benchmark.

Carbon Contracts for Difference
Support linked to CO_2 actually avoided

Protects industrial competitiveness

Monetise energy savings 3

ENERGY SAVINGS CERTIFICATES

- Turns final energy savings into a verifiable economic asset.
- Remuneration depends on actual, eligible, measured and certified savings.

Energy Savings Certificates
(CAEs)

Rewards verified results

Effective financing must address the entire economic equation: UPFRONT INVESTMENT + OPERATING COST GAP + VALUE OF SAVINGS

Conclusion

An integrated pathway to competitive industrial decarbonization

01 **Efficiency and selective electrification deliver near-term reductions**

Prioritise viable efficiency and compressor-drive projects, supported by competitive renewable power.

02 **Steam and power must be managed as one system**

Combine flexible cogeneration, PV and renewable PPAs with electric boilers and energy storage to use lower-price electricity while securing steam supply.

03 **Deeper reductions must preserve industrial competitiveness**

Integrate low-carbon steam and hydrogen into the site balance. Advance CCS where storage infrastructure and net-abatement economics support a competitive case.

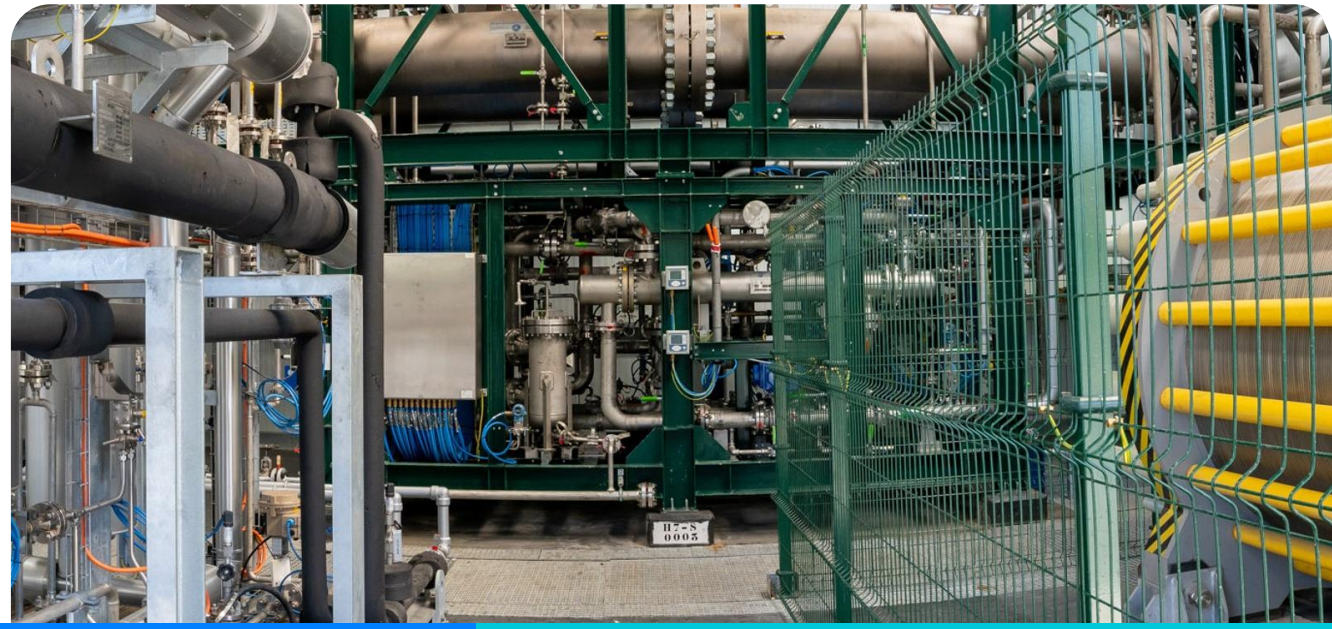
04 **Investment viability determines the pace of deployment**

Combine CAPEX support, operating-cost mechanisms and energy-savings certificates to move viable projects towards investment.

Decarbonization must preserve industrial competitiveness

Renewable Hydrogen Strategy at Repsol

Repsol's Three-Phase Renewable Hydrogen Strategy



Repsol envisions hydrogen development through a three-phase roadmap

Phase I (2027–2030)

Decarbonizing today

Replacing grey hydrogen with renewable alternatives

Phase II (2030+)

Fueling tomorrow

Scaling up the production of **synthetic fuels and direct consumption**

Phase III (2035+)

Connecting markets

Enabling hydrogen trading and full **market integration**

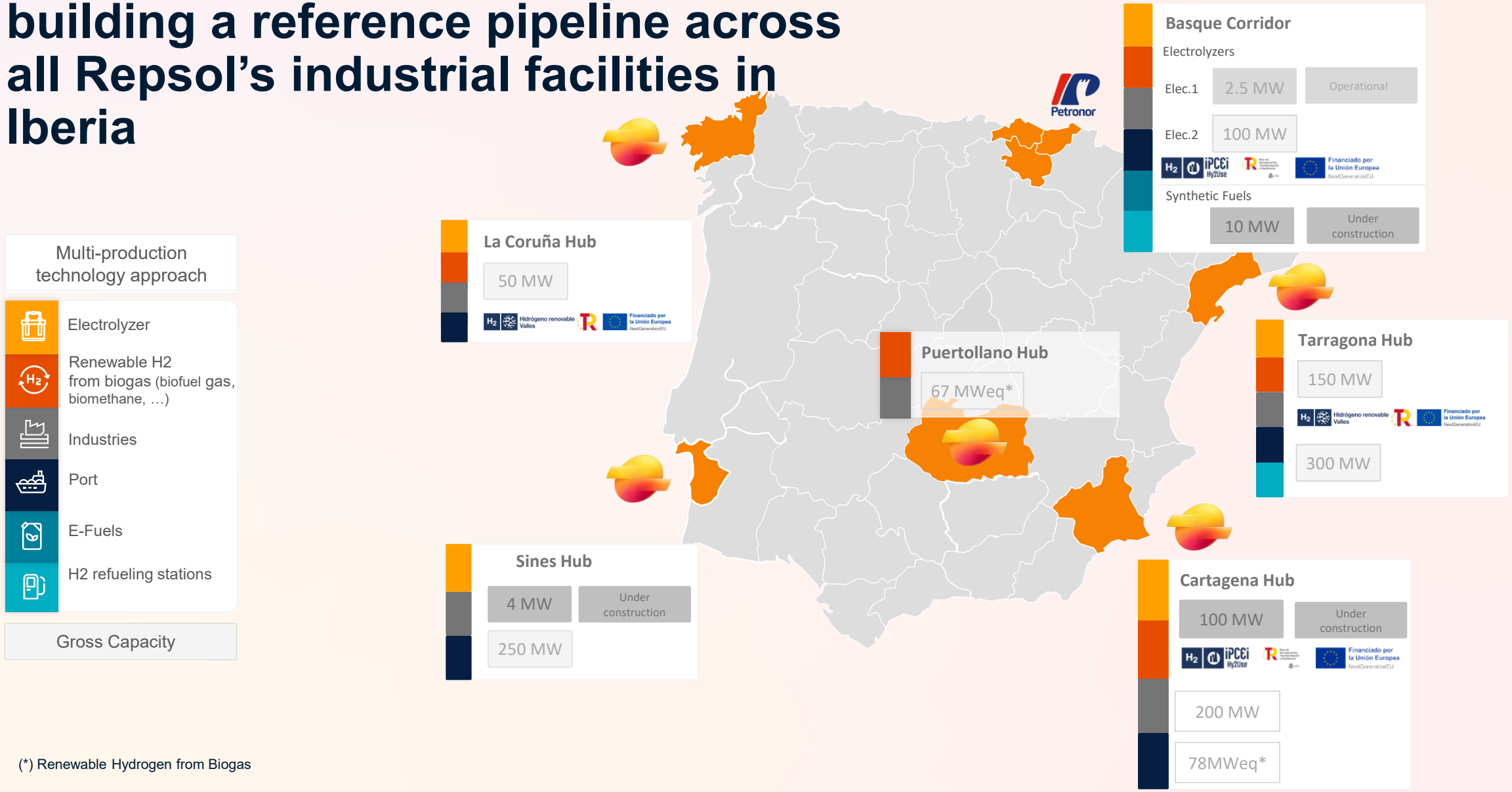
Leveraging the low marginal costs of large-scale renewable hydrogen production, **additional applications will emerge.**

Mobility

Industrial heat

Power system flexibility

Scaling up renewable hydrogen: building a reference pipeline across all Repsol's industrial facilities in Iberia



(*) Renewable Hydrogen from Biogas

Renewable fuels SCOPE 3

Renewable fuels main benefits

Renewable fuels are a real, efficient and complementary solution for reducing emissions in transport.

A real alternative for mobility



The use of this fuel can reduce net CO2 emissions by up to 90% compared to mineral fuel.

Compatible with existing vehicles and infrastructure



Suitable for current vehicles with combustion engines and available at service stations.

Alternative for all transport sectors



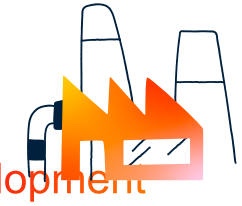
Its use is key in sectors that are difficult to electrify, such us aviation, maritime, and heavy road transport.

Promote the circular economy



Organic waste is used for its production, giving it a second life.

Foster industrial development



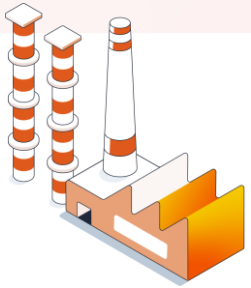
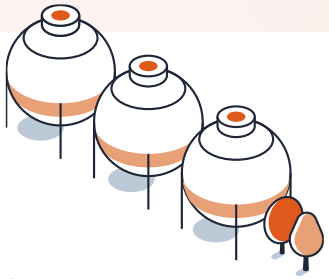
Its manufacture drives industrial growth and the creation of new quality jobs.

Boost energy independence



The raw materials used in its manufacture are locally sourced.

New Value Chain

01 Waste & feedstock	02 Primary Conversion	03 Secondary Conversion	04 Products	05 End Uses
				
Sustainable Biomass Used cooking oil (UCO) Lipid wastes Urban and Industrial Solid Waste Plastic waste Forestry, agricultural, livestock and food industry waste CO_2	**New units** Conversion of waste into synthetic oils and alcohols + Pretreatment	**Actual industrial site** Energy efficiency Renewable energy and carbon capture	**Liquid fuels and renewable gases** **Feedstock for petrochemical industry**	Renewable fuels for **road transport**. Renewable fuels for **aviation.** Renewable fuels for **maritime transport.** **Renewable** and circular **materials**. **Power** generation, **heating, industry**, residential.

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Our Strategy

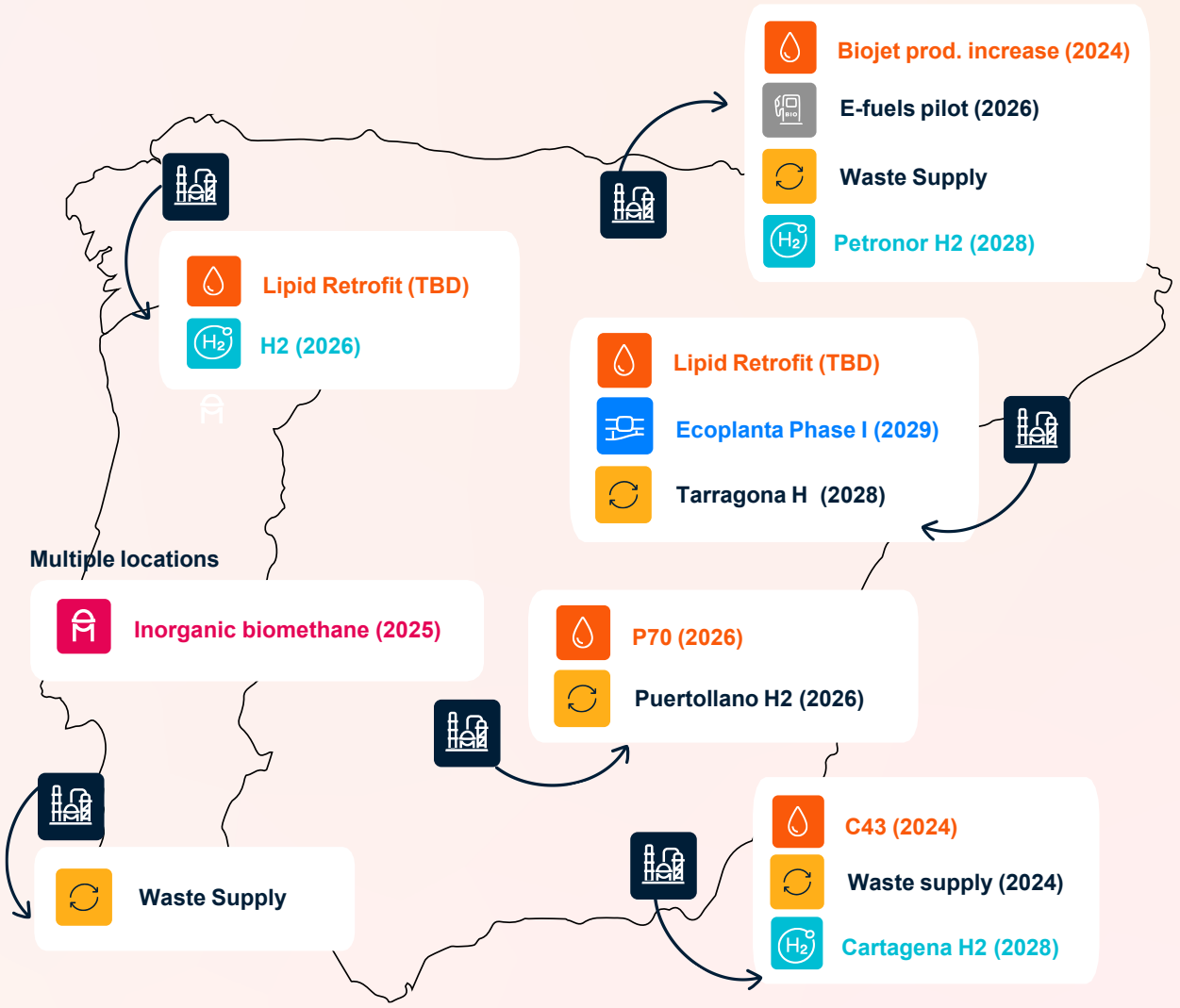
A focused technology roadmap in Industrial Low Carbon business

with a highly attractive project pipeline

Fuels platform	Strategic rationale	Main Risk
Lipid	Mature technology, taking advantage on retrofit of existing assets to accelerate production and lock-in attractive feedstock	Feedstock availability
Biomethane	Become a relevant biomethane producer by securing feedstocks and development capabilities through alliances, and leveraging Repsol's optionalities created by RED mandates to decarbonize mobility sector	Market development
Renewable Hydrogen	Leading H_2 production in Iberia, geared to decarbonize our own consumption, and benefit from a synergistic compliance of RED, Refuel Maritime & Refuel Aviation mandates	Technology scale-up
Gasification	An early adopter strategy enables access to premium markets of advanced biofuels & RFNBOs with bio-methanol	Technology scale-up & market development

Repsol's facility (Refinery / Chemical)

(202x) – Commercial Operation Date



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Industrial Assets Decarbonization in Repsol from current operations to new products

November 2026

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