Hydrogen Business Strategy
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05. SHYNE (Spanish Hydrogen Network)
01. Repsol company overview
Repsol today

+24,000 employees

24,000 employees

We sell our products in

+90 countries

+90 countries

24 million customers

24 million customers

1.35 electricity and gas customers

1.35 electricity and gas customers

CO₂ emissions reduced by

6.1 million metric tons

6.1 million metric tons

between 2006 and 2021

Upstream

572,000 boe/d

average production

Projects in 15 countries

in key geographic areas

Projects in 15 countries

in key geographic areas

Industrial

7 industrial complexes

in Spain, Portugal and Peru

+1 million bbl/d refining capacity

+1 million bbl/d refining capacity

Renewables

Projects in Spain, Chile and USA

1.5 GW in operation in Spain and Chile

1.5 GW in operation in Spain and Chile

Innovation and technology

+370 digital transformation initiatives

+270 circular economy initiatives

Repsol Tech Lab

+200 research alliances globally

Leaders in LPG

in Spain with 4 million customers

+4,600 service stations

in Spain, Portugal, Peru and Mexico

+4,600 service stations

in Spain, Portugal, Peru and Mexico

AutoGas

+400 supply points at service stations

+400 supply points at service stations

+500 public electric charging points

+500 public electric charging points

+1 million

Projects in 15 countries

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Leaders in LPG

in Spain with 4 million customers
Repsol is a vertically integrated energy company present in 36 countries.
01. Company overview

Repsol: Pioneering commitment with decarbonization goals

First O&G to target Net Zero emissions
Committed in December 2019, now increasing our ambition

Carbon Intensity Indicator\(^1\) reduction target [gCO\(_2\)/MJ]

<table>
<thead>
<tr>
<th>Year</th>
<th>Previous targets</th>
<th>2016</th>
<th>2025</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-10%</td>
<td>-20%</td>
<td>-12%</td>
<td>-25%</td>
<td>-50%</td>
</tr>
</tbody>
</table>

New Ambition to accelerate the path to Net zero emissions in scopes 1, 2 and 3\(^2\)

Leading ESG company

Leading the energy transition in line with the objective of the Paris agreement to limit global temperature increase to well below 2°C

32% Repsol’s institutional shares managed by ESG investors…

...more than doubling the Global oil and gas average

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1. 2016 baseline. 2. Scope 3 emissions based on the use of the products from our upstream production
Note: TPI: Level 4 “Strategic Assessment”; CDP: Within Oil & Gas: A- ; MSCI: In Integrated Oil and Gas: AA
Decarbonization is an opportunity to build business platforms as technology evolves.
02.
Repsol position
02. Repsol Position

Hydrogen consumption in Europe & Spain

Europe's H₂ market (~6.6 M tons/yr, €8.5bn) represents c.9% of world market and is concentrated on ammonia and refinery uses.

Hydrogen demand in Europe, 2020 (M tons/yr)

- Ammonia: 2.4 M tons/yr (36% of total)
- Chemicals (Methanol): 0.8 M tons/yr (13% of total)
- Others: 0.7 M tons/yr (11% of total)
- Total: 6.6 M tons/yr

H₂ prod. market size (€bn), c.9% of world total: 8.5

+0.4% growth in 2010-2019
- Shrinking refining throughput (-0.2%) and limited ammonia growth (0.5%)

Spaın's H₂ market driven by refinery end-use, accounts for 79% of total demand.

Hydrogen demand in Spain, 2019 (ktons/yr)

- Refining: 360 ktpa
- Ammonia: 498 ktons/yr (79%)
- Chemicals (Methanol): 116 ktons/yr (19%)
- Other: 13 ktons/yr (2%)
- Total: 627 ktons/yr

H₂ prod. market size (€bn): 0.8

1. Market size estimated with 1.3 €/kg full grey (incl. capex) H₂ production cost (assuming natural gas cost of 20 €MWh and excluding CO₂ price)

Source: IEA; Nexant
Repsol competitive advantages

02. Repsol Position

Leveraging sources of competitive advantage...

- Main H₂ consumer (largest in Spain, and >5% share in the EU)
- Early entry @ scale
- Large potential scale
- Industrial asset base and capabilities

... driving a differentiated market position

- Lower costs for H₂ and e-fuels
- Unique value proposition to end-customers
  - H₂ solutions
  - E-fuels
- Ability to attract partners
  - National
  - International
  - Technology
- Regulatory clout and presence
- Attractive equity story
- Repsol H₂

Focused organization

Iberian location – access to lower cost renewable

Integrated position
- Renewables
- Commercial

Repsol Hydrogen Video
02. Repsol Position

Present throughout the value chain

1,942 MW Renewable generation

299 MW Storage

552 MWeq H₂ Production

Geological storage

Biomethane production [steam reforming SBR]

Electrolysis

Photoelectrocatalysis

INDUSTRY:
- refinery, ammonia, methanol
- iron & steel industry

Bios & Waste

Hydrogen refuelling stations

E-Fuels

Hydrogen Refuelling Station

2,7 MM l/year of e-fuels

Power generation

Storage

1. Note: figures as of 2025

Power & Heat
- power storage, injection into grid, residential and commercial, industrial heat and power generation
03. Ambition

Repsol Hydrogen Video
# 03. Ambition

Current ambition aligned with “Fit for 55” targets

## 2025 objective

<table>
<thead>
<tr>
<th>H₂ capacity objective, 2025 (GW)</th>
<th>Repsol H₂ in own assets¹</th>
<th>3rd-party assets</th>
<th>Total ambition (updated)</th>
<th>Ambition in Strategic Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.45</td>
<td>0.10</td>
<td>0.55</td>
<td>+0.15</td>
</tr>
</tbody>
</table>

## 2030 ambition

<table>
<thead>
<tr>
<th>Required H₂ capacity vs. ambition, 2030 (GW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land transport</td>
</tr>
<tr>
<td>Aviation &amp; Maritime</td>
</tr>
<tr>
<td>Repsol H₂ in own assets</td>
</tr>
<tr>
<td>Repsol H₂ in own assets</td>
</tr>
<tr>
<td>3rd-party assets</td>
</tr>
<tr>
<td>3rd-party assets</td>
</tr>
<tr>
<td>E-fuels</td>
</tr>
<tr>
<td>Total ambition (updated)</td>
</tr>
<tr>
<td>Ambition in Strategic Plan</td>
</tr>
</tbody>
</table>

| Repsol min. regulatory requirement           |
| Repsol H₂ in own assets                     |
| Repsol H₂ in own assets                     |
| 3rd-party assets                            |
| 3rd-party assets                            |
| E-fuels                                     |
| Total ambition (updated)                    |
| Ambition in Strategic Plan                  |

- **Deployment of electrolyzer capacity in own refineries to develop experience and scale**
- Developing H₂ hubs around own site
- Participation in pilots with 3rd-parties to develop positioning and know-how in new applications
- Fit for 55 proposal strongly supports renewable H₂ development in Europe
- Current H₂ ambition in own-assets achieves minimum regulatory targets
- E-fuels plant to strengthen Repsol H₂ position and increase market share in a highly synergetic long-term business line
- Third party volumes to cover additional industrial needs

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1. Including the e-fuel pilot plant in Petronor;
2. SBR: Steam biomethane Reforming, renewable hydrogen production from biomethane
3. Renewable Fuel of Non Biological Origin – H2 and H₂ derivatives (e.g. e-fuels)
03. Business Roadmap
Pipeline of projects up to 2025

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Capacity (MW)</th>
<th>Capex (M€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrolyzers in Petronor, Cartagena &amp; Tarragona (2022-24-25)</td>
<td>232</td>
<td>179</td>
</tr>
<tr>
<td>Biogas in SMR plants across refineries (2025)</td>
<td>200</td>
<td>273</td>
</tr>
<tr>
<td>E-fuel pilot plant in Bilbao (2024)</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>Photoelec. in Puertollano (2025)</td>
<td>0.2</td>
<td>25</td>
</tr>
<tr>
<td>Pilots in mobility &amp; other industries (2023-25)</td>
<td>50</td>
<td>48</td>
</tr>
<tr>
<td>Electrolyzers with local partners (2025)</td>
<td>60</td>
<td>54</td>
</tr>
</tbody>
</table>

Total Capacity: 442 MW

Total Capex: 1,795 M€

Note 1: Capacities assume a 95% capacity factor.
Note 2: Equity share between 50% and 100% in projects deployed in Repsol refineries before 2025. Equity share for projects deployed in third-party assets in Spain of 50%. Equity share for international projects of 30%.

1. Assumes sizing of 3.25 MW renewable generation capacity per MW of electrolyzer (70% of Renewables power generation is dedicated H2 production, with the rest fed to the grid); Gross capacity assumes 100% of renewables development in projects in which Repsol's stake is >=50%.

1,795 M€ for Renewables Capacity
~700 M€ for Associated Renewables Net Capex
04. Business Roadmap
Repsol is promoting the creation of large regional hubs focusing on renewable hydrogen with the aim of coupling the production and demand.

H2 ecosystem involves the development of transport infrastructure and promotion of different uses.

The supply of hydrogen to this first network will be carried out from the main production and consumption hubs, such as refineries, which are already located near ports and in the TEN-T corridors.

The extensive network of 3,200 Repsol service stations in Spain, together with the large-scale production allows the company to develop HRS in main cities - 12 HRS by 2025.
04. Business Roadmap

Production of e-fuels in Petronor

Development of worldwide reference plant to achieve commercial level and leading position in production of synthetic fuels

Investments:
Wind generation, electrolysis, e-fuels plant: 74 M€

Production: 50bbl/d

Partners
04. Business Roadmap

SUNRGYZE – Renewable H₂ production technology

- Repsol - Enagas partnership: technological development of disruptive and photo-electrocatalytic process for production of cost-competitive renewable hydrogen

- 100% renewable
- 100% CO₂ reduction vs conventional hydrogen.
- Based on the direct conversion of solar energy into chemical energy
- Collaboration with different public and private entities
- Co-funded by European Regional Development Funds (FEDER) and EU Innovation Fund
04. Business Roadmap

First electrolyser in Petronor

First Project of Basque H2 Corridor (BH2C)

The project will contribute to changing the energy and economic model to progress on decarbonisation of strategic sectors such as energy, mobility, industry and services.
Repsol with great strengths to be the backbone of the Renewable Hydrogen roadmap and its sectoral integration, together with growing demand for $H_2$ in the coming years, and the role played by the European Funds, will lead Spanish national project.

Repsol's objective is to **develop a national project** for the deployment of the renewable hydrogen vector, supported by public-private collaboration, which will take the form of the creation/boosting of:

- **4 hydrogen valleys** where they will develop specific renewable $H_2$ production projects and end uses in industry and transport, in addition to renewable Electricity Generation and Storage Projects.

- **3 Transversal Innovation Hubs and 1 Digitalisation and Knowledge Management Hub** with R&D&I and technological development, Knowledge Management and Digitalisation projects that guarantee a sustainable economy based on this energy vector.

**Multi-sectoral vision**

- Impacts in terms of ecology, job creation, knowledge and technological sovereignty
- Presence in 10 **Autonomous Regions**
- Investment of 3,230 M€*

Project aligned with both the EEFF and the Spanish Plan "**España Puede**", especially with component 9, based on **technological and sectoral diversification and a coherent systemic approach**

**Tractor effect of SMEs**, with 71 partners involved in the project and will be conveyed through **two relationship models**, strategic agreements and declarations of interest, to **facilitate the governance** of the project and **unify interests** of entities from different sectors and along the value chain.

* Total CAPEX. Repsol's CAPEX is approximately 2,250 M€
06. SHYNE: Spanish Hydrogen Network Project

Repsol’s Industrial Leadership and the sum of the capabilities of partners, and the growth of the hydrogen industry with the boost of FFEE, result in SHYNE creation

In January 2022 SHYNE- 33 partners: 22 companies, 11 associations, technological centers and universities

+ 3 new promoters

+ 38 companies and associations
06. SHYNE: Spanish Hydrogen Network Project

SHYNE is a backbone agent in the integration of the hydrogen value chain in Spain

**Renewable generation impacts**

- **1.942 MW**
  - Renewable generation

**Macroeconomic impacts**

- **3.230 M€**
  - CAPEX
- **>5.000 M€**
  - of economic impact
- **>13.700**
  - new jobs
- **4**
  - H2 Valleys

**Other impacts**

- **12**
  - Hydrogen refueling stations
- **8.000 l/day**
  - of e-fuels
- **112 M€**
  - Investment in digitilization (Digitilization and Knowledge Management hub)

*Se incluye un proyecto de producción de 40 MW y 120 M€ (CAPEX total), 81 M€ (CAPEX Repsol) a partir de residuos en Galicia.
**06. SHYNE: Spanish Hydrogen Network Project**

SHYNE project is fully aligned with the guidelines and objectives both at European and national level for Hydrogen

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th>Reglamento MRR</th>
<th>Flagships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project is aligned with the European taxonomy:</td>
<td>The annex VI of the regulation, activity 022 is identified with a 100% impact on the ecological transition</td>
<td>Power up</td>
</tr>
<tr>
<td>► Renewable H2 production</td>
<td>► Projects are aligned with the principle- DNSH*</td>
<td>Recharge &amp; Refuel</td>
</tr>
<tr>
<td>► H2 Storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>► Emissions even below thresholds</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**National Plan “España Puede”**

<table>
<thead>
<tr>
<th>III. Just and inclusive energy transition</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Renewable Hydrogen Roadmap and its sectoral integration</td>
</tr>
<tr>
<td>With strong relation with other components of the Plan related to climate change mitigation: 6, 7 and 12**</td>
</tr>
</tbody>
</table>

**Hydrogen Roadmap and its sectoral integration**

- Objectives of Hydrogen Roadmap of October 2020:
  - 4 GW of installed electrolyser capacity by 2030
  - 25% of renewable H2 in total industrial consumption
  - 5,000 - 7,500 vehicles with renewable Hydrogen fuel
  - 150 - 200 busses with renewable Hydrogen fuel cell
  - 2 commercial train lines powered by renewable H2

Note: *Do Not Significant Harm
**Component 6- Safe and Sustainable Mobility, 7- Development and integration of Renewables, 12- Spanish industrial policy 2030
Thank You
Annex.
Sustainable Mobility
Annex. Mobility

Repsol is a national leader in energy and mobility products
Annex. Mobility

Repsol low carbon fuels

A 2-platform model creates synergies with electrification to accelerate the decarbonization of all transport modes, where H2 has a key role

<table>
<thead>
<tr>
<th>2 platform model</th>
<th>Low carbon liquid fuels platform</th>
<th>Electricity platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADV. BIOFUELS &amp; NEGATIVE FOOTPRINT BIOS</td>
<td>E-FUELS</td>
<td>RENEWABLE HYDROGEN</td>
</tr>
<tr>
<td>0 gCO₂eq/MJ (&lt;100% vs. mineral)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CO₂ intensity</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ abatement potential (TtW1)</td>
<td>3.0 Mt/y</td>
<td>5.5 Mt/y</td>
<td>14.5 Mt/y</td>
<td>14.0 Mt/y</td>
</tr>
<tr>
<td>Related technology pathways</td>
<td>Renewable H₂ production</td>
<td>Biological platform</td>
<td>Thermochemical platform</td>
<td>Lipid platform</td>
</tr>
<tr>
<td>Applicability by transport mode</td>
<td>Light duty road</td>
<td>Heavy duty road</td>
<td>Aviation</td>
<td>Marine</td>
</tr>
<tr>
<td>Scale-up needs</td>
<td>Fuel production</td>
<td>Distribution network</td>
<td>Vehicle fleet</td>
<td></td>
</tr>
<tr>
<td>Ease of deployment</td>
<td>Fast as no changes are needed in fleets with ICE power train technology, nor in fuel logistics infrastructure</td>
<td>No changes are needed in fleets with ICE power train technology, nor in fuel logistics infrastructure. E-fuels need to progress down in the cost curve</td>
<td>Complex and slow due to fleet renewal and a completely new H₂ distribution infrastructure</td>
<td>Complex and slow due to fleet renewal and new fast charging infrastructure to enable long distance transport</td>
</tr>
</tbody>
</table>

1 TtW: Tank-to-Wheel.

CO₂ capture potential (TtW1)

<table>
<thead>
<tr>
<th>CO₂ capture potential</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ capture potential</td>
<td>0 Mt/y</td>
<td>1.0 Mt/y</td>
<td>6.5 Mt/y</td>
<td>14.0 Mt/y</td>
</tr>
<tr>
<td>Related technology pathways</td>
<td>Renewable H₂ production</td>
<td>Carbon capture</td>
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</tr>
</tbody>
</table>
### Annex II. Market Vision

### Hydrogen competitiveness

Low-carbon H₂ expected to become competitive vs incumbent by 2030-35

<table>
<thead>
<tr>
<th></th>
<th>Conventional H₂</th>
<th>Low carbon H₂</th>
<th>Renewable H₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂ production cost¹ (€/kg)</td>
<td><strong>EU</strong>&lt;br&gt;1.0-1.5&lt;br&gt;1.4-1.9&lt;br&gt;1.6-2.1</td>
<td><strong>North Europe estimates</strong>&lt;br&gt;2.2&lt;br&gt;1.6-1.7&lt;br&gt;1.6-1.7</td>
<td><strong>Spain estimates</strong>&lt;br&gt;3.4&lt;br&gt;2.3 - 2.7&lt;br&gt;0.7 - 0.9</td>
</tr>
<tr>
<td>Cost excl. capex (€/kg)</td>
<td>1.3-1.8&lt;br&gt;1.7-2.2&lt;br&gt;1.9-2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO₂ price high range (€/ton)</td>
<td>25-75&lt;br&gt;50-100&lt;br&gt;75-125</td>
<td>2.5&lt;br&gt;1.9-2.0&lt;br&gt;1.9-2.0</td>
<td>Capex &amp; Opex&lt;br&gt;Current³&lt;br&gt;2030³&lt;br&gt;2035³</td>
</tr>
<tr>
<td>Power</td>
<td></td>
<td>1.3&lt;br&gt;1.6 - 1.8&lt;br&gt;&lt;2.0</td>
<td>&lt;2.0</td>
</tr>
</tbody>
</table>

1. 20 €/MWh natural gas price
2. Considers carbon capture of 90% of total CO₂ produced
3. 100 MW electrolyser, 1200 €/kW of CapEx (full project costs incl. electrical connection, civil, H₂ intermediate storage, project costs), 65% electrolyser efficiency, ~70% load factor, electricity price 32 €/MWh, 6.4 €/MWh grid toll.
4. Low range: 100 MW electrolyser, 579 €/kW CapEx, 68% efficiency, ~70% LF, electricity price 25 €/MWh, 6.4 €/MWh grid toll; high range: 100 MW electrolyser, 760 €/kW CapEx, 68% efficiency, 70% LF, electricity price 30 €/MWh, 6.4 €/MWh grid toll.
5. CapEx 400 €/kw, 68% efficiency, LF ~70%; electricity price 20 €/MWh, 6.4 €/MWh toll, OpEx 24 €/kW