ESG DAY 2023

Renewable Fuels and Circular Materials.
Synergies and opportunities for Repsol’s Industrial Business

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Director of Renewable Fuels
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In October 2015, the European Securities Markets Authority (ESMA) published its Guidelines on Alternative Performance Measures (APMs). The guidelines apply to regulated information published on or after July 3, 2016. With effect from January 1, 2023, Repsol has revised its financial information reporting model. More details about said change and all the information and breakdowns relative to the APMs used in this presentation are available on Repsol's website.

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Index

01. Repsol’s Value Proposal

02. Waste to Fuels and Materials Opportunities

03. Conclusions
01.
Repsol’s Value Proposal
In the current context, four main trends are encouraging the development of a carbon neutral business based on renewable fuels and circular materials:

**Energy transition and independence**
- Fit for 55 sets targets to reduce greenhouse gas emissions by at least 55%. It includes:
  - RED II revision (RED III)
  - ReFuelEU aviation
  - FuelEU maritime
  - Energy Taxation Directive (Directive 2003/96/EC)
- European energy independence: REPowerEU accelerates energy transition to decrease dependency of fossil fuels coming from Russia

**Circular economy regulatory push**
- Circular economy regulatory measures will stimulate a feedstock market to be recycled or recovered:
  - Waste Framework Directive to reduce landfilling to 10% in 2035
  - Packaging and Packaging Waste Directive (under revision)

**Client demand**
- Relevant companies in airlines and chemicals sectors are pledging to become net zero and demanding sustainable products such as renewable fuels (i.e. SAF, methanol) and sustainable chemicals in response to customer demands and to shareholders’ pressure
- Circular plastics have a low impact on final end customer manufactured goods prices

**Competitiveness of green solutions**
- Natural gas prices could remain structurally higher than historical values in the long term due to substitution of Russian pipelined natural gas by LNG
- CO₂ emission prices have also significantly increased and will increasingly play a relevant role in production costs and make profitable technologies to reduce emissions (that were not viable with historical prices)

Public aid will also play an essential role: EU State Members have committed cumulative investments of ~450 B€ per year in their National Energy and Climate Plans while, in the US, significant supply incentives are coming through IRA.
Repsol has the flexibility to provide the best decarbonization compliant option for customers

Repsol has its own regulatory targets as fuel supplier and industrial company:

- **Refining & Chemicals**: process decarbonization for ETS/CBAM
- **Customer Centric**: RED and ReFuel Aviation.

We have the capability to provide the most competitive compliant option with a differentiated commercial strategy.

Repsol can provide competitive product to third parties to comply with regulation:

- **Other fuel suppliers**: renewable fuels to comply with their RED targets
- **Maritime**: ship owners and operators compliance with FuelEU Maritime, ETS and IMO requirements.
- **Aviation**: airlines compliance with ReFuel Aviation, ETS and ICAO requirements.
- **Materials**: Provide raw materials to produce circular plastics to increase recycled content in packaging and auto industry
- **Industry**: H₂, biomethane and HVO in industrial processes for ETS and RED.

Players in different sectors are voluntarily committing to sustainability goals

Repsol integrated strategy will enable a 360° approach to tailor its offering to clients needs in renewable fuels, renewable gases & circular materials.
Decarbonization of key sectors:
transport, Industry and materials...

7 Mt/y de CO₂ avoided in 2030

Waste primary transformation
Value creation to local and rural areas

... through our circularity value chain...

Existing sites
Industrial Transformation

3 Mt/y waste
... through waste valorization
(Municipal, primary sector and plastic waste)

Circular Economy makes sense
Repsol can provide a sound response to waste management with its projects

- Used Cooking Oil
  To avoid water contamination and waste treatment costs

- Biomethane from manure
  To avoid water and soil contamination

- Material recovery of plastic waste
  To avoid landfilling and maximize material valorization

- Valorization of rejects from Municipal Solid Waste
  To avoid landfilling

- Valorization of agricultural and forestry waste
  To avoid wildfires and landfilling

- Material recovery of foam mattresses
  To avoid landfilling and maximize material valorization

+ Maximum carbon recovery from waste thanks to hydrogen and materials production

*MSW: Municipal solid waste
# Repsol's Value Proposal

Repsol is able to integrate different technologies to cover demand with competitiveness

<table>
<thead>
<tr>
<th>Description</th>
<th>Higher maturity</th>
<th>Lower maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Lipid hydrotreating</strong></td>
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<td></td>
</tr>
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<td></td>
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<tr>
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<td></td>
</tr>
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<td></td>
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<tr>
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<tr>
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* Proposals

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¹ Reverse Water Gas Shift + Fischer Tropsch, demo plant in Petronor
## Repsol’s Value Proposal

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*Low-Risk Tech*  *First-of-a-kind projects*  *Technology optionality*  *Proposals*

1. Reverse Water Gas Shift + Fischer Tropsch, demo plant in Petronor
02. Waste to Fuels and Materials. Opportunities and synergies
As part of feedstock strategy, Repsol is contributing to UCO recollection

**Current situation**

<table>
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<th>Recovered</th>
<th>Non recovered</th>
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<td>72%</td>
<td>4%</td>
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**Environmental challenge and Legislative objectives**

Waste and contaminated soils Law establishes the obligation from municipal entities to collect in a segregated way the used cooking oils produced in homes starting December 31st 2024.

To achieve this objective, it is necessary to deploy a collection system for the domestic channel, as well as incorporate new waste treatment and recovery technologies, and new actors that are capable of marketing the products on the market.

The Spanish Government through its PNIEC 2021-2030 also reflects the importance of the collection of used cooking oil and its transformation into biofuels for the reduction of emissions derived from its inadequate management, as well as providing other benefits such as the contribution to renewable energy objectives and the reduction of the risk of contamination of waters and aquifers.

**ESOPO Project: a comprehensive solution to recover used cooking oil (UCO)**

- Customers can deliver used cooking oil at Service Stations
- UCO delivery is rewarded with balance in Waylet
- A certified aggregator will collect and filter the oil
- Repsol will transform the UCO into biofuels

- Pilot Madrid April 2023 – 135 EESS
- Signed agreements with 2 regional governments (Madrid and Galicia), 2 under way
- Current 153 EESS

Source: Geregras (2022)
Waste to Fuels and Materials. Opportunities and synergies

Lipid Waste to Renewable Fuels. Value creation leveraged in current assets with a very competitive CAPEX/production ratio

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Coprocessing

> 500 kty

Very competitive but less flexible available capacity

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Lipid Waste to Renewable Fuels. Value creation leveraged in current assets with a very competitive CAPEX/production ratio

New Unit – Cartagena C43

- Capex: ~ 250 M€
- Production capacity: 250 kt/y HVO or 195 kt/y SAF
- Capex ratio: ~ 1 k€/t HVO
- Flexibility: Possibility of feeding raw material with high/low acidity and production capacity of HVO or SAF
- EBITDA: 350 – 650 €/t feedstock

Retrofitting 100% - Puertollano Diesel Desulfurization unit

- Capex: ~ 130 M€
- Production capacity: 240 kt/y HVO, bionaphtha and bioLPG
- Capex ratio: ~ 0.65 k€/t HVO
- Flexibility: Possibility of feeding raw material with low acidity and produce HVO

Coprocessing

> 500 kty

Very competitive but less flexible available capacity
Biomethane as proper management of livestock waste essential to avoid contamination problems in soil, water and atmosphere

Current situation of livestock waste in Spain

- Spain
  - Livestock farms > 200,000
  - Biomethane production potential > 100 TWh

- The development of livestock farming has led to an increase in the volume of livestock waste and, therefore, new solutions are required for its management.
- It is necessary to carry out a correct management of this waste to avoid important environmental consequences in soils, water and atmosphere.
- Livestock sector is key in Spain, specially in rural areas.

Spain has the potential to be the 2nd producer in Europe

Regulation

- Spain has the objective of reducing emissions from diffuse sectors by 37.7% by 2030. Besides, the PNIEC establishes in its objective scenario a reduction of 4 Mtpa of CO2 in 2030 for the livestock sector.
- The European Commission recommends the reduction of methane emissions from livestock by developing the production of renewable energy, investing in anaerobic digesters to produce biogas from waste such as manure.
- The application of manure and slurry directly to the soil is limited by law. It establishes the requirement to adopt measures in its application and storage to avoid emissions of ammonia and greenhouse gases and limits the injection of nitrogen in vulnerable areas.
Repsol upsides in Biomethane value chain

- **Municipal & Industrial Biowaste**
- **Agriculture and Livestock waste**

**Biomethane Production**
- **Fermentation**

- **Direct use as Renewable Fuel for heavy duty, maritime and industry**
- **Energy for Refining/Chemicals**
- **Existing Steam Reformers**
- **Synthetic Fuels Production**

- **Reduced Carbon Footprint for fuels and chemicals**
- **Renewable Hydrogen to reduce biofuels footprint**
- **Renewable Fuels**

**Flagship initiative**
**Galicia Manure Project**
- **Production capacity**: 600 GWhy Biomethane
- **Use of residues**: Manure / Organic MSW/ISW
- **EBITDA**: ~ 45 €/MWh
- **Projected number of plants**: 10
Gasification is key to achieve EU waste management objectives

**Waste management**

- **Yellow bin**: Packaging sorting plant → Recoverable plastics → Mechanical Recycling
- **Grey bin**: TMB → Landfill → Incineration
- **Brown bin**: Compost → Other recoverable → Compost

**Legislative objectives**

Spanish legislation (Law on waste and contaminated soils) establishes ambitious objectives on the 2025-2035 horizon that require changes to current waste management schemes.

- % waste to landfill: 20% (2030) → 10% (2035)
- % preparation for reuse and recycling: 60% (2030) → 65% (2035)

Additionally, the Law on Waste and Contaminated Soils contemplates a new minimum national tax (*) for landfill and incineration (€30/tn for landfill and €10/tn in the case of incineration for municipal waste rejection).

(*) minimum that can be increased in the different regions

**Towards a circular management of waste**

Currently, landfilled waste in Spain is 53% and only 35% is recycled.
Spain has great potential for biomass resources and its valorization can bring important benefits

Current situation

Agricultural and forestry residues are among those with the greatest volume and potential and have multiple technological options for their use.

Spain has more than 17.5 Mt of biomass dry matter available per year, with a total potential of 36.7 Mt with a huge potential in terms of biomass resources:

EU rank

#3 Wooded land
#2 Highest agricultural production

Benefits from valorization

- Prevention of the spread of uncontrolled fires.
- Minimization of the spread of pests and diseases in agricultural crops.
- It offers new options for the agricultural sector such as the use of vacant land or the introduction of rotating crops, without displacement of existing crops.
- Economic development in rural areas is promoted, generating jobs in areas affected by depopulation, thus contributing to a fairer transition, and to the revitalization and structuring of the territory.

Gasification allows to treat waste that otherwise would be sent to landfill and helps wildfires prevention

**Reduction of landfill rate**

Using the waste that is currently being sent to landfill contributes to the objectives of: increasing waste recycling rates and reducing landfill rates.

**Technology**

Enerkem is the technology chosen for this Project, a strategic partner in which Repsol invested in 2022. Enerkem has an industrial demo operating since 2016, de-risking future investments.

**Ecoplanta**

Project has been awarded with the **Innovation Fund** grant and has been one of the seven chosen projects amongst more than 300 projects in 2021.

**What’s next**

5 initiatives under dev

Up to 2.4 Mty waste and 1.5 Mty methanol
Our initiatives are integrated creating additional value

Renewable Hydrogen as feedstock for...

- Renewable hydrogen as an enabler for renewable fuels and circular chemicals production
- $H_2$ needed to improve $H/C$ ratio and energy content
- Renewable $H_2$ improves GHG footprint for biofuels
- All phase 1 projects funded by EC or Spanish Government.

Renewable Fuels coproduced with...

- Competitive thanks to our Industrial Sites
  - Industrial infrastructure and know-how
  - CAPEX reduction, reliability increase

Circular Materials

- Material valorization of waste is needed. Repsol offers fuels and materials valorization having better access to waste
- Processing mixed organic and plastic waste has value for Repsol
- Flexibility to use bioproducts (BioLPG, Naphtha, HVO) in fuels or materials

Renewable Fuels as an enabler for renewable fuels and circular chemicals production.
The integration goes beyond industrial business

Low Carbon Generation
Repsol's low carbon generation and pipeline gives us presence in the whole value chain as renewable electricity is key for hydrogen and renewable fuels production.

Hydrogen

ReFuels & Circular Materials

Industrial Sites

Customer Centric
Repsol has a strong track-record and know-how in commercializing a wide variety of products being the leader in Iberia.

Waste to Fuels and Materials. Opportunities and synergies
Puertollano Renewable and Circular Site Case. Synergies

Our inland refinery is already a recognized reference for circular materials and biofuels production, with several projects underway for biofuels and hydrogen.

The refinery employs ~1300 people directly and ~1900 indirect, a ~7% of total population. Additionally, around 4000 employments are induced to the site activity.
03.
Conclusions
Repsol can rely on its competitive advantages to give a solution for decarbonization of our customers and waste management

01 Industrial sites across Iberia
- 1st quartile refining assets can be retrofitted to carbon neutral production
- Repsol's influence in Iberia is relevant for direct access to feedstock
- Iberia has cheap renewable electricity

02 Integration throughout value chain
- Presence in all the value chain from waste and renewable electricity to final customer
- Repsol's activities can provide critical feedstocks (renewable H₂, biogenic CO₂) etc
- Repsol can benefit from its position as producer and consumer

03 Fuels, Hydrogen and Chemicals integration
- 360° approach to waste, valorization routes and technologies
- Repsol to produce ren.fuels and circular materials depending on feedstock availability and market conditions, pivoting in intermediate products (e.g., methanol)

04 International presence and partnerships development
- Repsol's international presence and size position the company as a suitable partner for companies in the low-carbon business
- Repsol has developed a strong portfolio of collaborators and partnerships across the whole value chain

Complex project execution experience with large industrial transformations already developed
THANK YOU
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