ESG DAY 2023

In search of carbon-free opportunities in the subsoil

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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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01. Why and How are we doing this?
### Geological Low Carbon Solutions – Why?

The development of low carbon business platforms is a priority for Repsol and an opportunity for E&P.

Repsol is stepping up the transition through new business platforms across four main pillars:

<table>
<thead>
<tr>
<th>Period</th>
<th>Industrial transformation</th>
<th>Renewable generation</th>
<th>Customer centric businesses</th>
<th>Carbon sinks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020-25</td>
<td>Advanced biofuels, biogas and recycling</td>
<td>Hybrid plants</td>
<td>Low carbon power retail + Energy solutions</td>
<td>Natural climate solutions</td>
</tr>
<tr>
<td></td>
<td>Renewable hydrogen</td>
<td>Stationary energy storage</td>
<td>Dual platform advanced mobility</td>
<td>Carbon Capture Utilization &amp; Storage</td>
</tr>
<tr>
<td>2025-30</td>
<td>Synthetic fuels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+2030</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: CCS (Carbon Capture and Storage)

E&P can leverage existing capabilities in new low carbon business opportunities to support Repsol’s transition strategy.

- CCS
- H₂ storage
- Geothermal power
- Geothermal heat
An excellent complement to Upstream activities

Among all decarbonization solutions, some are based on the subsurface: CCS, Geothermal and H₂ Storage.

It’s in our DNA
These solutions can be applied internationally, require relevant investments in projects with significant risk profiles and are likely to be executed under government contracts.

We have the Right-to-Win
O&G companies have the right capabilities to develop competitive advantages in these contexts.

The Geological Low Carbon Solutions Unit is conceived as a decarbonization tool for Repsol Upstream activities and a strategic complement capable of generating value and sizable growth potential.
Geological Low Carbon Solutions – How?

Organization evolution within Repsol

**Origin**
- Sakakemang Discovery.
- Repsol announces Net Zero Commitment by 2050.

**First Steps**
- General Green Exploration groups created within Exploration Dir.

**2019**

**2020**

**2021**
- Green Exploration in 3 main business lines
- Seismicity and MMV capabilities reinforcement.
- First Geothermal license and MOUs with Key Stakeholders.

**Plan Execution**
- Team growth and re-skilling.
- Projects pipeline realization.

**2022**

**2023**
- GLCS Direction is created.
- Internal SP for the Unit is created.
- Geothermal and H₂ licenses in Spain.

2019

2020

2021

2022

2023
## Market expectations

**Strong market growth expected in CCS and Hydrogen Storage, Geothermal growth highly dependent on technological developments**

### Graphs at different scales

<table>
<thead>
<tr>
<th></th>
<th>CCS¹</th>
<th>Geothermal power²</th>
<th>Geothermal heat³</th>
<th>Hydrogen storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global ($B)</td>
<td>4</td>
<td>~7</td>
<td>1.7</td>
<td>~0.1</td>
</tr>
<tr>
<td>Market size ($B)</td>
<td>72</td>
<td>9-15</td>
<td>3-5</td>
<td>~4</td>
</tr>
<tr>
<td></td>
<td>345</td>
<td>13-27</td>
<td>4-7</td>
<td>~15</td>
</tr>
</tbody>
</table>

### Main risks & uncertainties

- **Dependancy on public incentives**
- **In some geographies (e.g., EU), doubtful CCS public perception and potential govt. reluctance in storage permits concession³**
- **New techs. yet to be proven**
- **No specific regulatory incentives yet, could change with NZIA⁴**
- **Uncertain cost competitiveness vs. other renewables**
- **New techs. yet to be proven**
- **No specific regulatory incentives yet, could change with NZIA⁴**
- **Lack of distribution networks in core locations**
- **Dependency on the actual H₂ demand growth and infrastructure development**
- **Uncertainty on actual large-scale storage needs**

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1. Includes Carbon capture, transport and sequestration (only sequestration is ~17% of total value); includes EOR in operation; market size in revenues, assuming 65 €/ton for capture, ~95% volume at 5-15 €/ton for transport and ~90% volume at 18-15 €/ton for storage. 2. Market size in revenues, assuming LCOE in geothermal for power generation 56 €/MWh. 3. Market size in revenues, assuming LCOE in geothermal for heat production 39 €/MWh. 4. Net-Zero Industrial Act could favor CCS and Geothermal development while accelerating permitting processes.
02. CCS: Ambition and projects
Geological Low Carbon Solutions - CCS

Strategic geographies and storage capacity ambitions

1. Americas
   - Corpus Christi
   - Proyecto Lochridge

2. Iberia Hinterland, Southern Europe and North Africa
   - Proyecto Pycasso
   - Spain / Portugal

3. SE Asia
   - Sakakemang – South Sumatra

Annual CO₂ stored
Net Risked Mtpa

Target

- 01. ESG Day
- 02. The Repsol Commitment
- 03. Net Zero Emissions by 2050
Texas 2nd CCS Request for Proposals results announced on August 22nd, 2023.

Repsol led consortium only awardee in Corpus Christi area in two Blocks:
- Port Aransas North
- Mustang Island

575 km² Total acreage
>600 Mtons Preliminary storage capacity
Access to more than 60 Mtpa of CO₂ emissions in the proximity

Consortium Components
40% Repsol
40% CarbonVert
10% Mitsui
10% Posco

Other awardees in Galveston area: BP (1 block) and ExxonMobil (3 blocks)
Southern Europe – Pycasso Project

Program initiated in 2021 around Avenia that includes 30 institutions and industrials.

Objective

The objective of the program is to study the feasibility of subsurface CO₂ storage and CO₂ valorization options as a decarbonization solution for the industrial activity in SW France and North of Spain.

- 15 Mtons of CO₂ in the area of influence of Pycasso.
- Possibility of use the industrial basin of Lacq for valorization options.
- Sustainable and secure potential of subsurface storage in depleted gas fields.
- Strong alignment between local and national administration, social stakeholders, emitters and potential operators.

Pycasso Project is included in the French ZIBAC initiative (Zone Industriel bas en Carbone) with a 2030 horizon.

Pycasso is referenced in the recently published CCUS French Strategy (June 2023) and has been included in the preliminary list of PCIs of the European Commission. Final evaluation of projects is due at the end of October.
**Indonesia – South Sumatra CCS Hub**

**Phase 1-2 Highlights**

- **CCS Regulation** recently approved (March 2023) recognize CCS activities as cost recovery item.
- **POD including CCS in Sakakemang** has been submitted to regulator (SKK Migas) in August 2023.
- **Phase 1 - Stand Alone facility** (~0.5 Mtpa in a total of 12 years). First Injection expected 4Q2027/1Q2028.
- Potential storage upside to expand the project to Corridor depleted fields (additional storage capacity in Gelam and Dayung). **Phase 2**.
- Available emissions from oil and gas operations in the area could add up to 2 Mtpa.

**Phase 2-3 Highlights**

- Large Scale CO₂ storage capacity add up to 500 Mtons in unconfined saline aquifers.
- **Repsol’s footprint** in the area captures most of the identified CO₂ storage capacity.
- Excellent location with direct access to main pipeline infrastructure and close proximity to shore (<40 km) for a future CO₂ maritime terminal if needed.
- Available emissions from coal-power plants and other industries in the area could add up to 6 Mtpa.
- Possible future development into regional hub to capture emissions from Local Industry (Phase 2) and international sources (Phase 3).
- Regulation on CCS for National and International Industry to be issued 4Q2023.
03. Geothermal Energy
Geothermal energy

Subsurface continuous and renewable source of energy

Geothermal Highlights

- #1 renewable energy (RE) baseload power for the future: once developed, geothermal supplies electricity 24/7, similar to nuclear and with negligible footprint.

- US Dept of Energy estimates by 2050, Geothermal would account for 8.5% (57% of Baseload RE) of the US power generation. 20X increase

- Renewable: Considered renewable energy because earth heat is unlimited, however some of the current producers liberate considerable amounts of associated CO₂.

- Exploration Risk: geothermal projects require significant investment upfront and are subject to the geological risk of finding very high flows of hot fluids.

- Technology: Binary Cycle power plants, Enhanced Geothermal Systems and Closed Loops, have the potential to expand the activity beyond volcanic geographies. Lithium extraction from fluids is an additional upside.

United States:
According to DOE forecast, Geothermal power could provide about 57% of the baseload RE generation portfolio by 2050 (or 20.4% of all RE generation).
Canary Islands Emissions: Currently most electricity (85%) is derived from fossil fuels, emitting 5 Mtpa of CO₂.

Renewable energy: Solar and wind potential are limited by space and tourism considerations.

Electricity Generation Price: Historically high because of isolated and over-dimensionalized conventional thermal plants system.

Licenses: 3 exploration licenses awarded to Repsol (Lisa, Isora and Tajao), Evaluation licenses under ongoing Bidding Process in Tenerife, Gran Canaria and La Palma.

Activity: Magnetotelluric Survey completed in Gran Canaria (175 stations), Shallow wells and geophysics programmed for 2023/24, followed by a deep geothermal well in 2025.

Aspiration: to generate electricity from a first modular plant of 30 MW by 2029. Total project CAPEX ~300M$.
Geothermal: Eagle Ford – Technology development

**Strategy**

- Replace Oilfield electrical needs with geothermal energy to reduce Scope 2 emissions and take advantage of well synergies.
- South Texas is an optimal location due to regionally high heat flow overlying production and multiple geological targets for water.

**Projects**

1. Lower Wilcox Fm. (self – finance)
   - Temp: <=300F
   - Use traditional O&G practices and hydrothermal resource exploitation
   - 1st test in June to verify commerciality

2. Edwards Fm. (Gov. Funds - FOA)
   - Temp: >350F
   - Hot Tight Rock (EGS techniques)
   - Re-Purposing Wells
   - FOA application in June

3. Eagle Ford Fm. (self + Gov. Funds)
   - Temp: >300F
   - Hot Fractured Rock (EGS techniques)
   - Re-Purposing Wells and Fracture Network
04.

H₂ Storage
**H₂ Storage**

**Why H₂ storage?**

- **Green H₂:** the fuel of the future is also the lower mass and radius molecule, storage is challenging, subsurface space is a solution.

- **Salt mining:** halite represents the better seal for storage integrity and one of the easiest lithologies to mine through dissolution.

- **Location:** about 10-20% production of green hydrogen will have to be stored next to the transportation network due to intermittent generation.

- **Regulation:** no specific regulation yet in most countries, most likely similar to Natural Gas storage.

- **Technology:** proven technology used in mining as well as methane and oil storage for decades. H₂ fast cycling injection/withdrawal to be tested.

- **Market forecast:** Spain expected to have a 0.4-0.9 Mtpa H₂ storage need by 2040.

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**Some numbers as a reference**

<table>
<thead>
<tr>
<th>Net Capacity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Salt Cavern: <strong>3700 tons</strong></td>
</tr>
<tr>
<td>Average cylindrical tank: <strong>0.3 tons</strong></td>
</tr>
</tbody>
</table>

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**NASA Cape Cañaveral - 4,500 m³**

**Salt Caverns - 500,000 m³**

**Standard Cylinder - 90 m³**
THANK YOU
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