From oil&gas to a decarbonized energy portfolio: technology & economy

Financiación sostenible para los objetivos climáticos
Club Español de la Energía, 25 February 2020

Climate Change and Energy Transition

The challenge... (the Kaya identity)

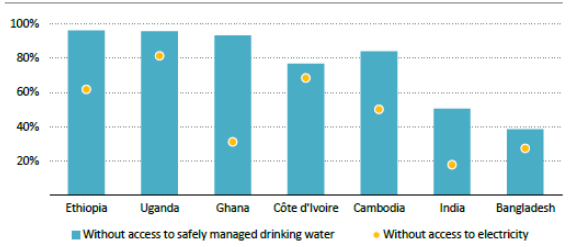
REPSOL

$$CO_2 \text{ emissions} = P \times \frac{GDP}{P} \times \frac{E}{GDP} \times \frac{CO_2}{E} - CO_2$$

Population	Development	Energy Intensity	Carbon Intensity	Carbon Capture
P	GDP / P	E / GDP	CO_2 / E	CO_2
Demography	Wellbeing	**Technology**	**Technology**	**Technology**

World population **of 7.6 billion** to reach **8.6 billion** in 2030, **9.8 billion** in 2050

Share of population without access to electricity or water in rural areas today

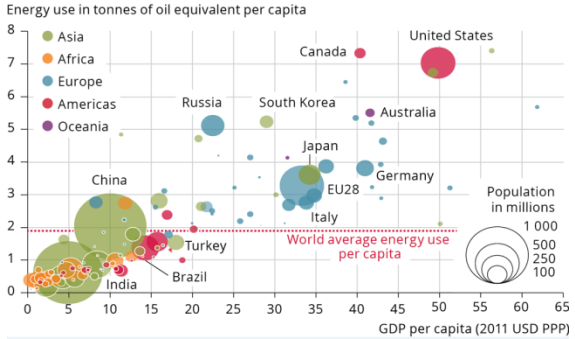


Almost two-thirds of those without access to clean drinking water in rural areas also lack access to electricity, opening opportunities to co-ordinate solutions

Source: IEA, WEO 2018

Socioeconomic progress needs energy

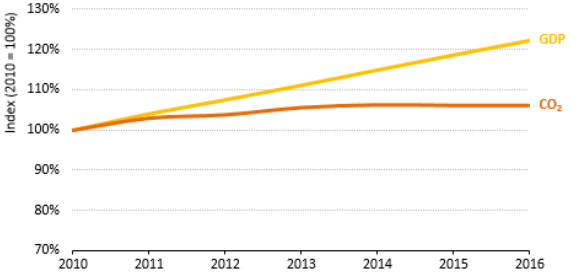
Per capita energy consumption



Source: European Environment Agency

Decoupling energy consumption from GHG emissions

Change in global economic output and energy-related CO_2

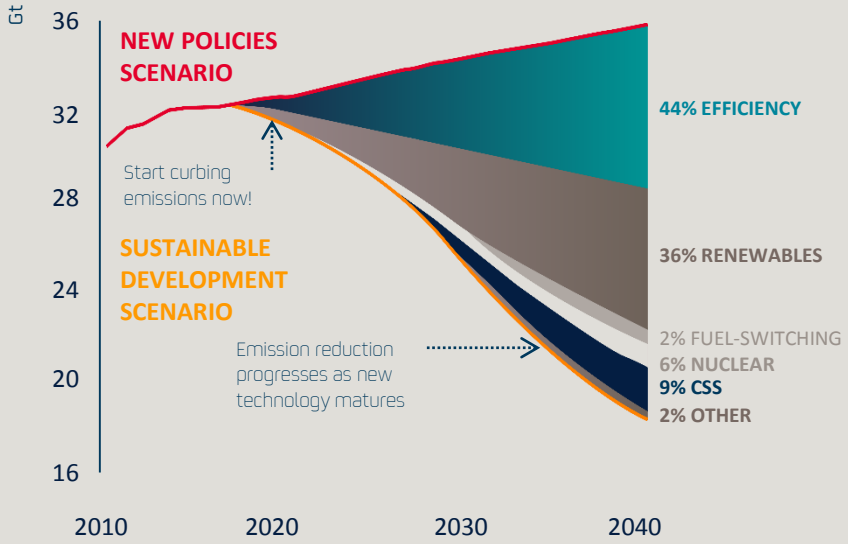


Source: IEA, WEO 2017

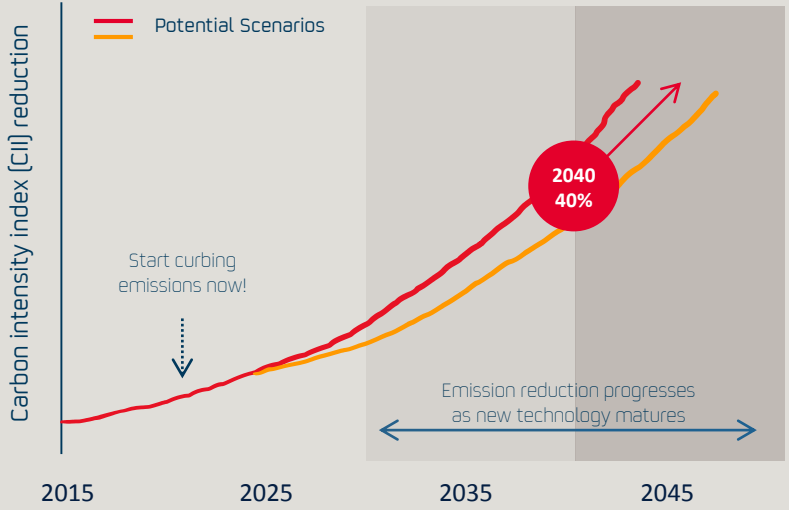
Carbon intensity reduction pathway

Paris-aligned Repsol's approach 2018

IEA Sustainable Development Pathway



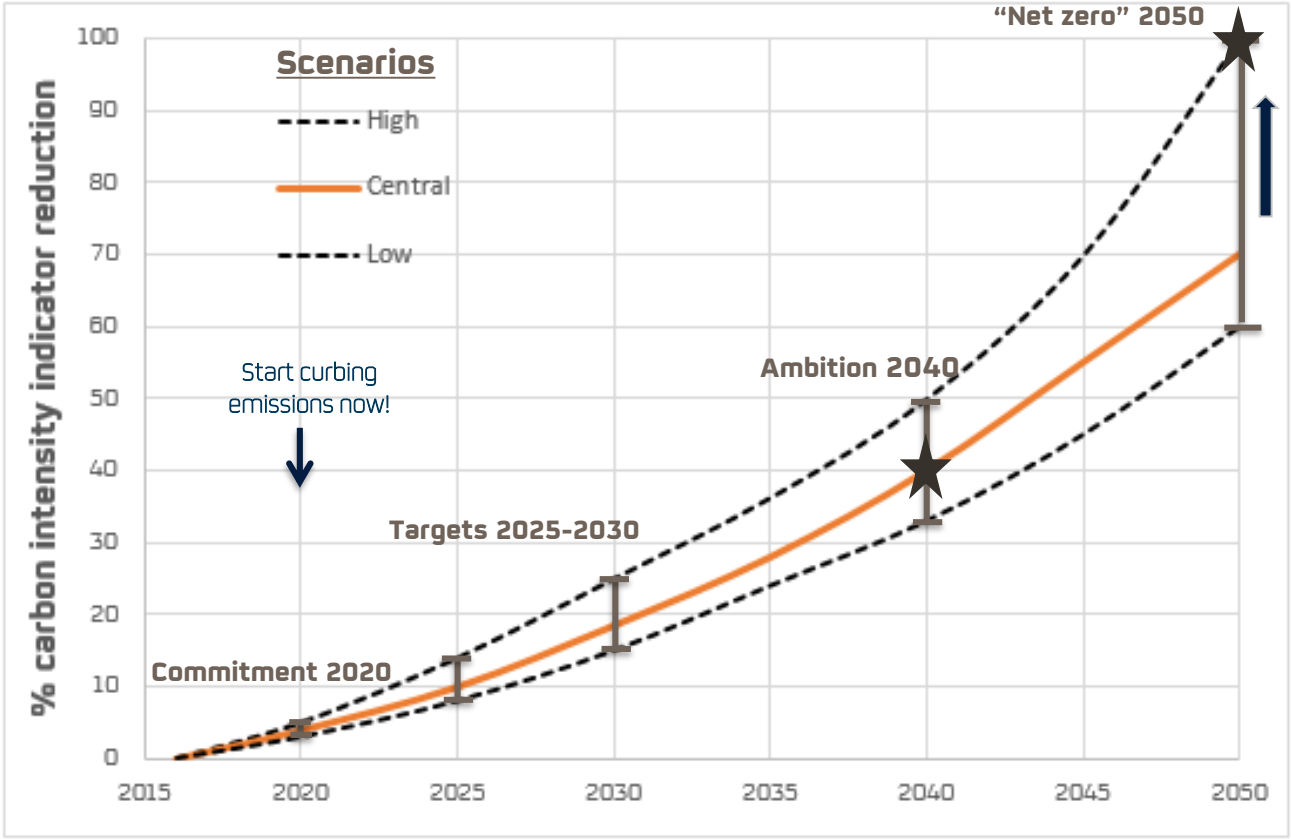
Repsol Decarbonization Pathway 2018



Ambitious long term-target in line with IEA SDS (40% 2040) with short-term commitment (3% 2020)

Carbon Intensity Indicator

One further step: Repsol decarbonization pathway 2019



Key technologies

Renewables and energy storage

POWER SUPPLY	TRANSMISSION & DISTRIBUTION	ACTIVE DEMAND
The rise of wind and solar generation enables a **renewable powered energy sector**, ensuring social, economical and ecological sustainability.	The **active system management of TSO-DSO-consumer bidirectional power flows** enables a reliable and efficient energy supply, underpinned by other energy carriers.	**Penetration of DERs** increase complexity in the demand-side, requiring **customer centric products** focused on client experience.

Distributed generation
Deployment of renewable DERs for electricity/heat supply.

Stationary energy storage
Provide full dispatching capabilities and enable the active management of DERs.

Low C generation
High renewable penetration capacity driven by the reduction of manufacturing costs of solar PV and wind power technologies.

Advanced mobility
Self-driving capabilities disrupt vehicle ownership model and turn intermodal mobility into a service.
Progressive electrification of road, air and marine transport (direct/indirect).

Demand response
Dynamic optimization of the energy consumption integrating automated market driven responses.

Smart home / building
Fully connected home enables complete monitoring and automation of lighting, safety/security, energy and HVAC systems.

Smart grids network
Dynamic grid management with a two-way digital communication.

Gas & H_2 distribution network
Increasing levels of renewable gases in gas grid reduces its carbon intensity and enables bulk energy storage. H_2 grids enable sector coupling and industry decarbonization.

Key technologies

CCUS, NET's and Nature-based Solutions

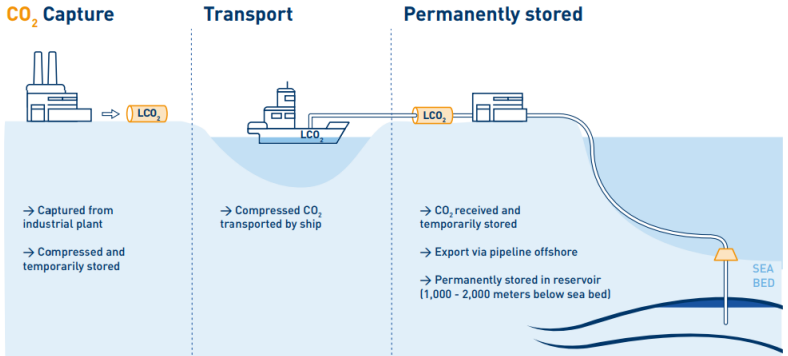
CCUS (Carbon Capture, Use and Storage) and NET (Negative Emission Technologies)

In the power sector, CCUS can decarbonize power generation from hydrocarbons, particularly from natural gas.

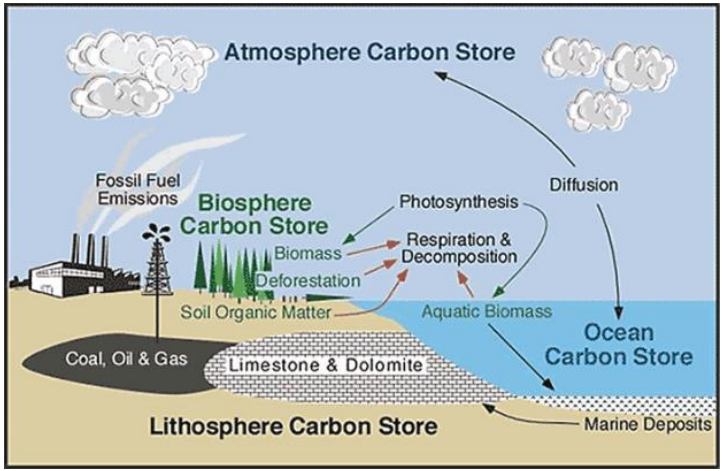
CCUS technologies offer a solution for emission reduction from **hard-to-abate industrial processes**, as cement, steel and petrochemicals.

In O&G operations, CO_2 separated from **natural gas production** can be reinjected in the field, instead of being vented to the atmosphere.

CCUS is a key element to deploy **negative emissions technologies (NET)**, such as bioenergy with CCUS, direct air capture with CO_2 storage or e-fuels (CO2 + green/blue hydrogen).



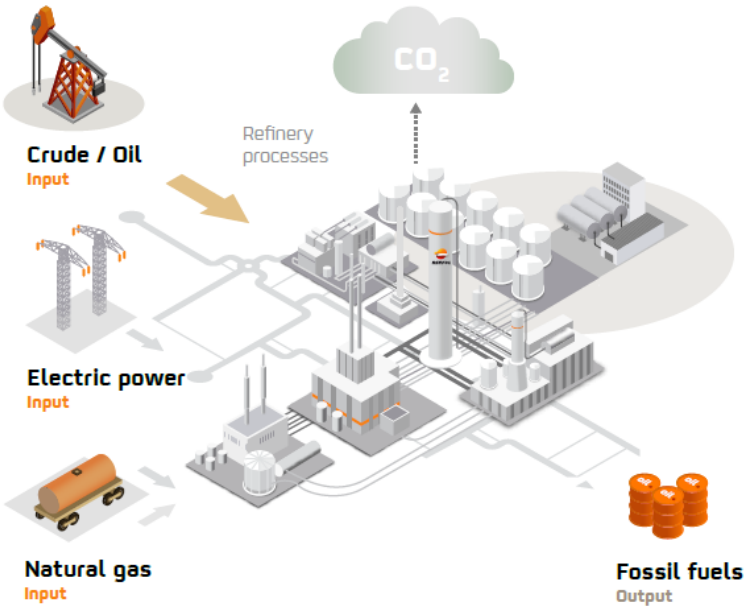
Nature-based Solutions

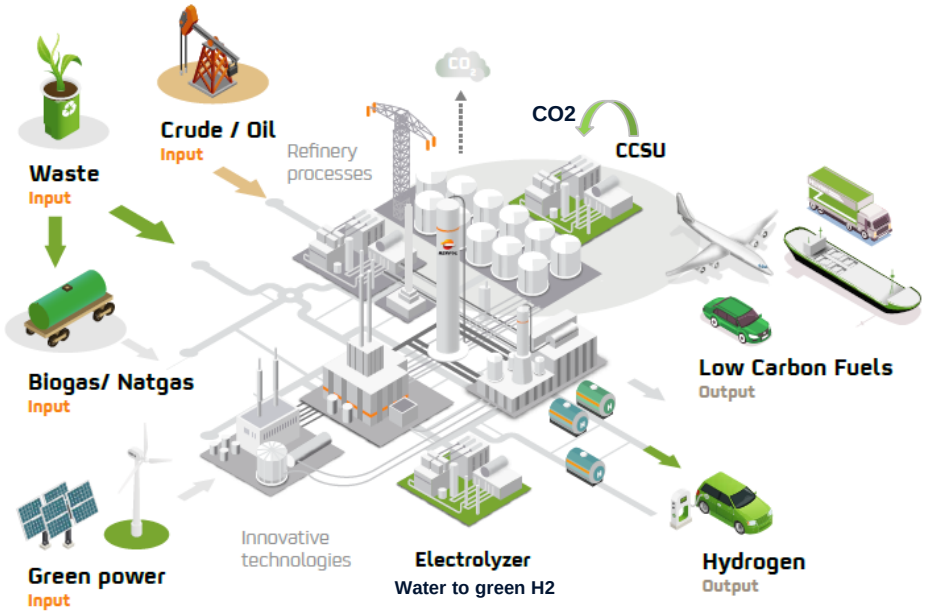


- Additionally, ecosystems (forests, soils, water) are natural sinks of CO2 that positive man action can reinforce.

Key technologies

Low carbon refineries and fuels





CURRENT → **FUTURE**

From current refinery processes...

...towards low carbon refineries

Climate Change and Energy Transition

Sustainable economy and financing

Principles for effective economic policies to address global challenges as climate change:

- Measures are introduced as soon as possible *(act now!)*
- Universal participation *(global governance)*
- Marginal cost - of reducing emissions - equal for all *(global price of carbon, technology neutral)*
- Increasing stringency over time *(time for technology maturation)*

(Summary from 2018 Economy Nobel Prize W. Nordhaus, "Climate change: the ultimate challenge for economics", *plus own interpretation*

- Financial community response to Climate Action driven by:
  - Assessment of climate-driven risks to companies
  - ESG responsibility and social pressure
- Transparent and harmonized disclosing of risks, targets, metrics (TCFD)
- Public and private approaches to qualify companies/sectors/activities for sustainable financing (benchmarks, metrics)

Sustainable finance: What principles to apply?

Inclusive and fit-for-purpose

Any initiative or project that make a **real contribution** to reducing GHG emissions, both short-term (start acting now!) and long-term (ambitious vision)

Technology neutral

All potentially promising technologies

Technology evolution and breakthroughs are **uncertain and not linear**

Protect competitiveness

Climate Change is a **global** issue, the EU to lead, not to decouple from global governance

Safeguard international competitiveness of **EU industries**