Repsol response to the public consultation on the EU Strategy for long-term GHG emission reductions

Annex I

Repsol, as an integrated energy company, is working to be an active part of the solution to climate change, driving plans to reduce the amount of power used in our operations, working to reduce greenhouse gas (GHG) emissions, and analyzing new energy solutions. In this sense, Repsol looks forward to the publication of the European Commission strategy on long-term EU greenhouse gas emissions reductions, in line with the Paris Agreement, and commits to its further development.

The present document underlines some recommendations we believe need to be taken into consideration at EU level in order to ensure a low carbon future, safeguarding the competitiveness of the European economy.

Repsol comments and recommendations

Repsol has reduced 4.5 Mt CO_2 annual run rate by 2017 starting in 2006, with a target of 5.2 Mt by 2020 and will continue raising its ambition in order to achieve long-term goals. It is hard to calculate the potential reductions of our sector up to 2050, as this will depend on several factors such as framework conditions. In this regard, we would like to highlight:

- It is important to establish **flexible mechanisms** to achieve the proposed objectives.
- **Innovation and technological development** are essential for ensuring reliable and sustainable energy supply in the long term. Technological development will significantly increase the options available and over time, will bring down the costs and ensure competitiveness.
- Adapting the European energy mix will require **significant investments**. As European industry members, we will need a competitive and investment-friendly environment.
- We see the switch from coal to gas as the most cost- effective solution in terms of cost for promoting a structured transition to a low-emissions future, especially in the field of power generation. This shall be complemented with a mix of options, such as energy efficiency, low carbon fuels (biofuels…), alternative feedstock, CCS-CCUS, renewables.
- The concept of **technological neutrality** must prevail to prevent hampering technologies that could be even more competitive if specific mandates were not established. It is only by doing so that an energy transition and reduction of emissions can be guaranteed at the lowest possible cost to society.
- Climate change should be tackled **taking into account all sectors** and its associated costs on the reduction of CO_2 tons.
- **Cross-sectorial R&D programmes** shall be incentivized for all technologies with long-term reduction potential.
- We see **global carbon pricing** as the policy framework that will create a level playing field and provide our businesses with a clear roadmap for future investments in low emissions projects.
- A close link between the long-term EU´s greenhouse gas emissions reductions strategy and EU´s **circular economy package** shall be promoted, in order to maximize potential synergies.

Table on mitigation options – reducing industrial greenhouse emissions

Annex II

Industrial Sector	Technology option	Mitigation potential	Economic viability	Technology readiness	Year of large scale deployment
Refining	Low CAPEX energy efficiency investments (Continuous improvement: through implementation of a combination of measures and projects involving some capital expenditure. Examples include fouling mitigation, catalyst improvements and hardware improvements such as new motors, heat-exchangers, etc.)	20% (2050 CO2 emissions vs 2030 Reference Scenario)		TRL 6-8.	Progressive uptake from now until 2040
	High CAPEX energy efficiency investments (Major capital projects: Larger efficiency improvements reflecting changes to the technical configuration of individual refineries (e.g. extensive revamps of existing facilities, new process plants)		The capex required to implement these technologies into the 2030 Reference Scenario (Oil & CCS case) has been preliminary estimated at minimum 45,000 M€ for the whole EU refining system (profitable projects across the whole EU refining system).	TRL 3-8	By 2040
	Integration of processes (Inter-unit heat integration)			TRL 6-8	Progressive uptake from now until 2040
	Energy Management Systems combining equipment (e.g. energy measurement and control systems) with strategic planning, organization and culture.		This estimated cost only refers to the generic cost of the different technologies and opportunities identified. The actual cost of implementation would be determined by the specific conditions of each individual asset.	TRL 6-8	Progressive uptake from now until 2040

	Heat recovery technologies (Increased recovery of refinery low-grade heat for export and electricity production)			TRL 3-6	2025-2030
	Recovery of lower CO2 fuels (Improved recovery of Hydrogen and LPG from fuel gas)	25%		TRL 4-8	By 2040
	Higher levels of electrification of machinery, general operations (increased use of imported low-carbon electricity: Use of electricity for general operations a/o rotating machines)	Notes.		TRL 8	As grid becomes decarbonized. Progressive uptake from now until 2050
	Use of electric heaters (Increased use of imported low-carbon electricity: Substitution of fired heaters/boilers by electric heaters)	1. 2050 CO2 emissions vs 2030 Reference Scenario		TRL 4-8	As grid becomes decarbonized. Progressive uptake from now until 2050

	Production of hydrogen (Increased use of imported low-carbon electricity: Production of hydrogen with electrolysers using imported renewable electricity.)	2. It assumes that Energy Efficiency measures (above) are exercised		TRL 4-6	As grid becomes decarbonized. Progressive uptake from now until 2050
	Carbon Capture: Capture of a portion of the total CO2 emitted by refineries.The potential role of a CCS scheme together with steam reforming plants (SMR) to produce a low-carbon intensity Hydrogen is explicitly explored.	25% Notes. 1. 2050 CO2 emissions vs 2030 Reference Scenario 2. It assumes that all previous opportunities (described above) are exercised)		TRL 6-7	Major deployment in the 2030-2050 timeframe
	Low carbon feedstocks (Progressive integration of sustainable bio-feedstocks, power-to-fuels and bio-blendstocks into the refinery. Negative emissions could potentially be achieved when combined with CCS.)	Depending on pathways considered the abatement potential (Direct emissions) could be higher than 70% (Direct + Indirect CO2 emissions) for maximum estimated uptake.	he preliminary capex estimate varies depending on the combination of different low carbon feedstocks (availability) and technologies considered (different pathways chosen by individual refineries). This capex assumes the co-processing or co-location of new conversion technologies within or close to the refinery, maximizing the synergies and utilization of the existing refining units. As a first estimate based on Concawe's preliminary modelling work (potential future demand) complemented with external references, the CAPEX required is about 600,000 M€ for maximum uptake.	TRL 3-7	2020 +
Chemical	Energy efficiency (catalysts, best	Medium to	Relatively high depending	6-9 (TBC)	Ongoing

industry	practice technologies, advanced heat integration, process intensifying equipment)	low. For 6 most emitting chemical building blocks: up to 8.5 Mt CO_2 annually in 2050 (Dechema-Ambitious scenario)	on level of advancement of the technology		
	Direct and indirect use of electricity in chemical processes (incl. electrochemical conversion of CO_2 into CO)	High/Medium For electricity based steam and steam recompression (indirect use): 22.6Mt CO_2 annually in 2050 (Dechema)	Depends on electricity price versus fossil energy price, as well as availability and reliability of supply.	5-6 (TBC)	In the 2030s-2040s
	Waste-to-chemicals (including chemical recycling of plastics)	Low to Medium		3 to 6 (TBC)	
		example: 1.36 t CO_2 avoided /t of 'green' methanol (Enerkem consortium in Rotterdam)	Depends on efficiency/cost of waste separation and preparation (quality) of the respective feedstock streams		In the 2020s-30s
		Potential around 10Mt CO2 annually	Also depends on prices of other valorization processes		
		Approx 11 Mt/yr go to energetic recovery (incineration). Assuming chemical recycling to absorb 50 % a max. reduction of 18 Mt CO2 could be possible. Further estimating			

		sorting, transport and energy required for chemical recycling to reduce the 18 Mt by about 1/3 the potential would be 10 – 12 Mt CO2 reduction per year.			
	CO_2 and CO as feedstock (combined or not with hydrogen)	High/Medium	Low	1 to 8 (TBC)	For methanol and olefins, will strongly depend on framework conditions
		examples:	Today, only economically viable for a limited range of products Depends on availability of clean hydrogen.		
		1.52t CO_2 avoided /t of methanol			
		1.89t CO_2 avoided /t of olefin			
		30Mt CO_2 avoided in 2050			
		Dechema Ambitious scenario)			
		For polyols: -20% compared to conventional products			
	Biomass as feedstock	High/Medium especially for local/regional uses	Today, economically viable for a limited range of products	3 to 9 (TBC)	Ongoing, but low amounts
		Limited by availability of biomass	Accelerated upscaling, financial de-risking measures will be needed for biomass us as feedstock to expand		
	Digital technologies in support of the above technologies from process design to production	Medium	Depends on type and scale of technology	5 to 9 (TBC)	Ongoing
	Fossil fuel based low carbon production processes	High	Depends on a global carbon price		In the 2030s

	Renewable or low carbon hydrogen	High/medium depending on the technology: 1) Electrochemical: it will depend on the electricity mix 2) Photoelectrochemical: up to 92 % CO_2 emission reduction since no external input of electricity is needed, only direct use of sunlight	Depends on type and scale of technology	1 to 7	In the late 2020’s