REPSOL CHALLENGES FOR RED EMPRENDIA

A. Exploration and Production of Oil & Gas

The evolution of global energy markets over the coming decades includes the continuing persistent rise in demand for energy services from a growing world population and economy. The share of fossil fuels in the overall primary fuel mix, remain dominant in 2040. Given the current O&G challenges[1] and the high oil price volatility, it is imperative to investigate new technologies to minimize time, cost and environmental impact for the E&P.

1. **New technologies for fluid recovery in porous systems**
   - New concepts to modify wettability of porous systems (*Enhanced Oil Recovery*)
   - Novel biotechnologies to improve fluid recovery in porous systems
   - New frontier technologies for increasing oil production in mature plays
   - New concepts for fluid recovery in harsh and remote places:
     - Sub-sea factory in deep water (*including power generation and storage*), robotics, new materials,..

2. **Micro/nano autonomous sensors to monitor physicochemical properties in remote and harsh places**
   - Autonomous sensors for on-line measurement of physicochemical properties of multi-phase fluids in porous systems and harsh conditions (HPHT- High pressure and temperature)
   - Energy harvesting technologies and wireless communication techniques for sensors autonomy

3. **Disruptive geophysical technologies for enhanced subsurface information**
   - New routes for improving seismic images in multiple earth layers
   - Cross-industry imaging technologies
   - New avenues for indirect fluid detection (*i.e. Oil and Gas*)

B. New systems for power generation and storage

The power sector is undergoing a fundamental transformation, shifting from large centralized generation assets toward an increasingly decentralized electrical grid that makes use of distributed energy resources. The growth of distributed generation is being accelerated by increased financial viability because of lower prices to produce, store and install distributed generation.

4. **New technologies in distributed power generation and storage to disrupt the "status-quo"**
   - Cutting-edge technologies for shifting from large centralized energy generation to distributed energy resources
   - Disruptive technologies to re-imagine how to generate, store, and consume energy in the coming years.
   - Confluence of new distributed frontier technologies for power generation and residential-scale storage (*i.e. battery pack prices lower than $150/kWh*)

[1] *More exhausted conventional reservoirs; Production in remote and frontiers plays; More viscous crude oil; Unconventional reservoirs with low porosity and permeability, ..*

In addition to the traditional knowledge areas for energy companies, we invite experts in trans-disciplinary and enabling[2] technologies to propose innovative solutions to the mentioned challenges, from different perspectives;

- *Nanotechnology*
- *Advanced Materials with disruptive properties*
- *Biotechnology for O&G*
- *Photonics*
- *Sensors*
- *Robotics*
- *Super-conductivity*
- *Wireless energy transmission*
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This list is not exhaustive, and we are open to consider proposals that arise from new approaches or new science and technology fields.

[2] Wikipedia: "*An enabling technology is an invention or innovation that can be applied **to drive radical change** in the capabilities of a user or culture. Enabling technologies are characterized by rapid development of subsequent derivative technologies, often in diverse fields*".