

CIVIL AND ENVIRONMENTAL ENGINEERING

PNRR - Biological methane production from hydrogen and carbon dioxide

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Context of the research activity	<p>Biological methane production may be in situ or ex situ. In situ includes the introduction of H₂ into a biogas reactor, to be combined with the innate CO₂, produced by the anaerobic metabolizer, to finally be converted into methane under the action of methanogenic bacteria. The ex-situ biogas upgrade method is based on CO₂ supply from an extrinsic source, along with H₂ in an anaerobic vessel initially accommodating pure or enriched hydrogenotrophic organisms, leading to their transformation into methane.</p> <p>PNRR M4C2, Investimento 1.3 - Avviso n. 341 del 15/03/2022 - PE0000021 Network 4 Energy Sustainable Transition (NEST) - CUP E13C22001890001</p>
Objectives	<p>The research concerns conventional power generation methods currently used on oil and gas platforms, thus proposing plausible alternative methods to exploit renewable energy sources in the environment surrounding the platform such as solar, wind and/or wave. Later, as renewable energy is often attributed to excess energy production, this surplus in energy can be used to produce hydrogen by hydrolysis, which may be either used as a source of energy to power some already existing gas turbines, or even be implemented for methane production along with CO₂ affluent often produced with the gas stream. The methane produced can increase the production rates of the platform, while using renewable energy for the process and reducing the platforms emissions and operation costs with respect to the quantity of gas produced. This possible surplus in energy will be analyzed in order to build up a model able to predict in time the possible energy excess. Laboratory tests will be performed in order to single out the best ex situ biological methanation conditions according to the energy availability in platform. This research covers transition of oil and gas energy production towards renewable energy sources, and methods to exploit them.</p>
Skills and	

**competencies
for the
development of
the activity**

Renewable energies, biological processes, environmental engineering